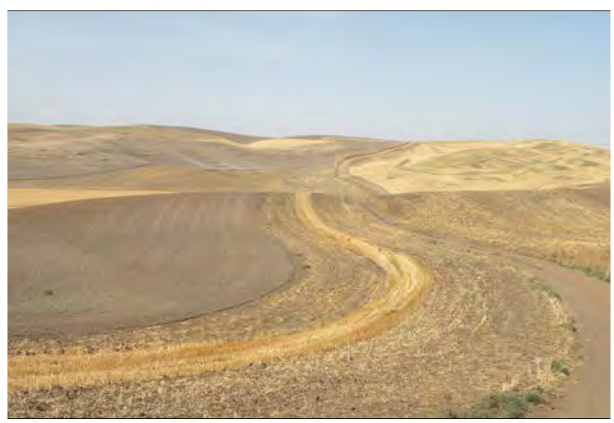
U.S. Army Corps of Engineers
Walla Walla District

Lower Snake River Programmatic Sediment Management Plan, Final Environmental Impact Statement

Record of Decision

November 2014



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Lower Snake River Programmatic Sediment Management Plan and Environmental Impact Statement

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NORTHWESTERN DIVISION
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RECORD OF DECISION
LOWER SNAKE RIVER PROGRAMMATIC SEDIMENT MANAGEMENT PLAN AND ENVIRONMENTAL IMPACT STATEMENT

DECISION

This Record of Decision (ROD) documents my decision and rationale for the formal adoption of the PSMP alternative, Alternative 7 – Comprehensive (Full System and Sediment Management Measures as described in Section 2.2.5.7 and Appendix A of the FEIS) for managing sediment within the lower Snake River system that interferes with the existing authorized project purposes of the lower Snake River Projects (LSRP). I have reviewed the Lower Snake River Programmatic Sediment Management Plan (PSMP) and Final Environmental Impact Statement (FEIS) for managing sediment within the lower Snake River system to meet the authorized project purposes that are affected by sediment deposition. I have also reviewed all correspondence and comments on the Draft and Final PSMP EIS from other agencies, Native American Tribes, non-governmental organizations, the general public, and an Independent Technical Review Panel; the 2014 Biological Opinions for the Programmatic Sediment Management Plan from the National Marine Fisheries Service and the U.S Fish and Wildlife Service; and all other pertinent documents for this project.

I find the selected alternative in the PSMP EIS technically feasible, environmentally justified, cost effective, and in accordance with the environmental statues and the public interest.

SELECTED ALTERNATIVE

The selected alternative (Alternative 7) is the comprehensive alternative and provides a broad range of dredging, system management, and structural management measures for the Corps to use to address sediments that interfere with the existing authorized project purposes of the LSRP. The selected alternative also provides a programmatic framework to evaluate and implement actions relying on these sediment management measures. The adoption of Alternative 7 as the PSMP alternative provides the framework for the Corps to identify sediment accumulation and forecast future problem areas and sediment management solutions. In sum, the PSMP identifies a wide range of measure to accomplish the purpose of maintaining the LSRP and proves a decision-making process to manage and, if possible, prevent sediment accumulation that interferes with existing authorized project purposes. While the PSMP itself provides the framework, site-specific implementation of any future measure requires any necessary evaluation under the National Environmental Policy Act (NEPA), tiered from this programmatic PSMP EIS, environmental coordination under applicable laws, and in some cases, may require additional studies and congressional authorization.

Consistent with the PSMP, the Corps also evaluated implementing a current immediate need action to address sediment accumulation that is currently interfering with authorized purposes of the LSRP. Relying on the information in the EIS, this separate action is being considered in a separate Record of Decision.

ALTERNATIVES AND CONSIDERATIONS BALANCED IN MAKING THE DECISION

The PSMP framework is intended to address problem sediment accumulation throughout the LSRP by embracing a comprehensive approach to long-term sediment management solutions while still leaving the Corps with the ability to address immediate needs, should they arise. Alternatives were developed through several iterative processes described in Section 2.2of the FEIS relying on information from investigations of sediment sources, expertise from other agencies, input from lower Snake River sediment management working group (LSMG), formal scoping process for this EIS, and tribal, non-governmental organizations and public meetings and workshops in the communities. Section 1.6.2.2 and 1.6.2.3 of the FEIS summarizes the conclusions of extensive research conducted since 2005 to understand sediment sources, transport, and yield within the watershed, as well as potential climate (fire) influences to sediment loading. A robust scoping process, a series of meetings with interested parties, knowledge gained from Corps and Corps-sponsored studies and reliance on the best available scientific information allowed for a complete and refined list of measures and the development of a wide-range of alternatives for the plan. A preliminary list of those measures that may address sediment accumulation in the lower Snake River were narrowed to measures that could meet the purpose and need. These measures were then combined into a range of alternatives and presented with analysis in the draft EIS.

Preliminary alternatives that were eliminated from further consideration included expansion on the upland sediment reduction measures, non-structural measures to manage the reservoir system differently or remove or reconfigure facilities, structural sediment management measures that trap sediments or change river hydrology to pass sediments, and an alternative that combines features of system management measures and sediment management measures that pass sediments through the system or trap sediments.

These alternatives were screened from further consideration based on whether or not the alternative would meet the purpose and need. For the purpose of immediate needs for navigation (such as the conditions prompting the Current Immediate Need action), only dredging and dredged material management was determined to be feasible and effective. Thus, any alternatives not containing the option of using the dredging and dredge material management measure were not carried forward. The Corps also considered other measures in combination with dredging (e.g., drawdown), but the combined use of such measures was either impractical (e.g., planning timeframe) or of negligible benefit (e.g., agitation) for an immediate need action. [1] Similar impracticalities exist for the Structural Sediment Management Measures such as agitation to resuspend, and other System Management Measures such as reconfiguring or relocating affected facilities—used either independently or in combination with other measures. Remaining measures, such as Upland Sediment Reduction Measures or insertion of Bendway weirs are plainly ineffective for immediate needs brought about by existing accumulation.

Collectively, many of the measures that made up the alternatives were seen as potentially being effective and retained as measures in Alternative 7, where they could be evaluated for site specific application in the adopted PSMP.

In addition to the No Action Alternative (Alternative 1), the PSMP/EIS evaluates two sediment management alternatives that could address future sediment accumulation interefering with the congressionally authorized purposes of the LSRP, Alternatives 5 and 7. Alternative 5, Dredging-Based Sediment Management represents a continuation of the Corps' historical practices of using dredging as the primary tool for managing sediment. Alternative 7 is the selected, Comprehensive Alternative.

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[1] During development of the PSMP, the Corps considered a wide range of measures for addressing an immediate need for sediment accumulation interfering with navigation. The Corps identified dredging as the only measure available to effectively address an immediate (short-term) need to reestablish the federal navigation channel to congressionally authorized dimensions.[1] Dredging was, therefore, the only measure (in addition to interim operational management of the reservoir levels) incorporated into the PSMP to address an immediate need for navigation. Regarding Reservoir Drawdown to Flush Sediment (Drawdown), flow would be temporarily modified to increase the capacity of the river system to scour and carry sediment, thereby flushing deposited sediments downstream. Drawdowns of the pool elevation by 10 to 15 feet during a 30- to 45-day period [late April-June] would be conducted in an effort to flush sediments from the navigation channel and selected Port berthing areas. Lower Granite Reservoir is the only LSRP reservoir in which this measure would be effective. The FEIS further described this measure as requiring "adequate high-flow prediction and modeling to allow the Corps to conduct drawdown operations in a timely manner for this measure to function effectively . . . .[and] sufficient lead time to plan, design, and implement modifications to infrastructure." The 1992 drawdown test caused significant damage to shoreline facilities. As a result, drawdown would not fully address accumulated sediment that is already interfering with existing authorized project purposes. Drawdown is a partial solution and a potential future forecast need measure only, given the required planning lead time, necessary infrastructure precautions, need for adequate spring snowpack/runoff, and one (1) year minimum timeframe to accomplish the navigation maintenance when combined with winter dredging. Additionally, combining a drawdown with dredging would likely involve increased adverse environmental effects versus effects from dredging alone. Therefore, drawdown was not chosen as a measure to address the immediate needs for navigation in the PSMP.

The No Action Alternative provides the baseline condition for the comparison of alternatives that were determined to be effective at meeting the stated purpose and need in the FEIS. For the no action alternative, the Corps would monitor conditions in the lower Snake River and use operational management of the reservoir levels,[2] (consistent with applicable biological opinion and other requirements) to provide a 14-foot water depth in the navigation channel depth and, to the extent possible, provide for other existing authorized purposes. A constraint of the no action alternative is that the Corps can raise reservoir levels only to the maximum operating pool (MOP) elevation for each reservoir, thereby limiting this alternative's effectiveness over time as sediment continues to accrue and drive up reservoir levels. This scenario does not allow for long-term successful operation of the LSRP for existing authorized project purposes. The No Action Alternative would also require the Corps to continue to operate the Lower Granite Pool above MOP. The Corps has a responsibility to operate at MOP during juvenile Chinook outmigration under NOAA's Federal Columbia River Power System Supplemental (FCRPS) Biological Opinion (BiOp) 2014.[3] The no action alternative would not satisfy the stated purpose and need in the FEIS, but was carried forward as a baseline to compare other alternatives.

Alternatives 5 and 7 both included the operational reservoir management measure currently implemented in the No Action Alternative as a measure for maintaining existing authorized purposes of the LSRP, but Alternative 5 would address future sediment accumulation problems through dredging and dredged material management measures. The Corps would monitor sedimentation, and either in anticipation of or in response to accumulation that interferes with existing authorized purposes, the Corps would initiate planning, environmental compliance and implementation of dredging and dredged material management. Alternative 5 would be effective in dealing with reoccurring sediment accumulation problems and can incorporate proactive maintenance. In comparison to Alternative 7, however, it falls short in providing a broad array of measures to draw upon for implementation. Drawing upon a mix of measures, as presented in Alternative 7, was determined to be environmentally preferable. Therefore, Alternative 5 was not the selected plan.

The selected plan, Alternative 7, provides a suite of all effective dredging, system management, and structural sediment management measures that the Corps could implement to address sediment accumulation interfering with the authorized purposes within the lower Snake River. Selection of Alternative 7 includes adoption of the PSMP which has identified the effective

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[2] Referred to in the FEIS and PSMP as the Navigation Objective Reservoir Operation (NORO) measure.

[3] The NOAA Fisheries 2008 Federal Columbia River Power System Biological Opinion Reasonable and Prudent Alternative (RPA) called for the Corps to operate the lower Snake River reservoirs at Minimum Operating Pool, with a one-foot operating range during the juvenile salmon outmigration (from April 3 until approximately September 1), unless adjusted to meet authorized project purposes, primarily navigation. (see RPA Action 5). The subsequent 2010 and 2014 Supplemental FCRPS Biological Opinions continued to include this action.

measures, a monitoring protocol applying currently gathered data points, and triggers, to govern decision-making and initiate further action based on a site specific problem identified through monitoring and adaptive management processes. Management measures included in Alternative 7 include the Navigation objective reservoir measure (adjusting the pool levels to meet authorized project purposes), dredging the navigation channel and other associated areas to achieve congressionally authorized depths or dredging to improve conveyance capacity, in-water or uplands disposal of dredged material, beneficial placement of dredged material, reservoir drawdown to flush sediments, reconfiguring or relocating facilities, raising Lewiston levees, placing bendway weirs, dikes and dike fields in the river; agitating sediments, and trapping upstream sediment in reservoir. Using long term monitoring, the PSMP will allow the Corps to predict areas that could be significantly impacted by sediment accumulation and using triggers, initiate a NEPA analyses to apply site specific measures proactively to avoid accumulation, and when additional measures are available and feasible. In addition, under the PSMP, the Corps will continue regional coordination with the LSMG as a tool for exploring potential sediment reduction measures in the future.[4] By selecting Alternative 7, the Corps is also able to track and anticipate trends due to climate variability, and by maintaining a robust list of management measures, address changes in hydrology and sediment accumulation through time. For these reasons, Alternative 7 is the selected plan.

Alternative 7 is the environmentally preferred alternative. It provides the widest range of measures to meet site specific needs, and has the potential to do so in an environmentally focused manner. Adoption of the PSMP itself does not have any negative impacts to environmental resources, but allows for long term planning of sediment management that could identify holistic solutions that require less interference with natural processes, or utilization of natural process, to resolve accumulation in areas that interfere in the maintenance of authorized projects and their ability to meet project purposes. Alternative 7 allows the Corps to take steps towards reducing sediment accumulation in a proactive manner. It allows for meeting MOP conditions consistent with the NOAA 2014 FCRPS BiOp that are not available with the No Action Alternative. Alternative 7 meets the purpose and need for the federal action.

MEANS TO AVOID AND MINIMIZE ADVERSE EFFECTS

The PSMP has broadly anticipated and addressed the potential of adverse impacts associated with implementation of any future measure within the framework of the PSMP. The adoption of the PSMP itself is not anticipated to have a negative effect, and in fact, the management plan is intended to be used as a framework to identify long term solutions for proactively addressing sediment problems. To ensure adverse impacts are avoided or minimized, once a potential

[4] Table 2-4 of the FEIS mistakenly omitted Local Sediment Management Group (LSMG) Coordination Meetings as one of the measures included in Alternative 7

sediment problem is identified through monitoring and a need for an action is triggered by the PSMP framework, the proposed site-specific action would be evaluated based on effectiveness of a measure and environmental effects. Additionally, any action would be coordinated and reviewed through the NEPA process and other processes of environmental regulations, as necessary, to identify and adopt any measures as appropriate to reduce or avoid impacts. All practical means to avoid or minimize adverse environmental effects have been incorporated into the selected plan. The Corps' compliance with NMFS and FWS biological opinions (BiOp's) are discussed below including terms and conditions to minimize impacts to listed species.

SIGNIFICANT PUBLIC/ AGENCY COMMENTS RAISED IN THE FINAL PSMP/EIS

There were many comments received on the Final EIS, a majority of which were duplications of comments received on the draft EIS, were considered and incorporated in the FEIS, or otherwise responses previously provided in Appendix G. New comments that raised significant or new issues were reviewed for consideration in making this decision and responses are provided. A portion of those new and significant comments are addressed below, and the remainder can be found in the attached Comment Response Document. While not a requirement under NEPA or the Corps implementing regulations for NEPA, for this action the Corps chose to provide additional information in the attached Comment Response Document responsive to each comment received on the FEIS, even if that was only to state where the comment was previously addressed in the FEIS.

There were comments that the PSMP is just a dredging plan. The Corps' response is PSMP is not a dredging plan; it is a management framework for addressing sediment accumulation problem area in the LSRP to meet authorized purposes. While dredging is one available management measure under the Plan, dredging is not the default measure for addressing any and all sediment problems. The PSMP requires the Corps to study long-term solutions for areas of reoccurring sediment accumulation (more than once in five years), which interfere with existing authorized project purposes of the LSRP (i.e., future forecast needs). Such studies will consider many long-term measures (individually or in combination) and ultimately identify the least cost, environmentally acceptable, technically feasible long-term alternative. Those potential management measures are described in depth in the FEIS (see, for example, Section 2.2.5.7) and laid out in the plan at Section 2.4. The Corps is aware of areas of reoccurring sediment problems (e.g., confluence of the Snake and Clearwater Rivers federal navigation channel and a few boat basins and irrigation intakes). The Corps will continue to monitor sediments problems in the LSRP as described in the plan, and conduct tier-off NEPA analysis and take actions as described in Section 3.3.4 of the PSMP, subject to availability of funds.

Another comment received stated that the 2005 settlement agreement mandates that the Corps cannot evaluate alternatives that include dredging-only measures (Alternative 5). The Settlement Agreement does not limit the Corps' ability to consider any alternative when developing the PSMP, including one based primarily on dredging, nor is it implied. The settlement agreement simply stated, "Defendant Corps of Engineers agrees that it will initiate and complete a NEPA analysis on a long-term plan for the management of sediment in the lower Snake River, to be designated the Programmatic Sediment Management Plan, ("PSMP')..." The PSMP was developed and included a broad range of measures, including dredging, that were determined to be effective in reducing accumulated sediments. Appendix A of the EIS is the PSMP, developed, in part, to address the settlement agreement. There is no requirement, legal or otherwise, outside of the commitment in the settlement agreement, that requires or directs the Corps to produce the PSMP or which alternative must be considered. The EIS documents the development of alternatives to address sediment accumulation that hinders maintenance of authorized projects and purposes on a regional scale, and then evaluated both the impacts of implementing the PSMP, as one alternative, as well as other alternatives that meet the purposes of the study. The settlement agreement directed the Corps to undertake a study, which has been completed; it is important to note that it did not dictate the solution or alternative measure that the Corps must adopt or limit the alternatives that the Corps may consider.

The EPA provided multiple comments to the FEIS regarding topics such as coordination, information sharing with other land management agencies and watershed groups, and taking proactive measures. The Corps' has committed to continue active participation in the Lower Snake Management Group and is actively participating in other regional sediment management groups within the watershed. They also provided comments on monitoring and adaptive management, to which the Corps is committed to monitoring as per terms and conditions of the Biological Opinions (BiOp's). There was also a question of how the Corps ensures it is selecting the least cost method (federal standard) for dredge material disposal. The 404(b)(1) guidelines (least cost, environmentally acceptable) are compatible with the Federal Standard (33 CFR 335.7), and for example, if two or more alternatives satisfy the 404(b)(1) guidelines and are technically feasible, the Corps is required by its regulations to select the least costly alternative.

There was an interpretation reflected in a comment that any immediate need action under the PSMP framework would automatically include a dredging measure. This is a misunderstanding of the commenter in how the framework would be used in decision making. In summary, ongoing monitoring identifies accumulation areas that have the potential to interfere with authorized project purposes. Accumulation areas may hit triggers identified in the PSMP framework, and if a trigger met, a team would initiate review and significance of the problem, site characteristics, and available effective measures for that site. The way the Corps responds to triggers will differ depending on what the authorized project purpose is, and the trigger level that was met. However, measure implemented shall be the least cost, technically feasible and environmentally acceptable in accordance with Corps regulations. Immediate need action decisions would follow the framework, and the selected measure could not be anticipated prior to full review of all measures to the site specific conditions and severity of accumulation.

The Corps received substantial public comment on the economic considerations applied in developing the PSMP FEIS. These comments urged the Corps to apply what is ultimately not an appropriate level of economic analysis for the development of an operations and maintenance action. The economic justification requirements in the Corps planning guidance for a new navigation project requiring authorization are significantly more rigorous but are not applicable in this maintenance situation. The decision to address the current immediate need is not a new navigation project that would call for this level of analysis, but rather operation and maintenance action taken to address sediment accumulation in the LSRP using a programmatic perspective. Because the LSRP are existing authorized Civil Works projects, the Corps planning guidance provides for the Corps to confirm that continued maintenance is warranted based on an evaluation of navigation indicators (ER 1105-2-100 paragraph E-15 h(3)(i)(1)) before preparation of dredged material maintenance plans (DMMPs). However, as stated in Section 1 of the FEIS, the PSMP is a unique O&M document and guidance concerning the development of DMMPS was applied in general when applicable. For example, the DMMP economic indicators generally reviewed in this analysis included consideration of the current tonnage and transportation savings that continue to demonstrate that continued maintenance is warranted. The current tonnage level estimates show that there continues to be a significant amount of tonnage using the Lower Snake River. For example, 3.3M tons transited the system in 2012. This was up approximately 500,000 tons from 2011. Also, the Corps Planning Center of Expertise for Inland Navigation estimates that movements on the LSRP save about $10.9 a ton versus moving by rail.[5]

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[5] Comments on the topic of economics also critiqued the numbers represented in the 2002 Lower Snake River Juvenile Salmon Migration Feasibility Study (LSRJSM). The 2002 LSRJSM Feasibility Report and the Transportation Analysis developed for that EIS is the most thorough, widely accepted analysis of the transportation benefits associated with the LSRP. The study team included representatives of various Federal and regional agencies, tribal representatives, and other interested parties. Further the analyses were reviewed by the Independent Economic Advisory Board. This independent group of expert economists evaluated the analysis and determined that the results were the "best available estimate" of the impacts and were of "a balanced professional quality". Nonetheless, it is true that the numbers in the study resulted in projections for the 2002-2012 time period that exceeds current tonnage numbers. Therefore, the Corps also looked to the current tonnage numbers and found the difference to be generally in line with trends in inland waterway traffic nationwide during the same time period. Current tonnage estimates show that there continues to be a significant amount of tonnage using the Lower Snake

COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

The Draft PSMP and EIS were released for public and agency review on December 21, 2012, with the comment period extended to March 26, 2013 at the request of members of the public. The Corps held two public information meetings on January 24, 2013following release of the draft. Concerns received through public and agency comments were addressed with detailed responses and included in Appendix G of the Final PSMP EIS. The Final PSMP and PSMP EIS were revised as appropriate in light of public and agency comments received. The Final PSMP EIS was released on August 22, 2014 for a 30-day public and agency review. NEPA analysis for implementation of the Immediate Need Action was included in the PSMP EIS. Coordination and appropriate consultation was conducted with Federal and State Agencies and Tribes on the preferred plan in the draft and FEIS.

Compliance with the Endangered Species Act was accomplished through ongoing consultation with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (FWS). Separate Biological Assessments (BA) for species under the purview of the NMFS and FWS were prepared and coordinated to assess project impacts of the programmatic plan. The PSMP Programmatic BA concluded PSMP actions may affect, is likely to adversely affect Snake River spring/summer (SRSS) Chinook, Snake River fall-run (SRFR) Chinook, Snake River (SR) sockey, Snake River Basin (SRB) steelhead, and bull trout. Additionally, the Corps determined the project will not appreciably diminish the conservation value of designated critical habitat for these species. The BA also concluded the action may affect, but is not likely to adversely affect Upper Columbia River (UCR) spring chinook, UCR steelhead, and Mid-Columbia River stealhead, and Washington ground squirrel, and there will be no effect to their designated critical habitat. The Services provided Biological Opinions (BiOps) on November 13 and 14, 2014, which are hereby adopted. Formal consultation was concluded with the consideration of the BiOps from each agency. The BiOps also included Reasonable and Prudent measures with terms and conditions, which the Corps intends to comply with; Conservation Recommendations as described within the BiOp will be considered.

The PSMP does not provide site-specific information about all potential future actions. Actions implemented under the PSMP that require CWA compliance will be carried out in accordance with the 404(b)(1) guidelines and submitted to the appropriate state agencies along with requests for section 401 certification. Following the PSMP framework, sites for future implementation of measures would need to conduct site specific analysis and coordination for NHPA compliance.

River - 3.3M tons in 2012. The projected tonnage from the LSRJFM Report for 2012 was 4.9M tons. As a result, both the current tonnage numbers and the analysis of the LSRJSM were applied in making this decision.

Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, and Executive Memorandum of April 29, 1994, Government-to-Government Relations with Native American Tribal Governments, require federal agencies to consult with tribal governments prior to developing regulatory policies that have tribal implications or taking actions that affect federally recognized tribal governments. Letters accompanying copies of the draft EIS went out to regional Tribal governments on December 13, 2012, and included an offer of government-to-government (G2G) consultation on the PSMP and current immediate need to reestablish the congressionally authorized navigation channel. The Corps received requests for technical staff consultation from the Nez Perce Tribe and the Confederated Tribes and Bands of the Yakama Nation. Technical staff meetings occurred in Lapwai, Idaho with the Nez Perce Tribe on February 15, 2013, and with the Confederated Tribes and Bands of the Yakama Nation on March 18, 2013. After the technical staff meeting the Nez Perce Tribe requested G2G consultation. That meeting occurred on April 5, 2013 with the Nez Perce Tribal Executive Committee in Lapwai, Idaho. The Nez Perce requested a second G2G meeting with the Corps' Walla Walla and Seattle Districts, that meeting occurred in Walla Walla, Washington on March 14, 2014. Following the release of the Final EIS the Nez Perce Tribe requested an additional technical staff meeting, which occurred in Walla Walla, WA on September 5, 2014. The Corps has satisfied its G2G consultation responsibilities under the EO/EM.

CONCLUSION

In the PSMP and PSMP EIS, the Corps has considered the purpose and need of the proposed action and has analyzed a reasonable range of alternatives that adequately address the objectives of the proposed action, and the extent to which the impacts of the action could be mitigated. The Corps has also considered public and agency comments received during the EIS review periods. In balancing the projected effects of the various alternatives presented in the EIS and the public interest, Alternative 7 is the selected plan. Alternative 7 reflects implementation of all reasonable, practicable means to avoid, minimize, or compensate for environmental harm from the action. All applicable laws, regulations, and local government plans were considered in evaluation of these alternatives. In Summary, I find that the selected plan represents the course of action, which on the balance, best serves the public interest. This Record of Decision completes the procedural requirements of the National Environmental Policy Act.

11/14/2014
Date

JOHN S. KEM
BG, Corps of Engineers
Commander Northwestern Division

Record of Decision
Implementation of Current Immediate Need Action
Lower Snake River Programmatic Sediment Management Plan and Environmental Impact Statement

DEPARTMENT OF THE ARMY
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RECORD OF DECISION
IMPLEMENTATION OF CURRENT IMMEDIATE NEED ACTION
LOWER SNAKE RIVER PROGRAMMATIC SEDIMENT MANAGEMENT PLAN AND ENVIRONMENTAL IMPACT STATEMENT

DECISION

This Record of Decision documents my decision regarding implementation of the Current Immediate Need Action to reestablish the federal navigation channel to congressionally authorized dimensions (14' deep and 250' wide), consistent with the Lower Snake River Programmatic Sediment Management Plan ("PSMP" or "plan") and evaluated in the Final Environmental Impact Statement ("FEIS" or "PSMP EIS"). I reviewed the PSMP, FEIS, all correspondence and comments on the Draft and Final PSMP EIS from other agencies, Native American Tribes, non-governmental organizations, the general public, and an Independent Technical Review Panel; the 2014 Biological Opinions for the Current Immediate Need Action from the National Marine Fisheries Service (NMFS) and the U.S Fish and Wildlife Service (FWS); and all other pertinent documents for this project. Based upon this review, and the review of my staff, I find the selected Current Immediate Need Action (maintenance dredging with in-water disposal at Knoxway Canyon to create shallow water habitat for juvenile salmonids) described in the PSMP EIS to be technically feasible, environmentally justified, cost effective, and in accordance with all statutory and regulatory requirements, the Corps' treaty and trust responsibilities to Native American Tribes, and the public interest. Therefore, I approve implementation of the selected action and its execution in the next available winter in-water work window.

SELECTED ACTION FOR CURRENT IMMEDIATE NEED

Concurrent with the greater PSMP study timeframe, existing and potentially worsening sediment accumulation conditions arose at the downstream navigation lock approach at Ice Harbor Dam and the confluence of the Snake and Clearwater rivers upstream. The accumulation called for immediate attention due to impediments to safe navigation, and in addition, addressing the accumulation is consistent with the Corps responsibilities under the Endangered Species Act for operation of the Federal Columbia River Power System[1]. In the interest of efficiency and in order to facilitate meaningful public involvement on our sediment management planning in that region, the Corps analyzed the potential for site-specific immediate action alongside the plan-level descriptions in the PSMP EIS. The use of a single FEIS to evaluate both the PSMP and the

[1]The NOAA Fisheries 2008 Federal Columbia River Power System Biological Opinion Reasonable and Prudent Alternative (RPA) called for the Corps to operate the lower Snake River reservoirs at Minimum Operating Pool, with a one-foot operating range during the juvenile salmon outmigration (from April 3 until approximately September 1), unless adjusted to meet authorized project purposes, primarily navigation. (see RPA Action 5). The subsequent 2010 and 2014 Supplemental FCRPS Biological Opinions continued to include this action.

Current Immediate Need Action was determined to be in line with CEQ guidance and regulations.[2]

The Corps relied on the development of the PSMP, including its evaluation of management measures, to identify the best site-specific effective solution to address the Current Immediate Need. It was only after the identification of PSMP alternatives to be evaluated in detail was complete that the Corps considered the effectiveness of the Alternatives in addressing the current immediate need. As described below, the result of that process was that dredging and disposal presented the only measure capable of meeting the purpose and need to re-establish the federal channel to congressionally authorized dimensions to address sediment accumulation that is currently interfering with commercial navigation. Other structural and management measures under the plan were determined to be ineffective or infeasible with respect to addressing the sediment that had already accumulated in the channel and that is presently impairing navigation. Even considering the determination in the plan, the Corps concludes independently for this action that none of the measures identified in the FEIS for addressing sediment impairing the navigation purpose would be effective to address the Current Immediate Need. The FEIS describes the rates of sedimentation and the utility of the measures to support this determination, as described further below.

The footprint for the Current Immediate Need Action is limited to relatively small and specific problem areas. The Current Immediate Need Action includes dredging the navigation channel at the downstream lock approach at Ice Harbor Dam and the Snake/Clearwater Rivers confluence at the upstream end of the Lower Granite Reservoir (approximately 422,000 to 500,000 cubic yards (cy)), to reestablish the federal navigation channel to the congressionally authorized dimensions (14 feet deep by 250 feet wide) when operating at minimum operating pool (MOP).

The disposal method for this action is to use the dredged material to create shallow-water habitat for juvenile salmonids at Knoxway Canyon (RM 116), in a reach of the river where such habitat is limited. The FEIS evaluated disposal alternatives for the Current Immediate Need Action by drawing upon the plan-level disposal measures and carrying them forward in site specific detail in the 404(b)(1) evaluation found at Appendix L.

The Corps' Seattle and Walla Walla Regulatory offices are reviewing permit applications under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act from the Ports of Lewiston and Clarkston for berthing area maintenance. The FEIS considered potential direct, indirect, and cumulative environmental effects associated with these related maintenance actions and the Corps (in accordance with applicable regulations) will prepare a separate decision document addressing the permit decisions. If the permits are issued, this berthing area maintenance is planned to be carried out in conjunction with the Corps' Current Immediate Need Action in accordance with all applicable laws and regulations, with the Ports' responsible for all their associated costs.

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[2] See CEQ's proposed Guidance on Effective Use of Programmatic NEPA Reviews (August 25, 2014) (Agencies may prepare a single NEPA document to support both programmatic and project-specific proposals. Such an approach may be appropriate when an agency plans to make a broad program decision, as well as decisions to implement one or more specific projects under the program.)

ALTERNATIVES AND CONSIDERATIONS BALANCED IN MAKING THE DECISION

The PSMP framework is intended to address problem sediment accumulation throughout the LSRP ("Lower Snake River Projects") by embracing a comprehensive approach to long-term sediment management solutions while still leaving the Corps with the ability to address immediate needs, should they arise. Therefore, the alternatives analysis considered immediate needs as well as long-term management needs. The range of alternatives in the FEIS was developed through several iterative processes described in Chapter 2 and Tables 2-1(describing the measures) and 2-4 (describing the measures comprising each alternative). This development process relied on information from investigations of sediment sources, expertise from other agencies, input from lower Snake River sediment management working group (LSMG), formal scoping process for this EIS, and tribal, non-governmental organizations and public meetings and workshops in the communities. I've considered this, as well as the conclusions of the extensive research conducted since 2005 to understand sediment sources, transport, and yield within the watershed, as well as potential climate (fire) influences to sediment loading.

A robust scoping process, series of meetings with interested parties, and knowledge gained from Corps and Corps-sponsored studies and reliance on the best available scientific information allowed for a complete and refined list of measures and development of a wide range of alternatives. Preliminary lists of those measures that may address sediment accumulation in the lower Snake River were narrowed to measures that could meet the purpose and need. These measures were then combined into a range of alternatives and presented with analysis in the draft EIS.

Preliminary alternatives that were eliminated from further consideration included expansion on upland sediment reduction measures, non-structural alternatives to manage the reservoir system differently or remove or reconfigure facilities, structural sediment management alternative that trap sediments or change river hydrology to pass sediments, and an alternative that combined features of system management measures and sediment management measures that pass sediments through the system or trap sediments.

These alternatives were screened from further consideration based on whether or not the alternative would meet the purpose and need. For the purpose of immediate needs for navigation (such as the conditions prompting the Current Immediate Need action), only dredging and dredged material management was determined to be feasible and effective. Thus, any alternatives not containing the option of using the dredging and dredge material management measure were not carried forward. The two remaining alternatives—Alternatives 5 and 7—and the No Action Alternative were carried forward for evaluation in the EIS.

The No Action Alternative provides the baseline condition for the comparison of alternatives that were determined to be effective at meeting the stated purpose and need in the FEIS. For the no action alternative, the Corps would monitor conditions in the lower Snake River and use operational management of the reservoir levels (consistent with applicable biological opinion and other requirements) to provide a 14-foot water depth in the navigation channel depth and, to the extent possible, provide for other existing authorized purposes[3]. A constraint of the no action alternative is that the Corps can raise reservoir levels only to the maximum operating pool (MOP) elevation for each reservoir, thereby limiting this alternative's effectiveness over time as sediment continues to accrue and drive up reservoir levels. Continuing under that scenario results in negative impacts to existing authorized project purposes. The No Action Alternative would also require the Corps to continue to operate the Lower Granite Pool above MOP. This interferes with the Corps ability to to operate at MOP during juvenile Chinook outmigration under NOAA's Federal Columbia River Power System Supplemental (FCRPS) Biological Opinion (BiOp) 2014. The no action alternative would not satisfy the stated purpose and need in the FEIS, but was carried forward as a baseline to compare other alternatives.

Of the remaining alternatives, the Corps selected Alternative 7 as the PSMP. In addition to fully addressing immediate needs, the alternative provides for proactive monitoring and planning for addressing potential sediment accumulation rather than reacting to accumulation once it becomes an identified problem. Management measures included in Alternative 7 are operational management of the reservoir levels to allow for safe navigation, dredging the navigation channel and other associated areas to achieve depth or dredging to improve conveyance capacity, in-water or uplands disposal of dredged material, beneficial placement of dredged material, reservoir drawdown to flush sediments, reconfiguring or relocating facilities, raising Lewiston levees, placing bendway weirs, dikes and dike fields in the river; agitating sediments, and trapping upstream sediment in reservoir. Such management measures will be considered as in the future under the PSMP, based on tier-off NEPA reviews.

During development of the PSMP, the Corps considered a wide range of measures for addressing an immediate need for sediment accumulation interfering with navigation. The Corps identified dredging, as a result of the analysis in the EIS for development of the PSMP, as the only measure available to effectively address an immediate (short-term) need to reestablish the federal navigation channel to congressionally authorized dimensions.[4] Dredging was, therefore, the only measure (in addition to interim operational management of the reservoir levels) incorporated into the PSMP to address an immediate need for navigation. The Corps also considered other measures in combination with dredging (e.g., drawdown), but the combined use of such measures was either impractical (e.g., planning timeframe) or of negligible benefit (e.g., agitation) for an immediate need action. Similar impracticalities exist for the Structural Sediment Management Measures such as agitation to resuspend, and other System Management Measures such as reconfiguring or relocating affected facilities—used either independently or in combination with other measures. Remaining measures, such as Upland Sediment Reduction Measures or insertion of Bendway weirs are plainly ineffective for immediate needs brought about by existing accumulation.

Regarding Reservoir Drawdown to Flush Sediment (Drawdown) specifically, flow would be temporarily modified to increase the capacity of the river system to scour and carry sediment, thereby flushing deposited sediments downstream. Drawdowns of the pool elevation by 10 to 15 feet during a 30- to 45-day period [late April-June] would be conducted in an effort to flush

[3] Referred to in the FEIS and PSMP as the Navigation Objective Reservoir Operation (NORO) measure.
[4] The same determination was made for adjacent/related port berthing area maintenance.

sediments from the navigation channel and selected Port berthing areas. Lower Granite Reservoir is the only LSRP reservoir in which this measure would be effective. The FEIS further described this measure as requiring "adequate high-flow prediction and modeling to allow the Corps to conduct drawdown operations in a timely manner for this measure to function effectively . . . .[and] sufficient lead time to plan, design, and implement modifications to infrastructure." The 1992 drawdown test caused significant damage to shoreline facilities. As a result, drawdown would not fully address accumulated sediment that is already interfering with existing authorized project purposes.

Drawdown is a partial solution and a potential future forecast need measure only, given the required planning lead time, necessary infrastructure precautions, need for adequate spring snowpack/runoff, and one (1) year minimum timeframe to accomplish the navigation maintenance when combined with winter dredging. Additionally, combining a drawdown with dredging would likely involve increased adverse environmental effects versus effects from dredging alone. Therefore, drawdown was not chosen as a measure to address the immediate needs for navigation in the PSMP, and was not selected to address the Current Immediate Need.

The Corps, however, evaluated alternatives for disposal of dredged material. Disposal alternatives were identified through evaluation under the substantive provisions of CWA Section 404(b)(1), guidelines established by the EPA (40 C.F.R. 230), and Corps regulations. (PSMP, Section 2.4.1). The disposal alternatives in this analysis were incorporated into the NEPA process and ultimately identified the Corps' proposed/preferred disposal alternative. Knoxway Canyon (River Mile 116) was identified as the proposed disposal site. This disposal site and method of disposal also allows for the opportunity to reuse the sediments in such a manner as to create shallow-water habitat for juvenile salmonids.

Alternative 7 is the environmentally preferred alternative, which identifies dredging (after interim use of operational management of reservoir levels) as the only measure available to address an immediate need for navigation. The No Action Alternative perpetuates the sediment accumulation problem into the future and continues to interfere with the Corps MOP operation during juvenile Chinook outmigration under NOAA's 2014 FCRPS Supplemental BiOp. The Current Immediate Need Action includes methods of dredging and disposal, monitoring, and construction practices that minimizes any potential adverse impacts and is consistent with the Corps responsibilities under the Endangered Species Act for operation of the Federal Columbia River Power System, reducing impacts over the No Action Alternative. Additionally, the Current Immediate Need Action would place sediments in-water in such a way to create shallow water habitat for juvenile salmonids, improving habitat availability in the reservoir system.

MEANS TO AVOID AND MINIMIZE ADVERSE EFFECTS

For the Current Immediate Need Action, placement of dredged material in-water will be conducted in such a manner to reduce turbidity and beneficially reuse the dredged material to construct a shallow water bench. This will provide approximately 13 acres of shallow water aquatic habitat specifically for out migrating juvenile fall Chinook salmon. Dredging and construction will take place within the designated winter in-water work window[5] (currently December 15 to March 1 in the lower Snake River) to minimize impacts to salmonids. A mechanical method of dredging, such as clamshell, dragline, or a shovel/scoop dredge, will be used to avoid or reduce fish and lamprey entrainment. Water quality monitoring will be conducted at project areas in real-time so any actions can be taken rapidly should water quality standards become exceeded. Effects on biota would be minimized by limiting discharges to a small area relative to the reservoir system and within the approved in-water work window.

Using the Dredged Material Evaluation and Disposal Procedures, and the 2009 Sediment Evaluation Framework for the Pacific Northwest, sediments from areas to be dredged for the Current Immediate Need Action and associated Port berthing areas under Corps permits were evaluated to minimize the potential for effects on water chemistry and suitability for in water placement. Additional sampling and analyses were completed in November 2013 with the detection of 4-methylphenol and phenol, which occur in the environment from natural microbial degradation and anthropogenic sources. However, bioassays were completed and an additional study conducted with the Corps' Engineer Research and Development Center (ERDC) to evaluate the potential toxicity and bioaccumulation of this compound in the lower Snake River. Using the NMFS fish criteria, the results demonstrated that nearly all sustained exposure concentrations at the placement site after construction is completed would be less than 0.1 percent of the NMFS criteria. Based on the results of the bioassays, predicted water concentrations within the immediate area of dredging operations, dredged material placement, and above or within the bioactive zone of the constructed shoal following site construction, toxicity to fish and tainting of fish tissue is not expected.

The Current Immediate Need Action will have minimal impacts to fish and aquatic organisms from disruption, temporary displacement, noise, and burial. The Corps will minimize such effects through the dredge type, timing, monitoring, and disposal method, which will create approximately 13 acres of shallow water habitat for juvenile salmonids. All practical means to avoid or minimize adverse environmental effects have been incorporated into the selected action. The Corps' compliance with NMFS and FWS biological opinions (BiOp's) are discussed below including terms and conditions to minimize impacts to listed species

SIGNIFICANT PUBLIC/ AGENCY COMMENTS RAISED IN THE FINAL PSMP/EIS

There were many comments received on the Final EIS, a majority of which were duplications of comments received on the draft EIS that were considered and incorporated in the FEIS or otherwise responses previously provided in Appendix G. New comments that raised a significant or new issue were reviewed for consideration in making this decision and responses are provided. A portion of those new and significant comments are addressed below, and the remainder can be found in the attached Comment Response Document. While not a requirement under NEPA or the Corps implementing regulations for NEPA, for this action the Corps chose to provide additional information in the attached Comment Response Document responsive to each

[5] The winter in-water work window is established by the states and NMFS as dates when in-water work in a river/tributary is less likely to adversely affect fish/habitat.

comment received on the FEIS, even if that was only to state where the comment was previously addressed in the FEIS.

The Corps received substantial new public comment on the economic considerations applied in developing the PSMP FEIS. These comments urged the Corps to apply what is ultimately not an appropriate level of economic analysis for the development of an operations and maintenance action. The economic justification requirements in the Corps planning guidance for a new navigation project requiring authorization are significantly more rigorous but are not applicable in this maintenance situation. The decision to address the current immediate need is not a new navigation project that would call for this level of analysis, but rather operation and maintenance action taken to address sediment accumulation in the LSRP using a programmatic perspective. Because the LSRP are existing authorized Civil Works projects, the Corps planning guidance provides for the Corps to confirm that continued maintenance is warranted based on an evaluation of navigation indicators (ER 1105-2-100 paragraph E-15 h(3)(i)(1)) before preparation of dredged material maintenance plans (DMMPs). However, as stated in Section 1 of the FEIS, the PSMP is a unique O&M document and guidance concerning the development of DMMPS was applied in general when applicable. For example, the DMMP economic indicators generally reviewed in this analysis included consideration of the current tonnage and transportation savings that continue to demonstrate that continued maintenance is warranted. The current tonnage level estimates show that there continues to be a significant amount of tonnage using the Lower Snake River. For example, 3.3M tons transited the system in 2012. This was up approximately 500,000 tons from 2011. Also, the Corps Planning Center of Expertise for Inland Navigation estimates that movements on the LSRP save about $10.9 a ton versus moving by rail.[6]

The EPA provided multiple comments to the FEIS regarding topics such as coordination, information sharing with other land management agencies and watershed groups, and taking proactive measures. The Corps' has committed to continue active participation in the Lower Snake Management Group and is actively participating in other regional sediment management groups within the watershed. They also provided comments on monitoring and adaptive management, to which the Corps is committed to monitoring as per terms and conditions of the BiOp's. There was also a question of how the Corps ensures it is selecting the least cost method (federal standard) for dredge material disposal. The 404(b)(1) guidelines (least cost,

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[6] Comments on the topic of economics also critiqued the numbers represented in the 2002 Lower Snake River Juvenile Salmon Migration Feasibility Study (LSRJSM). The 2002LSRJSM Feasibility Report and the Transportation Analysis developed for that EIS is the most thorough, widely accepted analysis of the transportation benefits associated with the LSRP. The study team included representatives of various Federal and regional agencies, tribal representatives, and other interested parties. Further the analyses were reviewed by the Independent Economic Advisory Board. This independent group of expert economists evaluated the analysis and determined that the results were the "best available estimate" of the impacts and was of "a balanced professional quality". Nonetheless, it is true that the numbers in the study resulted in projections for the 2002-2012 time period that exceeds current tonnage numbers. Therefore, the Corps also looked to the current tonnage numbers and found the difference to be generally in line with trends in inland waterway traffic nationwide during the same time period. Current tonnage estimates show that there continues to be a significant amount of tonnage using the Lower Snake River - 3.3M tons in 2012. The projected tonnage from the LSRJFM Report for 2012 was 4.9M tons. As a result, both the current tonnage numbers and the analysis of the LSRJSM were applied in making this decision.

environmentally acceptable) are compatible with the Federal Standard (33 CFR 335.7), and for example, if two or more alternatives satisfy the 404(b)(1) guidelines and are technically feasible, the Corps is required by its regulations to select the least costly alternative.

COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

The Draft PSMP and EIS were released for public and agency review on December 21, 2012, with the comment period extended to March 26, 2013 at the request of members of the public. The Corps held two public information meetings on January 24, 2013 following release of the draft. Concerns received through public and agency comments were addressed with detailed responses and included in Appendix G of the Final PSMP EIS. The Final PSMP and PSMP EIS were revised as appropriate in light of public and agency comments received. The Final PSMP EIS was released on August 22, 2014 for a 30-day public and agency review. NEPA analysis for implementation of the Immediate Need Action was included in the PSMP EIS. Coordination and appropriate consultation was conducted with Federal and State Agencies and Tribes on the preferred plan in the draft and FEIS.

Compliance with the Endangered Species Act was accomplished through consultation with the NMFS and FWS. The Corps prepared a Biological Assessment (BA) for species under the purview of the NMFS and FWS and coordinated to assess project impacts of the Current Immediate Need Action. The BA concluded the action may affect, and is likely to adversely affect SRSS Chinook, SRF Chinook, SR steelhead, and bull trout; may affect, but is not likely to adversely affect SR sockeye, and may affect, and is likely to adversely affect designated critical habitat for SRSS Chinook, SRF Chinook, SRB steelhead, SR sockeye, and bull trout. The Services provided BiOp's on November 13 and 14, 2014 and are hereby accepted. Formal consultation was concluded with the consideration of the BiOp's from each agency. The BiOp's also included Reasonable and Prudent measures with terms and conditions, which we have considered and agree to implement; Conservation Recommendations as described within the BiOp's will be considered.

Section 404 of the Clean Water Act of 1977 requires that all projects involving the discharge of dredged or fill material into waters of the United States be evaluated for water quality and other effects prior to making the discharge. The Section 404(b)(1) Evaluation for the Current Immediate Need Action (FEIS, Appendix L) evaluated disposal alternatives and addressed water quality effects of the preferred in-water discharge of dredged material to be performed by the Corps in the first available in-water work window (December 15 to March 1) following completion of the PSMP FEIS. The analysis included the berthing areas maintained by the Ports of Lewiston and Clarkston. This evaluation assessed the potential effects of the proposed discharges, and possible alternatives, utilizing guidelines established by the U.S. Environmental Protection Agency (EPA) under Section 404(b)(1) of the Act (40 C.F.R. 230). Although the Corps does not process and issue permits for its own activities, the Corps authorizes its own discharges of dredged or fill material by applying all applicable substantive legal requirements, including application of the section 404(b)(1) guidelines and associated evaluation factors in 33 C.F.R. 336.1(c).

The Corps requested certification under Section 401 of CWA from the Washington Department of Ecology (WDOE) for the Current Immediate Need Action. The Corps received a Section 401 water quality certification from WDOE on August 29, 2014 for the proposed action and will comply with the conditions of the Certification. The Ports of Lewiston and Clarkston have applied for separate 401 certification for their berthing area maintenance actions.
Compliance with the National Historic Preservation Act (NHPA) was coordinated with both the WA ID State Historic Preservation Officers (SHPO) for the Current Immediate Need Action. The Corps has determined that the proposed Current Immediate Need Action (dredging and disposal) will result in no adverse effects to historic properties. This determination has been provided to the SHPOs, and interested Tribes. The Washington and Idaho SHPOs concurred with this determination on March 20, 2013 and February 1, 2013, respectively.

Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, and Executive Memorandum of April 29, 1994, Government-to-Government Relations with Native American Tribal Governments, require federal agencies to consult with tribal governments prior to developing regulatory policies that have tribal implications or taking actions that affect federally recognized tribal governments. Letters accompanying copies of the draft EIS went out to regional Tribal governments on December 13, 2012, and included an offer of government-to-government (G2G) consultation on the PSMP and current immediate need to reestablish the congressionally authorized navigation channel. The Corps received requests for technical staff consultation from the Nez Perce Tribe and the Confederated Tribes and Bands of the Yakama Nation. Technical staff meetings occurred in Lapwai, Idaho with the Nez Perce Tribe on February 15, 2013, and with the Confederated Tribes and Bands of the Yakama Nation on March 18, 2013. After the technical staff meeting the Nez Perce Tribe requested G2G consultation. That meeting occurred on April 5, 2013 with the Nez Perce Tribal Executive Committee in Lapwai, Idaho. The Nez Perce requested a second G2G meeting with the Corps' Walla Walla and Seattle Districts, that meeting occurred in Walla Walla, Washington on March 14, 2014. Following the release of the Final EIS the Nez Perce Tribe requested an additional technical staff meeting, which occurred in Walla Walla, WA on September 5, 2014. The Corps has satisfied its G2G consultation responsibilities under the EO/EM.

CONCLUSION

In the PSMP and FEIS, the Corps has considered the purpose and need and a reasonable range of alternatives that adequately address the objectives of the proposed action, and the potential effects of the action including mitigation The Corps has also considered public and agency comments received during the draft and final EIS review periods. The Current Immediate Need Action includes implementation of all reasonable, practicable means to avoid, minimize, or compensate for environmental harm from the action. All applicable laws and regulations were considered in evaluation of the Current Immediate Need Action. In Summary, I find that the selected action, dredging with in-water disposal at Knoxway Canyon represents the course of action, that on the balance, best serves the public interest. This Record of Decision completes the procedural requirements of the National Environmental Policy Act for the Current Immediate Need Action.

11/14/2014
Date

JOHN S. KEM
Brigadier General, U.S. Army
Division Commander

Comment Response Document

Comment Response Document

The Corps made the Final Programmatic Sediment Management Plan (PSMP) Environmental Impact Statement (EIS) available for public review and comment on August 22, 2014 and provided a period for the public to review the document and provide comments to the Corps by September 22, 2014.

The Corps received 1,106 individual comment documents (e.g., letter, email) from agencies, individuals, and organizations during the public review period for the Final PSMP EIS. Of these 1,106 documents, 1,061 were substantially the same format letter. Therefore, there were 45 unique comment documents submitted. The Corps carefully reviewed each of the comment documents to identify comments and concerns raised by the public and agencies. The Corps considered each specific comment and prepared responses to those comments.

All comments and responses regarding the Final EIS are presented in this Comment Response Document (CRD). The CRD is organized as follows: (1) table of individuals who submitted comments with letter number provided for cross referencing, (2) table of comments by individuals and associated responses prepared by the Corps, and (3) the original comment documents in their entirety with individual comments highlighted as presented in the comment/response table. While not a requirement under NEPA or the Corps implementing regulations for NEPA, for this action the Corps chose to provide additional information in the attached Comment Response Document responsive to each comment received on the FEIS, even if that was only to state where the comment was previously addressed in the FEIS.

For those comments that had previously been addressed in the Draft PSMP EIS CRD (found in the FEIS Appendix G – Public Involvement), the Corps has provided a link to that document in the comment/response table, as applicable. Please note – the link is to a very large document that will take considerable time to open. It is recommended that when prompted to open or save the file, you choose to save to your desktop. The action will progress faster and will provide you a copy of the document to use at your leisure.

Table 1. Individuals Providing Comments

Commenter	Affiliation	Comment Source	Letter #
Alan (Butch) Odegaard	Northwest Professional Power Vessel Association	E-Mail Direct to Owner	0022
Amer Badawi	Columbia Grain	E-Mail Direct to Owner	0033
Arvid Lyons	Lewis-Clark Terminal	Letter	0035
Bill Chetwood		E-Mail Direct to Owner	0001
Brian Malley	Lindblad Expeditions	Form Letter	0010
Bruce Blackwell		E-Mail Direct to Owner	0009
Christine Reichgott		Letter	0043
David A. Solem	South Columbia Basin Irrigation District	Letter	0036
David Bean		E-Mail Direct to Owner	0041
David Doeringsfeld	Port of Lewiston	Letter	0018
Doug Mattoon	Valley Vision	Letter	0039
Ernest Goitein		E-Mail Direct to Owner	0027
Greg Clark	U.S. Geological Society	E-Mail Direct to Owner	0002
James M. Kuntz	Port of Walla Walla	Letter	0019
James Waddell		E-Mail Direct to Owner	0025
Jay T. Waldron	Schwabe, Williamson & Wyatt	Letter	0020
John E. Love	Port of Whitman County	Letter	0021
Kevin Culbert	American Construction Company	Letter	0014
Kristin Meira		E-Mail Direct to Owner	0028
Linwood Laughy		E-Mail Direct to Owner	0030
LuVerne & Kathleen Grussing		Form Letter	0015
Marshall Doak	Palouse Regional Transportation Planning Organization	Letter	0037 0038
Mary O'Farrell		Form Letter	0007
Matt Diederich	Oregon State Historic Preservation Office	Letter	0034
Michael C. Jones	Lindblad Expeditions	E-Mail Direct to Owner	0032
Mike Thompson	Port of Lewiston	Letter	0040
Norm Semanko	Idaho Water Users Association	E-Mail Direct to Owner	0029
Paula Menyuk		Form Letter	0006
Randy Hayden	Port of Pasco	Letter	0016
Richard Finn	Port of Portland	E-Mail Direct to Owner	0023
Richard Till		Form Letter	0045
Rick Schwartz	Washington Department of Natural Resources	Form Letter	0013
Rob Rich	Shaver Transportation Company	E-Mail Direct to Owner	0026
Robert Curcio	Tidewater Barge Lines	Letter	0017
Robert Koch	Lewis-Clark Terminal	Form Letter	0011
Ronald M Fritz	Valley Vision	Form Letter	0012
Sally Nunn		Form Letter	0044
Sandra Thompson		Form Letter	0008
Silas Whitman	Earth Justice	Letter	0042
Sister Roberta Hudlow		Form Letter	0005
Stephanie Utter	USBR-Ephrata	E-Mail Direct to Owner	0024
Stephen Pauley		E-Mail Direct to Owner	0003

Commenter	Affiliation	Comment Source	Letter #
Steve Mashuda		Letter	0031
Various Authors*		Comment Form	0004

*See commenter list below.

Aaron Kirtz
Aaron Warren
Adam Roske
Adelaide Prudden
Alan Grainger
Alan Langrall
Alan Reynolds
Albert Chen
Albert H. Lerner
Albert Laya
Alberta Harbutt
Alex Lechich
Alex O'Connell
Alex Samarin
Alex Stavis
Alexander Flemmer
Alfredo Barroso
Alice Neuhauser
Alice Tobias
Alison Taylor
Allen Harthorn
Allen Heide
Allison Cyr
Allison Halgren
Amanda Grondin
Amy Zimmerman
AnaLisa Crandall
Andre Kohler
Andrea Fulton
Andrea Silverman
Andrew Forauer
Andrew Kalukin
Andrew Sewell
Andrew Steel
Andy Lynn
Angela Fazzari
Ann Granatelli
Ann Robinson
Anne Fuller
Anne Haven McDonnell
Anne Huckins
Anne Lazarus
Anne Veraldi
Annette Huenke
Annie McCuen
Anthony Carpio
Anthony DeRiggi
April Theod
Arden Erlichman
Audrey David
Barb Kruse
Barbara Aronowitz
Barbara Bennigson
Barbara Dettlaff
Barbara Grandin
Barbara Haas
Barbara O'Steen
Barbara Rizzo
Barbara Robbin
Barbara Rosenkotter
Barbara Snider
Barbara Viken
Barbara Wallesz
Barri Bernier
Barry Ross
Ben Basin
Ben Rall
Ben Welborn
Bernard Galiley
Beth Stanberry
Betsy Young
Betty Lawrence
Betty Schuessler
Bev Angel
Beverlee Goynes
Bill & Marilyn Voorhies
Bill Cagno
Bill Chockla
Bill Fowlie
Bill Gerdts
Bill Gregory
Bill Spillman
Bill Witherspoon
Blaine Ackley
Bob Gillespie
Bob Hammond
Bob Karcich
Bob Triggs
Bobbi Jo Harvey
Bobbie Flowers
Bobby Hayden
Bonnie Brooks
Bonnie Burke
Brad Higgs
Brad Nelson
Brad Walker
Bradford Bryce
Brenda Byrne
Brent Errickson
Brian Fink
Brian Mohr
Brian Morton
Briana Wagner
Bridget Barlow
Bruce Bernard
Bruce Slightom
C DeVine
C Rivera
C Thomas Schaefer
C.A. Huff
Cal Elshoff
Candy Bowman
Candy LeBlanc
Carla Hervert
Carmen Blakely
Carmen McDermott
Carmen Sebastian
Carol Frey
Caroline Armon
Carolyn De Mirjiam
Carolyn du Brin
Carrie Bates
Catherine Chutich
Catherine Tierney
Catherine Vidal
Cathy Gumtow Farrior
Cathy Teich
Celeste Howard
Chad Halsey
Chad Lent
Charles Ballard
Charles Hammerstad
Charles Miller
Charles Van Deusen
Charlie Hill
Charlotte Towey
Cheriel Jenson
Cheryl Jennings
Cheryl Ritenbaugh
Cheryl Slightom
Chip Stringer
Chris Brozell
Chris Drumright
Chris Kopczynski
Chris MacKrell
Chris Olsen
Chris Preston
Chris Riley
Chris Vozzo
Christian Thalacker
Christie Bergman
Christine B. Reichgott
Christopher Allan
Christopher Ceneviva
Christopher Fetta
Christopher Heuman
Christopher Lima
Christopher Salp
Chuck Trost
Claire Bogaard
Claire Cohen
Claire Egtvedt
Clarence Sanders
Clay Livingston
Clayton Medeiros
Clifford Press
Cody Dolnick
Coleen Moore
Colin Carlberg
Connie Livingston-Dunn
Conrad Hohener
Contantin Rusti
Craig Mackie
Craig Mankowski
Craig Smith
Craig Suttles
Crista Worthy
Crystal Gartner
Cythia Gerdes
D P
D.D. Trent
Dain Liepa
Dale Giese
Daleski Anne
Dan Brissenden
Dan Cenis
Dan Esposito
Dan Jimenez
Dan Sherwood
Dan Silver
Daniel Beck
Daniel Ciske
Daniel Harvey
Daniel Hawley
Daniel Katz
Daniel McCarthy
Daniel Newell
Daniel Wise
Daralene Finnell
Darcy Olsen

David & Leneda Ditterick
David Abram
David Atwood
David Burkhart
David Caplan
David Dunneback
David Ellenberger
David Feldkamp
David Goodlin
David Jaffe
David Juth
David Konigsberg
David Linde
David Marancik
David Mead
David Mizerka
David Moore
David N. Orth
David Stockton
David Taylor
Davin Henderson
Dawn Baier
Dean Davis
Deb Faulkner
Debbie Brush
Debbie Reynolds
Debbie Stempf
Deborah Efron
Deborah Giordano
Debra Rehn
Den Mark Wichar
Denee Scribner
Denis Bogan
Denise Hoffer
Denise Hudson
Dennis Feichtinger
Dennis Ledden
Dennis Roscetti
Dennis Ziober
Derek Gendvil
Diane Berliner
Dianne Ensign
Dinda Evans
Diron Baker
Don Cloud
Don Lichtblau
Donald Coyne
Donald Johnson
Donna Davis
Donna Fabiano
Donna Lozano
Donna R Schall
Donna Shepherd
Dori Grasso
Doris Munger
Dorothy Jordan
Doug Brander
Douglas Coffman
Douglas Smith
Dr Brian Sullivan
Dr Gary Carlson
Dr Geffrey Thompson
Dr George Barton
Dr Hugh Clark
Dr Mary Bandura
Dr Mitchell Stargrove
Dr Norman Baker
Dr Richard Schubert
Dr Sandra Joos
Dr Sharon Price
Duane Dahlgren
E. George Strasser
E. Nylen
Ed Heidel
Edh Stanley
Edmund Burke
Edward Bielaus
Edward Cubero
Edward Dombroski
Edward Moorehead
Edwin Quigley
Eileen Flaherty
Eileen Smith
Elaine Genasci
Elena Powers
Elizabeth Ettienne
Elizabeth Path
Elizabeth Saenger
Elizabeth Watts
Ellen Glaccum
Ellen Singer
Elyse Friedman
Emily Kessler
Eowyn Grecco
Eric O'Rafferty
Eric Ott
Eric Polczynski
Eric Sentianin
Eric Staples
Erik Winkler
Ernest Goitein
Ethlynn Dewitt
Eva Bagno
Evan Jackson
Evan Roman
Evelyn Fraser
Evelyn Lilienfeld
Evelyn Yaari
Fauna-June Fauth
Felton Jenkins
Fenn Wimberly
Ferris Lyle
Fletcher Chouinard
Florence Wagner
Floss Shahbegian
Frank Kohn
Frank Lorch
Franklin Kapustka
Franklin Platizky
Fred Fillmore
Fred Jennings
Fred Lavy
Fred Teixeira
Frederick Ege Jr.
Frederick Reimers
Fredric Salstrom
G Allen Daily
Gabe Wigtil
Gary B
Gary Evans
Gary Hall
Gary Hunt
Gary Mueller
Gary Oechsle
Gary Petersen
Gary York
Gavin Kramer
Gene Chorostecki
Geoffrey Schaney
George Valashinas
Georgeanne Samuelson
Georges Boyer
Gerald McNeill
Gerald Thompson
Gerry Miliken
Gina O'Brien
Gina Santonas
Ginna & Ken Lagergren
Glen Zeeck
Glenn Short
Gloria Aguirre
Gloria Cameron
Gordon Ehrman
Grace Burson
Greg Digennaro
Greg Loomis
Greg Obray
Gregg Schlanger
Gregory Fitz
Gregory Topf
Gunthild Sondhi
Hal Anthony
Harold Bankirer
Harrison Hilbert
Heather Chapin
Helen Manning-Brown
Helen Obenchain
Heloise C Seailles
Henry Bennett
Holly Rose
Holly Williams
Howe Crockett
Ian Shelley
J I Farlow
J R Summers
Jaci Christenson
Jack Smith
Jacob Pavlak
Jacquelyn Sidor
Jaedra Luke
James Bronson
James Conroy
James Fitch
James H. Jorgensen
James Hood
James Loacker
James Maloney
James McRoberts
James Rankin
James Rogers
James Romanyak
James Spagle
James Thompson
James Wong
Jamie Wheeler
Jan Ackerman
Jane Alexander
Jane Demmert
Jane Drews
Jane Eagle
Jane Ellison
Jane H. Beattie
Jane Steadman
Janet Dunkelberger
Janet Hannel
Janice Inghram
Janice Palma-Glennie
Jared Scarborough
Jason Bowman
Jason Kinsey
Jay Harrison
Jay Humphrey
Jay Peery
Jayne Wallingford
Jean Reiher
Jeanne Crowley
Jeanne Hyde
Jeannine LeMay
Jeff Fagerholm
Jeff Holberg
Jeff Manker
Jeff Tatom
Jeffrey Hudgens
Jeffrey Womble
Jennifer Hall
Jennifer Piercy
Jennifer Wittlinger
Jenny Goldberg
Jerry Clymo
Jerry Gillissen
Jerry Johannes
Jerry Norris
Jesse Gore

Jessica Drummond
Jessica Phelps
Jette Morache
Jill Hammond
Jill Hein
Jill Johnson
Jill Ransom
Jill Riebesehl
Jim Davis
Jim Dickinson
Jim Evans
Jim Hanley
Jim Head
Jim Lansing
Jim Litts
Jim Novak
Jim Tornatore
Joan Bell-Kaul
Joan Kalvelage
Joan Kitterman
Jodi Rodar
Joe Harvey
Joe Howard
Joe Weis
Joel Finley
Joel Hitsman
Joel Isaacson
Joel Perkins
John Barto
John Boyce
John Brinkley
John Chappell
John DeVoe
John Dutton
John Finnell
John Heimer
John Humphries
John Isaacs
John Kirchner
John Kubisiak
John MacDonald
John Markham
John Pritchard
John Sherwin
John Stokes
John Walton
John Warner
Jon Anderson
Jon Lund
Jonas Herzog
Jonathan Alexander
Jonathan Rosenfield
Joseph Bowers
Joseph Ciavaglia Jr.
Joseph Marotta
Joseph Remuzzi
Joseph Rusconi
Joseph Vincent
Josh McKimmy
Joshua Messinger
Joshua Olson
Juan Calvillo
Judith Chapman
Judith Maron-Friend
Judith Prowell
Judith Smith
Judy D'Amore
Judy Keene
Julia Blake
Julie Ford
Julie Kennie
Julie Litwin
Julie Ostoich
Julie Spickler
Julie Walters
Julie Whitacre
June Dean
June Roffler
Justin Boucher
Justin Ramsey
Karen Biesanz
Karen Larsen
Karen Martellaro
Karen Meter
Karen Naiman
Karen Renne
Karen Wonders
Karl Howard
Kate Skolnick
Kate Sky
Kathe Gabrick
Katherine Dawson
Kathleen Corby
Kathleen Cronin
Kathleen Querner
Kathleen Schaeffer
Kathryn Gallo
Kathy Ison
Kathy Tonegawa
Kathy White
Kay Novak
Kaye McGehee
Keith Kleber
Keith Shein
Kelly Allison
Kelly Riley
Ken Mundy
Ken Ohlson
Ken Valley
Kendra Bengelink
Kenneth Babineau
Kenneth Bird
Kenneth Popper
Kenneth Rose
Kenneth Walters
Kent Minault
Kerstin Beerweiler
Kevin Culbert
Kevin Fox
Kim Dickey
Kim Lyons
Kimberly Clemens
Kimberly Leeper
Kirk Maes
Kitty Vincent
KL Matlock
Kristi Noem
Kyle Shepard
Kyra Rice
L Walters
Lance Cole
Lance Preston
Lance Rava
Landon Hancock
Lara Derasary
Lara Sox-Harris
Larry Bragman
Larry Dennis
Larry Franks
Larry Petersen
Larry Trochtenberg
Larry Walker
Laura Ackerman
Laura Chariton
Laura Ellenwood
Laura Goldblatt
Laura Leong
Laura Napoleon
Lauren Devine
Laurie Amith
Laurie Fisher
Laurie Lewis
Lawrence Crowley
Lawrence Gioielli
Lawrence Kenney
Lawrence Magliola
Leay Meyer
Lee Ann Gekas
Lee Gibson
Lee Taiz
Lenore Perconti
Les Roberts
Leslee Goodman
Lewis Glenn
Linda Bescript
Linda Ricks
Linda Romero
Kirschner
Linda Schrader
Linda Swan
Lindon Schultz
Lisa Lucas
Lisha Doucet
Liz Horsmon
Lois Mason
Lora Cox
Louise Mann
Louise Wallace
Lowell Young
Luke Nelson
Lurah Klaas
Lydia Garvey
Lyle Collins
Lyn Zerin
Lynden Brown
Lynn Cralle
Lynn Forster
Lynn Gleason
Lynn Romano
M K Hueftle
M L Moore
M. Scott Connor
M.J. Caputo
Madelaine Sutphin
Maia Howes
Malcolm Gardner
Manny Zanger
Margaret Crane
Margaret MacGregor
Margarita Perez
Marguery Lee Zucker
Maria Martini
Maria White
Marianne Nelson
Marianne Wallin
Marie Socarras
Marie Wakefield
Marilyn Hill
Marilyn Scott
Maris Skuja
Mark Bruner
Mark de Reus
Mark Johnson
Mark Kaharick
Mark Lee
Mark M Giese
Mark Mitchell
Mark Moskowitz
Mark Reback
Mark Robertson
Mark Smith
Martha Leahy
Martha Miners
Martha Perez
Martin Chamberlin
Martin Glynn
Martin Lecholat
Martin Nicholas
Mary Baechle
Mary Grady
Mary H. Masters
Mary Hahn

Mary Lyda
Mary Mathews
Mary O'Farrell
Mary Quimby
Mary Skirving
Mary Vlazny
MaryAnna Foskett
Maryanne Embury
Maryellen Read
Maryellen Redish
Matt Richmond
Matthew Bales
Matthew Locati
Matthew Petronko
Matthew Reid
Matthew Takas
Matthew Yost
Max Kaehn
Meg Wickwire
Meg Ziegleder
Megan Juenemann
Melissa Eddy
Melodie Martin
Melvin Hughes
Michael Laird
Michael Cate
Michael Checa
Michael Drais
Michael Felber
Michael Hopper
Michael Kochan
Michael Levenberg
Michael Maggied
Michael Mathis
Michael McGuire
Michael Price
Michael Schuessler
Michael Symonanis
Michael Tomlinson
Michael W Evans
Michael Zeigler, II
Michel Wingard
Michele Gielis
Michelle Bogaard
Michelle Hoff
Michelle Kofler
Michelle von Kampen
Mickie Harshman
Miguel Ramos
Mikal Jakubal
Mikasa Moss
Mike Gibson
Mike Hammond
Mike Ihli
Mike Miller
Mike Philbrick
Mike Webb
Mikki Chalker
Misty Schultheis
Mitch Cholewa
Molly Field
Monica Gilman
Morgan Locke
Morgan Pierce
Muriel Roberts
Murlin Goeken
Nancy Ellis
Nancy Gathing
Nancy Heistand
Nancy Huntsman
Nancy McAllaster
Nancy Merrick
Nancy Wall
Nancy Wright
Natalie Cohen
Nathan Hall
Nathan Petz
Nathaniel Holt
Nicholas Mantas
Nick Serrano
Nicole Jergovic
Noah Leh
Noah Youngelson
Noel Harris
Noel Murray
Norm Ritchie
Olivia McLaurine
Omar Siddique
Osalyn Houser
Owen Glick
P Hickey
P.H. Emile
Pam Slater-Price
Pam Young
Pamela Fletcher
Pamela Haas
Pamela Johnston
Pamela Posey
Patricia Kupchak
Patricia Liermann
Patricia Matejcek
Patricia Sullivan
Patricia Vazquez
Paul Bechtel
Paul Bruckner
Paul Fiscella
Paul Gasser
Paul Hopfenbeck
Paul Hunrichs
Paul Jerome
Paul Meyer
Paul Moss
Paul Mueller
Paul Russell
Paul Schutt
Paul Shanahan
Paul Smith
Paul Vesper
Paul Zoch
Penny Olsen
Peter Engbretson
Peter Klosterman
Philip Ratcliff
Phillip Bass
Phillip Callaway
Phillip Naro
Phyl Morello
Phyllis Chavez
Portia McCracken
Rachel Denny
Rachel Leip
Rachel Sonnenblick
Ralph Bocchetti
Ralph Kennaugh
Ramsay Kieffer
Ramsy Gregory
Randall Collins
Randy Corbett
Randy Harrison
Raymond Collard
Raymond Pallein
Rebecca Clark
Rebecca Koo
Rebecca Leas
Rebecca Sundberg
Red Diamond
Rene Robert
Rhett Lawrence
Rhonda Wright, M.D.
Rich Kemper
Rich Rupp
Richard & Eileen Heaning
Richard Amerling
Richard Dilley
Richard Francisco
Richard Heiber
Richard Heinlein
Richard Jorgensen
Richard Leach
Richard Lindstrom
Richard Luczyski
Richard Smith
Rick Brooks
Rick Lee
Rick O'Bryan
Rick Schwartz
Rift Vegan
Rita Walsh
River Steenson
Rob Masons
Rob Seltzer
Rob Stonecipher
Robbin Turner
Robert Bristol
Robert Burnett
Robert Cramer
Robert Feuchter
Robert Giusti
Robert Heydenreich
Robert House
Robert Jensen
Robert Larratt
Robert Magne
Robert Marshall
Robert Moore
Robert Morton
Robert Owens
Robert Renner
Robert Rosenberg
Robert Sorensen
Robert Steininger
Robert Sullivan
Robert Sylvester
Robert Vestal
Robert Welsh
Roberta Vandehey
Roberto Gomez
Robin Schaef
Robyn Ingram
Rocky Elliott
Roger Godfrey
Roger Newton
Ron Spies
Ronald Knight
Ronald Silver, CEP
Ross Wright
Roy Oshita
Russ Anderson
Russell Symon
Ruth Lorenz
S J Stratford
S Neimark
S R Kansa
Sabina Morelli
Sacha Biondi
Sally Hodson
Sally Hurst
Sally Purbrick-Illek
Sandra Carter
Sandra F. Wilson
Sandra Thompson
Sandy Zelasko
Sara King
Sara Kolp
Sara Steil
Sarah Boucas Netto
Sarah Richey
Sarah Stahelin
Sarah Wiebenson
Satya Vayu
Scott Johnson
Scott Keithley
Scott Leffler
Scott Newell
Scott Sobel

Scott Van Egeren
Scott Weber
Scott Worthen
Shaney Bisset
Shannah Praus
Sharon Ellis
Sharon Intilli
Sharon Karl
Shawn Blaesing-Thompson
Shawn Desjardins
Shawn Donnille
Shawn McMurdo
Shel Grove
Sheri Kuticka
Sherri Nolan
Sienna M Potts
Silas C. Whitman
Sister Roberta Hudlow
Stacey Bradley
Stacy Bloodworth
Stefanie Naden
Stephen Black
Stephen Draper
Stephen Greenberg
Stephen Jacobs
Stephen Oder
Steve Meador
Steve Netti
Steve Schramm
Steve Sheehy
Steve Smith
Steve Wagner
Steven Chan
Steven Collins
Steven Davies-Sigmund
Steven Ellis
Steven Nelson
Steven Richards
Steven Sorenson
Stuart Mork
Stuart Slutzman
Sue Morrison
Sue Pfeiffer-Johnson
Sue Smith
Summer Hess
Susan Carroll
Susan Emery
Susan Horlick
Susan Pines
Susan Smith
Susan Vennerholm
Susie Petra
Suzanna Ricker
Suzanne Bores
Suzanne Jerabeck
Suzanne Kiffman
Suzanne Skinner
Suzette Jacobs
Syd Bottomley
Sydney Meazell
Sylvan Thompson
Sylvia Rodriguez
Taggart Howland
Teri Sigler
Terrie Williams
Theron Wells
ThoLoucks
Thom Peters
Thomas Alexander
Thomas Conroy
Thomas Deetz
Thomas Knight
Thomas McCoy
Thomas Melville
Thomas Osborn
Thomas Windberg
Thorsten Ostrander
Thqtj Tajta
Tim Rich
Tim Thomas
Timothy Devine
Timothy O'Shea
Timothy Rosser
Tina Brenza
Tina Juarez
Todd Anslow
Todd Magaline
Tom Ferguson
Tom Hinz
Tom Kovalicky
Tom Kozel
Tom Pomeroy
Tomi Ann Iler
Toniann Reading
Tracy Hyland
Tracy Leigh
Tracy Napp
Trent Block
Tyler Hartanov
V R Sansone
Valerie BlineVance Handley
Vicki Cyr
Vicki Johnson
Victor Breed
Victoria Babich
Victoria Brandon
Victoria Miller
Virginia Brown
Virginia Douglas
Virginia Eagan
Vito Marrone
Wade Stoddard
Wallace Beck
Wallace Wild
Walt Kloefkorn
Walter Tingle
Wayne Kelly
Wendy McGowan
Wesley Banks
William & Marianne Sherman
William Blair
William Bodden
William Clemons
William Edgington
William Erickson
William Felder
William Gardner
William Gawne, Jr
William Howald
William Hutchings
William Johnson
William Kuestner
William Lusk
William O'Brien
William Rivers
William Seyfried Jr.
William Shaw
William Vanway
Willie Thompson
Woodrow Albin
Yvonne E Carter
Yvonne Kuperberg
Zachary Winkler
Zandra Saez

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0001	Bill Chetwood	20267	Where is the economic pragmatism? Not once in the published "Program 7" choice is the practical economics of maintaining a shipping channel for commerce. How are we supposed to give a intelligent opinion of the proposal without knowing the complete ongoing annual expense and required subsidies of maintaining commercial shipping on the water? Or does the Corps think that this is not an issue? It shouldn't take another very long to present a cost/benefit analysis that is reasonably accurate.	See response to DEIS comment 8360 in letter 12. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0002	Greg Clark	20268	Some of us that were involved in the previous data-collection activities (Molly Wood, Ryan Fosness, and myself) were discussing the PSMP, and were wondering if the Corps might have interest in us coming to Walla Walla for a discussion of the work we did during 2008-11, as well as talk about monitoring ideas as part of the PSMP moving forward.	Comment noted.
0003	Stephen Pauley	20374	Dredging will have to be done again in 5	The Programmatic Sediment Management Plan is not establishing a regular maintenance dredging plan, however the PSMP will provide the basis for continuing maintenance activities. Dredging is one of a number of measures identified in the PSMP to manage

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			years.	sediment that interferes with existing authorized project purposes of the LSRP.
0003	Stephen Pauley	20375	Dams do have a lifetime, but the COE would like us to believe they last forever - providing of course they get the money to make repairs and stay in business. Now we're being asked to approve the dredging of silt above Lower Granite Dam or even build the dikes higher to prevent overflow.	See response to DEIS comment 8360 in letter 12 and 8361 in letter 14. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0003	Stephen Pauley	20376	It should be noted that grain shipping through the locks is a free govt. subsidized benefit as is the maintenance of the dams and the locks. The taxpayer is paying millions to ship grain by barge, to move smolts by barge, and to raise smolts in hatcheries.We wouldn't need any of these if we breached the 4 LSR dams.	See response to DEIS comment 8368 in letter 29. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0003	Stephen Pauley	20377	Grain barging? A railway already exists along the lower Snake. Improve it and use it to get grain from Lewiston to the Tri Cities.	See response to DEIS comment 8360 in letter 12. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0004	Various Authors	20273	I oppose any further spending on expensive dredging in the lower Snake River waterway unless the Corps first provides an honest,	See response to DEIS comment 8360 in letter 12. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			transparent economic analysis that the four lower Snake River dams' benefits outweigh the tremendous costs to the public and to our wild salmon.	
0004	Various Authors	20355	These dams are causing flood risk and sediment problems for riverside towns.	See response to DEIS comment 8490 in letter 58. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf Regarding flood risk at Lewiston, Section 3.7.3 of the FEIS states :"…the existing levee systems appear adequate to provide protection from overtopping during the SPF [standard project flood] and exceed the requirements for levee systems under the National Flood Insurance Program. After 50 years of simulated sediment accumulation, the model predicts that the levee systems would be adequate to provide protection from overtopping during the SPF."
0004	Various Authors	20356	[Dams] impede migration and harm habitat for wild salmon and steelhead. Their energy production is replaceable with clean, affordable and reliable alternatives.	The potential effects associated with the existence of the lower Snake River dams is outside the scope of this NEPA analysis. The PSMP is an operation and management plan for addressing sediment accumulation that interferes with existing authorized project purposes of the LSRP, which appropriately assumes continued existence of the LSRP.
0004	Various Authors	20358	It fails to adequately address the impacts dredging itself will have on wild salmon.	See response to DEIS comment 8460 in letter 44. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0004	Various Authors	20359	the plan fails to consider the most effective solution to the sediment, flooding, and salmon problems—removal of the four lower Snake River dams.	See response to DEIS comment 8686 in letter 68. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0006	Paula Menyuk	20276	As an American taxpayer, I oppose any further spending on expensive dredging in	See response to DEIS comment 8360 in letter 12. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-

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			the lower Snake River waterway unless the Corps first provides an honest, transparent economic analysis that the four lower Snake River dams' benefits outweigh the tremendous costs to the public and to our wild salmon. In an era of declining federal resources, we can't afford to waste millions of dollars on the lower Snake—especially when salmon and taxpayer-friendly alternatives are available and scarce infrastructure dollars are needed elsewhere.	14_HandF.pdf
0007	Mary O'Farrell	20277	Looking at the success of the Elwah Dam removal, it seems like a no-brainer!	See response to DEIS comment 8368 in letter 29. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf -
0008	Sandra Thompson	20278	The Corps must first provides an honest, transparent economic analysis that the four lower Snake River dams' benefits outweigh the tremendous public costs and damage to our wild salmon and the surrounding economics.	See response to DEIS comment 8360 in letter 12 and comment 8460 in letter 44. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0008	Sandra Thompson	20361	For decades now, it's been general knowledge (and experience) that dams cause flood risk and	See response to DEIS comment 8361 in letter 14. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			sediment problems.	Regarding flood risk at Lewiston, Section 3.7.3 of the FEIS states :"…the existing levee systems appear adequate to provide protection from overtopping during the SPF [standard project flood] and exceed the requirements for levee systems under the National Flood Insurance Program. After 50 years of simulated sediment accumulation, the model predicts that the levee systems would be adequate to provide protection from overtopping during the SPF."
0008	Sandra Thompson	20362	the plan fails to consider the most effective solution to the sediment, flooding, and salmon problems— removal of the four lower Snake River dams.	See response to DEIS comment 8368 in letter 29. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0008	Sandra Thompson	20363	In an era of declining federal resources, we can't afford to waste millions of dollars—especially when better alternatives are available.	Comment noted.
0008	Sandra Thompson	20366	It fails to adequately address the impact of dredging on wild salmon.	See response to DEIS comment 8460 in letter 44. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0009	Bruce Blackwell	20279	That means we are advocating that Alternative 7 be selected and work begin as soon as possible.	Comment noted.
0010	Brian Malley	20367	I am following up to below email correspondence from Bruce Blackwell's dated Sept 11, 2014 (provided below). I want to be clear that Mr. Blackwell's comments do not represent the BFCG membership as a whole, and that discussion amongst	Comment noted.

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			our committees has not taken place at this time. I believe Mr. Blackwell's intentions to be good - but his message below seems to imply discussion upon the PSMP EIS has already taken place with BFCG membership. We do anticipate discussion at our Board meeting next Friday, September 19th - after which our agency may submit formal comment.	
0011	Robert Koch	20378	my thoughts also, one member can only speak for him/herself and not for the board or council they are members of.	Comment noted.
0012	Ronald M Fritz	20379	I am against this plan of dredging. The barge traffic on the snake River does not seem sufficient to warrant the amount of money that the Army Corps of Engineers is considering spending on this dredging plan.	See response to DEIS comment 8360 in letter 12 and comment 8490 in letter 58. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0013	Rick Schwartz	20368	No authorization is required for your proposed activity on state-owned aquatic lands and DNR has determined this project is unlikely to further impact these lands.	Comment noted.
0014	Kevin Culbert	20391	Some have also claimed that maintenance of the	Comment noted.

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			inland navigation channel would be a 'subsidy' to towboat companies, shippers, growers, or others. In reality, federal navigation channels are national assets that benefit many sectors. These benefits radiate throughout the economy in the form of lower transportation costs for shippers, increased revenues to growers, lower prices for consumers, increased employment opportunities at ports and terminals, and the ability for our farmers and manufacturers to compete in tough international markets.	
0014	Kevin Culbert	20392	ACC strongly urges the Corps to deny any further requests for extension on the commenting period and to finalize and issue the FE IS, PSMP, and Record of Decision no later than October 22, 2014, as you originally committed.	The Corps intends to issue a ROD pursuant to completion of review of FEIS comments, ESA compliance and similar requirements.
0014	Kevin Culbert	20393	ACC also urges the Corps to work with its sister agencies to quickly resolve any lingering loose ends by: (1) shoring up its record in response to comments, especially	Comment noted.

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			those received by other federal and state agencies; and (2) completing the Endangered Species section 7 consultation forthwith, and implementing any required mitigation measures that ensue from that process.	
0014	Kevin Culbert	20394	Finally, it is important to note that reservoir 'drawdown' on the Lower Snake River is simply not a viable option to address sediment accumulation.	Comment noted.
0015	LuVerne & Kathleen Grussing	20417	Tonnage shipped to and from the port has declined dramatically over the past 10 years, and there is no indication that this trend will ever be reversed, for the simple reason that there are better, faster, more efficient methods of transporting these goods.	PSMP EIS considered shipments throughout the entire Lower Snake River, not just those from the Port of Lewiston. Producers and shippers rely on a multimodal system. See FEIS section 3.5.2.
0015	LuVerne & Kathleen Grussing	20418	Natural sedimentation from the Salmon and Clearwater River basins will require continual dredging of the Snake River to maintain even a 12 foot deep shipping channel. And the sediment that is deposited naturally outside the dredged shipping channel will,	See response to DEIS 8360 in letter 12 and 8361 in letter 14. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf Regarding flood risk at Lewiston, Section 3.7.3 of the FEIS states :"…the existing levee systems appear adequate to provide protection from overtopping during the SPF [standard project flood] and exceed the requirements for levee systems under the National Flood Insurance Program. After 50 years of simulated sediment accumulation, the model predicts that the levee systems would be adequate to provide protection from overtopping during the SPF."

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			in the near future, require raising the levees in Lewiston and Clarkston to prevent those two cities (and the port!) from being inundated. None of this will change as long as the dams in the Snake River below Lewiston remain in place. In addition to the flood risk and sediment problems for riverside towns, the four Snake River Dams have been a major factor in the decline and subsequent T&E Species listing of Idaho's magnificent Salmon and Steelhead. They impede migration and have done great harm to the habitat for all wild Salmon and Steelhead returning to Idaho. Continual annual dredging is the only way that the dams can fulfill their original mission.	
0015	LuVerne & Kathleen Grussing	20419	The Corps must assess the value of that original mission compared to the costs of the loss of wildlife and fisheries that have already occurred and continue to occur due to dredging. If an honest evaluation were made, many	See response to DEIS comment 8360 in letter 12. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			studies have already shown that in terms of pure economics, Salmon and Steelhead contribute far more to the local, regional, and national economies than does the pathetic amount of shipping (made possible only by continued dredging) that actually occurs on the Lower Snake River.	
0015	LuVerne & Kathleen Grussing	20420	When assessing the efficacy of the proposed dredging, the Corps must consider an alternative which includes removing or breaching the four Lower Snake River Dams. If the dam removal alternative is not considered, the assessment of dredging outside that context will be rendered completely worthless. The Corps' dredging plan offers no sound justification for spending more public money on these high cost, low value dams. It fails to adequately address the impacts dredging itself will have on wild Salmon. Worst of all, the plan fails to consider the most effective solution to the sediment, flooding, and fisheries problems: Removal of	See response to DEIS comment 8368 in letter 29. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			the four lower Snake River dams.	
0015	LuVerne & Kathleen Grussing	20421	As taxpayers and residents of Lewiston-Clarkston Valley, we oppose spending any more tax dollars on a money-losing waterway that harms fish and our cherished lifestyle and customs.	Comment noted.
0016	Randy Hayden	20369	The Port of Pasco strongly supports the conclusions of the EIS and final PSMP for the lower Snake River. We are hopeful that with the completion of these document the Corps will be able to proceed with long overdue maintenance dredging of the Snake River to support Port and river transportation.	Comment noted..
0017	Robert Curcio	20370	We strongly support the Corps' PSMP EIS and your plan to perform immediate and critically needed maintenance dredging to reestablish the federally authorized navigation channel on the Lower Snake River at the downstream navigation lock approach at Ice Harbor Dam and the confluence of the Snake and Clearwater rivers.	Comment noted.
0017	Robert Curcio	20371	We agree that the Corps does not need	Comment noted.

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			to produce a detailed economic analysis or a cost/benefit analysis under the National Environmental Policy Act or the Water Resources Development Act to support the Corps' decision to conduct maintenance dredging. Dredging of the Lower Snake River navigation channel is a maintenance project, not a new construction project, and the economic necessity for maintenance dredging is evidenced by the continued commercial use and reliance on the federal navigation channel by the inland ports, transportation providers and business community.	
0018	David Doeringsfeld	20387	We strongly support the Environmental Impact Statement ("EIS") and final Programmatic Sediment Management Plan for the tower Snake River on this sediment evaluation. We also support the plan to tackle long overdue routine maintenance dredging in areas of the federal navigation channel which have become constrained.	Comment noted.
0018	David	20388	Nonetheless, because	All EIS comments and associated attachments are included as part of the project's Administrative Record.

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	Doeringsfeld		socio-economic impacts must be studied on a more general level as part of any EIS, please see a study submitted by Pacific Northwest Waterways Association (PNWA) conducted by Dr. Eric Fruits of Nathan Associates regarding the economic necessity of and justification for immediate dredging. We ask that you include this study in your final administrative record and factor it into your final decision-making, as appropriate.	
0018	David Doeringsfeld	20389	The Port of Lewiston strongly urges the Corps to deny any further requests for extension on the commenting period and to finalize and issue the FEIS, PSMP, and Record of Decision no later than October 22, 2014, as you originally committed.	Comment noted.
0018	David Doeringsfeld	20390	Finally, it is important to note that reservoir "drawdown" on the Lower Snake River is simply not a viable option to address sediment accumulation.	Comment noted.

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0019	James M. Kuntz	20372	The Port agrees that neither a detailed economic analysis nor a cost/benefit analysis is required under the National Environmental Policy Act ("NEPA"), or the Water Resources Development Act in support of the Corps' decision to conduct routine maintenance dredging of the Lower Snake River federal navigation channel. Corps policy and the underlying statutes clearly distinguish between the types of analysis required for construction of new projects versus maintenance of existing projects. The economic necessity for maintenance dredging is evidenced by the continued commercial use and reliance on the federal navigation channel by the inland ports and shipping community.	Comment noted.
0019	James M. Kuntz	20373	We urge the U.S. Army Corps of Engineers to finalize its ROD by October 22, 2014, and move forward with routine maintenance dredging on this critical federal navigation channel.	Comment noted.
0020	Jay T. Waldron	20395	We strongly support the Corps' very	Comment noted.

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			thorough and what we believe to be a legally defensible Environmental Impact Statement ("EIS") and final programmatic Sediment Management Plan for the lower Snake River on this sediment evaluation. Schwabe also supports the Corps' plan to perform long overdue routine maintenance dredging in areas of the federal navigation channel which have become constrained and have unlimited effective cargo loading to make shipping the most cost-efficient.	
0020	Jay T. Waldron	20396	In short, Schwabe has reviewed closely the comments the Corps is receiving from PNWA, of which Schwabe is a member. Rather than restate PNWA's detailed analysis, and copy their attachment, we choose to ask the Corps to consider Schwabe's endorsement of those PNWA comments as standing for our own, and to add our voice to the points they make so ably.	Comment noted.
0021	John E. Love	20397	We urge the U.S. Army Corps of Engineers to finalize its ROD by October	The Corps intends to issue a ROD pursuant to completion of review of FEIS comments, ESA compliance and similar requirements.

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			22, 2014, and move forward with routine maintenance dredging on t his critical federal navigation channel.	
0021	John E. Love	20398	The port also strongly urges the Corps to deny any further requests for extension on the commenting period and to finalize and issue the FEIS, PSMP, and Record of Decision no later than October 22, 2014.	Comment noted.
0021	John E. Love	20399	It is also critical to emphasize that "drawdown" on the Lower Snake River is simply not a viable option to address sediment accumulation.	Comment noted.
0022	Alan (Butch) Odegaard	20400	The COE identified Alternative 7, Comprehensive (Full System and Sediment Management Measures) as the preferred alternative for the PSMP. The NWPPVA fully supports this longterm PSMP and the immediate action plan to re-establish the federal navigation channel to authorized dimensions for the Corp's Lower Snake River Projects (LSRP). Maintenance of the navigation system for the LSRP has enormous effects on	Comment noted.

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			the economy of the Lewiston, Idaho, Clarkston, Washington, and the Pacific Northwest Region.	
0023	Richard Finn	20401	The Corps of Engineer has developed a thorough PSMP/EIS that justifies maintenance dredging this winter. The Port of Portland urges the Corps of Engineers to proceed with this long overdue navigation activity.	Comment noted.
0024	Stephanie Utter	20402	The Bureau of Reclamation's Burbank Pumping Plant 1, which is operated and maintained by the South Columbia Basin Irrigation District (District), on the south bank of the Lower Snake River approximately five miles below Ice Harbor Dam. In the main stem of the Columbia River below the confluence of the Snake and Columbia Rivers, there are two more pumping plants. These pumping plants are also operated and maintained by the District; they pump water from the McNary Pool to the southern portion of the Columbia Basin	The Corps will implement all applicable standard procedures to ensure sediment management is carried out in the least impactive manner feasible. In addition, the Corps would continue to coordinate meetings with all applicable land use management agencies and groups through the annual LSMG meeting. The LSMG meeting would serve as an information exchange forum between the Corps and federal and state regulatory agencies, tribes, local governments, and other stakeholders. The primary purposes of the meeting would be to share data and compare trends observed by each agency, identify potential opportunities to improve each agency's independent sediment reduction practices, and analyze trends on a watershed basis. Information gained from LSMG meetings may be used by the Corps to adapt PSMP measures. The Corps intends to explore opportunities for other regional coordination concerning sediment management in the lower Snake River basin (e.g., provision of staff expertise under the Regional Sediment Management Program), which are hosted/facilitated by other agencies or stakeholders. The Bureau of Reclamation is encouraged to participate in these meetings.

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			Irrigation Project. In the past, the intake valves of the pumping plants have clogged due to sedimentation. Dredging activities and sediment removal should be done in a manner that minimizes adverse effects to the operations, facilities, and resources of the Columbia Basin Irrigation Project particularly (Burbank Pumping Plants 1, 2, and 3).	
0025	James Waddell	20422	In the draft EIS for the Lower Snake River Programmatic Sediment Management Plan (LSRPSMP) the NWW claimed the district had no requirement to provide any economic justification for its sediment management plans, including the $6.5 million "immediate action" dredging project embedded in the LSRPSMP. Perhaps in a reaction to public outcry regarding this issue, NWW now claims that commercial navigation on the lower Snake River saves $25 million annually based on a projected cost differential of $8.25 per ton between shipping	See response to DEIS comment 8480 in letter 52. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf These comments urge the Corps to apply an inappropriate level of economic analysis for the development of an operations and maintenance action. The economic justification requirements in the Corps planning guidance for a new navigation project requiring authorization are significantly more rigorous but are not applicable in this maintenance situation. Specifically, the Corps guidance cited in these comments is for the evaluation of Dredged Material Management Plans (DMMP's) and found in the Planning Guidance Notebook (PGN) (Engineer Regulation [ER] 1105-2-100). The PSMP is not a DMMP for multiple reasons, including it looks to more than dredging actions to address sediment accumulation problems. In addition, the internal Corps Budget Engineering Circular further confirm this approach by supplying internal guidance that feasibility-level cost benefit analysis are not called for in operation and maintenance actions (Corps Engineering Circular 11-2-200). The PSMP and the decision to address the current immediate need are not new navigation projects that would call for a feasibility-study level of analysis, but rather operation and maintenance actions taken to address sediment accumulation in the LSRP using a programmatic perspective. Because this is an existing authorized navigation project, the Corps planning guidance recommends the Corps to confirm that continued maintenance is warranted based on an evaluation of navigation indicators [ER 1105-2-100 paragraph E-15 h(3)(i)(1))] before preparation of a DMMP, which was generally applied to the PSMP The economic indicators reviewed in this analysis included consideration of the current tonnage and transportation savings that continue to demonstrate that continued maintenance is warranted. The current tonnage level estimates show that there continues to be a significant amount of tonnage using the Lower Snake River. For example, 3.3M tons transited the system in 2012. This was up approximately 500,000 tons from 2011. Also, the Corps Center of Expertise for Inland Navigation estimates that movements on the LSRP save about $10.90 per ton versus moving

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			by barge and shipping by other means. The $8.25/ton figure is then applied to a claimed annual freight volume of 3 million tons, resulting in the claim of $25 million in savings.	by rail. After considering the comments, the Corps has determined these economic indicators establish that the development and adoption of the PSMP is economically warranted. Comments on the topic of economics also critiqued the numbers represented in the 2002 Lower Snake River Juvenile Salmon Migration Feasibility Study (LSRJSM). The 2002 LSRJSM Feasibility Report and the Transportation Analysis developed for that EIS is the most thorough, widely accepted analysis of the transportation benefits associated with the LSRP. The study team included representatives of various Federal and regional agencies, tribal representatives, and other interested parties. Further the analyses were reviewed by the Independent Economic Advisory Board. This independent group of expert economists evaluated the analysis and determined that the results were the "best available estimate" of the impacts and were of "a balanced professional quality". Nonetheless, it is true that the numbers in the study resulted in projections for the 2002-2012 time period that exceeds current tonnage numbers. Therefore, the Corps also looked to the current tonnage numbers and found the difference to be generally in line with trends in inland waterway traffic nationwide during the same time period. Current tonnage estimates show that there continues to be a significant amount of tonnage using the Lower Snake River - 3.3M tons in 2012. The projected tonnage from the LSRJFM Report for 2012 was 4.9M tons. As a result, both the current tonnage numbers and the analysis of the LSRJSM were applied in making this decision.
0025	James Waddell	20423	However, my principal comments concern the claimed savings of $8.25 per ton for barge transportation, which NWW states they derived from information in the 2002 Final Lower Snake River Juvenile Salmon Migration Feasibility Report (LSRFR) That report claimed a savings of $5.75 per ton, to which NWW has apparently applied a 3% inflation factor over the ensuing 13 years. The analysis that produced the $5.75 figure was itself flawed and resulted from violations of USACE guidance.	See response FEIS Comment 20422 in letter 0025.
0025	James Waddell	20424	When these simple to see errors are corrected there is NO savings by using the Lower Snake Waterway. None	See response FEIS Comment 20422 in letter 0025.

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			whatsoever, thus NO economic justification for this or any other dredging on this waterway.	
0025	James Waddell	20425	NWW deviated from the standard Corps practice by electing to use costs generated by a computer model rather than actual rates (shown in the LSFS) for shipping goods to calculate changes in the NED account.	See response FEIS Comment 20422 in letter 0025.
0025	James Waddell	20426	However, if NWW's analysis used these higher "costs" in their formulation, the claimed navigation benefit of keeping the dams in place would be reduced—in fact, the benefit would be reduced to zero.	See response FEIS Comment 20422 in letter 0025.
0025	James Waddell	20427	By disregarding this guidance and standard practice, the District made an error in the LSFS that provided a faulty and overstated benefit for truck/barge navigation versus truck/rail.	See response FEIS Comment 20422 in letter 0025.
0025	James Waddell	20428	Rather than using the Reebie Cost Model the Corps erroneously adopted, a comparison can be made using the average shipping rate for each state identified by the Translog Associates' study as summarized	See response FEIS Comment 20422 in letter 0025.

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			in Table 3.3-1 and weighting this rate by the percentage of grain each state shipped as provided in Table 3.3-25.	
0025	James Waddell	20429	The claim of a $25 million benefit for maintaining this channel is a false claim.	See response FEIS Comment 20422 in letter 0025.
0025	James Waddell	20430	Further, the Corps' estimated $1-$5 million annual cost in the sediment management plan for maintenance of this waterway fails to consider fully the cost of lock operations/maintenance, major repairs such as $10 million lock gate replacements, and needed major lock rehabilitation expenditures on the near horizon, let alone the $16+ million the NWW has now spent on the sediment management plan itself.	In response to questions as to whether total operation and maintenance costs of the LSRP were included, the Corps can affirm that annual transportation savings continue to support continued maintenance of navigation channel, even with the costs of lock maintenance (routine and non-routine), factored in. In recent years, these costs have averaged about $4.6 million for routine maintenance, and $2 million for non-routine maintenance. Total navigation maintenance costs are approximately $7.6 million - $12.6 million per year. Considering, for example, the $10.90 per ton transportation savings factored together with current tonnage volumes (e.g. 3.3 million in 2012), annual savings remain conclusive when compared to "total" annual maintenance costs of the LSRP (channel and locks) and affirm that continued maintenance planning is warranted.
0025	James Waddell	20431	Indeed, a large portion of the .7 mcy of the dredging is required to maintain flow conveyance that is caused by sediment dropping out in the Lower Granite pool at the head of navigation at Lewiston.	The 0.7 mcy is the amount of material the Corps estimates would need to be dredged annually to maintain flow conveyance IF the risk of overtopping the Lewiston levees reached unacceptable levels. This figure was included in the Corps' PSMP Biological Assessment (BA) to provide an estimate of the magnitude of effect that could be expected if the flow conveyance dredging measure was implemented. However, including this figure in the BA does not mean the Corps has determined dredging is needed to prevent overtopping of the levees. Section 3.7.3 of the FEIS states :"…the existing levee systems appear adequate to provide protection from overtopping during the SPF [standard project flood] and exceed the requirements for levee systems under the National Flood Insurance Program. After 50 years of simulated sediment accumulation, the model predicts that the levee systems would be adequate to provide protection from overtopping during the SPF."
0025	James Waddell	20432	As noted above, navigation is not	See response FEIS Comment 20422 in letter 0025.

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			justified. It therefore does not meet the Congressional intent that the initial authorization was based on, nor meet the standard for continued maintenance.	
0025	James Waddell	20433	a corrected reanalysis of all project costs shows that navigation costs cannot be traded off or wrapped in with the other costs of the four dams and yield a positive benefit.	See response FEIS Comment 20422 in letter 0025.
0025	James Waddell	20434	Given these economic losses, it would be a far better investment of the Corps scarce O&M and planning resources to utilize the Corps Section 216 authority and undertake an immediate disposition study of the Four Lower Snake Dams over the next 6 months with the goal to begin drawing down the Lower Granite reservoir in the spring of 2015.	See response FEIS Comment 20422 in letter 0025 and DEIS comment 8360 in letter 12. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf .
0026	Mr Rob Rich	20403	Periodic dredging of sediment accumulation under the vigilant methodology set forth by the PSMP/EIS ensures the best possible practices to ensure environmental stewardship is exercised throughout	Comment noted.

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			the dredging project. We support and believe in the Walla Walla District's ability to safely, responsibly, economically provide the dredging needed to protect the great investment made in this Snake River system.	
0027	Ernest Goitein	20435	Barge traffic has been replaced by truck and train shipping leaving barge shipping at less than 4 percent of freight hauling.	See response FEIS Comment 20422 in letter 0025.
0027	Ernest Goitein	20436	It would make much more sense to tear down the dams and reestablish a healthy salmon fishery industry. This would produce an annual economic boom and income to the local communities.	See response to DEIS comment 8368 in letter 29. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0028	Kristin Meira	20404	We strongly support the Corps' significant effort to produce a very thorough and legally defensible Environmental Impact Statement ("EIS") and final Programmatic Sediment Management Plan for the lower Snake River on this sediment evaluation. We also support the Corps' plan to tackle long overdue routine maintenance dredging in areas of the federal	Comment noted.

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			navigation channel which have become constrained.	
0028	Kristin Meira	20405	Nonetheless, because socio-economic impacts must be studied on a more general level as part of any EIS, we are re-submitting a study conducted by Dr. Eric Fruits of Nathan Associates regarding the economic necessity of and justification for immediate dredging. We ask that you include this study in your final administrative record and factor it into your final decision-making, as appropriate.	All EIS comments and associated attachments are included as part of the project's Administrative Record.
0028	Kristin Meira	20406	PNWA also urges the Corps to work with its sister agencies to quickly resolve any lingering loose ends by: (1) shoring up its record in response to comments, especially those received by other federal and state agencies; and (2) completing the Endangered Species section 7 consultation forthwith, and implementing any required mitigation measures that result from that process.	Comment noted.
0028	Kristin Meira	20407	Finally, it is important to emphasize that	Comment noted.

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			reservoir "drawdown" on the Lower Snake River is simply not a viable option to address sediment accumulation.	
0029	Norm Semanko	20408	IWUA urges the Corps to deny any further requests for extension of the comment period. The FEIS, PSMP and ROD should be issued by October 22, 2014, as previously committed to. Further extensions will only delay implementation of a critically needed maintenance project.	Comment noted.
0029	Norm Semanko	20409	Finally, IWUA does not support reservoir drawdown as an alternative to the needed maintenance on the system. The 1992 test drawdown of the Lower Granite pool was a colossal failure, causing environmental and economic devastation that still resonates in the affected areas today.	Comment noted.
0030	Linwood Laughy	20437	NWW failed to consider fully any alternative other than dredging, thus continuing the cycle of perpetual dredging the plan was supposed to resolve.	See response to DEIS comment 8686 in letter 68. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0030	Linwood Laughy	20438	Yes, there are other alternatives in the tool box. Yet the PSMP failed to consider any	See response to FEIS comment 20316 in letter 31.

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			of them in any detail. First you dredge. Then when sediment build-up again becomes a problem, which you predict will be every 3-5 years, NWW will study what should be done. Meanwhile of course, the navigation channel becomes less than authorized, so an "immediate need action" emerges, which can only be solved by dredging, followed by more expensive planning. A cycle of expensively ineffectual study, planning and action = dredging is perpetuated.	
0030	Linwood Laughy	20439	Thus this critically important decision regarding future sediment management is left for further planning, which constitutes an unacceptable omission in the FEIS.	See response to DEIS 8686 in letter 68. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0030	Linwood Laughy	20440	The FEIS does state multiple times that .7 million cubic yards of sediment must be removed from the confluence of the Snake and Clearwater Rivers and approximately 2 miles up the Clearwater on an annualized basis in	See FEIS comment 20431 in letter 25.
0030	Linwood Laughy	20441	Using NWW's 3% inflation rate as	See response FEIS Comment 20422 in letter 0025.

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			applied to the claimed cost difference between shipping by barge versus by other means in 2002 ($5.75 to $8.45), the 2014 cost of required sediment removal would exceed $11 million on an annualized basis. It thus appears highly likely that dredging costs are closer to NWW's upper range of $5 million than they are to $1 million, and perhaps are greater than $5 million, perhaps even double that amount.	
0030	Linwood Laughy	20442	References are made throughout the FEIS to the need for further study and planning. The last round of planning cost the American public in excess of $16 million. If that cost were amortized over a 20-year period, the cost of managing sediment in the vicinity of the confluence of the Snake and Clearwater Rivers would increase an additional $800,000 per year just for past planning. Future planning costs are unknown but add to the total expense.	See response FEIS Comment 20422 in letter 0025.
0030	Linwood Laughy	20443	NWW's FEIS for the LSRPSMP fails to	See response to DEIS comment 8360 in letter 12 and FEIS comment 20422 in letter 25.

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			provide a serious look at alternatives and leaves many questions unanswered, but the bottom line is that further investment in commercial navigation on the lower Snake River is not economically justifiable. The USACE should halt this project and spend the savings on more justifiable waterway projects such as those on the Columbia River. Both USACE and American taxpayers stand to benefit from such course of action.	To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20298	The Corps' erroneous legal conclusion that Congress's authorization of a 14-foot navigation channel is somehow a mandate results in a single-minded focus on dredging – now and into the foreseeable future. Our March 26, 2013, comments responding to the Corps' draft environmental impact statement pointed out the Corps' legal error. DEIS Cmts. at 4-6. We adopt those comments in their entirety by reference. The Corps' flawed legal conclusion results in a narrow purpose-and-	See response to DEIS comment 8684 in letter 68. The Corps acknowledges it has broad discretion to manage the LSRP for all authorized project purposes. Whether the Snake River is open for commercial navigation 365 days a year, 10 months, or less does not reduce the need for channel maintenance to prescribe to the congressionally authorized dimensions. The need for channel maintenance addressed under this scenario is not reduced in any way. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			need statement that renders dredging a foregone conclusion and all other options window-dressing. That framing of the purpose and need – requiring a 14-foot channel immediately and indefinitely – yields a foregone conclusion because the answer to the Corps' narrow question will always be dredging. But the purpose of the navigation component of the Lower Snake River system is to facilitate navigation; the navigation component does not – and the system itself does not – exist to provide a dredged channel as the Corps' inverted reasoning would suggest.	
0031	Steve Mashuda	20299	Nor does the existence of the navigation component preclude options other than dredging, such as modifying, shifting, or shutting down activities or sites that create a need for dredging but return little in terms of navigation volume or positive economic benefits.	See response to DEIS comment 8754 in letter 76 and comment 8686 in letter 68, and FEIS comment 20422 in letter 25. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20300	Simultaneously, the Corps attempts to draw a distinction that	See response to DEIS comment 8684 in letter 68. The Corps acknowledges it has broad discretion to manage the LSRP for all authorized project purposes. Whether the Snake River is open for commercial navigation 365 days a year, 10 months, or less does not reduce the need for channel maintenance to prescribe to the congressionally authorized dimensions. The need for channel

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			"Congress intended for commercial navigation to be possible 365 days a year." Id. These statements demonstrate the inherent contradiction in the Corps' position – the idea that even when closed to navigation the channel must be theoretically usable. How maintaining the channel aids navigation – when navigation is suspended – is unclear other than that the Corps believes indefinite dredging is the solution. The Corps has also failed to clarify its position as to when navigation can be appropriately suspended. Through its past actions, the Corps has acknowledged that commercial navigation may be suspended for lock maintenance, but the Corps has not specified why navigation could not also be suspended in service of other Congressionally-authorized uses and purposes of the River, such as conservation of fish and wildlife. As our DEIS Comments detail, Congress	maintenance addressed under this scenario is not reduced in any way. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf .

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			requires the Corps to consider several purposes – including fish and wildlife conservation, power generation, and recreation.	
0031	Steve Mashuda	20301	There remains no principle of law or logic that would allow the Corps to claim it is under a mandate to maintain a particular channel depth on the Snake but not on the Columbia, only a few miles downstream.	See response to DEIS Comment 8684 in Letter 68. As stated in Section 1.2 of the FEIS, the Flood Control Act (FCA) of 1962 (PL 87-874) required establishment of the navigation channel within the Columbia-Snake River navigation system (including the LSRP) at 14 feet deep by 250 feet wide at minimum regulated flow (i.e., minimum operating pool, or MOP). While the language of the FCA is more than adequate legal foundation, the legislative history is supporting and provided here for background. The explicit designation of channel dimensions in the 1962 FCA was based on recommendations made by the Secretary of the Army and the U.S. Army Corps of Engineers in House Document 403, Eighty-seventh Congress (HD 403). HD 403 (Volume I) included A Report by The Division Engineer (June 1958), which included the following recommendation concerning depth of the Columbia-Snake River navigation system: "Because of the necessity for larger channel areas to reduce velocities immediately below dams, channel depths of 14 feet or greater will be obtained at negligible additional cost in all reservoir reaches. It is believed desirable that authorized project dimensions be established for this project for proper identification. Therefore, this report includes the recommendation as summarized in Chapter X [p. 396], that the minimum channel of the Columbia-Snake River slack water navigation system be designated as 14 feet in depth and 250 feet in width." (p. 85, emphasis added) Volume 1 of HD 403 also included the Report of the Chief of Engineers, dated March 31, 1961, which recommended, "That the depth and width of the authorized channel in the Columbia-Snake River barge navigation project be established as 14 and 250 feet, respectively, at minimum regulated flow." (Para. 31.e, p. 18). The entire Columbia-Snake River navigation channel is maintained for depths at least (minimum) 14 feet deep and maintaining areas where the navigation channel is deeper than 14 feet (e.g., the Columbia River below The Dalles Dam) is not inconsistent with the 1962 FCA or other federal law.
0031	Steve Mashuda	20302	The Snake River system as a whole is established for many purposes, with navigation as one component and a 14-foot channel as one option in the menu of possibilities to serve navigation. There are many ways to transport products that do not require the entire channel and that would retain the non-barging economic	See response to DEIS comment 8686 in letter 68. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			benefits port facilities provide.	
0031	Steve Mashuda	20303	it need only dredge. The Corps' myopic focus on channel depth and dredging improperly limits the alternatives the Corps considers in both the short and long-term.	See response to DEIS comment 8686 in letter 68. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20304	Based in large part on the Corps' improperly narrow purpose-and-need statement – deriving from its belief that it must maintain a 14-foot navigation channel – the Corps did not consider all reasonable alternatives	See response to DEIS comment 8686 in letter 68. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20305	The Corps' program is to provide transportation of goods in and out of the region consistent with the other purposes of the Snake River system.	See response to DEIS comment 8684 in letter 68. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20306	the Corps should have evaluated a no action plan that would maintain the system's ability to provide transportation of goods without a 14-foot channel that reaches all the way to the Port of Lewiston.	See response to DEIS comment 8687 in letter 68. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20307	Further, the Corps did not provide rigorous analysis of its "no-action" alternative and has not remedied this problem in the FEIS or responses to	See response to DEIS comment 9047 in letter 77. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf ..

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			comments	
0031	Steve Mashuda	20308	The Corps failed to consider light-loading barges and other methods that could be used with navigation-objective reservoir operation	See response to DEIS comment 8691 in letter 68. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20309	As discussed in the DEIS Comments, this description is itself a fiction since under the terms of the Biological Opinion for the Federal Columbia River Power System, the Corps is prohibited from raising MOP as the Corps envisions.	See Sections 1.4.2, 2.2.4.3, and 2.2.5.1 of the FEIS main report. Under Reasonable and Prudent Alternative Action 5 of the National Oceanic and Atmospheric Administration Federal Columbia River Power System 2014 Supplemental Biological Opinion (2014 FCRPS Supplemental BiOp), the Corps is to operate the lower Snake River reservoirs at Minimum Operating Pool, with a one-foot operating range during the juvenile salmon outmigration (from April 3 until approximately September 1), unless adjusted to meet authorized project purposes, primarily navigation. The Corps considers the Lower Granite Dam variable MOP operation necessary to ensure safe navigation and is an interim/temporary measure until the federal navigation channel can be re-established to the congressionally authorized dimensions of 14-foot deep by 250 feet wide. The Lower Granite Dam variable MOP operation was included in the Action Agencies FCRPS 2013 Implementation Plan that was reviewed and considered by NMFS for the 2014 FCRPS Supplemental BiOp.
0031	Steve Mashuda	20310	The Corps dismissed alternatives 2, 3, 4, and 6 without sufficient analysis based on its determination to dredge a 14-foot channel. The Corps automatically dismissed every option but Alternatives 5 (dredging only) and 7 (dredging plus Alternatives 3 and 4). The Corps has not complied with its obligation to thoroughly consider all reasonably available alternatives thoroughly and sufficiently evaluate the alternatives presented.	See response to DEIS comment 8684 and 8686 in letter 68. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20311	The dredging-only option, Alternative 5, also could be	The Corps disagrees the settlement limits its ability to consider any alternative when developing the PSMP, including one based primarily on dredging, nor is it implied. The settlement agreement simply states : "Defendant Corps of Engineers agrees that it will initiate and complete a NEPA analysis on a long-term plan for the management of

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			dismissed out of hand because it would not comply with the Corps' obligation to develop a programmatic sediment management plan. The 2005 settlement between the Corps and conservation groups requires the Corps to develop a programmatic plan to address sediment. Nat'l Wildlife Fed'n v. US. Army Corps of Eng'rs, CV02-2259L, Settlement Agreement at 3 (W.D. Wash. filed Sept. 8, 2005). Implicit in that settlement is that the Corps would not carry forward a plan that involves only dredging, i.e. Alternative 5. For that reason, Alternative 5 was illusory like the other alternatives the Corps rejected.	sediment in the lower Snake River, to be designated the Programmatic Sediment Management Plan, ("PSMP')…"
0031	Steve Mashuda	20312	The Corps also failed to consider other possible, credible alternatives such as, for example, dam breaching. Even if the Corps did not consider breaching all of the Lower Snake River dams, it should have considered breaching just Lower Granite dam.	See response to DEIS comment 8368 in letter 29 and 8686 in letter 68. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20313	Alternative 7 contains no commitments and	See response to DEIS comment 8408 in letter 22 and 8754 in letter 76.

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			minimal analysis of how the Corps will decide which actions to select in the future. There is no indication that the Corps is undertaking analysis now that will result in the implementation of any of the measures on its list of options, putting off needed analysis and implementation that should be happening now	To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20314	Corps' attempt to delay or downplay any analysis of the current flood risk to the City of Lewiston and any decision or discussion of the need to raise the levees if Lower Granite dam remains in place. The FEIS contains contradictory statements regarding the impact on flood risk to Lewiston of dredging the .7 mcy/year (annualized) of material necessary to maintain the channel.	See response to DEIS comment 8361 in letter 14, 8407 in letter 22, and 8490 in letter 58. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf The 0.7 mcy is the amount of material the Corps estimates would need to be dredged annually to maintain flow conveyance IF the risk of overtopping the Lewiston levees reached unacceptable levels. This figure was included in the Corps' PSMP Biological Assessment (BA) to provide an estimate of the magnitude of effect that could be expected if the flow conveyance dredging measure was implemented. However, including this figure in the BA does not mean the Corps has determined dredging is needed to prevent overtopping of the levees. Section 3.7.3 of the FEIS states :"…the existing levee systems appear adequate to provide protection from overtopping during the SPF [standard project flood] and exceed the requirements for levee systems under the National Flood Insurance Program. After 50 years of simulated sediment accumulation, the model predicts that the levee systems would be adequate to provide protection from overtopping during the SPF."
0031	Steve Mashuda	20315	The Corps, however, has given little indication as to how that process would work and which of its menu of options might be selected and in what circumstances, nor has the Corps given any indication as	See response to DEIS comment 8754 in Letter 76. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			to whether one of those options could ever beat out dredging in its analysis of cost- and technical-effectiveness, particularly in light of its perceived "duty" to constantly maintain a 14-foot channel.	
0031	Steve Mashuda	20316	Dredging is the selected option for all immediate need options, and – assuming that the Corps does not change its interpretation of the Flood Control Act of 1962 – it is not clear why it would not remain the favored option for all sediment management into the indefinite future.	See response to DEIS comment 8754 in letter 76. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf Dredging is not the only measure, nor is it the "selected measure" for immediate need actions under the PSMP (Appendix A). See Section 3.3.3. For immediate need actions involving sediment interfering with recreation areas (e.g., boat basins), the PSMP includes non-dredging interim measures and use of agitation to address the problem. Likewise, immediate need actions to address sediment interfering with fish and wildlife facilities (i.e., irrigation intakes) include non-dredging routine operation and maintenance actions or limited excavation by hand. Dredging is listed as an available immediate need measure for all project purposes, but it is not the only measure. Additionally, immediate need actions under the PSMP are intended to address non-reoccurring sediment accumulation problems. Future forecast need actions, which call for the initiating the study of long-term solutions, are intended to address reoccurring sediment accumulation problems (i.e., more than once in 5 years). Finally, the Corps developed the PSMP/EIS with no preconceived notions about reasonable/viable alternatives for managing sediment that interferes with existing authorized purposes of the LSRP. That position is supported by the years of in-depth sediment source/deposition studies conducted by the Corps and other entities (Appendices C-E). During development of the preferred alternative (Alternative 7 – Comprehensive (Full System and Sediment Management Measures)), dredging was identified as a feasible (proven) measure for addressing problem sediment accumulation in the short-term, but it is not the only measure incorporated into Alternative 7 for immediate need actions.
0031	Steve Mashuda	20317	The FEIS improperly includes the Corps' favored dredging action (its "immediate need" action) as part of this programmatic plan. The Corps cannot dredge unless and until it at finalizes and adopts the PSMP and the EIS in a Record of Decision and prepares separate, site-specific NEPA analysis (likely an EIS) for the	See response to DEIS comment 8771 in letter 76. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			"immediate need" action that satisfies the requirements of the law.	
0031	Steve Mashuda	20318	Rather than provide definite criteria that can be implemented to select between management options – and that would be transparent and predictable for the public – the Corps has provided only a list of possibilities that may or may not ever be used to supplement or replace dredging. While the Corps presents this scheme as a programmatic plan, it effectively amounts to a decision to dredge whenever there is sediment – in 1 to 3 year increments – with some possible but unspecified use of other measures at some possible but unspecified point in the future.	See response to FEIS comment 20316 in letter 0031 and DEIS comment 8754 in letter 76. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20319	We previously detailed at least three ways in which the proposed channel maintenance (in both the short and long term) affect and are affected by, climate change. It is at least reasonably foreseeable – and indeed, likely – that the sediment accumulation the Corps is	See response to DEIS comment 8461 in letter 44. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			attempting to address in the FEIS will increase and will require additional measures and additional costs over time. The Corps, however, does not factor any of these increases into the Corps' consideration of the environmental impacts from increased needs for channel maintenance over time, nor does the Corps consider the increases in any analysis of the benefits and costs of the PSMP.	
0031	Steve Mashuda	20320	The connection between climate change and increased sediment delivery is well-documented and far more complex than the Corps asserts. The Corps' continuing failure to consider the environmental and economic consequences of these substantial and reasonably foreseeable sediment increases violates NEPA.	See response to DEIS comment 8461 in letter 44 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf The Corps agrees the connection between climate change and increased sediment is complex, and has considered this in developing the PSMP and undertaking the underlying studies and analysis in this FEIS. Section 1.6.2.2 of the FEIS acknowledges wildfire in the watershed study area has been increasing and fire-affected areas of the Salmon River are the primary contributor of sand, the predominant problem sediment, to Lower Granite Reservoir. It also states the studies prepared for the PSMP indicate there are no practicable ways in this watershed to prevent fire or control the sediment resulting from fire. Section 4.12.1.2 of the FEIS states increased plant growth induced by increased precipitation as rain, combined with warmer, drier summers, may increase forest fire risk. It also states climate change in the Northwest may result in changes to timing of streamflow related to snowmelt and hydrologic responses will depend on the dominant form of precipitation within a particular watershed. Figure 4-1 in the FEIS indicates some of the watershed may already be experiencing peak annual sediment yield and that either an increase or a decrease in precipitation may result in a decrease in sediment yield. However, an increase in the amount of sediment entering the reservoirs does not automatically result in an increase in the implementation of sediment management measures as not all sediment accumulates in areas that interfere with existing authorized project purposes. "The PSMP is designed to adapt and adjust to the sort of complexity presented by drivers such as the interplay between climate change and sediment-delivery levels."
0031	Steve Mashuda	20321	nearly every element necessary to support healthy salmon and other fish and wildlife populations will	See response to DEIS comment 8368 in letter 29 and 8686 in letter 68. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			continue to decline in most of the Columbia River basin as the continuing effects of climate change are felt throughout the basin. The continued use of the Lower Snake River dams for navigation and other purposes compounds that problem by destroying salmonid habitat and interfering with salmon and steelhead migration to and from. While the Corps recognizes that its reservoirs result in higher and longer lasting water temperatures in the summer, FEIS at 4-73, it fails to analyze its decision to continue maintaining a navigation system that perpetuates this exceedence, nor does it recognize or consider that increasing temperatures from climate change will make this current problem worse over time.7 In choosing to maintain this waterway, the Corps is making a decision to carry forward (and thereby exacerbate) these impacts and must fully consider them. The FEIS does	

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			not do so.	
0031	Steve Mashuda	20322	a comparison of the GHG emissions from barges versus the emissions from trains is not the correct comparison. The Corps' continued narrow focus on emissions from barge tugs alone fails to capture the true impacts of barging and does not consider the relevant GHG emissions of continued reliance on the navigation channel.	See response to DEIS comment 8698 in letter 68. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf Although the comment response in the FEIS addressed the difference in GHG production between the different modes of transportation, that information is irrelevant to the analysis needed for the PSMP FEIS. The FEIS evaluates the effects on air quality and GHG emission from the equipment used to implement sediment management measures. The FEIS is not analyzing the effects of various transportation methods or the existence of the LSRP. See FEIS section 4.9 and 4.12.1.1.
0031	Steve Mashuda	20323	the Corps' simplistic approach presents a misleading, incomplete, and inaccurate picture of the socioeconomic effects and the true balance between the costs and benefits of the ongoing maintenance of the navigation channel or any of the alternatives that the Corps did consider (or should have considered). In doing so, the Corps has violated NEPA, its internal regulations, and its own guidance.	See response to DEIS comment 8360 in letter 12. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20324	close to 99% of the cost (and any purported benefit) of dredging or maintaining the channel relates at	See response to FEIS comment 20422 in letter 0025 and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			most to this total tonnage, not the 3 million tons for the entire Lower Snake River corridor that the Corps utilizes in its purported justification. This error alone, if corrected, would likely demonstrate that the costs of channel maintenance outweigh its benefits.	
0031	Steve Mashuda	20325	2002 EIS that the Corps relies on for the entirety of its estimates of transportation savings from dredging is riddled with errors and omissions, assumptions that have proven false over time, and warnings about the limited utility of the analysis that the Corps did not address – let alone correct – in this FEIS. Indeed, the available evidence shows that the ton-miles currently attributable to the Lower Snake River falls below the threshold that the Corps elsewhere considers as "negligible," suggesting that analyses would be better focused on disposing of or otherwise abandoning this project, not continuing to funnel	See response to FEIS comment 20422 in letter 0025 and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			scarce public resources into it.	
0031	Steve Mashuda	20326	Contrary to the Corps' position in its response to comments, nothing in 40 C.F.R. § 1502.23 excuses its failure to provide this information or analysis in the FEIS. Given the multi-decade commitment the Corps seeks to make in this FEIS, there is no reason for its failure to perform the analysis necessary to answer the fundamental question – "is all of this worth it?" – in this FEIS.	See response to DEIS comment 8360 in letter 12. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20327	The Corps continues to improperly dismiss those impacts as minimal based on the simple assertion that dredging during the "work windows" will minimize the number of fall chinook salmon exposed to these impacts. But the Corps has failed to explain how this dismissal accounts for what it elsewhere (and in other decisions) paints as a significant number of fall chinook that overwinter in the reservoirs. Nor does this explanation account for the potentially large number of ESA-listed	See response to DEIS comment 8460 in letter 44, 8694 in letter 68, and 9050 in letter 77. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf Dredging would remove only sediment that has accumulated and will not extend into the original riverbed material. The type of substrate will remain unchanged. No Chinook redds have ever been located in any of the proposed dredging areas. There have been a few redds located in the tailrace downstream from Ice Harbor Dam, but these areas have more suitable flow conditions than at the navigation lock approach. While juvenile fall Chinook and adult steelhead are known to overwinter in Lower Granite Reservoir, they are typically found in deeper water closer to the center of the channel than the shorelines. The dredging operation will not encompass the entire width of the channel. There will be ample water unaffected by the temporary disturbance caused by the dredging. The proposed action will not affect fish which may be moving between reservoirs.

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			Snake River steelhead that are also present in the reservoirs during this time, including those moving between reservoirs.	
0031	Steve Mashuda	20328	We have also explained that dredging will also destroy or adversely modify suitable spawning habitat for fall chinook. The Corps asserts the same "workwindow" response to this issue. But this response continues to ignore potential impacts of dredging and other activities on spawning habitat for Snake River Fall chinook. The Corps' assertion that it will complete these surveys before dredging and reinitiate consultation if any redds are found, does not account for the fact that dredging will destroy critical habitat suitable for spawning even if no redds are found in the snapshot survey the Corps promises to conduct.	See response to DEIS comment 8694 in letter 68. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf Regarding the navigation lock approach at Ice Harbor Dam, no redds have been located there in past surveys. Redds have been found downstream from the dam, so the Corps chose to be cautious and survey the lock approach prior to removing some of the accumulated sediment. The river bottom material will still be similar/same Chinook spawning habitat after the accumulated sediment is removed. See pages 3-9 and 3-12 (Section 3.1.4.2) of the FEIS for more information on fall Chinook critical habitat and spawning habitat in the LSRP.
0031	Steve Mashuda	20329	The Corps' "work window" explanation also does not address the potential impacts to ESAlisted white sturgeon and white sturgeon habitat, both of which are present in	Neither white sturgeon nor their habitat is listed under ESA for the lower Snake RIver.

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			the areas the Corps seeks to dredge.	
0031	Steve Mashuda	20330	Moreover, although it is unclear – based on the Corps' schizophrenic treatment whether the Corps believes that the shallow water habitat created by disposal of dredge spoils is intended to mitigate or offset the impacts to ESA listed fish, the FEIs fails to address the concerns raised by our organizations and other entities about the efficacy of that habitat.	See response to DEIS comment 8778r, 8747, and 8772 in letter 76. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf The FEIS does not identify the creation of shallow water habitat as mitigation for the current immediate need action. However, it clearly states the Corps proposes using the dredged material in a beneficial manner - to create shallow water habitat that benefits juvenile salmonids (See FEIS Sections 2.3.2 and 4.2.1.2, and Appendix K).
0031	Steve Mashuda	20331	The Corps must conduct a full public interest review and satisfy all requirements of § 404(b) of the Clean Water Act before it may proceed with its proposed "immediate need" dredging.	See response to DEIS comment 8710 in letter 68 and 9319 in letter 121. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20332	while the Corps finally acknowledges the existence of the McCoy unit facility, it provides no detail on the actual socioeconomic effects this and other facilities have and will continue to have in the future.	See response to DEIS comment 8700 in letter 68. See Section 4.11.3.6 in FEIS To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20333	The Corps also fails to address the cumulative effects of continued navigation – and the interrelated continued existence of	See response to DEIS comment 8791 in letter 97. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			the four Lower Snake River dams – on a host of resources.	
0031	Steve Mashuda	20334	In preparing the FEIS, the Corps had an obligation to satisfy at least these 13 requirements established, separately and jointly, by the agency's Planning Guidance Notebook, the National Environmental Policy Act (NEPA), and the Principles and Requirements for Federal Investments in Water Resources:	See response to DEIS Comment 8360 in Letter 12 and FEIS comment 20422 in letter 25 The Corps took a "hard look" at potential environmental effects associated with the proposed actions (and reasonable alternatives) through preparation of the draft and final EISs and will complete its responsibilities under NEPA by signing of a ROD (if appropriate). The Corps also satisfied its internal planning and review processes. The Corps utilized the principles in the Planning Guidance Notebook (PGN) (Engineer Regulation [ER] 1105-2-100) when applicable and appropriate to guide the planning process for the PSMP. However, the PSMP and the Current Immediate Need Action are O&M actions, rather than the planning studies for which the PGN provides the overall direction. The PGN is an internal policy/guidance document that applies primarily to major (new) implementation studies and not operation and maintenance (O&M) of existing multi-purpose Civil Works projects such as the LSRP. Second, Section 1.3.2 of the FEIS explained the limited application of the dredged material management planning (DMMP) processes in Corps planning guidance : "The general guidance contained in the ER was applied in the development of the proposed PSMP and this EIS. However, it should be noted that these documents were developed in part to fulfill the requirements of a settlement agreement and the PSMP is intended to address more than just dredged material management. Development of the proposed PSMP, therefore, did not follow the typical Corps DMMP planning process." The PGN is based on the Principles and Guidelines (P&Gs) published by the U.S Water Resource Counsel in 1983. The Principles and Requirements for Federal Investments in Water Resources (P&Rs) have not been incorporated into Corps policy and the Corps continues to follow the 1983 P&Gs. . The PSMP is an O&M plan and not the type of planning/implementation study requiring application of the water resources investment guidance contained in the P&Gs/P&Rs. .
0031	Steve Mashuda	20337	Moreover, the Corps must determine whether or not continued channel maintenance is warranted not for the entire lower Snake River as a unit, but for incremental segments of the river.	See response to FEIS comment 20422 in letter 0025 and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20338	The errors in that report are so numerous and pervasive that the Corps was unable to	See response to FEIS comment 20422 in letter 0025 and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			demonstrate the reasonableness of the increased cost to transport grain by rail or truck, about $8.45 per ton in current dollars, it extracted from the report.	
0031	Steve Mashuda	20336	Overall, it is clear that the Corps' erroneous assumptions, guesswork, and disregard of information that inconveniently indicates otherwise led it to incorrectly state that the Preferred Alternative's benefits outweigh its costs.	See response to FEIS comment 20422 in letter 0025 and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20335	Nowhere does the FEIS address ecosystem services, consider both monetary and non-monetary effects, or demonstrate that the economic benefits of the Preferred Alternative will outweigh the costs. Instead, it quantifies only one economic indicator by estimating the transportation savings that would result from dredging the channel and shipping cargo by barge rather than by rail or truck and asserting that the savings would exceed the dredging costs. This assessment,	See response to FEIS comment 20422 in letter 0025 and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			which occurs in a single paragraph, is flawed, however. It relies on an analysis that is too old, incomplete, and biased to be either relevant or accurate. Beyond that brief analysis, the FEIS contains numerous unsubstantiated statements about the benefits of barge traffic, but fails to provide the description of the competitive effects on the rail and trucking industries that is necessary to yield a full description of transportation-related effects.	
0031	Steve Mashuda	20339	The FEIS does not demonstrate the 2002 report is even relevant to the matters at hand.	See response to FEIS comment 20422 in letter 0025 and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20340	As a consequence, the lack of reliability in the 2002 report's commodity forecast carries over to the FEIS and undermines confidence in the Corps' determination. Until the Corps corrects the flaw, it is impossible for the Corps, the public, or decision-makers to ascertain the reasonableness of its estimate of	See response to FEIS comment 20422 in letter 0025 and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			transportation savings, $8.45 per ton, or of the selection of the Preferred Alternative based on that estimate.	
0031	Steve Mashuda	20341	These errors, individually and collectively, make the economic information in the FEIS an unreliable, inappropriate basis for its determination that continued maintenance of the channel is warranted. The FEIS asserts that continued maintenance would yield transportation savings, when correcting the errors likely would show the reverse.	See response to FEIS comment 20422 in letter 0025 and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20342	As the Corps prepared the FEIS, it possessed but disregarded large amounts of relevant, accurate, and reliable information about the alternatives' socioeconomic effects. The FEIS, itself, for example, reports the Corps, on average, will have to dredge about 0.7 million cubic yards (mcy) per year of sediment from Lower Granite pool each year. (FEIS, p. F- 20) Elsewhere, the Corps has revealed it incurs dredging costs of	See response to FEIS comment 20431 in letter 0025. The 0.7 mcy is the amount of material the Corps estimates would need to be dredged annually to maintain flow conveyance IF the risk of overtopping the Lewiston levees reached unacceptable levels. This figure was included in the Corps' PSMP Biological Assessment (BA) to provide an estimate of the magnitude of effect that could be expected if the flow conveyance dredging measure was implemented. However, including this figure in the BA does not mean the Corps has determined dredging is needed to prevent overtopping of the levees. Section 3.7.3 of the FEIS states :"…the existing levee systems appear adequate to provide protection from overtopping during the SPF [standard project flood] and exceed the requirements for levee systems under the National Flood Insurance Program. After 50 years of simulated sediment accumulation, the model predicts that the levee systems would be adequate to provide protection from overtopping during the SPF." Fflow conveyance dredging is different from navigation dredging and has a much larger footprint, scope, and cost. The cost estimate of $1-5 million applies only to navigation channel maintenance.

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			about $13 per ton.20 Multiplying these numbers indicates that the agency will, on average, incur dredging costs of about $9 million per year in Lower Granite pool alone. This number, though, contrasts with the cost estimate, $1–5 million, for channel maintenance along the entire lower Snake River. Nor does it include the costs of channel-maintenance actions other than dredging. In other words, the Corps' own numbers demonstrate that it will incur dredging costs 80–900 percent higher than the estimate it used in the FEIS to determine that channel maintenance is warranted.	
0031	Steve Mashuda	20343	The FEIS does not demonstrate that the Corps fully accounted for these infrastructure costs as it selected the Preferred Alternative.	The PSMP addresses maintenance actions for management of sediment accumulation that interferes with existing authorized project purposes of the LSRP, not dam maintenance. Dam infrastructure costs are not applicable.
0031	Steve Mashuda	20344	As it considered alternatives that would continue the operation of the four dams, the Corps also should have directly and fully discussed major costs associated with its obligations to	The PSMP is a plan designed to address sediment accumulation in the lower Snake River that interferes with existing authorized project purposes of the LSRP. It does not address O&M of the dams or any specific effects/mitigation/costs associated therewith.

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			compensate for the dams' harm to threatened and endangered species. The FEIS, however, does not demonstrate that the Corps fully accounted for these costs as it examined the Preferred Alternative.	
0031	Steve Mashuda	20345	The Corps also disregarded readily available information showing that the transportation savings from channel maintenance would be lower than those reported in the FEIS, and likely would disappear altogether. This saving falls far short of the estimated cost, $9 million per year, of dredging 0.7 million cubic yards of material per year.	See response to FEIS comment 20422 and 20431 in letter 0025 and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20346	The FEIS presents no information to substantiate an expectation that the downward trend of shippers preferring to ship cargo by barge rather than by rail or truck will not continue.	See response to FEIS comment 20422 in letter 0025 and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20347	To summarize, information readily available to the Corps shows that continued channel maintenance likely would not yield any transportation savings whatsoever.	See response to FEIS comment 20422 in letter 0025 and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			Instead, it would increase transportation costs, by subsidizing an inefficient barge system. By not expressing, studying, and analyzing this information, the FEIS fails to examine a critically important aspect of the PSMP's socioeconomic consequences.	
0031	Steve Mashuda	20348	The body of the FEIS does not even mention the national economic development account (NED) that the Principles & Guidelines specifies the Corps should use to account for each alternative's effects on the net value of the national output of goods and services. Instead, it discusses the value of only one type of service, by asserting, in a single paragraph and with no analysis, that continued channel maintenance will yield transportation savings.	See response to FEIS comment 20422 in letter 0025, comment 20334 in letter 0031, and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20349	The FEIS, however fails to demonstrate that it conducted a study satisfying these requirements, with respect to socioeconomic issues, as it prepared the proposed plan for managing sediment.	See response to FEIS comment 20334 in letter 0031.

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0031	Steve Mashuda	20350	the FEIS contains no information a reader can use to judge the reasonableness of its claims that continued maintenance of the navigation channel would yield transportation savings of $8.45 per ton, future shipments would be about 3 million tons per year, and the total transportation savings would be about $25 million. The FEIS, instead, cites the 2002 report, but provides no assessment of its relevance or accuracy.	See response to FEIS comment 20422 in letter 0025 and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20351	The FEIS offers no analysis of the downward trend and no explanation for not assuming that the downward trend will continue and future tonnage will be smaller than 3 million tons.	See response to DEIS comment 8573 in letter 91 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20352	FEIS does not describe the socioeconomic effects of the alternatives to the fullest extent possible.	See response to FEIS comment 20422 in letter 0025 and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20353	In its presentation of socioeconomic effects, the FEIS includes no mention of any study more recent than the 2002 report.	See response to FEIS comment 20422 in letter 0025, comment 20334 in letter 0031, and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0031	Steve Mashuda	20354	the FEIS must show how each of the actions being considered in the	See response to FEIS comment 20422 in letter 0025, comment 20334 in letter 0031, and DEIS comment 8360 in letter 12 To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-

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			Preferred Alternative performs with respect to the several requirements established in the P&R.	14_HandF.pdf
0032	Michael C. Jones	20444	Please move ahead with implementing long overdue immediate need maintenance dredging and create a plan to constantly keep routine maintenance dredging constantly in motion to maintain the 14 feet deep by 250 feet wide at minimum operating pool in the federal navigation channel. This will greatly benefit everyone along the river on the water and on the land.	Comment noted.
0033	Amer Badawi	20445	We appreciate the U.S. Army Corps of Engineers significant research and careful analysis of the proposed project. We feel both the economic and environmental gains justify the costs of this routine dredging. Investment in the maintenance and growth of the inland river systems is vital to continued strength of the grain industry, a resilient component of the U.S. economy.	Comment noted.
0034	Matt Diederich	20410	we suggest that the applicant contact a	The Corps will comply with requirements of applicable laws and regulations regarding archaeological and cultural resources. See Section 5 of FEIS.

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			professional archaeologist to conduct a archaeological survey of the project area.	
0034	Matt Diederich	20411	If you have not already done so, be sure to consult with all appropriate Indian tribes regarding your proposed project.	See FEIS Section 5.1.16 and Section 6.2 regarding tribal consultation.
0035	Arvid Lyons	20446	Trying to safely load and move barges is made more difficult today when trying to guess what the channel or berthing depths might be. Accidents happen. Since the last dredging in 2005 LCT has grounded a barge in March of 2008, two barges in March of 2012, a barge in December of 2012 and a barge in December in 2013 at a drafts ranging from 9ft. 6 inches to 13ft. 4 inches!	Comment noted.
0036	David A. Solem	20380	Dredging activities and sediment removal should be done in a manner that creates no adverse effects to the operations, facilities, and resources of the SCBID.	The Corps will implement all applicable standard procedures to ensure sediment management is carried out in the least impactive manner feasible.
0037	Marshall Doak	20381	We take this opportunity to let you know that we are in support of the Alternative 7-	Comment noted.

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			Comprehensive (Full Sediment Management Measures) of the draft PMSP/EIS.	
0037	Marshall Doak	20382	While this letter of support addresses the need to maintain the navigable channel open on the Snake and Columbia Rivers, it is noted that the issue of sedimentation is a complex matter; one that requires a multi-jurisdictional approach to sediment reduction closer to the sources of sediment supply to load the river channels. We urge the approach to the resolution of the matter be thoughtful and comprehensive for long-term solutions to be found, with the ability to maintain the channel as paramount within this effort.	The Corps will coordinate with agencies via LSMG and other forums as they are identified.
0038	Marshall Doak	20412	We take this opportunity to let you know that we are in support of the Alternative 7-Comprehensive (Full Sediment Management Measures) of the draft PMSP/EIS	Comment noted.
0038	Marshall Doak	20413	While this letter of support addresses the need to maintain the navigable channel open on the Snake	Comment noted.

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			and Columbia Rivers, it is noted that the issue of sedimentation is a complex matter; one that requires a multi-jurisdictional approach to sediment reduction closer to the sources of sediment supply to load the river channels. We urge the approach to the resolution of the matter be thoughtful and comprehensive for long-term solutions to be found, with the ability to maintain the channel as paramount within this effort.	
0039	Doug Mattoon	20383	This dredging work needs to occur with-in the upcoming work window.	Comment noted..
0039	Doug Mattoon	20384	it is important to emphasize that reservoir “drawdown” on the Lower Snake River is simply not a viable option to address sediment accumulation.	Comment noted.
0040	Mike Thompson	20385	I support the use of dredging the navigation channel in order to restore the channel to the appropriate depth and width to facilitate barging and tourism. The sedimentation has been allowed to collect for too long and needs to be removed.	Comment noted.

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0040	Mike Thompson	20386	If is my hope that you will deny further requests for extension of the comment period and that you will issue the FEIS, PSMP and Record of Decision no later than October 22, 2014, as you originally committed.	Comment noted.
0041	David Bean	20414	I oppose further spending on a money-losing waterway that harms salmon, forest health and taxpayer pocketbooks.	Comment noted.
0042	Silas Whitman	20280	The Corps' interpretation of what Congress intended for commercial navigation on the Snake River system remains flawed. First, although the FCA requires the federal navigation channel to be established at 14 feet deep by 250 feet wide, the Flood Control Act does not mandate the Corps to maintain the federal navigation channel at 14 feet when operating at Minimum Operating Pool (MOP). Second, neither the Flood Control Act nor any subsequent Congressional documents support an interpretation that Congress intended for the Corps to maintain the channel at no less	See response to FEIS comment 20298 in letter 0031.

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			than 14 feet at MOP year-round. To the contrary, Congress, in authorizing the Snake River Dams, considered and recognized that navigation may not be available year-round. House Doc. 704, 75th Cong., 3rd Sess. At 9, 39. In addition, the Corps has previously acknowledged time periods when full navigation on the Snake River will not be available. The Corps has also recognized that seasonal light loading has occurred and is occurring on the Snake River. In the PSMP/FEIS, the Corps acknowledges that that "Congress has not required that commercial navigation be guaranteed 365 days a year." FEIS Appendix Gat G-83 (response to Comment 8684). The Corps goes on to maintain, however, "Congress intended for commercial navigation to be possible 365 days a year." !d. These statements appear to be incongruent, suggesting that the Corps' interpretation of what Congress intended in authorizing	

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			the navigation channel remains unsupported.	
0042	Silas Whitman	20281	by narrowly defining the purpose and need to require maintenance of the navigation channel at no less than 14 feet by 250 feet year-round, and then applying two levels of screening criteria for the alternatives development that eliminate alternatives which, according to the Corps, interfere with authorized purposes (again maintaining the navigation channel at no less than 14 feet year-round), the Corps has impermissibly limited the range of alternatives it believes it must analyze to just two alternatives which both include dredging. These two dredging-based alternatives belie the Corps' assertion that it is stressing a "system based approach" to solve sediment-related problems. Such an excessively narrow range of alternatives for a programmatic document is unreasonable and does not satisfy NEPA.	See response to DEIS comment 8684 in letter 68 and FEIS comment 20301 in letter 31 regarding the 14 foot deep channel year-round. See response to DEIS comment 8686 in letter 68 regarding range of alternatives. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0042	Silas Whitman	20282	Yet the Corps, under the justification	See response to DEIS comment 8771 in letter 76.

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			of"efficiency," has adopted a highly unorthodox approach with the PSMP. The Corps is including an immediate site-specific action (dredging) but including it as part of the PSMP/FEIS. The Corps' radical approach is inconsistent with NEPA. the Tribe requests that the Corps finalize the PSMP in a Record of Decision and then prepare a separate, site-specific NEPA analysis for the "immediate need" action.	To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf See also, CEQ's proposed Guidance On Effective Use Of Programmatic NEPA Reviews (August 25, 2014) (Agencies may prepare a single NEPA document to support both programmatic and project-specific proposals. Such an approach may be appropriate when an agency plans to make a broad program decision, as well as decisions to implement one or more specific projects under the program.) https://www.federalregister.gov/articles/2014/08/25/2014-20199/effective-use-of-programmatic-nepa-reviews
0042	Silas Whitman	20283	Given the enormous importance of lamprey to the Tribe, further assurances are needed that the proposed action will not subject this species to additional hydro-system associated impacts. the statement on page 3-16 that " .. .it is unlikely that juveniles are present in moderate or high numbers within the reservoirs of the lower Snake River due to a paucity of available rearing habitat," is counter to current research observations for the Lower	See response to DEIS comment 8589 and 8590 in letter 91. The Corps is a signatory agency with many other state agencies/ Federal agencies / Tribes to the 2012 Pacific Lamprey Conservation Agreement. The Corps understands that lamprey are important and consequently committed to spend $50M on lamprey passage improvements at dams along the Lower Columbia and Snake rivers (Columbia Basin Fish Accords). To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			Columbia River. potential impacts from disturbance from dredge activities include direct injury (including mortality) and increased susceptibility to predation. Accordingly, the Tribe has outstanding concerns about lamprey impacts that the Corps has not adequately addressed. Without further analysis of impacts, it is inappropriate for the Corps to conclude that the project will have insignificant effects on treaty-reserved resources. Tribe strongly recommends that the Corps adopt 2010 guidelines established by the U.S. Fish and Wildlife Service related to lamprey and dredging and which the Tribe adopted as part of the TPLRP.	
0042	Silas Whitman	20284	Despite similar statements in the PSMP/FEIS about positive economic impacts from the project, the Corps simply disclaimed any connection causal connection between deepening the river and influencing the economy and declined	See response to DEIS comment 8573 in letter 91. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			to do the analysis.	
0042	Silas Whitman	20285	The PSMP/FEIS find that there are not disproportionate impacts of the project on the Tribe or its members. Any impacts on salmon, steelhead, lamprey or other trust resources, will have a disproportionate impact on the Tribe due to their reliance on fish and the importance of fish to Tribal culture, spirituality and economy. Tribal members consume a substantially higher rate of fish than the non-Tribal communities. Given the Corps' inadequate analysis concerning the impacts of the project on lamprey, see above, the Corps cannot conclude that there will be no disproportionate impacts to the Tribe or its members.	See response to DEIS comment 8552 in letter 91. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0042	Silas Whitman	20286	The available information in the PSMP DEIS suggests that the costs of dredging alone may greatly outweigh any perceived benefits captured through facilitating barge, rather than rail or truck, traffic. The PSMP/FEIS contains a	See response to DEIS comment 8360 in letter 12 and FEIS comment 20422 in letter 0025. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			short, one-paragraph statement relaying on a 2002 document maintaining that annual transportation savings of approximately $25 million is anticipated if the navigation channel is maintained. PSMP/FEIS at 3-55. The Tribe requests that the Corps undertake a more updated economic analysis is warranted that provides the Tribe and public a complete and accurate accounting of the socioeconomic effects of maintaining the navigation channel.	
0043	Christine Reichgott	20287	We commend the Corps for devoting significant time to resolving issues raised in our draft EIS comments. We believe that our objection to the draft EIS will be resolved with the Corps' commitment to engage with stakeholders in a technical forum on an ongoing basis.	Comment noted.
0043	Christine Reichgott	20288	We strongly support the Corps' statement that coordination and information sharing with other land management agencies and groups within the watershed is an	The Corps intends to honor its commitment and is already engaging with other regional sediment management groups within the Snake River watershed.

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			integral part of long-term planning and the adaptive management approach. We acknowledge that this commitment is reflected in the Plan as well as the Corps' intention to continue leading the Lower Snake Management Group and explore opportunities for other regional coordination. To demonstrate this commitment, the Corps will provide staff expertise for participation under the Regional Sediment Management Program. This pledge is the cornerstone of the EPA's long-standing support for a holistic watershed management approach. We are also pleased that the Corps will work with stakeholders to update the LSMG charter to reflect its ongoing role. We believe this follow-up engagement is crucial for meaningful and successful participation.	
0043	Christine Reichgott	20289	The Plan would be even more effective by providing clear direction on how sediment management adjustments will be made as additional	See response to DEIS comment 8746 In letter 76. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf

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			monitoring data come in. Inherent in the decision-making process would be an understanding of the uncertainties in the data and analyses. The Plan states that future forecast actions would be analyzed through a tiered NEPA analysis. However, there is a lack of specificity regarding components (e.g., action/measure, responsible entity, relevant program/statute, documentation, and method for updating the plan). As currently presented, we believe that the adaptive management plan does not clearly outline key steps in a concise and easily accessible format. We encourage the Corps to refine the adaptive management plan to address the need for additional detail regarding management direction.	The PSMP does not identify specific steps to be taken to for adaptive management as the steps would depend on the scope and scale of any needed changes. The NEPA process will be used to determine the level of effort and public involvement needed to make changes. The Corps will use the results of any monitoring performed as part of each individual tiered action to inform future decisions. For example, the Corps is committing to perform biological monitoring documenting the use of the shallow water habitat created by the proposed current immediate need dredged material disposal. The Corps would use results of that monitoring to adjust the design criteria for any future in-water dredged material disposal that creates habitat for salmonids.
0043	Christine Reichgott	20290	Although the Plan acknowledges the need to be proactive rather than reactive, the monitoring as described does not appear to provide support for proactivity. We recommend that the monitoring section	Section 4.1 and 4.2 of the PSMP (Appendix A) state the Corps will use the LSMG meetings to share information and identify potential opportunities to improve sediment reduction BMP's. Section 4.2 specifically states "Information gained from meeting participants may result in adapting measures for the implementation process within the PSMP." Table 2-4 of the FEIS mistakenly did not show the measure, Local Sediment Management Group (LSMG) Coordination Meetings" as one of the measures included Alternative 7. This will be clarified in the ROD.

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			of the Plan clearly include the intention to use available, upland monitoring information as part of the data bank considered in adaptive management.	
0043	Christine Reichgott	20291	Additionally, we believe that the Corps should continue to solicit information on sediment monitoring data, which could aid in further understanding the sediment budget (e.g., presently, unknown sources are between 21% and 33%). We believe this issue can be addressed as described by the Corps' commitment to engage in data sharing with stakeholders throughout the watershed and by considering potential implications of upland activities.	The Corps intends to coordinate with stakeholders in the watershed through LSMG and any other applicable forums, and will consider any monitoring data that is shared.
0043	Christine Reichgott	20292	We recommend that the Plan include these sections or a similar level of information describing monitoring validation and specifics of the monitoring program (question of interest, media to be sampled, parameter, responsible party, and reporting/analysis plan) to provide a clear understanding of the	Appendix A has been revised to better explain the Corps' monitoring capabilities, authority, and focus on sediment that interferes with authorized purposes of the LSRP. Some monitoring requirements are included in the NMFS 2014 BiOp. In addition, a detailed monitoring plan will be included with any individual tiered action.

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			program.	
0043	Christine Reichgott	20293	In our comments on the draft EIS we expressed concern regarding the prioritization of in-stream measures. We stated that there is a potential for significant environmental degradation to the Snake River habitat from the preferred alternative that could be addressed by project modification such as strategically prioritizing actions based on a more regional sediment management approach. We emphasized the need to consider sediment data from sources throughout the watershed. To address this issue, the Corps has committed to sharing and considering data from other sources in long-term management and continuing to engage with stakeholders through the LSMG or other forums. However, the preferred alternative described in the final EIS (Section 2.2.5.7 and Table 2-4) eliminated these important aspects as part of the available measures.	This was an oversight. The ROD text will reflect the Corps' commitment to participating in regional sediment management forums and sharing information/data on sediment management.

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			After discussing this issue with the Corps, we understand that this was an oversight and the actual Plan described in Appendix A does feature these components. To reconcile this issue, we recommend that the Record of Decision include the activities described in Appendix A, (Sections I. 7 and 4.2) and the Corps' dedication to the principles of Regional Sediment Management.	
0043	Christine Reichgott	20294	We continue to encourage the Corps to consider future disposal needs/locations so that a suite of options may be identified for comprehensive planning. We also encourage the Corps to prepare for any sediment quality testing so that the testing protocols can be better aligned with subsequent NEP A analyses. This will provide greater assurance of a proactive approach to sediment management.	Should the Corps perform maintenance dredging under the PSMP, the Corps would propose to perform sediment sampling and analysis as part of any NEPA analysis and the DMMP.
0043	Christine Reichgott	20295	The EPA believes that sediment should be managed as a resource in the river	See response to DEIS comment 8772 in letter 76. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidat

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			system, working with natural transport processes wherever possible, ultimately moving toward environmentally protective and ecologically sustainable sediment management in the Snake River watershed. To support this approach, the Corps is proposing in-stream disposal of dredged material for the purpose of creating shallow water habitat. NOAA concurred with this design. We support beneficial use of sediment. However, we have questions regarding the applicable regulations and permitting processes, particularly related to future disposal needs. The EPA agrees that compliance with 404(b)(l) guidelines and identification of the LEDPA is applicable for placement of fill material in waters of the U.S.; however, we are unclear how compliance with the Guidelines is compatible with a requirement to use the lowest cost method. Lowest cost is not an essential component	ed_FINAL_8-13-14_HandF.pdf The 404(b)(1) guidelines are not incompatible with the Federal Standard (33 CFR 335.7). If two or more alternatives satisfy the 404(b)(1) guidelines (are the LEDPA) and are technically feasible, the Corps is required by its regulations to select the least costly alternative.

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			of the 404 evaluation when determining the LEDP A. As currently written, these two processes appear contradictory. We recommend that the Record of Decision clearly disclose which statutes apply and provide information on the process for evaluating disposal methods.	
0043	Christine Reichgott	20296	This section refers to Section 3.2.3 for a description of actions that may be implemented in response to triggers. The document does not include a Section 3.2.3. We believe the correct section should have been 3.3.3.	Correct. The text reference should have been Section 3.3.3.
0043	Christine Reichgott	20297	The text states that minor actions may be covered under a categorical exclusion referencing footnote 7. The footnote refers the reader to footnote I, Section 1.5. However, there is no footnote in Section 1.5	The reference to footnote 7 was in error and should not have been included in the text.
0044	Sally Nunn	20415	We need to breach the dams.	See response to DEIS comment 8368 in letter 29. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-14_HandF.pdf
0045	Richard Till	20416	Please undertake a thorough and methodologically sound (i.e. actual peer	See response to DEIS commente 8360 in letter 12. To view responses to comments on DEIS, see Appendix G of the FEIS http://www.nww.usace.army.mil/Portals/28/docs/programsandprojects/psmp/Revised_Appendix_G_consolidated_FINAL_8-13-

Letter No.	Commenter	Comment No.	Comment	Response
			review) economic analysis of the costs and benefits of maintaining the Snake River dam system, including dredging that is necessary to prevent flooding. The Corps should be let sound decision making lead its analysis, not political agendas that favor the status quo and reliance on assumptions that may ignore enormous government subsidies for barging instead of alternative uses for public resources.	14_HandF.pdf

Supporting Documents

Comment Letters

U.S. Army Corps of Engineers
Walla Walla District, PSMP/EIS
Attention: Sandy Shelin, CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, Washington, 99362-1876

On the subject of the Executive Summary of the lower Snake River draft of the PSMP please accept this comment.

20267

Where is the economic pragmatism? Not once in the published "Program 7" choice is the practical economics of maintaining a shipping channel for commerce.

How are we supposed to give a intelligent opinion of the proposal without knowing the complete ongoing annual expense and required subsidies of maintaining commercial shipping on the water? Or does the Corps think that this is not an issue?

It shouldn't take another very long to present a cost/benefit analysis that is reasonably accurate. Without this information the "Executive Summary" is just another "tap dance".

Respectfully,

8/17/14

William E. Chetwood, D.M.D.
932 Stewart
Lewiston, Ida. 83501 wechetwood@cableone.net

DEPARTMENT OF THE ARMY
WALLA WALLA DISTRICT, CORPS OF ENGINEERS
201 NORTH THIRD AVENUE
WALLA WALLA WA 99362-1876

August 13, 2014

Planning, Programs, and Project
Management Division

Dear Interested Party:

The U.S. Army Corps of Engineers, Walla Walla District (Corps), invites your review and comment on the *Final Lower Snake River Programmatic Sediment Management Plan/ Environmental Impact Statement* (PSMP EIS). The Corps is proposing to adopt a long-term plan for managing sediment deposition interfering with authorized project purposes of the four lower Snake River dam and reservoir projects. The Corps is also proposing an immediate action consistent with the plan to re-establish the federal navigation channel to congressionally authorized dimensions, and has considered potential environmental effects for Section 404/10 permits for related maintenance dredging by the Ports of Lewiston and Clarkston. The PSMP EIS identifies and evaluates the potential environmental effects of a range of sediment management alternatives. The Corps has identified Alternative 7, Comprehensive (Full System and Sediment Management Measures) as the preferred alternative for the PSMP.

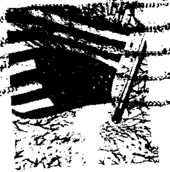
The PSMP EIS comment period opens August 22, 2014, (expected date of publication in the Federal Register) through September 22, 2014. The document is available at: www.nww.usace.army.mil/Missions/Projects/ ProgrammaticSedimentManagementPlan.aspx. You must submit comments via e-mail to psmp@usace.army.mil or via mail to: U.S. Army Corps of Engineers, Walla Walla District, PSMP/EIS, Attention: Sandy Shelin, CENWW-PM-PD-EC, 201 North Third Avenue, Walla Walla, Washington, 99362-1876. If you would like a compact disc or to review a paper copy, contact Ms. Shelin, Environmental Coordinator, at 509-527-7265. If you have questions about the project, please contact Mr. Richard Turner, Project Manager, at 509-527-7625.

Sincerely,

Michael S. Francis
Chief, Environmental Compliance Section

W.E. Chetwood
932 Stewart
Lewiston, Id 83501

SPOKANE WA 992
19 AUG 2014 PM 3 L



U.S. Army Corps of Engineers
Walla Walla District, PSMP/EIS
201 north third avenue
Walla Walla, Wa
99362-1876

ATTN: Sandy Shelin

99362187601

Final EIS Comment F0002

From: Clark, Gregory
To: Turner, Richard C NWW; PSMP
Cc: Molly Wood; Ryan Fosness
Subject: [EXTERNAL] PSMP EIS
Date: Tuesday, August 19, 2014 2:53:56 PM

20268 Hi Richard and Sandy - A number of us at the USGS read through the recently distributed Final Lower Snake River Programmatic Sediment Management Plan/EIS and were interested to note that the Corps has identified the Comprehensive approach for managing sediment as the preferred alternative. Some of us that were involved in the previous data-collection activities (Molly Wood, Ryan Fosness, and myself) were discussing the PSMP, and were wondering if the Corps might have interest in us coming to Walla Walla for a discussion of the work we did during 2008-11, as well as talk about monitoring ideas as part of the PSMP moving forward.

If you have any interest in this or other issues that we may be able to help with, please let me know and we'll work out a time to get together either in person or by phone. I hope all is well I look forward to hearing from you

Greg

Greg Clark
Hydrologist/Associate Director
U.S. Geological Survey
Idaho Water Science Center
208-387-1324 (o)
208-863-6493 (c)
gmclark@usgs.gov

Final EIS Comment F0003

From: Stephen Pauley
To: PSMP
Subject: [EXTERNAL]
Date: Monday, August 25, 2014 11:05:00 PM

I object to the proposed dredging project.

20374 Barge traffic is down. Costs are rising. Lewiston is taxing its residents $450,000 to subsidize the "Port" which employs very few people. Dredging will have to be done again in 5 years. It's an enormous cost to preserve an outmoded waterway which was sold to the public with the promise of thriving cities along the Snake River bringing prosperity to all. The waterway resulted in the decimation of native salmon runs and the river corridor is still bordered by desert land.

My additional reasons stem from the manner in which over the years the Army COE has misled the public, the agencies, the Congress, and the many Presidents who have looked at the issue of saving Columbia - Snake River salmon & steelhead runs in the Northwest.

When one reads the history of how the four lower Snake dams were built, from 1962-1975, one sees that the COE made outlandish statements that these dams would not harm fish. There were a few scientists who spoke up on the side of salmon and steelhead and warned that salmon runs would be harmed.
But once lobbyist Herbert West entered the scene on behalf of the power & forestry industries and grain growers, the war to prevent the 4 dams was lost. West was relentless in his mission to get Congress to approve these 4 dams.

West used any arguments he could to persuade Congress to appropriate money for the 4 LSR dams. Eisenhower was opposed citing cost/benefit concerns. But in 1957 Sen. Warren Magnuson slipped into a midnight appropriation bill $1 million to start Ice Harbor Dam, and that was the beginning of the end for sustainable native salmon and steelhead runs into Idaho. Ice Harbor Dam was completed in 1962 followed by Lower Monumental, Little Goose, and Lower Granite.

Ice Harbor's selling point was that hydro power was needed to produce plutonium at Hanford, WA, and the Cold War depended on our nuclear weapons readiness to compete with the Soviets. The cornerstone of Ice Harbor states this clearly. West knew that it would be hard to oppose weakening our national defense.

Once Lower Granite was completed in 1975, the bottom dropped out of the salmon runs. The mission of the Army COE ever since has been to "technofix" all problems associated with low fish returns. Mother Nature does not always respond to technofixes.

The Army COE depends on the barging smolts down river

Final EIS Comment F0003

through dam locks, dam modifications like smolt bypass tunnels and screening from turbines, hatcheries, Spring spill, and testimony that everything is fine. This has been the operational montra: that 'we can tame Mother Nature if you just give us the money we need'. We hear a version of this year after year. It's not working.

During the salmon hearings in the NW in 1999-2000 over 15,000 NW citizens testified before the COE and NMFS. 80% of those were in favor of breaching the 4 LSR dams. That didn't matter; the hearings were window dressing only. The COE and NMFS were not going to change their ways and NW politicians and Clinton-Gore were weak kneed.

From 1995 to 2013 five COE/NMFS Biological Opinions reviewed by federal judges were found to be inadequate. The arrogance of the COE continued to say that the dams posed no jeopardy to salmon and steelhead. Finally Judge Redden's 2006 order to spill water during Spring runoff to help the smolts downriver benefited fish returns, but the COE views this process as wasting water that could be used to make more hydro power. Salmon smolts look at this as creating the current they need to move to the ocean.

Throughout the many years court orders have been defied by the COE: In 2001 Judge Helen Frye ruled that the COE had violated the Clean Water Act by allowing water temps to exceed survival levels. The COE responded by saying there was nothing they could do to cool the downstream water. The judge bought the story and let the COE off the hook.

In 1971 the COE defied a court order to stop building Lower Granite pending the results of a lawsuit. They kept building.

Up until 1953 the COE said the dams did not harm fish- 21 yrs after they knew the opposite. In 1988 the COE refused to put in a juvenile bypass facility at Ice Harbor after Congress ruled that they should. The COE said barging fish was better. After much pressure they complied.

One sees this constant pattern of arrogance and defiance by the COE which marches to its own drum and gets away with it time after time.

Independent science advisory boards have studied the issue and have recommend breaching. The Rand Report of 2002 MR-1604-PCT said that breaching would CREATE 15,000 new jobs and not harm the NW economy -- contrary to what politicians were saying. This report was ignored by all the powers who want to keep the status quo.

The General Accounting Office report 02-612 of 2002 said that $3.3 billion had been spent on so called 'fish recovery' since 1982 with nothing to show for it.

Final EIS Comment F0003

It's important to note that when dams were being built from the 30's to the 70's the COE rarely if ever included in their costs the money needed for decommissioning or dam removal. Dams do have a lifetime, but the COE would like us to believe they last forever - providing of course they get the money to make repairs and stay in business.

20375

Now we're being asked to approve the dredging of silt above Lower Granite Dam or even build the dikes higher to prevent overflow. This represents another "technofix" to avoid facing the real issue: the extinction of native salmon. Silt is a flood threat to Lewiston, and it prevents grain barges from having a 14 ft clearance to avoid running aground.

It should be noted that grain shipping through the locks is a free govt. subsidized benefit as is the maintenance of the dams and the locks. The taxpayer is paying millions to ship grain by barge, to move smolts by barge, and
20376 to raise smolts in hatcheries. We wouldn't need any of these if we breached the 4 LSR dams.

The taxpayer cost to dredge is huge, and was never a consideration when the original LSR dam funding went through Congressional appropriations. But it's just another "make work" project to keep the COE Walla Walla office in

business. Govt. contracts always trump fish survival.

And the fish? The hatchery system and the barging of smolts have been the COE's solution to native salmon extinction. The reasoning goes that if you flood the rivers with millions of hatchery fish and barge them through the locks, the runs will survive. But hatchery fish are cousins, not natives; products of interbreeding the genes of weak fish with weak fish. They lack diversity and the ability to ward off predators and diseases. They lack the drive to make the 1600 mile round trip through 8 dams each way to return to Idaho's pristine spawning streams.

Returns of native salmon are still below sustainable levels while hatchery returns are improving. Some improvement is due to ocean conditions which vary with the PDO or Pacific Decadal Oscillation - colder water upwells about every 20-30 yrs to help adult salmon feed on more bait fish. Some improvement is also due to the '06 court ordered spilling of smolts in Springtime, and the genetic engineering of Redfish Lake Sockeye at the Eagle Idaho Hatchery.

Power? There is now more than enough wind power in the Columbia Gorge to make up for the loss of the 1200 mw of ave. lower Snake Dam power. Solar power is also increasing in the NW.

Irrigation? From Ice Harbor Reservoir only and to just 13 farms. Lower the intake pipes and subsidize the farmers the increase in electricity cost to raise the water higher.

Final EIS Comment F0003

20377

Grain barging? A railway already exists along the lower Snake. Improve it and use it to get grain from Lewiston to the Tri Cities.

Hatcheries, spill, smolt barging, dredging, and dam modifications are not the answers to prevent the extinction of native salmon and steelhead on the Columbia-Snake rivers.

The solution: the will to challenge the arrogance of the Army COE, and the removal of the 4 LSR dams.

Stephen M Pauley MD
Ketchum Idaho
spauley4@gmail.com

http://west.stanford.edu/students/soco/2012/lower-granite-dam

http://idahorivers.org/blog/?p=779

http://www.mcclatchydc.com/2013/03/29/187275/climate-change-expected-to-increase.html

http://www.oregonlive.com/environment/index.ssf/2013/04/plan_for_snake_river_dredging.html

Final EIS Comment F0004

From: Miguel Ramos
To: PSMP
Subject: [EXTERNAL] Official Public Comment - PSMP/EIS, Attn: Sandy Shelin, CENWW-PM-PD-EC
Date: Thursday, September 11, 2014 11:00:36 AM

Dear Ms. Shelin

TO: Sandy Shelin, U.S. Army Corps of Engineers
RE: Official Public Comment - PSMP/EIS
September 22, 2014

I am writing to submit my official public comment on the U.S. Army Corps of Engineers' proposed plan to dredge the lower Snake River navigation waterway (the Programmatic Sediment Management Plan FEIS).

20273 As an American taxpayer, I oppose any further spending on expensive dredging in the lower Snake
River waterway unless the Corps first provides an honest, transparent economic analysis that the four
lower Snake River dams' benefits outweigh the tremendous costs to the public and to our wild salmon.

20355 These dams are causing flood risk and sediment problems for riverside towns. They impede migration
20356 and harm habitat for wild salmon and steelhead. Meanwhile, their transportation value is in free-fall
with container shipping down more than 70 percent.Their energy production is replaceable with clean,
affordable and reliable alternatives.
The Army Corps' plan offers no sound justification for spending more public money on these high cost,
low value dams. It fails to adequately address the impacts dredging itself will have on wild salmon. 20358
Worst of all, the plan fails to consider the most effective solution to the sediment, flooding, and salmon
20359 problems—removal of the four lower Snake River dams.

With shipping traffic on the lower Snake River waterway in steep decline, the Corps must justify spending additional taxpayer dollars on a marginal barge corridor when much-needed maintenance repairs are needed on the far more valuable lower Columbia waterway. In an era of declining federal resources, we can't afford to waste millions of dollars on the lower Snake—especially when salmon and taxpayer-friendly alternatives are available and scarce infrastructure dollars are needed elsewhere.

I oppose further spending on a money-losing waterway that harms salmon and taxpayer pocketbooks.

Miguel Ramos
4663 fremont st
Bellingham, WA 98229

Final EIS Comment F0168

From:	Sister Roberta Hudlow
To:	PSMP
Subject:	[EXTERNAL] Official Public Comment - PSMP/EIS, Attn: Sandy Shelin, CENWW-PM-PD-EC
Date:	Thursday, September 11, 2014 12:20:09 PM

Dear Ms. Shelin

TO: Sandy Shelin, U.S. Army Corps of Engineers
RE: Official Public Comment - PSMP/EIS
September 22, 2014

I am writing to submit my official public comment on the U.S. Army Corps of Engineers' proposed plan to dredge the lower Snake River navigation waterway (the Programmatic Sediment Management Plan FEIS).

As an American taxpayer, I oppose any further spending on expensive dredging in the lower Snake River waterway unless the Corps first provides an honest, transparent economic analysis that the four lower Snake River dams' benefits outweigh the tremendous costs to the public and to our wild salmon.

These dams are causing flood risk and sediment problems for riverside towns. They impede migration and harm habitat for wild salmon and steelhead. Meanwhile, their transportation value is in free-fall with container shipping down more than 70 percent.Their energy production is replaceable with clean, affordable and reliable alternatives.
The Army Corps' plan offers no sound justification for spending more public money on these high cost, low value dams. It fails to adequately address the impacts dredging itself will have on wild salmon. Worst of all, the plan fails to consider the most effective solution to the sediment, flooding, and salmon problems—removal of the four lower Snake River dams.

With shipping traffic on the lower Snake River waterway in steep decline, the Corps must justify spending additional taxpayer dollars on a marginal barge corridor when much-needed maintenance repairs are needed on the far more valuable lower Columbia waterway. In an era of declining federal resources, we can't afford to waste millions of dollars on the lower Snake—especially when salmon and taxpayer-friendly alternatives are available and scarce infrastructure dollars are needed elsewhere.

I oppose further spending on a money-losing waterway that harms salmon and taxpayer pocketbooks.

I concur with all of the above. More people are eating salmon than ever before, so the ALL the salmon runs are needed to fill the demand. Salmon are more valuable than dead cargo rivers.

Sister Roberta Hudlow
3865 Hartford
St. Louis, MO 63116

Final EIS Comment F0222

From: Paula Menyuk
To: PSMP
Subject: [EXTERNAL] Official Public Comment - PSMP/EIS, Attn: Sandy Shelin, CENWW-PM-PD-EC
Date: Thursday, September 11, 2014 12:59:34 PM

Dear Ms. Shelin

TO: Sandy Shelin, U.S. Army Corps of Engineers
RE: Official Public Comment - PSMP/EIS
September 22, 2014

I am writing to submit my official public comment on the U.S. Army Corps of Engineers' proposed plan to dredge the lower Snake River navigation waterway (the Programmatic Sediment Management Plan FEIS).

20276

As an American taxpayer, I oppose any further spending on expensive dredging in the lower Snake River waterway unless the Corps first provides an honest, transparent economic analysis that the four lower Snake River dams' benefits outweigh the tremendous costs to the public and to our wild salmon. In an era of declining federal resources, we can't afford to waste millions of dollars on the lower Snake—especially when salmon and taxpayer-friendly alternatives are available and scarce infrastructure dollars are needed elsewhere.

I oppose further spending on a money-losing waterway that harms salmon and taxpayer pocketbooks.

Paula Menyuk
162 Mason Terrace
Brookline, MA 02446

Final EIS Comment F0228

From: Mary O"Farrell
To: PSMP
Subject: [EXTERNAL] Official Public Comment - PSMP/EIS, Attn: Sandy Shelin, CENWW-PM-PD-EC
Date: Thursday, September 11, 2014 1:03:08 PM

Dear Ms. Shelin

TO: Sandy Shelin, U.S. Army Corps of Engineers
RE: Official Public Comment - PSMP/EIS
September 22, 2014

I am writing to submit my official public comment on the U.S. Army Corps of Engineers' proposed plan to dredge the lower Snake River navigation waterway (the Programmatic Sediment Management Plan FEIS).

As an American taxpayer, I oppose any further spending on expensive dredging in the lower Snake River waterway unless the Corps first provides an honest, transparent economic analysis that the four lower Snake River dams' benefits outweigh the tremendous costs to the public and to our wild salmon.

These dams are causing flood risk and sediment problems for riverside towns. They impede migration and harm habitat for wild salmon and steelhead. Meanwhile, their transportation value is in free-fall with container shipping down more than 70 percent.Their energy production is replaceable with clean, affordable and reliable alternatives.
The Army Corps' plan offers no sound justification for spending more public money on these high cost, low value dams. It fails to adequately address the impacts dredging itself will have on wild salmon. Worst of all, the plan fails to consider the most effective solution to the sediment, flooding, and salmon problems—removal of the four lower Snake River dams.

With shipping traffic on the lower Snake River waterway in steep decline, the Corps must justify spending additional taxpayer dollars on a marginal barge corridor when much-needed maintenance repairs are needed on the far more valuable lower Columbia waterway. In an era of declining federal resources, we can't afford to waste millions of dollars on the lower Snake—especially when salmon and taxpayer-friendly alternatives are available and scarce infrastructure dollars are needed elsewhere.

I oppose further spending on a money-losing waterway that harms salmon and taxpayer pocketbooks.
20277 Looking at the success of the Elwah Dam removal, it seems like a no-brainer!

Mary O'Farrell
4858 S. Camano Drive
Camano Island, WA 98282

Final EIS Comment F0242

From: Sandra Thompson
To: PSMP
Subject: [EXTERNAL] Official Public Comment - PSMP/EIS, Attn: Sandy Shelin, CENWW-PM-PD-EC
Date: Thursday, September 11, 2014 1:11:31 PM

Dear Ms. Shelin

TO: Sandy Shelin, U.S. Army Corps of Engineers
RE: Official Public Comment - PSMP/EIS
September 22, 2014

I oppose the Army Corps of Engineers' proposed plan to dredge the lower Snake River navigation waterway (the Programmatic Sediment Management Plan FEIS) or any further spending on expensive dredging in the lower Snake River waterway under current conditions.

20278 The Corps must first provides an honest, transparent economic analysis that the four lower Snake River dams' benefits outweigh the tremendous public costs and damage to our wild salmon and the surrounding economics.

20361 For decades now, it's been general knowledge (and experience) that dams cause flood risk and sediment problems, impede migration and harm habitat for wild salmon and steelhead. Meanwhile, their energy production is replaceable with clean, affordable and reliable alternatives.

The Corps' plan offers no sound justification for spending more public money on these high cost, low value structures. 20366 It fails to adequately address the impacts of dredging on wild salmon. Worst of all, 20362 the plan fails to consider the most effective solution to the sediment, flooding, and salmon problems—removal of the four lower Snake River dams.

With shipping traffic on the lower Snake River waterway in steep decline, the Corps must justify spending additional taxpayer dollars on a marginal barge corridor when much-needed maintenance is needed on the far more valuable lower Columbia waterway.

20363 In an era of declining federal resources, we can't afford to waste millions of dollars—especially when better alternatives are available.

Let's stop old, wasteful, even reckless spending patterns and focus on all-around better options.

Thank you,

Sandra Thompson
Monterey Pines
Bend, OR 97701

Final EIS Comment F0284

From: Bruce Blackwell
To: PSMP
Cc: Jed Crowther; Andy Gomez
Subject: [EXTERNAL] PSMP EIS comment
Date: Thursday, September 11, 2014 1:54:03 PM
Attachments: PSMP EIS support doc..pdf

Greetings Sandy Shelin, I would like to comment on the Corps duty and obligation to keep the Snake River healthy and navigable for transportation of freight and people. It is paramount to the prosperity and continued growth of the Great Northwest and the United States as well. As an elected official I feel it is my duty to speak for the citizens and the surrounding community who recreate, fish, and send their wheat down river on barges to feed the nation and the world. The many organizations that I belong to, are in firm agreement that the Snake River must be maintained at all costs. Anything less would be
20279 catastrophic for the river and region. That means we are advocating that Alternative 7 be selected and work begin as soon as possible. I am sending part of a document from one of the associations that feels strongly about river commerce, as does the Benton Franklin Council of Governments who will be sending their own documentation. I thank you for your time and I hope my missive is one of millions. Mayor Blacky

Bruce Blackwell

Mayor

City of Connell

P: 509.234.2701

F: 509.234.2704

www.cityofconnell.com

Final EIS Comment F0284

BENTON-FRANKLIN-WALLA WALLA

GOOD ROADS AND TRANSPORTATION ASSOCIATION

DRAFT 2013 MULTI-MODAL TRANSPORTATION SYSTEM INFRASTRUCTURE NEEDS

A list and description of regionally significant multi-modal transportation issues/priorities for the movement of freight and people. The order of presentation does not represent order of importance or significance.

RIVER ISSUES

Columbia/Snake River Draw Down or Dam Breaching

A major regional issue is the potential draw down of Snake River reservoirs or the breaching of Snake River dams. Such actions would have a tremendous impact on the transportation system in the Palouse region. The deep draft and inland barging Columbia/Snake River system, with its government locks at each of eight dams, affords 465 miles of water transportation from Astoria, Oregon, at the mouth, to Lewiston, Idaho, at the terminus of the federal navigation channel. Over eleven million tons of cargo moves on the inland portion of the system alone. Just one typical 4-barge tow can move approximately 15,000 tons of grain. It takes 538 trucks or 140 rail cars to move the same quantity. Navigation is the lowest cost, most fuel efficient and least polluting mode for cargo transportation.

A study commissioned by dam breaching advocates reported that more than $1 billion would need to be spent to improve rail and highway infrastructure to accommodate a shift of cargo from barge to rail and truck. The Snake River Draw Down Study was commissioned by the Washington legislature in 1998. It estimated that the state would incur hundreds of millions of dollars in corridor improvement costs and increased maintenance cost if Snake River barge navigation were eliminated by breaching or drawdown.

Additional costs not considered in those studies would be incurred due to increased fossil fuel consumption, increased pollution, increased congestion and collisions (and fatalities) and increased freight rates due to loss of a modal competitor and shifting to higher cost modes of transportation. All of this presupposes that truck and rail, which are already at or beyond capacity, could take on this additional cargo.

The Benton-Franklin-Walla Walla GRTA supports a water surface elevation of the Columbia/Snake River system that meets our diverse needs and allows inland navigation to continue unimpeded.

Columbia/ Snake River System Major Maintenance for Inland Projects

The U.S. Army Corps of Engineers maintains a 14-foot navigation channel from Portland/Vancouver to Clarkston, Washington and Lewiston, Idaho, and operates navigation locks at eight federal hydropower projects on the Columbia and Snake Rivers. The inland navigation system provides access to domestic and international markets for producers throughout the western United States and is part of a just-in-time delivery system for this major international trade gateway.

The river system is poised for growth over the next fifteen years. It is fully functional now, and with targeted maintenance funding, it is expected to remain in service to handle that growth in the coming years. Though the system is aging, the Corps is properly maintaining the projects, both with planned repairs in the short run and by developing major maintenance plans for the longer term.

The Benton-Franklin-Walla Walla GRTA supports adequate federal funding for the U.S. Army Corps of Engineers to address aging infrastructure on the Columbia Snake River System.

Last Updated: 10.9.13

Final EIS Comment F0284

Snake River Dredging

The safety and economic efficiency of navigation on the Snake River was jeopardized for several years by lawsuits preventing Corps of Engineers dredging. The Corps, therefore, operated three of the four Snake River reservoirs at levels above minimum operating pool (MOP) to ensure that the authorized depth of 14 feet was maintained in the navigation channel. At times that still left the Ports of Lewiston and Clarkston with only 10 feet and 8.5 feet, respectively, at their grain and container facilities. The result was only partially loaded barges at increased shipping costs.

Following a lawsuit settlement, the Corps of Engineers completed necessary dredging in the winter of 2005-2006. As part of the terms of the settlement, the Corps was also required to complete a Programmatic Sediment Management Plan (PSMP) which should be finalized in 2013. The PSMP will identify sources of sediment in the Lower Snake River, as well as possible approaches to minimize and remove sedimentation in the navigation channel.

Completion of the PSMP is critical, as over the past seven years severe siltation has occurred and dredging is again necessary. Dredging is the key to ensuring that the Columbia Snake River System remains a viable international trade gateway.

The System is the number one wheat export gateway in the U.S., with 40% of its wheat traveling by barge to the Lower Columbia River for export to international markets. It is also the third largest grain export gateway in the world. Snake River barging of wheat, other grains, paper products, petroleum products and general container cargo amounts to about ten million tons per year with an estimated value of $3 billion.

The Snake River is a critical part of our transportation system that keeps Northwest products competitive in the global marketplace.

The Benton-Franklin-Walla Walla GRTA supports intermittent dredging to maintain 14 feet of draft at the minimum operating pool level on the Snake River from the Columbia River to the ports of Lewiston and Clarkston.

Final EIS Comment F0505

From: Brian Malley
To: PSMP
Cc: "Bob Koch"; bblackwell@connellwa.org; "Andy Gomez"
Subject: [EXTERNAL] FW: PSMP EIS comment
Date: Friday, September 12, 2014 1:15:58 PM

Ms. Shelin/Corp of Engineers Representative -

20367

I am following up to below email correspondence from Bruce Blackwell's dated Sept 11, 2014 (provided below). I want to be clear that Mr. Blackwell's comments do not represent the BFCG membership as a whole, and that discussion amongst our committees has not taken place at this time.

I believe Mr. Blackwell's intentions to be good - but his message below seems to imply discussion upon the PSMP EIS has already taken place with BFCG membership. We do anticipate discussion at our Board meeting next Friday, September 19th - after which our agency may submit formal comment.

Lastly, I appreciate your time yesterday in addressing my areas of question with the varying alternatives within the PSMP EIS.

Thank you and have a great weekend -

Brian Malley

Executive Director

Benton-Franklin Council of Governments

bmalley@bfcog.us <mailto:bmalley@bfcog.us> | 509.943.9185 | www.bfcog.us

BFCGLOGO

BFCG fully complies with Title VI of the Civil Rights Act of 1964 and related statutes and regulations in all programs and activities. For more information or to obtain a Title VI Complaint Form call (509) 943-9185 or online at www.bfcog.us <http://www.bfcog.us> .

From: Andy Gomez [mailto:agomez@bfcog.us]
Sent: Thursday, September 11, 2014 3:20 PM
To: 'Brian Malley'; 'Tanna Dole (E-mail)'; Len Pavelka; Geoff Wagner; Jacob Gonzelez
Subject: FW: PSMP EIS comment

Final EIS Comment F0505

See attached and below.

From: Bruce Blackwell [mailto:bblackwell@connellwa.org]
Sent: Thursday, September 11, 2014 1:52 PM
To: psmp@usace.army.mil
Cc: Jed Crowther; Andy Gomez
Subject: PSMP EIS comment

Greetings Sandy Shelin, I would like to comment on the Corps duty and obligation to keep the Snake River healthy and navigable for transportation of freight and people. It is paramount to the prosperity and continued growth of the Great Northwest and the United States as well. As an elected official I feel it is my duty to speak for the citizens and the surrounding community who recreate, fish, and send their wheat down river on barges to feed the nation and the world. The many organizations that I belong to, are in firm agreement that the Snake River must be maintained at all costs. Anything less would be catastrophic for the river and region. That means we are advocating that Alternative 7 be selected and work begin as soon as possible. I am sending part of a document from one of the associations that feels strongly about river commerce, as does the Benton Franklin Council of Governments who will be sending their own documentation. I thank you for your time and I hope my missive is one of millions. Mayor Blacky

Bruce Blackwell

Mayor

City of Connell

P: 509.234.2701

F: 509.234.2704

www.cityofconnell.com

Final EIS Comment F0522

From:	Robert Koch
To:	Brian Malley; PSMP
Cc:	Bruce Blacky Blackwell; "Andy Gomez"
Subject:	[EXTERNAL] Re: PSMP EIS comment
Date:	Friday, September 12, 2014 4:32:18 PM

20378

Thank you Brian for your commit, my thoughts also, one member can only speak for him/herself and not for the board or council they are members of.
Bob

Sent from Surface Pro

From: Brian Malley <mailto:bmalley@bfcog.us>
Sent: Friday, September 12, 2014 1:15 PM
To: psmp@usace.army.mil
Cc: Bob Koch <mailto:RKoch@co.franklin.wa.us> , Bruce "Blacky" Blackwell <mailto:bblackwell@connellwa.org> , 'Andy Gomez' <mailto:agomez@bfcog.us>

Ms. Shelin/Corp of Engineers Representative -

I am following up to below email correspondence from Bruce Blackwell's dated Sept 11, 2014 (provided below). I want to be clear that Mr. Blackwell's comments do not represent the BFCG membership as a whole, and that discussion amongst our committees has not taken place at this time.

I believe Mr. Blackwell's intentions to be good - but his message below seems to imply discussion upon the PSMP EIS has already taken place with BFCG membership. We do anticipate discussion at our Board meeting next Friday, September 19th - after which our agency may submit formal comment.

Lastly, I appreciate your time yesterday in addressing my areas of question with the varying alternatives within the PSMP EIS.

Thank you and have a great weekend -

Brian Malley

Executive Director

Benton-Franklin Council of Governments

bmalley@bfcog.us <mailto:bmalley@bfcog.us> | 509.943.9185 | www.bfcog.us

BFCGLOGO

Final EIS Comment F0522

BFCG fully complies with Title VI of the Civil Rights Act of 1964 and related statutes and regulations in all programs and activities. For more information or to obtain a Title VI Complaint Form call (509) 943-9185 or online at www.bfcog.us <http://www.bfcog.us> .

From: Andy Gomez [mailto:agomez@bfcog.us]
Sent: Thursday, September 11, 2014 3:20 PM
To: 'Brian Malley'; 'Tanna Dole (E-mail)'; Len Pavelka; Geoff Wagner; Jacob Gonzelez
Subject: FW: PSMP EIS comment

See attached and below.

From: Bruce Blackwell [mailto:bblackwell@connellwa.org]
Sent: Thursday, September 11, 2014 1:52 PM
To: psmp@usace.army.mil
Cc: Jed Crowther; Andy Gomez
Subject: PSMP EIS comment

Greetings Sandy Shelin, I would like to comment on the Corps duty and obligation to keep the Snake River healthy and navigable for transportation of freight and people. It is paramount to the prosperity and continued growth of the Great Northwest and the United States as well. As an elected official I feel it is my duty to speak for the citizens and the surrounding community who recreate, fish, and send their wheat down river on barges to feed the nation and the world. The many organizations that I belong to, are in firm agreement that the Snake River must be maintained at all costs. Anything less would be catastrophic for the river and region. That means we are advocating that Alternative 7 be selected and work begin as soon as possible. I am sending part of a document from one of the associations that feels strongly about river commerce, as does the Benton Franklin Council of Governments who will be sending their own documentation. I thank you for your time and I hope my missive is one of millions. Mayor Blacky

Bruce Blackwell

Mayor

City of Connell

P: 509.234.2701

F: 509.234.2704

www.cityofconnell.com

Final EIS Comment F0606

From: Ronald Fritz
To: PSMP
Subject: [EXTERNAL] Fwd: Snake river dredging
Date: Monday, September 15, 2014 8:24:01 AM

Sent from my iPhone

Begin forwarded message:

From: Ronald Fritz <ronaldfritz4@gmail.com>
Date: September 15, 2014 at 8:21:40 AM PDT
To: "joellen.darcy@us.army.mil" <joellen.darcy@us.army.mil>
Subject: Snake river dredging

Dear Ms. Darcy and other Army Corps officials,

I'm writing to submit my official public comment on the U.S. Army Corps of Engineers' plan to dredge the lower Snake River navigation waterway (the Programmatic Sediment Management Plan Final Environmental Impact Statement).

20379

I am against this plan of dredging. The barge traffic on the snake River does not seem sufficient to warrant the amount of money that the Army Corps of Engineers is considering spending on this dredging plan.

I hope you will consider my opinion when finalizing your plan.

Ronald M Fritz

2516 S Hwy 95

Coeur dalene, ID 8381;

Sent from my iPhone

Final EIS Comment F0613

From:	Schwartz, Rick (DNR)
To:	PSMP
Subject:	[EXTERNAL] CENWW-PM-PD-EC Snake River PSMP EIS Comments
Date:	Monday, September 15, 2014 4:36:25 PM
Attachments:	CENWW-PM-PD-EC PSMP EIS Comment Letter.pdf

Ms. Shelin,

Please find the attached WDNR comments regarding the USACE 2014 Final EIS CENWW-PM-PD-EC. Thank you for allowing us the opportunity to comment on this draft. If you have any questions regarding these comments do not hesitate to contact me.

Rick Schwartz

Aquatic Land Manager – Rivers District

WA Department of Natural Resources

Office: 360-740-6806

Cell: 360-338-2726

rick.schwartz@dnr.wa.gov

www.dnr.wa.gov <http://www.dnr.wa.gov/>

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

Caring for
your natural resources
... now and forever

September 15, 2014

Ms. Sandy Shelin, Environmental Coordinator
U.S. Army Corps of Engineers, Walla Walla District
201 North Third Avenue
Walla Walla, WA 99362-1876

Subject: CENWW-PM-PD-EC Final Lower Snake River Programmatic Sediment Management Plan / Environmental Impact Statement Comments

Dear Ms. Shelin:

Thank you for the opportunity to provide comments on the Final Lower Snake River Programmatic Sediment Management Plan / Environmental Impact Statement located in the navigation channel of the Snake River. The Department of Natural Resources (DNR) is steward of Washington's aquatic lands and their resources. Aquatic lands are managed for current and future citizens of the state to sustain long-term ecosystem and economic vitality, and to ensure access to the aquatic lands and the benefits derived from them. Washington DNR's management authority derives from the State's Constitution (Articles XV, XVII, XXVII), Revised Code (RCW 79.02 and 79.105) and Administrative Code (WAC 332-30). As proprietary manager of state-owned aquatic lands, DNR has been directed to manage the lands "...for the benefit of the public" in a manner that provides "...a balance of public benefits for all citizens of the state" that includes"

Encouraging direct public use and access

Fostering water-dependent uses

Ensuring environmental protection, and

Utilizing renewable resources.

In addition, generating revenue in a manner consistent with subsections 1) through 4) of this section is a public benefit (RCW 79.105.030).

DNR has completed a review of your project. Portions of the project are located on bedlands of the Snake River owned by the State of Washington and managed by DNR.

PACIFIC CASCADE REGION ▮ 601 BOND RD ▮ PO BOX 280 ▮ CASTLE ROCK, WA 98611-0280
TEL (360) 577-2025 ▮ FAX (360) 274-4196 ▮ TTY (360) 902-1125 ▮ TRS 711 ▮ WWW.DNR.WA.GOV
EQUAL OPPORTUNITY EMPLOYER

Ms. Shelin
September 15, 2014
Page 2 of 2

To ensure sustainable management of state-owned aquatic lands, DNR has established environmental protection goals. These goals seek to ensure uses of state-owned land do not result in: shading that harms aquatic vegetation and fish migration; compaction, disruption, or impeding the natural movement of sediments; underwater noise that can disrupt important aquatic species when they are most vulnerable; or, release harmful contamination and waste. DNR is committed to working with applicants, in coordination with permitting agencies, to find ways to avoid impacts to aquatic habitats and species on state-owned aquatic land.

20368

No authorization is required for your proposed activity on state-owned aquatic lands and DNR has determined this project is unlikely to further impact these lands.

Again, thank you for the opportunity to comment on this important issue. If you have any questions or if I can be of assistance to you, please call me at (360) 740-6806 or email me at rick.schwartz@dnr.wa.gov.

DNR reserves the right to comment on future amendments and revisions to this proposal.

Sincerely,

Rick Schwartz, Land Manager
Aquatic Resources Division/Rivers District

AMERICAN CONSTRUCTION COMPANY

America's Waterfront Contractor

September 15, 2014

U.S. Army Corps of Engineers, Walla Walla District
PSMP/EIS
Attention: Sandy Shelin
CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA, 99362-1876

Re: American Construction Comments on PSMP/EIS

Dear Ms. Shelin:

American Construction Company, Inc. (ACC) appreciates the opportunity to provide comments on the Lower Snake River Final Programmatic Sediment Management Plan (PSMP) and Environmental Impact Statement (PSMP EIS). We strongly support your efforts to produce a specific and defensible Environmental Impact Statement (EIS) and final PSMP for the lower Snake River on this sediment evaluation. We also support the plan to address long overdue routine maintenance dredging in areas of the federal navigation channel which have become overburdened.

ACC is a general marine contractor that has been in business since 1903. Our longevity and stability as a company is demonstrated by its loyal and experienced work force. Having been in business over the last hundred years, American has the breadth and depth of experience to handle any marine project, to include dredging. The PSMP/EIS directly impacts the operations of ACC and the methods in which we conduct business. By elongating this process, ACC and companies like ours, are forced to wait in the balance as dredging projects continue to be delayed.

This letter is meant to address not only the direct impacts to ACC, but the holistic economic impacts to the region. ACC relies upon the advertisement and award of federally funded dredging projects to sustain our operations and provide reliable jobs to our hard-working labor force. Craft labor jobs are the lifeblood of the dredging community and the lack of decision puts strain on the financial impacts for these citizens.

ACC agrees with your conclusion that neither a detailed economic analysis nor a cost/benefit analysis is required under the National Environmental Policy Act (NEPA), or the Water Resources Development Act to support the Corps' decision to conduct maintenance dredging of the Lower Snake River federal navigation channel. Corps policy and the underlying statutes clearly distinguish between the types of analysis required for construction of new projects versus maintenance of existing projects. The economic necessity for maintenance dredging is evidenced by the continued commercial use and reliance on the federal navigation channel by the inland ports and shipping community.

A study conducted by Dr. Eric Fruits of Nathan Associates regarding the economic necessity of and justification for immediate dredging was submitted to the Corps more than a year ago on August 9, 2013 in response to comments submitted by American Rivers on the Draft EIS. This study was submitted by an

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AMERICAN CONSTRUCTION COMPANY

America's Waterfront Contractor

organization that ACC is a member of, Pacific Northwest Waterways Association (PNWA). The study concludes that the benefits of dredging far exceed its costs. It further illustrates the robust economic benefits to commercial navigation generally, and grain shippers, barging, container shippers, the cruise industry and tourists more specifically, that will be realized through immediate dredging. Finally, Dr. Fruits takes issue with the methodology used and the conclusions reached in a contrary analysis performed by Ernest Niemi on behalf of American River et al.

The Columbia Snake River System is a 470-mile transportation link for the states of Idaho, Montana, Oregon and Washington, each of which relies heavily on the trade and commerce that flows on this system. Our river system is primarily an export gateway, making it possible for producers in the Northwest and Midwest to access international markets. It is the number one U.S. export area for wheat and barley, second for soy, and is the largest on the West Coast for wood products and mineral bulks.

Due to our 111 years of marine and waterway experience, we know and understand that the river system provides the safest, least polluting, and most economical mode of transportation. Barging carries more cargo and utilizes less energy than trucking and rail. A typical 4-barge tow carries as much cargo as 538 trucks. Each year, barging keeps hundreds of thousands of trucks off the highways that run through the sensitive airshed of the Columbia River Gorge.

The federal government, the states of Washington and Oregon, and local communities have made a significant investment in the future of the Columbia Snake River System. In November 2010, the local area celebrated the completion of the Columbia River Channel Deepening, a project that has already resulted in over $1B in private investment in the region. The U.S. Army Corps of Engineers also completed a 15-week extended lock maintenance closure during the winter of 2010/2011. Locks at The Dalles, John Day and Lower Monumental received new downstream gates, and repairs were completed at other projects. Congress, this Administration, and the surrounding states and communities have demonstrated their commitment to the future of the entire river system, including the Lower Snake, and the transportation benefits this river provides to the region and nation.

The recently completed channel deepening and lock repairs means we have a more reliable navigation system which is well positioned to handle additional tonnage. The ports and terminals on the Columbia/Snake are ready to move more cargo, create more jobs, and generate more revenue for their local communities. Most of the region's ports have the capacity to expand and are actively cultivating new business. In fact, this growth has already begun. We are seeing tremendous investment in the grain export facilities on the Lower Columbia, and higher wheat and soy tonnage is predicted.

Some have argued that the benefits of maintaining the Snake River navigation channel do not outweigh the costs. This is incorrect as demonstrated by the enclosed analysis by Dr. Fruits. Snake River cargo volumes have been remarkably stable over the past twenty years. The U.S. Army Corps of Engineers' Lock Performance Monitoring System shows that there were 3.8M tons of commercial cargo in CY1993, 3.1M tons in CY2002, and 3.1M tons in 2012.

The benefits to grain shippers alone are significant and reach over $10M annually. Container shipping, the cruise industry and the tourism supported by the river system accrue additional benefits. Barging

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also disciplines rail and trucking rates, and is absolutely critical to the efficient movement of Northwest products. All three modes of freight transportation are essential if we are to continue being a region and nation that grows and manufactures products for export.

20391 Some have also claimed that maintenance of the inland navigation channel would be a 'subsidy' to towboat companies, shippers, growers, or others. In reality, federal navigation channels are national assets that benefit many sectors. These benefits radiate throughout the economy in the form of lower transportation costs for shippers, increased revenues to growers, lower prices for consumers, increased employment opportunities at ports and terminals, and the ability for our farmers and manufacturers to compete in tough international markets.

20392 **ACC strongly urges the Corps to deny any further requests for extension on the commenting period and to finalize and issue the FEIS, PSMP, and Record of Decision no later than October 22, 2014, as you originally committed.** The issues raised by the commenting public have been more than thoroughly addressed. As evidenced by the multi-volume supporting studies, the degree of technical, scientific, and engineering analysis that now supports the EIS and PSMP is extraordinary and far surpasses that which is required by NEPA or the Clean Water Act. Further requests for comment will serve only to delay implementation of a critically needed maintenance project and will not otherwise produce a more thoughtful analysis.

20393 ACC also urges the Corps to work with its sister agencies to quickly resolve any lingering loose ends by: (1) shoring up its record in response to comments, especially those received by other federal and state agencies; and (2) completing the Endangered Species section 7 consultation forthwith, and implementing any required mitigation measures that ensue from that process.

20394 Finally, it is important to note that reservoir 'drawdown' on the Lower Snake River is simply not a viable option to address sediment accumulation. As the 1992 drawdown of the Lower Granite pool demonstrated, a great deal of environmental harm results from this approach, including the demise of thousands of stranded fish. In addition to the environmental devastation caused by the drawdown, severe economic damage also resulted. The 1992 test drawdown rendered the Clarkston Grain terminal useless, impeded barge traffic, obstructed access at the Ports of Lewiston and Wilma, eliminated access at the Port of Clarkston's tour boat dock, and ruined the Red Wolf Marina, which later went bankrupt as a result.

The Snake River navigation projects keep our regional and national economy strong and help us retain jobs by providing businesses with affordable, reliable transportation to get goods to international markets. Having waited almost ten years to engage in the type of maintenance dredging that occurs routinely on every other major navigation system throughout the county, the navigation community can ill-afford to lose another work window in which to conduct environmentally responsible maintenance work. **We urge the U.S. Army Corps of Engineers to finalize its ROD by October 22, 2014, and move forward with routine maintenance dredging on this critical federal navigation channel.**

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AMERICAN CONSTRUCTION COMPANY

America's Waterfront Contractor

Sincerely,

Kevin Culbert
President
American Construction Company, Inc.

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www.americanconstco.com

Final EIS Comment F0628

From:	Matt Childs
To:	PSMP
Subject:	[EXTERNAL] PSMP EIS Comments
Date:	Tuesday, September 16, 2014 4:03:05 PM
Attachments:	PSMP EIS_Walla Walla Corps.pdf

In response to the Lower Snake River Final Programmatic Sediment Management Plan and Environmental Impact Statement (PSMP EIS), American Construction Company, Inc. would like to submit the attached comments. We appreciate the opportunity to voice our opinion and are glad the Corps of Engineers looks at this issue holistically.

If you have any questions, please contact me.

Respectfully,

Matt Childs

Business Development Manager

American Construction Co., Inc.

1501 Taylor Way

Tacoma, WA 98421

Office: 253-254-0118

Fax: 253-254-0155

Cell: 812-251-6639

www.americanconstco.com <http://www.americanconstco.com/>

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www.facebook.com/americanconstco <http://www.facebook.com/americanconstco>

Final EIS Comment F0631

From: LuVerne and Kathy Grussing
To: joellen.darcy@us.army.mil
Cc: PSMP
Subject: [EXTERNAL] Lower Snake River Programmatic Sediment Management Plan EIS
Date: Tuesday, September 16, 2014 6:17:23 PM

Dear Ms. Darcy and other Army Corps Officials,

Please accept these comments into the official record for the U.S. Army Corps of Engineers' plan to dredge the lower Snake River navigation waterway (the Programmatic Sediment Management Plan Final Environmental Impact Statement).

The so-called Port of Lewiston has never lived up to the hype and promise expected when the lower Snake River was dammed (damned!) to create Idaho's only "seaport". Tonnage shipped to and from the port has declined dramatically over the past 10 years, and there is no indication that this trend will ever be reversed, for the simple reason that there are better, faster, more efficient methods of transporting these goods. Natural sedimentation from the Salmon and Clearwater River basins will require continual dredging of the Snake River to maintain even a 12 foot deep shipping channel. And the sediment that is deposited naturally outside the dredged shipping channel will, in the near future, require raising the levees in Lewiston and Clarkston to prevent those two cities (and the port!) from being inundated. None of this will change as long as the dams in the Snake River below Lewiston remain in place. 20417

20418

In addition to the flood risk and sediment problems for riverside towns, the four Snake River Dams have been a major factor in the decline and subsequent T&E Species listing of Idaho's magnificent Salmon and Steelhead. They impede migration and have done great harm to the habitat for all wild Salmon and Steelhead returning to Idaho. Continual annual dredging is the only way that the dams can fulfill their original mission. The Corps must assess the value of that original mission compared to the costs of the loss of wildlife and fisheries that have already occurred and continue to occur due to dredging. If an honest evaluation were made, many studies have already shown that in terms of pure economics, Salmon and Steelhead contribute far more to the local, regional, and national economies than does the pathetic amount of shipping (made possible only by continued dredging) that actually occurs on the Lower Snake River.

20419

20420 When assessing the efficacy of the proposed dredging, the Corps must consider an alternative which includes removing or breaching the four Lower Snake River Dams. If the dam removal alternative is not considered, the assessment of dredging outside that context will be rendered completely worthless. The Corps' dredging plan offers no sound justification for spending more public money on these high cost, low value dams. It fails to adequately address the impacts dredging itself will have on wild Salmon. Worst of all, the plan fails to consider the most effective solution to the sediment, flooding, and fisheries problems: Removal of the four lower Snake River dams.

In an era of declining federal resources, we can't afford to waste millions of taxpayer dollars on dredging the lower Snake--especially when fish- and taxpayer-friendly alternatives are available, and scarce infrastructure dollars are needed elsewhere.

Final EIS Comment F0631

20421

As taxpayers and residents of Lewiston-Clarkston Valley, we oppose spending any more tax dollars on a money-losing waterway that harms fish and our cherished lifestyle and customs.

Sincerely,

LuVerne and Kathleen Grussing
23860 Hewett Road
Juliaetta, Idaho 83535

From: Randy Hayden
To: PSMP
Subject: [EXTERNAL] Comments to PMSP/EIS
Date: Wednesday, September 17, 2014 3:06:21 PM
Attachments: PSMP Comment-2014-0916.pdf

Please See Attached.

Thank you,

Randy Hayden | Port of Pasco

Executive Director

1110 Osprey Pointe Blvd

Ph 509.547.3378 | PO Box 769

Fx 509.547.2547 | Pasco WA 99301

mailto:rhayden@portofpasco.org <mailto:rhayden@portofpasco.org>

September 17, 2014

U.S. Army Corps of Engineers, Walla Walla District
PSMP/EIS
Attention: Sandy Shelin
CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA, 99362-1876

Re: Port of Pasco Comments to PSMP/EIS

Dear Ms. Shelin:

Thank you for the opportunity to comment on the Lower Snake River Final Programmatic Sediment Management Plan and Environmental Impact Statement (PSMP EIS). The Port of Pasco strongly supports the conclusions of the EIS and final PSMP for the lower Snake River. We are hopeful that with the completion of these documents the Corps will be able to proceed with long overdue maintenance dredging of the Snake River to support Port and river transportation.

20369

The Port of Pasco agrees with your conclusion that neither a detailed economic analysis nor a cost/benefit analysis is required under the National Environmental Policy Act ("NEPA"), or the Water Resources Development Act to support the Corps' decision to conduct maintenance dredging of the Lower Snake River federal navigation channel. Corps policy and the underlying statutes clearly distinguish between the types of analysis required for construction of new projects versus maintenance of existing projects. The economic necessity for maintenance dredging is seen every day by the continued use of the lower Snake River by inland ports and the shipping community.

We are aware of arguments that barge transportation is no longer needed and that freight hauled out of our region could easily be transferred to trains and trucks. We believe this is a very short sighted strategy that does not provide our freight system with the resiliency needed for long term success. As an example, we are currently seeing significant freight forced off the rail system because of capacity constraints within the national BNSF network. Trucking infrastructure is not able to make up the deficit leaving some of our region's agricultural producers without an efficient means of transportation. Removing barging from the suite of transportation options would further degrade our shipping capacity and market competitiveness. All three modes of freight transportation are essential if we are to continue being a region and nation that grows and manufactures products for export.

The river system also provides the safest, least polluting, and most economical mode of freight transportation. Barging carries more cargo and utilizes less energy than trucking and rail. A typical 4-barge tow carries as much cargo as 538 trucks. Adding those trucks to our roads would only serve to increase air pollution and further exacerbate congestion and highway maintenance costs.

Northwest growers, manufacturers, shippers, and many others have waited almost ten years for Snake River maintenance dredging that occurs routinely on every other major river system throughout the country. We cannot afford to lose another work window for dredging and we urge the Corps to finalize its ROD and begin work on this critical federal navigation channel.

Thank you for the opportunity to provide these comments. We appreciate your work in thoroughly addressing the significant regulatory requirements associated with in-water maintenance activities.

Sincerely,

Randy Hayden
Executive Director
Port of Pasco

September 18, 2014 Sent via email: psmp@usace.army.mil

U.S. Army Corps of Engineers
Walla Walla District, PSMP/EIS
Attention: Sandy Shelin, CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA, 99362-1876

Re: Final Lower Snake River Final Programmatic Sediment Management Plan and Environmental Impact Statement

Dear Ms. Shelin:

Tidewater is the largest barge operator on the Columbia-Snake River System and handles approximately 85% of the waterborne cargo transiting through the locks and dams. We operate daily over the entire length of the Columbia-Snake River System from Astoria, Oregon at the mouth of the Columbia River, to Lewiston, Idaho, the terminus of the federally authorized commercial navigation channel.

20370 Tidewater appreciates the opportunity to comment on the Final Lower Snake River Programmatic Sediment Management Plan (PSMP) and Environmental Impact Statement (EIS). We strongly support the Corps' PSMP EIS and your plan to perform immediate and critically needed maintenance dredging to reestablish the federally authorized navigation channel on the Lower Snake River at the downstream navigation lock approach at Ice Harbor Dam and the confluence of the Snake and Clearwater rivers.

The Columbia-Snake River System is an important transportation link and export gateway for the states of Washington, Oregon, Idaho and Montana, making it possible for producers in the Northwest and Midwest to access international export markets by providing affordable, reliable inland marine transportation options to shippers. The Snake River dredging project is an important part of keeping our regional and national economy strong.

The federal government, the states of Washington, Idaho and Oregon, and local businesses have demonstrated their commitment to the future of the entire river system, including the Lower Snake, by making significant investments in the system. In the past four years, since completion of the Columbia River channel deepening, there has been over $1B in private investment in the region. The grain elevators in Portland and Vancouver Ports have invested nearly $430 MM in expansions, taking their export capacity from 22MM tons/year in 2010 to over 52MM tons per year by 2015. Much of the increased volumes to these export elevators will be through barge transport down river, as rail congestion in the PNW is now limiting export growth. In addition, the Corps has made significant infrastructure investments in repair projects at several of the navigational locks on the system.

20371

We agree that the Corps does not need to produce a detailed economic analysis or a cost/benefit analysis under the National Environmental Policy Act or the Water Resources Development Act to support the Corps' decision to conduct maintenance dredging. Dredging of the Lower Snake River navigation channel is a maintenance project, not a new construction project, and the economic necessity for maintenance dredging is evidenced by the continued commercial use and reliance on the federal navigation channel by the inland ports, transportation providers and business community.

From:	Carol Bua
To:	PSMP
Subject:	[EXTERNAL] Snake River PSMP EIP Comment Letter
Date:	Thursday, September 18, 2014 1:56:44 PM
Attachments:	image001.png PSMP EIP Comment Ltr - Tidewater - 09-18-14.pdf

Please find attached Tidewater's comment letter re the Final Lower Snake River Final Programmatic Sediment Management Plan and Environmental Impact Statement

Thank you.

Sincerely,

Carol Bua

Carol Bua

Public Affairs Manager

Tidewater

(360) 759-0310

www.tidewater.com <http://www.tidewater.com/>

Tidewater_logo_green

While maintenance dredging occurs routinely on every other major navigation system throughout the country, it has been almost 10 years since maintenance dredging has taken place in the Lower Snake River. The navigation community and those that rely on the inland marine transportation system, cannot afford to lose another work window in which to conduct this much needed maintenance work. We urge the U.S. Army Corps of Engineers to finalize its Record of Decision by October 22, 2014, and move forward with routine maintenance dredging on this critical federal navigation channel.

Sincerely,

Robert Curcio
President & CEO

Final EIS Comment F0639

From:	Dave Doeringsfeld
To:	PSMP
Subject:	[EXTERNAL] Port of Lewiston - PSMP
Date:	Thursday, September 18, 2014 2:09:22 PM
Attachments:	PSMP Comments - Port of Lewiston.PDF

Please find attached the Port of Lewiston's comments for the PSMP

Port of Lewiston

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E-mail: portinfo@portoflewiston.com
Container Yard
(208) 743-3209 • 1-877-777-8099

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Jaynie K. Bentz
Traffic Manager
Kim Petrie

September 17, 2014

U.S. Army Corps of Engineers, Walla Walla District
PSMP/EIS
Attention: Sandy Shelin
CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA, 99362-1876

Re: PNWA Comments on PSMP/EIS

Dear Ms. Shelin:

20387 The Port of Lewiston appreciates the opportunity to provide comment on the Lower Snake River Final Programmatic Sediment Management Plan and Environmental Impact Statement (PSMP EIS). We strongly support the Environmental Impact Statement ("EIS") and final Programmatic Sediment Management Plan for the lower Snake River on this sediment evaluation. We also support the plan to tackle long overdue routine maintenance dredging in areas of the federal navigation channel which have become constrained.

The safe loading and transport of barges has been impacted by siltation at the Port of Lewiston. Lewis Clark Terminal, Inc., (LCT) one of the largest grain shippers on the Columbia/Snake River System, has struggled to safely load barges because of unannounced or unaccounted conditions such as pool fluctuations and changes in shifting sediment. In April, 2012 a loaded grain barge (drafting 13'4") grounded in the Clearwater River Turning Basin at the Port of Lewiston. There are areas within the Turning Basin as shallow as 9 to 10 feet in depth. LCT has grounded multiple barges during loading at MOP +2 when pool elevations were changed by less than 1-foot.

Corps policy and the underlying statutes clearly distinguish between the types of analysis required for construction of new projects versus maintenance of existing projects. The Port of Lewiston agrees with the Corps conclusion that neither a detailed economic analysis nor a cost/benefit analysis is required under the National Environmental Policy Act ("NEPA"), or the Water Resources Development Act to support the Corps' decision to conduct maintenance dredging of the Lower Snake River federal navigation channel. The economic necessity for maintenance dredging is evidenced by the continued commercial use and reliance on the federal navigation channel by the inland ports and shipping community.

Idaho's Seaport

20388

Nonetheless, because socio-economic impacts must be studied on a more general level as part of any EIS, please see a study submitted by Pacific Northwest Waterways Association (PNWA) conducted by Dr. Eric Fruits of Nathan Associates regarding the economic necessity of and justification for immediate dredging. We ask that you include this study in your final administrative record and factor it into your final decision-making, as appropriate.

PNWA originally submitted Dr. Fruit's study to the Corps more than a year ago on August 9, 2013 in response to comments submitted by American Rivers on the Draft EIS. The study concludes that the benefits of dredging far exceed its costs. It further illustrates the robust economic benefits to commercial navigation generally, and grain shippers, barging, container shippers, the cruise industry and tourists more specifically, that will be realized through immediate dredging. Finally, Dr. Fruits takes issue with the methodology used and the conclusions reached in a contrary analysis performed by Ernest Niemi on behalf of American River et al.

The Columbia Snake River System is a 470-mile federally recognized Marine Corridor that links the states of Idaho, Montana, Oregon and Washington, each of which relies heavily on the trade and commerce that flows on this system. Our river system is primarily an export gateway, making it possible for producers in the Northwest and Midwest to access international markets. It is the number one U.S. export area for wheat and barley, second for soy, and is the largest break bulk gateway on the West Coast for wood products and mineral bulks.

The river system provides the safest, least polluting, and most economical mode of transportation. Barging carries more cargo and utilizes less energy than trucking and rail. A typical 4-barge tow carries as much cargo as 538 trucks. Each year, barging keeps hundreds of thousands of trucks off highways.

Some have argued that the benefits of maintaining the Snake River navigation channel do not outweigh the costs. This is incorrect as demonstrated by Dr. Fruits' analysis. Snake River cargo volumes have been remarkably stable over the past twenty years. The U.S. Army Corps of Engineers' Lock Performance Monitoring System shows that there were 3.8M tons of commercial cargo in CY1993, 3.1M tons in CY2002, and 3.1M tons in 2012.

The benefits to grain shippers alone are significant and reach over $10M annually. Container shipping, the cruise industry and the tourism supported by the river system accrue additional benefits. Barging also disciplines rail and trucking rates, and is absolutely critical to the efficient movement of Northwest products. All three modes of freight transportation are essential if we are to continue being a region and nation that grows and manufactures products for export.

Some have also claimed that maintenance of the inland navigation channel would be a "subsidy" to towboat companies, shippers, growers, or others. In reality, federal navigation channels are national assets that benefit many sectors. These benefits radiate throughout the economy in the form of lower transportation costs for shippers, increased revenues to growers, lower prices for consumers, increased employment opportunities at ports and terminals, and the ability for our farmers and manufacturers to compete in tough international markets.

20389 The Port of Lewiston strongly urges the Corps to deny any further requests for extension on the commenting period and to finalize and issue the FEIS, PSMP, and Record of Decision no later than October 22, 2014, as you originally committed. The issues raised by the commenting public have been more than thoroughly addressed. As evidenced by the multi-volume supporting studies, the degree of technical, scientific, and engineering analysis that now supports the EIS and PSMP is extraordinary and far surpasses that which is required by NEPA or the Clean Water Act. Further requests for comment will serve only to delay implementation of a critically needed maintenance project and will not otherwise produce a more thoughtful analysis.

20390 Finally, it is important to note that reservoir "drawdown" on the Lower Snake River is simply not a viable option to address sediment accumulation. As the 1992 drawdown of the Lower Granite pool demonstrated, a great deal of environmental harm results from this approach, including the demise of thousands of stranded fish. In addition to the environmental devastation caused by the drawdown, severe economic damage also resulted. The 1992 test drawdown terminated navigation uses at the ports of Lewiston, Clarkston and Whitman County.

The Snake River navigation projects keep our regional and national economy strong and help us retain jobs by providing businesses with affordable, reliable transportation to get goods to international markets. Having waited almost ten years to engage in the type of maintenance dredging that occurs routinely on every other major navigation system throughout the county, the navigation community can ill-afford to lose another work window in which to conduct environmentally responsible maintenance work. We urge the U.S. Army Corps of Engineers to finalize its ROD by October 22, 2014, and move forward with routine maintenance dredging on this critical federal navigation channel.

Sincerely,
PORT OF LEWISTON

David Doeringsfeld
General Manager

PORT of WALLA WALLA
JOB CREATION • TRANSPORTATION

310 A Street
Walla Walla Regional Airport
Walla Walla, Washington 99362-2269

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September 18, 2014

U.S. Army Corps of Engineers, Walla Walla District
PSMP/EIS
Attention: Sandy Shelin
CENWW-PM-PD-EC
201 N. Third Ave.
Walla Walla, WA 99362-1876

Re: PNWA Comments on PSMP/EIS

Dear Ms. Shelin:

The Port of Walla Walla appreciates the opportunity to provide comment on the Lower Snake River Final Programmatic Sediment Management Plan and Environmental Impact Statement (PSMP EIS). The Port supports the Corps of Engineers' plan to undertake long overdue routine maintenance dredging in areas of the federal navigation channel which have become constrained. The Port believes re-establishing the federal navigation channel to congressionally authorized dimensions is in the public interest.

20372 The Port agrees that neither a detailed economic analysis nor a cost/benefit analysis is required under the National Environmental Policy Act ("NEPA"), or the Water Resources Development Act in support of the Corps' decision to conduct routine maintenance dredging of the Lower Snake River federal navigation channel. Corps policy and the underlying statutes clearly distinguish between the types of analysis required for construction of new projects versus maintenance of existing projects. The economic necessity for maintenance dredging is evidenced by the continued commercial use and reliance on the federal navigation channel by the inland ports and shipping community.

The Port understands that socio-economic impacts must be studied on a more general level as part of any EIS. Therefore, the Port offers the following information to clearly show that private investment activity is ongoing and growing on the Snake River waterway:

1. Effective January 1, 2014, the Port entered into a 20 year lease with Northwest Grain Growers. This lease includes the use of a barge slip for shipping grain. This property sat idle for 2 years.

2. Effective April 1, 2014, the Port entered into a 25 year lease with The Scoular Company of Omaha, Nebraska. This lease includes non-exclusive use of a barge slip and high dock at Burbank, Washington. The Scoular Company is investing $2 million in renovation and repairs to ensure safe and efficient operation. They plan to operate year around and expect to annually load 5 plus million bushels of wheat, primarily originating from southern Idaho, onto barges headed to Portland for export. This property sat idle since 2007.

September 18, 2014
Page 2

The Columbia Snake River System is a 470-mile transportation link for the states of Idaho, Montana, Oregon and Washington, each of which relies heavily on the trade and commerce that flows on this system. The river system is primarily an export gateway, making it possible for producers in the Northwest and Midwest to access international markets. It is the number one U.S. export area for wheat and barley, second for soy, and is the largest on the West Coast for wood products and mineral bulks. The Snake River navigation projects keep our regional and national economy strong and help us retain jobs by providing businesses with affordable and reliable transportation to get goods to international markets.

Users of the Snake River navigation system have waited nearly 10 years for the Corps of Engineers to complete the PSMP and engage in the type of maintenance dredging that occurs routinely on every other federal major navigation system throughout the county. Port of Walla Walla customers and users of this system need predictability of service to plan future investments. The navigation community can ill-afford to lose another work window in which to
20373 conduct environmentally responsible maintenance work. We urge the U.S. Army Corps of Engineers to finalize its ROD by October 22, 2014, and move forward with routine maintenance dredging on this critical federal navigation channel.

Sincerely,

James M. Kuntz
Executive Director

From: June Meiners
To: PSMP
Cc: Paul Wemhoener
Subject: [EXTERNAL] Snake River Dredging Letter
Date: Friday, September 19, 2014 8:35:45 AM
Attachments: Snake River Dredging Comments.pdf

Please find attached a letter of comments from Port of Walla Walla regarding Snake River dredging.

Becky K. Hulse

Executive Assistant

Port of Walla Walla

310 A St.

Walla Walla, WA 99362-2269

Cell: (509)876-1376

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JAY T. WALDRON
Direct Line: 503-796-2945
E-Mail: jwaldron@schwabe.com

September 19, 2014

U.S. Army Corps of Engineers, Walla Walla
District
PSMP/EIS
Attention: Sandy Shelin
CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA 99362-1876

Re: PNWA Comments on PSMP/EIS

Dear Ms. Shelin:

The law firm of Schwabe Williamson & Wyatt ("Schwabe") appreciates the opportunity to comment on the Lower Snake River Final Programmatic Sediment Management Plan and Environmental Impact Statement (PSMP EIS). We strongly support the Corps' very thorough and what we believe to be a legally defensible Environmental Impact Statement ("EIS") and final Programmatic Sediment Management Plan for the lower Snake River on this sediment evaluation. Schwabe also supports the Corps' plan to perform long overdue routine maintenance dredging in areas of the federal navigation channel which have become constrained and have limited effective cargo loading to make shipping the most cost-efficient. 20395

Failure to dredge recently has created new hurdles for the Snake ports, and for shippers and carriers, and they all deserve a fully authorized Federal shipping channel at the authorized depth.

The Schwabe law firm has helped our clients for over one hundred years. We have represented what are called, maritime interests since shortly after World War II. In addition to representing current carriers serving Lewiston, such as Tidewater and Shaver, we also are proud to do work for the Ports of Lewiston, Clarkston, Whitman County, Walla Walla, the ports of the Tri-Cities, Morrow and Umatilla, and down river ports such as the Port of Vancouver and Portland, which loads in deep draft vessels cargo from Snake River ports to ship their products into international commerce. At lower river ports, cargo also is loaded on barges headed up river

U.S. Army Corps of Engineers, Walla Walla District
September 19, 2014
Page 2

to these same ports. We also have worked closely with PNWA as an association since the early 1980s.

Schwabe agrees with your conclusion that neither a detailed economic analysis nor a cost/benefit analysis is required under the National Environmental Policy Act ("NEPA"), or the Water Resources Development Act to support the Corps' decision to conduct maintenance dredging of the Lower Snake River federal navigation channel. Corps policy and the underlying statutes clearly distinguish between the types of analysis required for construction of new projects versus maintenance of existing projects. The economic necessity for maintenance dredging is evidenced by the continued commercial use and reliance on the federal navigation channel by the inland ports and shipping community.

20396 In short, Schwabe has reviewed closely the comments the Corps is receiving from PNWA, of which Schwabe is a member. Rather than restate PNWA's detailed analysis, and copy their attachment, we choose to ask the Corps to consider Schwabe's endorsement of those PNWA comments as standing for our own, and to add our voice to the points they make so ably.

We trust that you and your staff will accept this format as a way to simplify your review of comments on the final PSMP/EIS document.

Over the years, we have provided comments on a wide variety of Corps proposals. We usually have supported your initiatives, but, from time to time, we have faulted your draft proposals as treating certain issues too superficially. As far as the PSMP/EIS now before you though, this is not such any analysis. We are pleased to encourage you to adopt this without delay, and to implement a maintenance dredging program to take place in the next available fish window.

In closing, we thank the Corps for the opportunity to provide these comments. We are happy to answer any questions that you or our staff have on this issue.

Very truly yours,

Jay T. Waldron

JTW:ktle

S&W

PDX\105422\148797\WHE\14573985.1

From:	Levesque, Kathleen T.
To:	PSMP
Cc:	Waldron, Jay; Evans, Walter
Subject:	[EXTERNAL] PSMP EIS
Date:	Friday, September 19, 2014 1:54:55 PM
Attachments:	Letter to US Army Corps of Engineers re PSMP EIS.pdf

Please see attached letter sent on behalf of Schwabe, Williamson & Wyatt.

KATHLEEN T. LEVESQUE | Legal Assistant
SCHWABE, WILLIAMSON & WYATT
1211 SW 5th Ave., Ste. 1900, Portland, OR 97204
Direct: 503-796-3732 | Fax: 503-796-2900 | Email: klevesque@schwabe.com <mailto:klevesque@schwabe.com>
Assistant to Mark Long, Kent Roberts, Charmin Shiely, and Walt Evans

Final EIS Comment F0642

Port of Whitman County

302 N. Mill St.
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www.portwhitman.com

September 22, 2014

U.S. Army Corps of Engineers, Walla Walla District
PSMP/EIS
Attention: Sandy Shelin
CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA, 99362-1876

Re: PNWA Comments on PSMP/EIS

Dear Ms. Shelin:

The Port of Whitman County appreciates the opportunity to provide comment on the Lower Snake River Final Programmatic Sediment Management Plan and Environmental Impact Statement (PSMP EIS). The port manages three water dependent industrial sites on the Lower Snake River, all of which utilize the river for the shipping of grain, agricultural chemicals, break bulk cargo and wood products. Maintenance dredging is critical on the Lower Snake to maintain the balance of multi-modal transportation system in our region. Barging provides a safe, reliable, environmentally friendly and affordable option to the businesses and agricultural producers that are the backbone of our economy. Without scheduled maintenance dredging, this efficient and critical system cannot function.

The port strongly supports the Corps' strong effort to produce a thorough and legally defensible Environmental Impact Statement ("EIS") and final Programmatic Sediment Management Plan for the lower Snake River. We also support the Corps' plan to tackle long overdue routine maintenance dredging in areas of the federal navigation channel which have become constrained.

The Snake River navigation projects keep our regional and national economy strong and help us retain jobs by providing businesses with affordable, reliable transportation to get goods to international markets. Growers, manufacturers, shippers, and many others have waited almost ten years for the type of maintenance dredging that occurs routinely on every other major river system throughout the country. We cannot afford to lose another work window for the Corps to conduct this long overdue maintenance work.
20397 We urge the U.S. Army Corps of Engineers to finalize its ROD by October 22, 2014, and move forward with routine maintenance dredging on this critical federal navigation channel.

20398 The port also strongly urges the Corps to deny any further requests for extension on the commenting period and to finalize and issue the FEIS, PSMP, and Record of Decision no later than October 22, 2014, as you originally committed. The issues raised by the commenting public have been more than thoroughly addressed and enough is enough. Any further delay would put undue strain on the functionality of the river system and our regional economy.

20399 It is also critical to emphasize that "drawdown" on the Lower Snake River is simply not a viable option to address sediment accumulation. As the 1992 test drawdown of the Lower Granite pool illustrated, a great deal of environmental harm resulted from this approach, including the demise of thousands of stranded fish. In addition to the environmental devastation caused by the drawdown, severe economic damage also resulted. The 1992 test drawdown rendered the Clarkston Grain terminal useless, impeded barge traffic, obstructed access at the Ports of Lewiston and Wilma, eliminated access at the Port of Clarkston's tour boat dock, drove the Red Wolf Marina to bankruptcy and severely impacted the viability of both State and county roads, resulting in costly repairs. For those of us who personally experienced the 1992 drawdown and saw firsthand the impacts it had on industry and infrastructure, the possibility of another costly drawdown "experiment" to try to solve sediment problems is not acceptable.

Thank you for the opportunity to provide these comments. The port commission appreciates USACE's outstanding work during this lengthy process. We look forward to seeing the ROD finalized and the maintenance dredging plan move forward. It is critical to the economy of our region for maintenance dredging to occur this winter.

Sincerely,

Port of Whitman County Commissioners

John E. Love, President

Tom Kammerzell, Vice President

Daniel W. Boone, Secretary

From:	Debbie Snell
To:	PSMP
Subject:	[EXTERNAL] Port of Whitman County Comment Letter - USACE PSMP - Lower Snake River
Date:	Friday, September 19, 2014 3:15:37 PM
Attachments:	USACEPSMPComment9-19-14.PDF

To Whom It May Concern,

Attached is the above referenced comment letter. If you have any issues reading it, please contact me as soon as possible.

Thank you.

Debbie A. Snell

Properties and Development Manager

Port of Whitman County

302 N Mill Street

Colfax, WA 99111

509-397-3791 Office

509-879-7997 Cell

From: River Quest Excursions
To: PSMP
Subject: [EXTERNAL] NWPPVA Comment on COE Walla Walla District''s Final PSMP EIS
Date: Monday, September 22, 2014 5:25:58 AM
Attachments: SEP 21 2014 - NWPPVA COMMENT ON COE WALLA WALLA DISTRICT''S FINAL PSMP EIS.pdf

---

Sandy Shelin:

Please find attached our comment. Hard copy to follow.
Thank you for your time.

Alan (Butch) Odegaard
President Northwest Professional Power Vessel Association

Northwest Professional Power Vessel Association
Butch Odegaard, President: 1523 Powers, Lewiston, ID 83501
Telephone: (208) 746-8060 FAX: (208) 798-4995 E-mail: riverquest@cableone.net

September 21, 2014

U.S. Army Corps of Engineers Walla Walla District
PSMP/EIS
Attention: Sandy Shelin
CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA 99362-1876

Dear Ms Shelin:

Thank you for inviting the Northwest Professional Power Vessel Association (NWPPVA) to comment on the U.S. Army Corps of Engineers (COE), Walla Walla District's Final Lower Snake River Programmatic Sediment Management Plan/Environmental Impact Statement (PSMP/EIS).

20400 The COE identified Alternative 7, Comprehensive (Full System and Sediment Management Measures) as the preferred alternative for the PSMP. The NWPPVA fully supports this long-term PSMP and the immediate action plan to re-establish the federal navigation channel to authorized dimensions for the Corp's Lower Snake River Projects (LSRP). Maintenance of the navigation system for the LSRP has enormous effects on the economy of the Lewiston, Idaho, Clarkston, Washington, and the Pacific Northwest Region.

In addition, commercial tour boats bring thousands of passengers to the Port of Clarkston via the inland navigation system from Lewiston, Idaho to the Pacific Ocean. Commercial jet boat tours, operated by NWPPVA members, take tour boat passengers from Clarkston, WA upstream through the free flowing Snake River from Hells Gate State Park, about 33 mile below the Hells Canyon National Recreation Area (HCNRA) and into HCNRA.

Sincerely,

Alan (Butch) Odegaard

Final EIS Comment F0644

From:	Finn, Rick
To:	PSMP
Subject:	[EXTERNAL] Port of Portland Comments-PSMP-EIS
Date:	Monday, September 22, 2014 9:30:25 AM
Attachments:	Marine-Snake River Maintenance Dredging-Port of Portland Comments-PSMP-EIS-9-14.pdf

I've attached a letter from the Port of Portland on the Lower Snake River Final PSMP/EIS. Thank you for taking our views into account on this matter.

Rick Finn
Federal Affairs Manager
Port of Portland
Office: (503) 415-6045
Cell: (503) 718-1255
rick.finn@portofportland.com

Final EIS Comment F0644

Mission: To enhance the region's economy and quality of life by providing efficient cargo and air passenger access to national and global markets.

PORT OF PORTLAND
Possibility. In every direction

September 22, 2014

Ms. Sandy Shelin
Walla Walla District
U.S. Army Corps of Engineers
CENWW-PM-PD-EC
Walla Walla, Washington 99362-1876

Dear Ms. Shelin:

On behalf of the Port of Portland, I am writing to provide comments on the Lower Snake River Final Programmatic Sediment Management Plan and Environmental Impact Statement (PSMP/EIS). The Port strongly supports maintenance dredging in 2014 in those areas of the Lower Snake River federal navigation channel that are now constrained by shoaling.

Established in 1891 by the Oregon Legislature, the Port of Portland owns four marine terminals, three airports (Portland International, Hillsboro, and Troutdale), and five industrial parks. The Port's mission is to enhance the region's economy and quality of life by providing efficient cargo and air passenger access to national and global markets.

The Port of Portland has historically worked to maintain and improve navigation on the shallow-draft and deep-draft reaches of the Columbia/Snake/Willamette River system. This sustainable system for transporting cargo provides significant benefits to the Pacific Northwest and the United States as a whole by reducing shipping costs, environmental impacts, safety risks, and community effects.

A variety of cargo is transported by barge between marine terminals on the Lower Snake River and the Port of Portland. For example, the Port's Terminal 5 receives wheat from upriver grain elevators, and Terminal 6 exports containerized cargo that originates at the Port of Lewiston. All of this marine cargo relies upon a safe Lower Snake River federal navigation channel that is maintained at its authorized depth and width.

20401 The Corps of Engineers has developed a thorough PSMP/EIS that justifies maintenance dredging this winter. The Port of Portland urges the Corps of Engineers to proceed with this long overdue navigation activity.

Thank you for the opportunity to comment on this matter. The Port appreciates the excellent work that the Corps of Engineers has done to restore full navigation on the Lower Snake River.

Sincerely,

Richard Finn

Richard Finn
Federal Affairs Manager

7200 NE Airport Way Portland OR 97218
Box 3529 Portland OR 97208
503.415.6000

From:	abphillips@usbr.gov on behalf of FrontDesk, BOR EFO
To:	PSMP
Cc:	dsolem@usbr.gov
Subject:	[EXTERNAL] United States Army Corps of Engineers, Walla Walla District Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement, Walla Walla Washington Letter
Date:	Monday, September 22, 2014 9:35:10 AM
Attachments:	United States Army Corps of Engineers, Walla Walla District, PSMP-EIS.docx

Please find Subject letter attached, thank you

EPH-2212
ENV-6.00

Ms. Sandy Shelin
United States Army Corps of Engineers, Walla Walla District
201 North Third Avenue
Walla Walla, Washington 99362-1876

Subject: United States Army Corps of Engineers (Corps), Walla Walla District, Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement, Walla Walla, Washington

Dear Ms. Shelin:

20402

Thank you for the opportunity to review and comment on the proposed Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement (PSMP/EIS). The Bureau of Reclamation's Burbank Pumping Plant 1, which is operated and maintained by the South Columbia Basin Irrigation District (District), on the south bank of the Lower Snake River approximately five miles below Ice Harbor Dam. In the main stem of the Columbia River below the confluence of the Snake and Columbia Rivers, there are two more pumping plants. These pumping plants are also operated and maintained by the District; they pump water from the McNary Pool to the southern portion of the Columbia Basin Irrigation Project. In the past, the intake valves of the pumping plants have clogged due to sedimentation. Dredging activities and sediment removal should be done in a manner that minimizes adverse effects to the operations, facilities, and resources of the Columbia Basin Irrigation Project particularly (Burbank Pumping Plants 1, 2, and 3).

If you have any questions, please contact Ms. Gina Hoff, Water Quality Specialist, at 509-754-0254.

Sincerely,

Stephanie Utter
Ephrata Field Office Manager

cc: Mr. Dave Solem
South Columbia Basin Irrigation District Manager
P.O. Box 1006 (1135 East Hillsboro, Suite A)
Pasco, WA 99301

bc: EPH-2212, EPH-2704-2

WBR:GHoff: aphillips:09/18/2014:509-754-0254
United States Army Corps of Engineers, Walla Walla District, PSMP/EIS

From:	Phillips, Andrew
To:	PSMP
Subject:	[EXTERNAL] United States Army Corps of Engineers (Corps), Walla Walla District, Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement, Walla Walla, Washington
Date:	Monday, September 22, 2014 9:56:54 AM
Attachments:	Army Corp Scan.pdf

Dear Ms. Shelin, please find your electronic copy attached, thanks

--

Andrew Phillips
Field Office Assistant

U.S. Bureau of Reclamation - Ephrata Field Office

P.O. Box 815 / 32 C Street NW

Ephrata, WA 98823

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United States Department of the Interior
BUREAU OF RECLAMATION
Ephrata Field Office
P.O. Box 815
Ephrata, Washington 98823

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
EPH-2212
ENV-6.00

SEP 22 2014

Ms. Sandy Shelin
United States Army Corps of Engineers, Walla Walla District
201 North Third Avenue
Walla Walla, Washington 99362-1876

Subject: United States Army Corps of Engineers (Corps), Walla Walla District, Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement, Walla Walla, Washington

Dear Ms. Shelin:

Thank you for the opportunity to review and comment on the proposed Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement (PSMP/EIS). The Bureau of Reclamation's Burbank Pumping Plant 1, which is operated and maintained by the South Columbia Basin Irrigation District (District), on the south bank of the Lower Snake River approximately five miles below Ice Harbor Dam. In the main stem of the Columbia River below the confluence of the Snake and Columbia Rivers, there are two more pumping plants. These pumping plants are also operated and maintained by the District; they pump water from the McNary Pool to the southern portion of the Columbia Basin Irrigation Project. In the past, the intake valves of the pumping plants have clogged due to sedimentation. Dredging activities and sediment removal should be done in a manner that minimizes adverse effects to the operations, facilities, and resources of the Columbia Basin Irrigation Project particularly (Burbank Pumping Plants 1, 2, and 3).

If you have any questions, please contact Ms. Gina Hoff, Water Quality Specialist, at 509-754-0254.

Sincerely,

Stephanie Utter
Ephrata Field Office Manager

cc: Mr. Dave Solem
South Columbia Basin Irrigation District Manager
P.O. Box 1006 (1135 East Hillsboro, Suite A)
Pasco, WA 99301

From: kairos42@earthlink.net
To: PSMP
Cc: eric.v.hansen5.civ@mail.mil; douglas.w.lamount2.civ@mail.mil
Subject: [EXTERNAL] Comments to Walla Walla District"s Plans to Dredge the Lower Snake River and PSMP
Date: Monday, September 22, 2014 2:51:01 PM
Attachments: JW FEIS 2014 comments.doc

Sandy Shelin

United States Army Corps of Engineers

Email:psmp@usace.army.mil

Jo-Ellen Darcy

U.S. Army Corp of Engineers

Email:joellen.darcy@us.army.mil

The Walla Walla District (NWW) of the USACE has by now spent over $16 million preparing a sediment management plan for the lower Snake River, which in reality is a plan to maintain a navigation channel through the confluence of the Snake and Clearwater Rivers and up the Clearwater two miles to the Port
20422 of Lewiston, Idaho. In the draft EIS for the Lower Snake River Programmatic Sediment Management Plan (LSRPSMP) the NWW claimed the district had no requirement to provide any economic justification for its sediment management plans, including the $6.5 million "immediate action" dredging project embedded in the LSRPSMP. Perhaps in a reaction to public outcry regarding this issue, NWW now claims that commercial navigation on the lower Snake River saves $25 million annually based on a projected cost differential of $8.25 per ton between shipping by barge and shipping by other means. The $8.25/ton figure is then applied to a claimed annual freight volume of 3 million tons, resulting in the claim of $25 million in savings.

This unsupported analysis suffers from numerous flaws. For example, aside from a minimal amount of dredging at a lock entrance at Ice Harbor Dam, the only freight impacted by the LSRPSMP is that from the Port of Lewiston, which totals approximately 900,000 tons per year, not 3 million. The NWW might also have explored why freight volume on the lower Snake River has declined by more than 60% over the past 15 years if in fact water transport is so much cheaper than other means. However, my
20423 principal comments concern the claimed savings of $8.25 per ton for barge transportation, which NWW states they derived from information in the 2002 Final Lower Snake River Juvenile Salmon Migration Feasibility Report (LSRFR) That report claimed a savings of $5.75 per ton, to which NWW has apparently applied a 3% inflation factor over the ensuing 13 years. The analysis that produced the $5.75 figure was itself flawed and resulted from violations of USACE guidance. Thus in the LSRPSMP the NWW provides the public and USACE HQ with a false claim derived from a previous flawed analysis, resulting in an erroneous savings per ton applied to an incorrect volume of freight. When these simple
20424 to see errors are corrected there is NO savings by using the Lower Snake Waterway. None whatsoever, thus NO economic justification for this or any other dredging on this waterway. Indeed, when all costs and benefits for operating and maintaining the four multipurpose dams on the lower Snake are considered, there is an average annual NED loss of at least $130 million, thus no economic justification for any of the purposes.

As a means of specific expansion of the above I have attached my complete comments and I request they be included in my comments on the FEIS of the LSRPSMP.

Jim Waddell, P.E., U.S. Army Corps of Engineers, Retired

289 Ocean Cove Lane, Port Angeles, Washington 98363

phone: 360-928-9589

Comments to the Final Environmental Impact Statement (FEIS) and for the Lower Snake River Programmatic22-Sep-14 Sediment Management Plan (PSMP) prepared by the Northwest Division's Walla Walla District (NWW), U.S. Army Corps of Engineers (USACE)

The purpose of my comments is to unravel the assumptions and conclusions that have led to claims by NWW that channel maintenance of the lower Snake River provides an annual savings of $25 million. This claim is made in the Final Environmental Impact Statement (FEIS) for the Lower Snake River Programmatic Sediment Management Plan (PSMP). The Walla Walla District has further made this same claim in statements to the press. Many of the public comments in response to the draft EIS for the PSMP requested that NWW address Cost-Benefit issues in a final sediment management plan and EIS. Moreover, this writer sent a letter to the Assistant Secretary of the Army (Civil Works), Ms. Darcy, expressing concerns regarding a lack of economic justification for the LSRPSMP and immediate need action. In response to these comments Ms Darcy stated that "requests for funding of O&M at existing projects is based on careful analysis, including a review of indicators of economic justification…"

The NWW FEIS included the following statement:

"To ensure that continued maintenance is warranted, the Corps considered the current amount of traffic and the increased cost of transporting goods by alternative modes (rail or trucks) as opposed to barge. A variety of products are transported by barge on the lower Snake River, including grain, containers, fertilizer, and machinery. Based on the 2002 Final Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement, (http://www.nww.usace.army.mil/Library/2002LSRStudy.aspx), the increased cost to transport grain by rail or truck is about $8.45 per ton in current dollars. Total tonnage on the lower Snake River is currently estimated at about 3 million tons with the majority being grain. Therefore, annual transportation savings of approximately $25M can be expected if the navigation system is maintained. In reality it is likely that benefits will increase in the future as traffic continues to recover from the recession. Annual costs to maintain the lower Snake River navigation channel are estimated to be in the $1-5M range. Therefore based on the estimated transportation savings, ongoing channel maintenance on the lower Snake River is warranted from the navigation perspective."

The analysis of the NWW's claim of $8.45 per ton difference in modal transport cost thus requires a review of the 2002 Lower Snake River Feasibility Report (LSRFR) since this report forms the basis on which the $8.45 cost difference is made. Section 3.3, Transportation, in Appendix I of the 2002 LSFS lays out the methodology for the report's claim that barge transportation resulted in a savings of $5.75 per ton in 1998 dollars compared to freight transportation by other means. The $8.45 appears to reflect a 3% per year inflation of that $5.75 cost per ton from 1998 to the present. Section 3.3 contains the following paragraph:

"The direct economic costs that would result from breaching the four lower Snake River dams are measured and expressed as changes in the NED account. NED costs represent the opportunity costs of resource use, measured from a national rather than a regional perspective. In the case of dam breaching, the change in the cost of transporting products and commodities now shipped from ports on the lower Snake River is a NED cost, but the loss of revenue and profit by barge companies is not. Only the costs of resources actually used are included in the NED analysis. Although market prices (e.g., transportation rates) often reflect the total opportunity cost of resources, this is not always the case, and surrogate costs must sometimes be used to adjust or replace market prices (or published or contract rates). In this study it was judged appropriate to use modal costs computed through analysis of the actual fixed and variable costs of each transportation mode—barge, rail, and truck, rather than rates."

20425 NWW deviated from the standard Corps practice by electing to use costs generated by a computer model rather than actual rates (shown in the LSFS) for shipping goods to calculate changes in the NED account. Members of the barging industry were the first to identify a problem with this approach as documented in the study on page I-3-85:

"During the course of this study it was determined that there is a large difference between barge costs as estimated by the Reebie Barge Model and rates that are actually charged by the barge industry. For example, the Reebie Model estimates a cost of $3.07 per ton for shipping grain from Almota, Washington to Portland, Oregon, compared with the actual rate charged by the industry of about $6.07 per ton. Industry representatives have stated on numerous occasions that the costs estimated by the Reebie Barge Model are incorrect (too low). In response to the comments by representatives of the barge industry, Corps analysts reviewed three other studies of barge costs. The finding was that all of the studies showed that rates are significantly higher than costs. In addition, input data for the Reebie Model were provided to an industry representative for review and comment. No comments on the input data were ever received from representatives of the industry. On the basis of currently available information, barge costs produced by the Reebie model are considered appropriate for use in the study. The effect of using higher costs in the model, as has been suggested by representatives of the barge industry***, would be to reduce the transportation system cost impacts of dam breaching and possibly indicate a large shift of grain from barge to rail.*** (Emphasis added)"

This last quote requires careful review. Rates (the actual prices shippers charged customers) were much higher than the "costs" the Reebie Model generated. High levels of profit in the rates the barging industry charged at the time for shipping grain on the lower Snake River contributed to the higher rates, which the barging industry considered "costs."

20426 However, if NWW's analysis used these higher "costs" in their formulation, the claimed navigation benefit of keeping the dams in place would be reduced—in fact, the benefit would be reduced to zero. In an effort to confirm the difference in cost versus rates, NWW hired another consulting firm, TransLog Associates, to obtain truck/barge and truck/rail rates which indeed verified significant differences between barging costs versus rates from all locations. It also found that in 11 of 18 locations the rail rates were below the rail costs calculated from the cost model. The NWW assessment of this information is noted on page I 3-82:

"A total of 18 origins were compared—nine in Washington, eight in Idaho, and one in Oregon. The comparison showed that truck/barge rates are consistently higher than costs and range from about one percent above costs to over 50 percent above costs. In the case of truck/rail, the comparison showed that rates were below costs for 11 of the 18 origins with a range from about 3 percent below costs to 30 percent below costs. The remaining seven origins had truck/rail rates that were higher than costs with a range of from nearly 33 percent above costs to a low of about one percent above costs. The wide disparity between rates and costs suggests that in many cases rates are not set in a competitive environment, which is the condition required for rates to be used in NED analyses. The comparison of rates and costs is shown in Table 3.3-1."

Of Importance here is not only the fact that barging rates were much higher than the costs, but also the comparison of shipping rates for truck/barge with shipping rates for truck/rail. Table 3.3-1 shows relatively small differences between actual shipping rates across modes from the same location, indicating that a competitive market was in place. This competitive market existed in spite of the very high profit margins reflected in the truck/barge rates. Further, the Corps' planning ER

1105-2-100 Appendix D relating to the calculation of benefits for Navigation projects states:

" (5) Use of Rates For Benefit Measurement. It is currently more difficult to accurately compute the long-run marginal costs of particular rail movements on the basis of cost estimation studies than to determine the rates at which railroad traffic actually moves. In competitive markets, rates (prices) correspond to marginal cost, and, given market stability, prices will settle at long-run marginal costs. ***Moreover, the rates actually charged determine the distribution of traffic among modes. For these reasons, rates will be used to measure shift of mode benefits.*** (Emphasis added)

20427 By disregarding this guidance and standard practice, the District made an error in
the LSFS that provided a faulty and overstated benefit for truck/barge navigation
versus truck/rail. The decision by the NWW to use costs generated by the Reebie
Model rather than rates raised the NED costs of breaching the dams and thus
supported the NWW's interests in keeping the dams in place. NWW also
predicted that use of the higher costs in their formulation would "possibly indicate
a large shift of grain from barge to rail", a prediction borne out by the decline of
freight traffic on the lower Snake River by 66% over the past 15 years. The LSFS
does include a means of more accurately approximating the difference between
truck/barge and truck/rail at the time of the LSR feasibility study upon which the
NWW has based its $8.25/ton differential. Rather than using the Reebie Cost
20428 Model the Corps erroneously adopted, a comparison can be made using the
average shipping rate for each state identified by the Translog Associates' study as
summarized in Table 3.3-1 and weighting this rate by the percentage of grain each
state shipped as provided in Table 3.3-25. The Translog study provided data for
Washington, Idaho, and Oregon, which in 1998 accounted for 92% of the grain
shipped on the lower Snake River. Washington shipped 66.6% of the barged grain,
Idaho 25.5%, and Oregon .8%. For Washington, the average truck/barge cost was
$12.84 per ton, with truck/rail at $13.44. Idaho had average truck/barge cost of
$20.01, with truck/rail at $18.77, while the data for Oregon was $17.89 for
truck/barge and $16.48 for truck/rail. When the state average rates are weighted
by each state's freight volume, truck/barge cost is $13.80 per ton and truck/rail is
$13.87, a difference of just 7 cents a ton. Thus NWW today is using the results of
a faulty analysis in the LSRFR to "ensure that continued maintenance (of the lower
20429 Snake River navigation channel) is warranted." The claim of a $25 million benefit
for maintaining this channel is a false claim. The 2002 study the NWW relies on to
make this claim is flawed, and the actual NED benefit can best be estimated at zero

O&M costs not considered

based on the 2002 LSFS. Further, the Corps' estimated $1-$5 million annual cost
20430 in the sediment management plan for maintenance of this waterway fails to
consider fully the cost of lock operations/maintenance, major repairs such as $10
million lock gate replacements, and needed major lock rehabilitation expenditures
on the near horizon, let alone the $16+ million the NWW has now spent on the
sediment management plan itself. If any benefits are actually attributable to
commercial navigation on the lower Snake, those benefits must be balanced
against all costs related to that navigation, not just the estimated $1-$5 million
annual costs for maintaining the navigation channel. Indeed the FEIS points out
the need to annually dredge .7 mcy of material to maintain the navigation channel
and current flow conveyance at the confluence of the Clearwater and Snake Rivers
at Lewiston. The average annual costs of this dredging computed at a 6.88%
discount rate adds $13 million per year to the O&M costs, far more than the stated
$1-5 million. Moreover, NWW's analysis does not quantify the approximately 9%
cost allocation of total project O&M attributable to the navigation purpose. When
summed, the cost of inland navigation, especially when hypothetical rail and
highway improvements for modal shifts are removed from the equation, far
exceeds any possible benefits. (The extent and costs of these improvements were
found to be significantly overstated in the 2002 LSFS and were even noted as such
in the report.)

NWW has a vested interest in keeping the lower Snake River Project alive, and they are partnered with the special interests that benefit from maintenance of the waterway at public expense. An honest, unbiased Cost/Benefit analysis of commercial navigation on the lower Snake River leads to two major conclusions: further expenditure of taxpayer dollars on this waterway is not economically justifiable, and the money that could be saved by closing the lower Snake to commercial navigation would be much more wisely spent on maintaining more productive waterways such as the Columbia River.

Response: Proposed current immediate need action is to address sediment accumulation that interferes with commercial navigation. See FEIS Section1.1.2.

However, the analysis of economic justification does not en[illegible]led
in the FEIS that dredging was required for all project purpo[illegible]ed
this in her letter: "..and the consideration of trade-offs and benefits related to all
20431 project purposes." Indeed, a large portion of the .7 mcy of the dredging is required
to maintain flow conveyance that is caused by sediment dropping out in the Lower
Granite pool at the head of navigation at Lewiston. Without this additional
dredging, the levees would have to be raised or the flood risk would be
unacceptable and eventual overtopping of the levees would likely occur. No
matter how one looks at this issue it must force an analysis of all alternatives that
20432 are economically justified. As noted above, navigation is not justified. It therefore

does not meet the Congressional intent that the initial authorization was based on, nor meet the standard for continued maintenance. It is not an uncommon alternative on the Corps inland navigation system to not dredge the fully authorized depth or width of a channel, or to suspend operations completely as in the case of the Willamette Falls Locks in 2011. Indeed nearly all efforts to maintain the originally authorized navigation channel of the Lower Snake River were suspended for more than 30 years due to a lack of economic benefit. All of this points to the fact that it is erroneous, misleading and an unreasonable excuse, not to include any alternative that does not include maintaining the navigation channel by stating that NWW has a "requirement" or is mandated to dredge the channel.

For NWW to correctly consider all reasonable and prudent alternatives, including dam breaching, would require an economic evaluation of the whole multi-purpose project. Since this was attempted in the 2002 LSFS there is a basis for analysis and it would not have been a major effort to correct and update the costs and benefits as was partially done in an attempt to justify navigation benefits in the current
20433 FEIS. However, **a corrected** reanalysis of all project costs shows that navigation costs cannot be traded off or wrapped in with the other costs of the four dams and yield a positive benefit. Specifically, correcting the costs in the NWW 2002 LSFS, NWW's actual costs from 1999 to 2012 and cost data from Bonneville Power Administration shows that when all corrected costs and benefits are added to the 2002 LSRFR balance sheet, the net economic benefit of breaching the dams is somewhere between an annual average benefit of $45 million to $300 million depending, in part, on the wide range included in the report for the recreational benefit. When these costs and benefits are brought forward to 2014 and projected over the next 100 years, the costs of operating the dams approaches $300 million per year and the overall benefits for breaching on an annual average basis range from $130 to $400 million. Trying to justify these dams in terms of navigation or hydropower, or as a multipurpose project, annually robs the American people of at least $130 million in economic benefit and deprives the COE's O & M budget of at least $50 million annually.

In Summation:

A requirement to dredge now or in the future does not exist without an economic justification and there is none for either navigation alone or as part of a multipurpose project.

In fact, the economic losses are so egregious under current operations that to leave off the most reasonable and prudent alternative is clearly in violation of NEPA.

20434 Given these economic losses, it would be a far better investment of the Corps scarce O&M and planning resources to utilize the Corps Section 216 authority and undertake an immediate disposition study of the Four Lower Snake Dams over the next 6 months with the goal to begin drawing down the Lower Granite reservoir in the spring of 2015.

These comments were prepared by Jim Waddell, P.E.,
U.S. Army Corps of Engineers, Retired

289 Ocean Cove Lane,
Port Angeles, Washington 98363
phone: 360-928-9589

Final EIS Comment F0647

From:	Rob Rich
To:	PSMP
Cc:	PNWA - Kristin Meira
Subject:	[EXTERNAL] Shaver Transportation Company comment
Date:	Monday, September 22, 2014 2:54:00 PM
Attachments:	PSMP comment0001.pdf

Attached is our comment for the Snake River PSMP project.

We appreciate the opportunity to share our position.

Best regards, Rob.

Rob Rich

V.P. Marine Services

Shaver Transportation Company

"Providing The Power Since 1880"

Phone: 503-228-8850 Fax: 503-274-7098

Cell: 503-781-7635

e-mail: rdr@shavertransportation.com

www.shavertransportation.com

Final EIS Comment F0647

SHAVER
TRANSPORTATION COMPANY

September 22, 2014

U.S. Army Corps of Engineers, Walla Walla District
PSMP/EIS
Attention: Sandy Shelin
CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA, 99362-1876

Re: Shaver Transportation Company comments on PSMP/EIS

Dear Ms. Shelin,

Shaver Transportation Company, at 135 years, is the oldest continuously operating tug and barge line on the West Coast, with our sole area of service being the Columbia Snake River system. We are a fifth generation family owned company with 100 employees who are supported by and dependent on the incredible integrated lock and dam system that has been steadily developed and improved upon since 1936.

Our fleet of grain barges and tugs serve the 27 upriver barge elevators and numerous Port and private docks that this system has seen develop and flourish, especially with the opening of Lower Granite lock and dam, which opened the Ports of Lewiston and Clarkston to the Pacific Rim.

We note that the two newest constructed barge elevators on the entire upriver system are in the Snake River at Pasco and Monumental, along with the long mothballed Port of Walla Walla Elevator at Burbank which has been remodeled and put back into service this year. Shaver Transportation has built eight of the last ten new grain barges on the system, the last two launched in 2013. We have repowered all of our upriver tugs to reduce our already lowest in transportation mode carbon footprint. We have purchased engines for construction an additional upriver tug. These multi-million dollar commercial investments in the Snake River System are not of a speculative nature, but of sound business principals and due diligence that show the Snake is a vital and solidly performing part of this whole integrated system.

Every piece of infrastructure, be it Nav locks, docks, highways, powergrids, or river channels all require periodic maintenance to keep them operating as intended, efficiently, and to preserve the investment made in the first place. Strong, unwavering support for the PSMP as it relates to maintenance dredging activities in the Lower Granite pool and at Ice Harbor Dam is paramount to Shaver, its Snake River barging dependent shippers, and the hundreds of families in the inland Northwest who depend on this system.

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Final EIS Comment F0647

20403

Periodic dredging of sediment accumulation under the vigilant methodology set forth by the PSMP/EIS ensures the best possible practices to ensure environmental stewardship is exercised throughout the dredging project. We support and believe in the Walla Walla District's ability to safely, responsibly, economically provide the dredging needed to protect the great investment made in this Snake River system.

We truly appreciate the opportunity to share our input at this critical juncture in this process. If there is any further assistance we can provide in this process, please feel free to contact us. We thank you in advance for your detailed review that allows this process to proceed during the 2014 in-water window as it quickly approaches.

Best Regards,

Rob Rich, V.P. Marine Services
Shaver Transportation Company

Final EIS Comment F0648

From:	fego@pacbell.net
To:	PSMP
Subject:	[EXTERNAL] Dredging on Snake River
Date:	Monday, September 22, 2014 3:35:47 PM
Attachments:	Snake.tif

Dear Ms. Shelin,

Per our phone conversation of a few minutes ago, please register my comments which are attached.

Cordially, Ernie

Final EIS Comment F0648

Ernest E. Goitein

167 Almendral, Atherton, California 94027

September 22, 2014

Subject: Dredging on Snake River

Sandy Shelin
United States Army Corps of Engineers
U.S. Army Corps of Engineers, Walla Walla District, PSMP/EIS
201 North Third Avenue
Walla Walla, WA 99362-1876

Dear Ms Shelin,

The dredging of sediment accumulated upstream of the Snake River Dams, proposed in the 2014 FEIS, does not make economic sense.

20435

Barge traffic has been replaced by truck and train shipping leaving barge shipping at less than 4 percent of freight hauling.

20436

It would make much more sense to tear down the dams and reestablish a healthy salmon fishery industry. This would produce an annual economic boom and income to the local communities.

Instead of a perpetual expensive taxpayer subsidy for sediment dredging, the Army Corps could actually create an economic benefit to the local communities and the environment.

Thank you for your consideration,

Ernest Goitein

Final EIS Comment F0649

From:	Kristin Meira
To:	PSMP
Subject:	[EXTERNAL] PNWA comments on PSMP FEIS
Date:	Monday, September 22, 2014 4:22:00 PM
Attachments:	20140922_PNWA comments on PSMP FEIS.pdf

Ms. Shelin,

Attached please find PNWA's comments on the Lower Snake River Final Programmatic Sediment Management Plan and Environmental Impact Statement (PSMP EIS).

Sincerely,

Kristin Meira

Executive Director

Pacific Northwest Waterways Association (PNWA)

503-234-8556 direct // 503-757-8716 mobile

www.pnwa.net <http://www.pnwa.net/>

PNWA
PACIFIC NORTHWEST WATERWAYS ASSOCIATION

September 22, 2014

U.S. Army Corps of Engineers, Walla Walla District
PSMP/EIS
Attention: Sandy Shelin
CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA, 99362-1876

Re: PNWA Comments on PSMP/EIS

Dear Ms. Shelin:

The Pacific Northwest Waterways Association ("PNWA") appreciates the opportunity to provide comment on the Lower Snake River Final Programmatic Sediment Management Plan and Environmental Impact Statement (PSMP EIS). We strongly support the Corps' significant effort to produce a very
20404 thorough and legally defensible Environmental Impact Statement ("EIS") and final Programmatic Sediment Management Plan for the lower Snake River on this sediment evaluation. We also support the Corps' plan to tackle long overdue routine maintenance dredging in areas of the federal navigation channel which have become constrained.

PNWA is a regional trade association comprised of approximately 130 organizations, including public and private ports, transportation, trade, tourism, agricultural, forest products and energy related entities. For eighty years, PNWA has led the way for development of economic infrastructure for navigation, hydropower and irrigated agriculture on the Columbia and Snake River System.

PNWA agrees with your conclusion that neither a detailed economic analysis nor a cost/benefit analysis is required under the National Environmental Policy Act ("NEPA"), or the Water Resources Development Act to support the Corps' decision to conduct maintenance dredging of the Lower Snake River federal navigation channel. Corps policy and the underlying statutes clearly distinguish between the types of analysis required for construction of new projects versus maintenance of existing projects. The economic necessity for maintenance dredging is evidenced by the continued commercial use and reliance on the federal navigation channel by the inland ports and shipping community.

20405 Nonetheless, because socio-economic impacts must be studied on a more general level as part of any EIS, we are re-submitting a study conducted by Dr. Eric Fruits of Nathan Associates regarding the economic necessity of and justification for immediate dredging. We ask that you include this study in your final administrative record and factor it into your final decision-making, as appropriate.

PNWA originally submitted Dr. Fruit's study to the Corps more than a year ago on August 9, 2013 in response to comments submitted by American Rivers on the Draft EIS. The study by Dr. Fruits concludes that the benefits of dredging far exceed its costs. It further illustrates the robust economic benefits to commercial navigation generally, and for grain shippers, barging, container shippers, the cruise industry and tourists more specifically, that will be realized through immediate dredging. Finally, Dr. Fruits refutes the methodology used and the conclusions reached in a contrary analysis performed by Ernest Niemi on behalf of American River et al.

www.pnwa.net
ph. 503-234-8551 • f. 503-234-8555 • 516 SE Morrison Street • Suite 1000 • Portland, OR 97214

The Columbia Snake River System is a 470-mile transportation link for the states of Idaho, Montana, Oregon and Washington. These states rely heavily on the trade and commerce that flows on this system. Our river system is primarily an export gateway, making it possible for producers in the Northwest and Midwest to access international markets. It is the number one U.S. export area for wheat and barley, second for soy, and is the largest on the West Coast for wood products and mineral bulks.

The river system provides the safest, least polluting, and most economical mode of freight transportation. Barging carries more cargo and utilizes less energy than trucking and rail. A typical 4-barge tow carries as much cargo as 538 trucks. Each year, barging keeps hundreds of thousands of trucks off the highways that run through the sensitive airshed of the Columbia River Gorge.

The federal government, the states of Washington and Oregon, and local communities have made a significant investment in the future of the Columbia Snake River System. In November 2010, we celebrated the completion of the Columbia River Channel Deepening, a project that already has resulted in over $1 Billion in private investment in the region. The U.S. Army Corps of Engineers also completed a 15-week extended lock maintenance closure during the winter of 2010/2011. Locks at The Dalles, John Day and Lower Monumental received new downstream gates, and repairs were completed at other projects. Congress, this Administration, and the surrounding states and communities have demonstrated their commitment to the future of the entire river system, including the Lower Snake, and to the transportation benefits this river provides to the region and nation.

The recently completed channel deepening and lock repairs translates into a more reliable navigation system which is well positioned to handle additional tonnage. The ports and terminals on the Columbia/Snake are ready to move more cargo, create more jobs, and generate more revenue for their local communities. Most of the region's ports have the capacity to expand and are actively cultivating new business. In fact, this growth has already begun. We are seeing tremendous investment in the grain export facilities on the Lower Columbia, and higher wheat and soy tonnage is predicted.

Some have argued that the benefits of maintaining the Snake River navigation channel do not outweigh the costs. This is incorrect, as demonstrated by the enclosed analysis by Dr. Fruits. Snake River cargo volumes have been remarkably stable over the past twenty years. The U.S. Army Corps of Engineers' Lock Performance Monitoring System shows that there were 3.8M tons of commercial cargo in CY1993, 3.1M tons in CY2002, and 3.1M tons in 2012.

The benefits to grain shippers alone are significant and reach over $10M annually. Container shipping, the cruise industry and the tourism supported by the river system provide additional benefits. Barging also disciplines rail and trucking rates, and is absolutely critical to the efficient movement of Northwest products. All three modes of freight transportation are essential if we are to continue being a region and nation that grows and manufactures products for export.

Some critics also have claimed that maintenance of the inland navigation channel amounts to a "subsidy" to towboat companies, shippers, growers, or others. In reality, federal navigation channels are national assets that benefit many sectors, and have since early in our history as a country. These benefits radiate throughout the economy in the form of lower transportation costs for shippers, increased revenues to growers, lower prices for consumers, increased employment opportunities at ports and terminals, and the ability for our farmers and manufacturers to compete in tough international markets.

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PNWA strongly urges the Corps to deny any further requests for extension on the commenting period and to finalize and issue the FEIS, PSMP, and Record of Decision no later than October 22, 2014, as you originally committed. The issues raised by the commenting public have been more than thoroughly addressed. As evidenced by the multi-volume supporting studies, the degree of technical, scientific, and engineering analysis that now supports the EIS and PSMP is extraordinary, and far surpasses that which is required by NEPA or the Clean Water Act. Further requests for comment will serve only to delay implementation of a critically needed maintenance project and will not otherwise contribute to a more thoughtful analysis.

20406 PNWA also urges the Corps to work with its sister agencies to quickly resolve any lingering loose ends by: (1) shoring up its record in response to comments, especially those received by other federal and state agencies; and (2) completing the Endangered Species section 7 consultation forthwith, and implementing any required mitigation measures that result from that process.

20407 Finally, it is important to emphasize that reservoir "drawdown" on the Lower Snake River is simply not a viable option to address sediment accumulation. As the 1992 test drawdown of the Lower Granite pool demonstrated, a great deal of environmental harm results from this approach, including the demise of thousands of stranded fish. In addition to the environmental devastation caused by the drawdown, severe economic damage also resulted. The 1992 test drawdown rendered the Clarkston Grain terminal useless, impeded barge traffic, obstructed access at the Ports of Lewiston and Wilma, eliminated access at the Port of Clarkston's tour boat dock, and ruined the Red Wolf Marina, which later went bankrupt as a result. The test drawdown also resulted in significant damage to roads, railroad embankments, guardrails, bridges, and railroad tracks.

The Snake River navigation projects keep our regional and national economy strong and help us retain jobs by providing businesses with affordable, reliable transportation to get goods to international markets. Growers, manufacturers, shippers, and many others have waited almost ten years for the type of maintenance dredging that occurs routinely on every other major river system throughout the country. We can ill-afford to lose another work window for the Corps to conduct this environmentally responsible maintenance work. We urge the U.S. Army Corps of Engineers to finalize its ROD by October 22, 2014, and move forward with routine maintenance dredging on this critical federal navigation channel.

Thank you for the opportunity to provide these comments. We appreciate the Corps' outstanding work during this lengthy process. We look forward to the Corps' plan to move forward, and for maintenance dredging to occur this winter.

Sincerely,

Kristin Meira

Kristin Meira
Executive Director
Pacific Northwest Waterways Association

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PNWA Membership Roster

PNWA 80 YEARS
PACIFIC NORTHWEST WATERWAYS ASSOCIATION

Advanced American Construction
AECOM
Almota Elevator Company
American Construction
Ball Janik LLP
Bell Buoy Crab Co.
Benton County PUD #1
BergerABAM Engineers, Inc.
Bergerson Construction, Inc.
BNSF Railway Company
BST Associates
Business Oregon Infrastructure Finance Authority
Central Oregon Basalt Products
Central Washington Grain Growers
Clark Public Utilities
Clearwater Paper Corporation
Collins Engineers Inc.
Columbia Basin Development League
Columbia County Grain Growers
Columbia Grain
Columbia River Bar Pilots
Columbia River Pilots
Columbia River Port Engineers
Columbia River Steamship Operators Association
Cooperative Agricultural Producers
David Evans and Associates
Dunlap Towing
Dutra Group
East Columbia Basin Irrigation District
EGT, LLC
Environ
Foss Maritime Company
Foster Pepper
Franklin PUD
GEI Consultants
Gordon Thomas Honeywell Government Affairs
Great Lakes Dredge & Dock
Hart Crowser, Inc.
Idaho AFL-CIO
Idaho Wheat Commission
ILWU Oregon Area District Council
ILWU Puget Sound District Council
J-U-B Engineers, Inc.
Kalama Export Company
Kiewit Infrastructure West Co.
KPFF Consulting Engineers
Lampson International, LLC
Landau Associates
LD Commodities Pacific, LLC
Lewis-Clark Terminal Association
MacKay & Sposito
Marine Industrial Construction
McGregor Company
Millennium Bulk Terminals
Moffatt & Nichol
Morrow Pacific Project
Normandeau Associates, Inc.
Northwest Grain Growers, Inc.
Northwest Public Power Assoc.
OR Public Ports Association
OR Wheat Growers League
Pacific Northwest Farmers Co-op
Pacific Northwest International Trade Association
Parsons Brinckerhoff
PBS Engineering & Environmental
PND Engineers, Inc.
PNGC Power
Pomeroy Grain Growers
Port of Anacortes
Port of Astoria
Port of Bandon
Port of Benton
Port of Camas-Washougal
Port of Cascade Locks
Port of Chelan County
Port of Chinook
Port of Clarkston
Port of Columbia County
Port of Coos Bay
Port of Everett
Port of Garibaldi
Port of Grays Harbor
Port of Hood River
Port of Humboldt Bay
Port of Ilwaco
Port of Kalama
Port of Klickitat
Port of Lewiston
Port of Longview
Port of Morrow
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Port of Seattle
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Port of Skagit
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Port of Umpqua
Port of Vancouver
Port of Walla Walla
Port of Whitman County
Port of Woodland
Puget Sound Pilots
Schwabe, Williamson & Wyatt
SDS Tug & Barge
Shaver Transportation Company
Stoel Rives LLP
Tangent Services, Inc.
Teevin Bros.
TEMCO
Tidewater Barge Lines
United Grain Corporation
USA Dry Pea & Lentil Council, Inc.
Vancouver Energy
Van Ness Feldman
WA Association of Wheat Growers
WA Council on International Trade
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Eric Fruits, Ph.D.
Director, Pacific Northwest

August 9, 2013

U.S. Army Corps of Engineers,
Walla Walla District
PSMP/EIS, Attention: Sandy Shelin, CENWW-PM-PD-EC,
201 North Third Avenue
Walla Walla, WA 99362-1876
psmp@usace.army.mil

RE: Response to Comments Submitted by American Rivers et al., and Ernie Niemi on the Draft Environmental Impact Statement for the Lower Snake River Programmatic Sediment Management Plan prepared by the U.S. Army Corps of Engineers

Dear Ms. Shelin:

I have been retained by the Pacific Northwest Waterways Association ("PNWA"), to provide an economic analysis of comments submitted by Ernie Niemi on behalf of American Rivers, Earthjustice, Save Our Wild Salmon, Sierra Club, and others (hereafter, "American Rivers") regarding the supposed "costs and benefits" of dredging associated with the U.S. Army Corps of Engineers' ("Corps") Lower Snake River Draft Programmatic Sediment Management Plan and corresponding environmental analysis.

I am a managing economist at Nathan Associates Inc., an international consulting firm that specializes in providing economics services to private and public sector clients. I earned both my masters and Ph.D. in economics from Claremont University, and a B.S. with Distinction in Business Economics and Public Policy from Indiana University. In addition to my Pacific Northwest economics consulting practice, I am an adjunct economics professor at Portland State University, and am an expert on economics, finance and statistics. A copy of my curriculum vitae is attached. My comments are based on my general expertise and knowledge regarding economics, finance, and statistics as well as publicly available information regarding dredging and associated benefits and costs.

As described more fully below, I conclude that the Niemi Comments are not based on sound economic principles, and are both misleading and factually unsupported. Contrary to Mr. Niemi's conclusions, the available information suggests that:

1. **The benefits of dredging exceed the costs by at least $5.5 million**. I draw this conclusion using the same methodology employed by Mr. Niemi, but adjust for inflation and use the correct cost of dredging and the correct measures of traffic volume. I reach the conclusion that the net benefits of dredging exceed the costs by at least $5.5 million *without* addressing additional dredging benefits derived from recreational uses of the river and the additional employment (e.g., port employment) and other economic activity associated with river transportation (which would normally be included in any formal cost/benefit analysis). Taken together, I am confident that if conducted, a comprehensive cost-benefit analysis would conclude that the benefits of dredging demonstrably outweigh the costs.

	High Cost Low Benefit	Low Cost High Benefit
Annual benefits of dredging		
Grain shippers	$4,207,840	$10,289,760
Container shippers	837,518	998,607
Cruise ships and associated tourism	2,600,000	5,300,000
Less: Costs of dredging, annualized	$2,166,667	$812,500
Net benefit of dredging	$5,478,692	$15,775,867

2. **Snake River freight traffic increased 50 percent in 2012 and is growing toward pre-recession levels.** I conclude that freight traffic is rising and currently trending toward pre-recession levels. In reaching a contrary conclusion, the Niemi Comments appear to "cherry pick" the years 1994 and 2009 to conclude that freight traffic on the Lower Snake River is undergoing a "structural" decline. Mr. Niemi disregards general economic trends as well as idiosyncratic economic conditions that explain the unusually low traffic in the years 2009 through 2011.

3. **The benefits to grain shippers alone is sufficient to justify the costs of dredging.** The annual benefits to grain shippers of dredging could be as high as $10.3 million a year, in which case the benefits *in a single year* would be enough to justify the $6.5 million the Corps has budgeted for dredging. In reaching a contrary conclusion, Mr. Niemi fails to use accurate dredging costs, fails to account

for inflation, and uses incorrect river traffic data. These inaccuracies and omissions by themselves invalidate Mr. Niemi's conclusions.

4. **The benefits to container shippers and the cruise ship industry and tourists provide additional justification for dredging.** The annual benefits of dredging for container shippers and the cruise ship industry could be as high as $6.2 million a year, demonstrating that the benefits *in a single year* would be almost enough to justify the $6.5 million the Corps has budgeted for dredging. The Niemi Comments fail to address the benefits of dredging to container shippers or the cruise ship industry and its customers. Because these obvious dredging benefits would normally be factored into any cost/benefit analysis, the absence thereof in the Niemi Comments renders his analysis both incomplete and economically inaccurate.

5. **Competition from Lower Snake River barges disciplines rail transport prices.** The Niemi Comments also overlook and fail to factor the benefits of dredging that is produced as a result of competition from truck-barge transportation. This well-recognized economic benefit normally results in a 20 percent reduction in rail rates for grain shipments. Mr. Niemi notes that competition between barge and rail has induced railroads to keep rates lower than they would be if truck/barge competition did not exist, but then fails to account for this obvious benefit.

6. **The region's rail network is at risk of congestion and the cost would increase with the elimination of barging on the Lower Snake River as a transportation option.** Without a truck-barge shipping option, increasing competition for rail resources from coal and oil shippers could result in steep price increases for grain shipments by rail. The Niemi Comments do not address the likelihood that the loss of barge transportation could choke the region's rail network.

7. **Expenditures on Lower Snake River dredging cannot be characterized as a "subsidy" to barge companies.** The Niemi Comments' description of a per-barge subsidy is at odds with basic principles of economics and completely ignores the benefits to growers, shippers, cruise ships, tourists, and other river users.

The Niemi Comments are based on an ad hoc approach that is at odds with basic economics principles

The Niemi Comments do not present a complete cost/benefit analysis. In fact, they reflect a flawed economic approach that uses selective and non-representative data, focuses on a narrow subset of economic activity, to opine that the costs of dredging exceed the benefits. Many of his comments are unsupported policy assertions, rather than conclusions based on analysis of facts and data. Because of the methodological and analytical errors, the Niemi Comments cannot be relied upon in any way to suggest that the costs of dredging outweigh the benefits.

- Mr. Niemi narrowly focuses on the change in lock traffic between the years 1994 (the middle of a peak period in river traffic) and 2009 (a year of low harvests and weak demand for Northwest wheat). By selectively focusing on these two dates, Mr. Niemi concludes that river traffic is facing “structural” decline (p. 17). In contrast, lock information through 2012 indicates that river traffic is approaching pre-recession levels.

- The Niemi Comments speculate that the costs of dredging would be $2 million a year, rather than relying on the amount currently budgeted by the Corps ($6.5 million) for the first dredging to occur in eight years.

- Mr. Niemi calculates the benefits of dredging for only a single activity: the shipping of grain. His analysis relies on a 10 year old study, but makes no adjustments for inflation. In addition, he uses the wrong measure of freight traffic that understates volume by a factor of nine. In particular, he focuses only on grain shipments reported by the Port of Lewiston, rather than total grain traffic as used in the study he cites.

- The Niemi Comments’ conclusions about the benefits to non-grain shippers are based on speculation rather than hard data (i.e., “*If* the saving per ton to shippers for other commodities are similar to those for grain …,” p. 17). Moreover, while relying on the 10 year old study for his grain calculations, Mr. Niemi omits any discussion of containers, logs and wood chips, and petroleum products, which also benefit from dredging and were discussed in that report.

- The Niemi Comments examine annualized costs and benefits, when the standard approach employed by economists calculates *net present value*—a well known and widely accepted method that uses inflation and interest rates to measure the value today of a stream of future costs and benefits. While the Niemi Comments (p. 7) cite an Office of Management and Budget document describing the process of calculating net present value and (p. 18) and another study concerning a rail facility, he diverges from the approaches used in these studies in presenting his annualized calculations.

- The Niemi Comments make numerous legal and regulatory conclusions that are generally understood to be outside the scope of economic analysis.

These methodological and analytical errors bias Mr. Niemi's conclusions and render them invalid for any regulatory purpose.

Commercial navigation increased 50 percent in 2012, is trending upward towards pre-recession levels, and is expected to continue to rise

Focusing on the decline in lock traffic between the years 1994 (the middle of a peak period in river traffic) and 2009 (a year of low harvests and weak demand for Northwest wheat), the Niemi Comments (p. 17) assert that the decline reflects a "structural" trend unrelated to the decline in commerce associated with the most recent recession.

In contrast, my analysis of Lower Snake River freight traffic, lock traffic, shipping reports from the Port of Lewiston, and conversations with staff at the Port of Clarkston and the Lewis Clark Terminal indicate that ***Snake River traffic increased 50 percent in 2012 and is growing toward pre-recession levels***.

Figure 1 provides the amount of freight traffic on the Snake River from 1983 through 2012.[1] The exhibit shows that freight traffic varies widely from year to year. An examination of five-year averages smooths the year-over-year variations and shows that freight traffic has been relatively stable since 1983, averaging about 5.2 million short tons of freight traffic a year.

Total Snake River freight traffic slowly increased through the 1980s and early 1990s, peaking in the mid-1990s. Since then, total Snake River freight traffic slowly declined, then dropped sharply with the most recent recession.[2]

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[1] U.S. Army Corps of Engineers (various). Waterborne commerce of the United States.

[2] The National Bureau of Economic Research concludes that the most recent recession began in December 2007 and ended in June 2009. The recovery since the end of the recession has been widely described by economists as "sluggish" and "lackluster."

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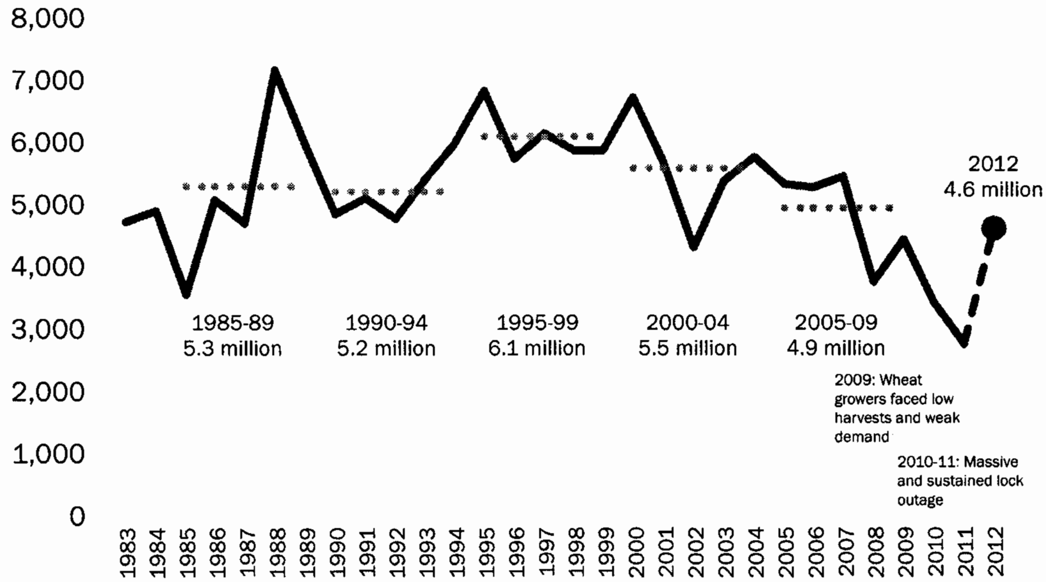
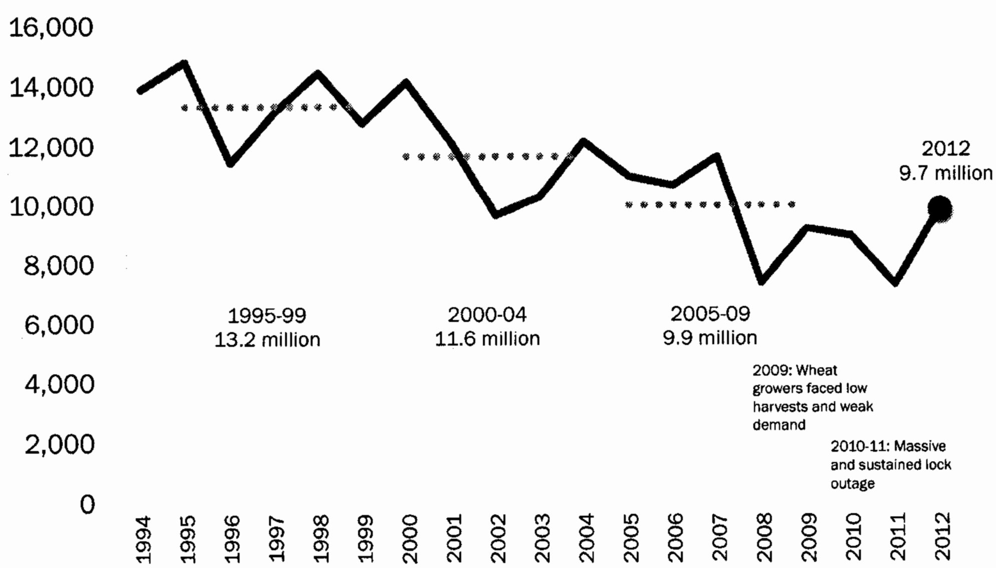
Figure 1: Snake River traffic, thousand short tons, 1983–2012



Source: U.S. Army Corps of Engineers, Waterborne Commerce of the United States

Figure 2: Snake River lock traffic, Lower Granite, Little Goose, Lower Monumental, and Ice Harbor combined, thousand short tons, 1994–2012



Source: U.S. Army Corps of Engineers, DEIS and Report on Civil Works Activities

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In 2009 wheat growers in the region faced low harvests from an unusually cool and dry spring as well as weak demand, both contributing to a decline in grain shipments.[3]

From the end of 2010 through the first quarter of 2011, the Columbia-Snake River System underwent a long-term, planned closure for maintenance. The coordinated closure eliminated barge transportation on much of the Columbia River and all of the Snake River for about 16 weeks. The result was a steep drop in reported Snake River freight traffic for 2010 and 2011. Information for total Snake River freight traffic for 2012 is not yet available from the Corps. But, statistical estimates based on shipping reports from the Port of Lewiston indicate that total Snake River freight traffic for 2012 will be reported to be approximately 4.6 million tons, which represents a 50 percent increase over 2010–11 average traffic.[4] Grain traffic for 2012 is estimated to be approximately 3.5 million tons.

Figure 2 confirms the statistical estimates. The figure provides the amount of lock traffic on the Snake River from 1994 through 2012.[5] As with total volume, lock traffic volume for 2012 was 50 percent higher than 2010–11 average traffic.

In short, there is no evidence that commercial navigation on the Lower Snake River is undergoing a long-run decline. In fact, recent shipping volumes show a steep increase in river traffic in 2012 and indicate that river traffic is returning to pre-recession levels. Recent forecasts by the U.S. Department of Agriculture project that on the demand side, Chinese imports of wheat in 2013–14 will be the highest since the 1990s.[6] On the supply side, this year's harvest is forecast to be above average. As a result, it is likely that Lower Snake River traffic volumes will continue their upward trend into the foreseeable future.

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[3] U.S. Department of Agriculture (2009). Tennessee news release. National Agricultural Statistics Service, May 12. ENP Newswire (2009). Good news continues to elude agricultural sector, October 9.

[4] Snake River freight traffic has a strong statistical relationship with Port of Lewiston shipments. Applying this statistical relationship (a technique known as *regression analysis*) to information from the Port of Lewiston, one may accurately estimate total Snake River freight traffic for 2012.

[5] DEIS, Table 3-13 and U.S. Army Corps of Engineers (various). Report of the Secretary of the Army on civil works activities. Lock traffic is counted differently from total Snake River traffic in that lock traffic is subject to double counting. Because of the differences in collection, lock traffic is approximately twice the size of total river traffic; this approximately 2-to-1 relationship is relatively stable over time. In general, Figure 1 is a more accurate representation of total Snake River traffic. Figure 2 includes some double counting, but has more current data. In addition, statistically speaking, the double counting in Figure 2 is not relevant in evaluating percentage changes over time.

[6] Terazono, E. and Farchy, J. (2013). Wheat rallies on raised China demand forecast. *Financial Times*, July 11. See also: U.S. Department of Agriculture (2013). World agricultural supply and demand estimates. WASDE-520, July 11.

Sandy Shelin
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The benefits to grain shippers alone is sufficient to justify the costs of dredging

The Niemi Comments (p. 16) incorrectly assert that the costs of dredging would be $2 million a year, while the benefits to grain shippers would only amount to $500,000 to $1 million a year. According to Mr. Niemi's calculations, the costs of dredging are greater than the benefits to grain shippers. However, my review of the approach employed by Mr. Niemi demonstrates that it is fundamentally flawed and cannot be relied upon to reach any conclusions regarding the benefits or costs associated with maintenance dredging.

The Niemi Comments fail to account for inflation, use both an incorrect measure of dredging costs and an incorrect measure of barge traffic, and fail to account for the impact of barge competition on rail prices.

Notwithstanding the above, were we to apply the methodology used by Mr. Niemi and correct only for inflation and transportation volumes, the costs of discontinuing dredging and thus closing the Lower Snake River to commercial navigation would be $4.1 million to $10.2 million.[7] ***By this measure alone—cost savings on grain shipments—the benefits of dredging are roughly two times to four times greater than the costs of dredging.***

	Low Benefit	High Benefit	Source
Costs			
Costs of dredging, 2005-06 dollars	$2,000,000	$2,000,000	Niemi Report, p. 16
Inflation	15%	15%	GDP deflator
Costs of dredging, 2013 dollars	$2,300,000	$2,300,000	
Benefit			
Additional costs, per ton	$0.96	$2.35	BST Associates, Tables 19 and 20
Inflation	24%	24%	GDP deflator
Additional costs, per ton, 2013 dollars	$1.19	$2.91	
Snake River grain volume, thousand tons	3,536	3,536	Statistical forecast
Benefit: Avoidance of additional costs, 2013 dollars	$4,207,840	$10,289,760	
Net benefit: Benefit less costs, 2013 dollars	**$1,907,840**	**$7,989,760**	

The Niemi Comments (p. 16) assume annualized dredging costs of $2 million. However, the Corps has budgeted a total of $6.5 million for the project. The Lower Snake River last was dredged at the end of 2005 and early 2006, which provides an eight year interval between dredging activities. Before that, the last dredging occurred in 1999.

[7] The Niemi Comments appear to have relied on BST Associates (2003). Lower Snake River transportation study final report. http://act. americanrivers.org/site/DocServer/lsr transportation study final report.pdf?docID=661, retrieved July 22, 2013. Tables 19 and 20.

The table below provides two alternative scenarios. The first scenario assumes dredging would occur every three years, for an annualized cost of $2.17 million. The second scenario assumes dredging would occur every eight years, for an annualized cost of $812,500. ***Using the correct measure of the costs of dredging as budgeted by the Corps indicates that the benefits to grain shippers alone of dredging can be as much as 12 times greater than the costs of dredging.***

	High Cost Low Benefit	Low Cost High Benefit	Source
Costs			
Cost of dredging	$6,500,000	$6,500,000	Corps budget
Number of years	3	8	Niemi Report, p. 16
Average annual cost	$2,166,667	$812,500	
Benefit			
Additional costs, per ton	$0.96	$2.35	BST Associates, Tables 19 and 20
Inflation	24%	24%	GDP deflator
Additional costs, per ton, 2013 dollars	$1.19	$2.91	
Snake River grain volume, thousand tons	3,536	3,536	Statistical forecast
Benefit: Avoidance of additional costs, 2013 dollars	$4,207,840	$10,289,760	
Net benefit: Benefit less costs, 2013 dollars	**$2,041,173**	**$8,123,093**	

The benefits to container shippers and the cruise ship industry and tourists provide additional justification for dredging

The Niemi Comments do not address the benefits of dredging to container shippers or the cruise ship business and its customers. Instead, the comments by American Rivers (p. 23) and the Niemi Comments incorrectly assert that container volume at the Port of Lewiston has steadily and permanently declined.

In fact, much of the decline in container volume coincided with the onset of the most recent recession. The recession began in December 2007 and continued through the middle of 2009. In the first year of the recession, container volume at the Port of Lewiston dropped by 39 percent as it did elsewhere throughout the country. For example, Mississippi River food and farm product shipments declined by more than 30 percent and all other product shipments declined by almost 25 percent in the first year of the recession; total U.S. grain shipments by barge declined by almost 20 percent.[8]

As the economy continues to improve, container volume at the Port of Lewiston continues to steadily increase. ***In 2012, container volume at the port was 28 percent higher***

[8] U.S. Department of Agriculture and U.S. Department of Transportation (2010). Study of rural transportation issues, Chapter 12: Barge transportation.

than the year before. Staff at the port have indicated that 2013 is projected to have greater volume than last year.

In light of the above, a review of the information relied upon by Mr. Niemi indicates that the benefits of dredging would be approximately $179 to $214 per container in 2013 dollars.[9] Applying the methodology used in the Niemi Comments and correcting for inflation and 2012 transportation volume, ***the annual benefits of dredging the Lower Snake River to enable commercial navigation would be $838,000 to $999,000 for container shippers***.

	High Cost Low Benefit	Low Cost High Benefit	Source
Benefit to Container Shippers			
Additional costs, per container	$144.44	$172.22	BST Associates, p. 65
Inflation	24%	24%	GDP deflator
Additional costs, per container 2013 dollars	$179.11	$213.56	
Lewiston container shipments, TEU	4,676	4,676	Port of Lewiston
Benefit: Avoidance of additional costs, 2013 dollars	$837,518	$998,607	

The Niemi Comments omit any discussion of logs and wood chips, petroleum products, and other goods which also benefit from dredging. For example, Tidewater Barge Lines reports that it routinely ships fertilizer by barge into Central Ferry on the Snake River for local distribution to area farms. In addition to grain, Tidewater picks up at the Port of Lewiston and delivers to the Port of Portland thousands of export cargo containers annually. These containers are mainly agricultural and wood products. Tidewater also delivers thousands of tons of woodchips and sawdust by barge into and out of the Ports of Wilma and Lewiston and moves heavy equipment and project cargoes into these Ports. Tidewater is currently engaged in developing two projects that would bring fertilizer (liquid and dry) by barge into the Port of Wilma. Mr. Niemi does not address any of these activities and how they benefit from dredging.

In addition, not only do transportation costs increase when shippers are forced to use an alternative to barge shipping, but as port profits decrease, employment opportunities and other economic activities are similarly adversely affected. A complete cost/benefit analysis would account for how this increased activity through dredging induces additional economic benefits for the surrounding communities.

[9] The Niemi Comments appear to have relied on BST Associates (2003). Lower Snake River transportation study final report. http://act. americanrivers.org/site/DocServer/lsr transportation study final report.pdf?docID=661, retrieved July 22, 2013.

In the years prior to the most recent recession (2005 through 2007), the Port of Clarkston reported an annual average of six cruise lines carrying approximately 26,000 passengers and staff. Since the recession (2008 through 2012), some cruise lines exited and some entered the market. On average, five lines were operating with an annual average of 11,500 passengers and staff. This year, as the economy slowly improves, another cruise ship is anticipated to enter the market to meet increasing demand.

Cruise ships benefit from the same infrastructure maintenance and improvements as maritime cargo. In addition, the volume of passengers carried on cruise ships on the Columbia River and Snake River system provide additional economic benefits to the surrounding communities. Based on earlier studies, it is estimated that in 2013 dollars, cruise ship tourism will add $2.6 million to $5.3 million to the communities in the Columbia River and Snake River system.[10] ***The economic benefits of cruise ship operations alone can be more than two times greater than the costs of dredging.***

Competition from barge transportation disciplines rail transport prices and relieves congestion on the region's rail network

The Niemi Comments note that competition between barge and rail has induced railroads to maintain lower rates than would otherwise result if there were no competition from barges.

Yet, Mr. Niemi fails to account for the fact that competition supplied by truck-barge transportation results in a 20 percent reduction in rail rates for grain shipments.[11] This is consistent with prior research demonstrating that wheat shipments originating 200 miles from water transport are subject to transportation rates that are 18.1 percent higher than those shipments originating 50 miles from water transport.[12] All of this demon-

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[10] Northwest Resource Information Center (2002). Idaho economic effects of breaching/not breaching the Army Corps of Engineers' Snake River Dams in S.E. Washington. Adjusted for inflation using GDP deflator and assuming cruise ship volume of one-half the volume assumed in the NRIC analysis.

[11] Winston, C., Maheshri, V., and Dennis, S. M. (2011). Long-run effects of mergers: The case of U.S. western railroads. *Journal of Law and Economics*, 54(2):275–304.

[12] Wu, F. L. (2010). An assessment of the impact of competition on rail rates for agricultural shipments: An empirical study of Minnesota rail rates on soybean, corn and wheat shipments. Minnesota Department of Agriculture, Agricultural Marketing Services, http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5084325.

strates that barge transportation on the Columbia and Snake Rivers competes with rail transportation and disciplines the rates that can be charged for rail transportation.[13]

Dredging benefits shippers—and ultimately consumers—by ensuring competitive transportation pricing among the various modes of transportation.

Increasing demand for coal from China and increasing production of oil in North Dakota's Bakken oil field are likely to increase rail traffic and add congestion to the Pacific Northwest's rail network. Several terminal projects are currently undergoing complex permitting processes. Freight trains already encounter bottlenecks along the same route coal trains will use from the Idaho Panhandle to the coast.[14] Three proposals for Northwest coal export terminals would generate nearly 7,000 coal train trips a year at full capacity on already congested tracks in Spokane and the Columbia River Gorge. If some or all of the proposed oil terminals are built, oil train traffic could hit up to 3,000 loaded trains a year, not counting direct trips to refineries.[15]

Without a barge shipping option, increasing competition for rail resources from coal and oil shippers could result in steep price increases for grain shipments by rail.

The dredging-as-subsidy myth

American Rivers (p. 23) assert that costs of dredging amounts to a "subsidy" of $11,000 for every full barge that leaves the Port of Lewiston. The Niemi Comments (p. 2) similarly characterize this as a "subsidy" to the barge industry. These comments single out the barge industry and do not identify any other river user as a recipient of the so-called "subsidy."

Under Mr. Niemi's definition of "subsidy," public education would be a subsidy to parents, national parks would be a subsidy to hikers, highway maintenance would be a subsidy to trucking companies, and the state-owned Washington Grain Train would be a subsidy to rail shippers. In other words, under Mr. Niemi's approach, every dollar the government spends is a subsidy to someone.

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[13] Casavant, K. and Jessup, E. (2006). Palouse River and Coulee City Railroad: Market assessment. Washington State Department of Transportation Office of Freight Strategy and Policy.

[14] Stewart, B. (2013). Northwest railroads will need improvements to handle coal trains. Oregon Public Radio Earthfix, April 1, http://earthfix.opb.org/communities/article/northwest-railroads-already-congested/, retrieved July 24, 2013.

[15] Learn, S. (2013). Oil trains – pipelines on wheels—headed to Northwest terminals and refineries from North Dakota fracking. *Oregonian*.

Mr. Niemi's notion of a "subsidy" yields implausible implications that are not supported by fundamental principles of economics. For example, his per-barge "subsidy" decreases with increased barge volume, which suggests the easiest way for dredging to pay for itself would be to encourage *more* barge traffic. Under his approach, the "subsidy" would be halved if barge traffic doubled.

American Rivers and Mr. Niemi suggest that the "subsidy" is $11,000 for a full barge leaving the Port of Lewiston. This raises the question:

> What would be the "subsidy" for an empty barge leaving the Port of Portland? Or a 7-day cruise? Or a fishing charter? Or a kayak?

It is a well known and widely accepted principle of economics that one cannot allocate common costs (e.g., dredging costs) across multiple products (e.g., barges full of grain, barges loaded with containers, cruise ships, and kayaks).[16] Nobel laureate George Stigler notes: "Such an allocation must be arbitrary, for there is no one basis of allocation that is more persuasive than others."[17]

In reality, navigable waterways are a benefit enjoyed by many. Barges, cruise ships, and recreational users all share a common benefit from dredging, as well as infrastructure maintenance and improvements. These benefits are transmitted throughout the economy in the form of lower transportation costs for shippers, increased revenues to growers, lower prices for consumers, increased employment opportunities at ports, and through many other ways.

On the other hand, without dredging, the river would be closed to commercial navigation and shippers would have to find alternative—and more costly—modes of transportation. USDA reports that the Columbia/Snaker River system is the top wheat export gateway in the country.[18] Growers and shippers would be disadvantaged because they would have to pay more for transportation and, in turn, earn less income from the crops he or she grew. The barge company would be worse off because it cannot earn any income on the waterway. Owners of non-barge shipping companies may be better off from the increased revenues, but their other customers would be disadvantaged be-

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[16] In economics this is known and the "beef and hides" problem in that it is impossible to allocate the cost of raising a cow across beef that is sold as food and the hides that are sold as leather. It was first articulated in Marshall, A. (1890). *Principles of economics*, available at http://www.econlib.org/library/Marshall/marP.html.

[17] Stigler, G. J. (1966) *The theory of price*, 3rd ed. Macmillan.

[18] U.S. Department of Agriculture (2013). Wheat inspected and/or weighed for export by class, region and port area, January 2012–December 2012.

cause competition from former barge shippers would drive up the prices they pay for transportation. In this way, the failure to dredge would impose what is known as a *deadweight loss* because the decline in economic activity disadvantages many buyers and sellers without any corresponding benefits.[19]

Conclusion

Based on my research and general experience and education as a professional and academic economist, I am confident that a comprehensive cost-benefit analysis would conclude that the benefits of dredging demonstrably outweigh the costs. In fact, my research, summarized in the tables presented in this letter, indicates that the benefits of dredging exceed the costs by at least $5.5 million. The total net benefits of dredging would be expected to be higher in that I have not examined recreational uses of the river and the additional employment (e.g., port employment) and other economic activities associated with river transportation, which if analyzed, would yield additional benefits.

As demonstrated above, the Niemi Comments cannot be used as a basis to conclude that the costs of dredging outweigh the benefits. In fact, an examination of comprehensive and up-to-date information and an application of widely accepted economics principles show that if properly performed, a cost/benefit analysis would conclusively demonstrate that the benefits of dredging would exceed the costs by a wide margin. .

Respectfully submitted,

Eric Fruits, Ph.D.
Nathan Associates Inc.
Managing Economist
Pacific Northwest Region

[19] One economics textbook defines a deadweight loss as, "costs to demanders that … are not benefits to suppliers." Heyne, P. (1991). *The economic way of thinking*, 6th ed. Macmillan.

Final EIS Comment F0650

From: Norm Semanko
To: PSMP
Subject: [EXTERNAL] Final Lower Snake River Programmatic Sediment Management Plan/Environmental Impact Statement (PSMP EIS)
Date: Monday, September 22, 2014 4:06:58 PM

September 22, 2014

U.S. Army Corps of Engineers
Walla Walla District
PSMP/EIS
Attention: Sandy Shelin
CENW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA 99362-1876
Via email: psmp@usace.army.mil

Re: Idaho Water Users Association Comments on Final Lower Snake River Programmatic Sediment Management Plan/Environmental Impact Statement (PSMP EIS)

Dear Ms. Shelin:

The Idaho Water Users Association ("IWUA") appreciates the opportunity to comment on the Lower Snake River Final Programmatic Sediment Management Plan and Environmental Impact Statement (PSMP EIS). We support the Corps' efforts to produce a thorough and legally defensible EIS and final PSMP for the lower Snake River. We also support the Corps' desire to take on this much needed routine maintenance dredging.

IWUA represents irrigation districts, canal companies, water districts, ground water districts, municipalities and many others who support the wise and efficient us of our water resources. Our membership also includes the Port of Lewiston, Idaho's seaport. IWUA members provide irrigation water to more than two million acres of irrigated farmland. In turn, agriculture relies on transportation to get its goods to market.

The Columbia-Snake River System is a 470-mile transportation link for the states of Idaho, Montana, Oregon and Washington. These states rely heavily on the trade and commerce that flows on this system. Our river system is primarily an export gateway, making it possible for producers in the Northwest and Midwest to access international markets. It is the number one U.S. export area for wheat and barley, second for soy, and is the largest on the West Coast for wood products and mineral bulks. The river system also rovides the safest, least polluting, and most economical mode of freight transportation.

20408 IWUA urges the Corps to deny any further requests for extension of the comment period. The FEIS, PSMP and ROD should be issued by October 22, 2014, as previously committed to. Further extensions will only delay implementation of a critically needed maintenance project.

20409 Finally, IWUA does not support reservoir drawdown as an alternative to the needed maintenance on the system. The 1992 test drawdown of the Lower Granite pool was a colossal failure, causing environmental and economic devastation that still resonates in the affected areas today.

The Snake River navigation projects help to keep our economy strong and get goods to international markets. Those who benefit from the system, and in fact the entire region, have waited long enough for this routine maintenance dredging to be done. We encourage the Corps to move forward and finish this important work.

Thank you again for the opportunity to provide these comments.

Respectfully submitted,

Final EIS Comment F0650

Norman M. Semanko
Executive Director & General Counsel
Idaho Water Users Association, Inc.
1010 W. Jefferson St., Suite 101
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norm@iwua.org

Final EIS Comment F0651

From:	Linwood Laughy
To:	PSMP
Cc:	Borg Hendrickson
Subject:	[EXTERNAL] FEIS Comments of Laughy and Hendrickson
Date:	Monday, September 22, 2014 4:31:21 PM
Attachments:	PSMP FEIS comments-Laughy & Hendrickson.pdf

Dear Ms. Shelin,

Attached find pdf copy of comments on the Lower Snake River Programmatic Sediment Management Plan FEIS.

Please acknowledge receipt.

Thank you.

Linwood Laughy   lochsalin@gmail.com

Linwood Laughy and Borg Hendrickson

Final EIS Comment F0651

September 22, 2014

Attn: Sandy Shelin
psmp@usace.army.mil

As taxpayers who have followed the development of the Lower Snake River Programmatic Sediment Management Plan since January 2013, we find ourselves disappointed in the Walla Walla District's (NWW) final sediment management plan and FEIS. After 8 years and now over $16 million in planning costs, NWW has produced a *plan to plan*. Dredging is also included, of course, given the plan's objectives, but other actions in the "tool box" are largely described as "needing further study." NWW gave no consideration to a true "no-action" alternative, ignored what has happened to regional freight transportation over the past 15 years, and failed to reach a conclusion about the level of flood risk in the Lewis-Clark valley. The economic justification NWW provides for its $6.5 million "immediate need" dredging project must be one of the flimsiest arguments offered on any USACE project for many years.

While we don't expect our comments to have any impact on NWW's hurried move to a Record of Decision and planned winter dredging, perhaps these comments can be useful to other USACE personnel, members of the public or staff at the General Accounting Office.

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1. NWW failed to consider fully any alternative other than dredging, thus continuing the cycle of perpetual dredging the plan was supposed to resolve. NWW's false claim that it is mandated to maintain a 14 by 250 foot navigation channel to the Port of Lewiston because NWW is authorized to do so creates a funnel through which all data leads to a foregone conclusion. In spite of minimal freight volume, the existence of a dredging-free multi-modal port just 4 miles downstream from the Port of Lewiston (POL), or the possibility of light-loading during parts of the year, no other alternative, including no action, is given consideration. Surely NWW didn't need 8 years and $16 million to reach the decision to continue perpetual dredging.

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2. Yes, there are other alternatives in the tool box. Yet the PSMP failed to consider any of them in any detail. First you dredge. Then when sediment build-up again becomes a problem, which you predict will be every 3-5 years, NWW will study what should be done. Meanwhile of course, the navigation channel becomes less than authorized, so an "immediate need action" emerges, which can only be solved by dredging, followed by more expensive planning. A cycle of expensively ineffectual study, planning and action = dredging is perpetuated.
3. The PSMP FEIS noted that flood risk for the city of Lewiston, Idaho—largely determined by sediment accumulation—ranged from "currently acceptable" to "marginally acceptable" over the next 50 years, to "unacceptable," when using the risk model in place when the levees that protect Lewiston were constructed. However, NWW suggests that a new hydraulic model based on the removal of sand bedforms by high flows indicates less need to reduce sediment accumulation for flow conveyance. The FEIS notes that "some methodology is not well detailed in existing USACE engineering guidance," requiring "new methodology for uncommon aspects of sedimentation analysis and flood risk." (Part 1, F-13) NWW concludes that

Final EIS Comment F0651

the model to use "is likely a decision to be made by jointly considering USACE policy and community tolerance of flood risk." Thus this critically important decision re-
20439 garding future sediment management is left for further planning, which constitutes an unacceptable omission in the FEIS.

4. In an attempt to justify economically the "immediate need action" dredging at the confluence of the Snake and Clearwater Rivers and up the Clearwater to the Port of Lewiston, NWW provides 4 figures: 3 million tons of cargo transported annually on the lower Snake River, a projected cost savings of $8.25 per ton for shipping that cargo by barge rather than by other means, and a cost of channel maintenance from $1-$5 million per year. The benefit that results is thus claimed to be approximately $20-$24 million annually. Each figure deserves brief comment:

    a. This dredging project is almost solely for the benefit of the Ports of Lewiston, Idaho (POL) and Clarkston, Washington (POC). The POC ships no freight. A private company ships a small amount of grain from the POC. Approximately 900,000 tons of freight is shipped annually on the Clearwater River, less than a third of the freight claimed in the FEIS. NWW knows this. Any attempts to claim otherwise are misleading and disingenuous or blatantly false.

    b. The claim of $8.45 in savings of barge over other means is based upon the faulty analysis of freight costs in the 2002 Final Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement. NWW made serious errors in determining the claimed transportation savings in that report and further now ignores the significant changes that have occurred in freight transportation to and from the region over the past 15 years. A 66% decline in freight volume on the lower Snake River during those years lends support to the fact that NWW should have used rates rather than costs in modal comparisons in the 2002 report and that the true difference in modal costs was most likely near zero. Now NWW elects to make another serious error built upon this previous mistake.

20440 c. The FEIS does state multiple times that .7 million cubic yards of sediment must be removed from the confluence of the Snake and Clearwater Rivers and approximately 2 miles up the Clearwater on an annualized basis in order to maintain the navigation channel and flow conveyance. While we find no information regarding the percentage of this volume attributable to each purpose, the removal of .7 mcy of sediment at 2005/06 dredging prices would cost approximately $8,925,000. Using NWW's 3% inflation rate as ap-
20441 plied to the claimed cost difference between shipping by barge versus by other means in 2002 ($5.75 to $8.45), the 2014 cost of required sediment removal would exceed $11 million on an annualized basis. It thus appears highly likely that dredging costs are closer to NWW's upper range of $5 million than they are to $1 million, and perhaps are greater than $5 million, perhaps even double that amount.

20442 d. References are made throughout the FEIS to the need for further study and planning. The last round of planning cost the American public in excess of

Final EIS Comment F0651

$16 million. If that cost were amortized over a 20-year period, the cost of managing sediment in the vicinity of the confluence of the Snake and Clearwater Rivers would increase an additional $800,000 per year just for past planning. Future planning costs are unknown but add to the total expense.

5. Finally, the FEIS fails to acknowledge the realities of commercial navigation on the lower Snake River. Consider these lower Snake River transportation facts:

- Over the past 15 years total freight volume has declined by 64%.
- During those years, entire industries, e.g. lumber and paper, have all but abandoned barge transportation during this period.
- Container traffic has declined by 77% during this same period and over 90% of incoming containers are empty.
- Freight volume is .3 billion ton-miles, well into the category the USACE considers "negligible." Were freight volume to somehow recover completely to its 15-year peak, the lower Snake River would still be in the USACE "negligible" category based on ton-miles, a Corps status suggesting that no further capital investment or maintenance expenditures should be made on this waterway.

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NWW's FEIS for the LSRPSMP fails to provide a serious look at alternatives and leaves many questions unanswered, but the bottom line is that further investment in commercial navigation on the lower Snake River is not economically justifiable. The USACE should halt this project and spend the savings on more justifiable waterway projects such as those on the Columbia River. Both USACE and American taxpayers stand to benefit from such course of action.

Linwood Laughy and Borg Hendrickson
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lochsalin@gmail.com   borghendrickson@gmail.com

From:	Steve Mashuda
To:	PSMP
Subject:	[EXTERNAL] comments on PSMP FEIS
Date:	Monday, September 22, 2014 4:57:55 PM
Attachments:	Final PSMP FEIS comments with attachments.pdf

Please see attached comments on behalf of American Rivers, Citizens for Progress, Earthjustice, Friends of the Clearwater, Borg Hendrickson, Linwood Laughy, Idaho Rivers United, Institute for Fisheries Resources, Pacific Coast Federation of Fishermen's Associations, Save Our Wild Salmon, Sierra Club, and Wild Steelhead Coalition on the Final Environmental Impact Statement for the Lower Snake River Programmatic Sediment Management Plan.

Please advise whether this transmission was received.

Thank you,

Steve Mashuda

Steve Mashuda

Staff Attorney

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September 22, 2014

U.S. Army Corps of Engineers,
Walla Walla District
PSMP/EIS, Attention: Sandy Shelin, CENWW-PM-PD-EC,
201 North Third Avenue
Walla Walla, Washington 99362-1876
psmp@usace.army.mil

via electronic mail and U.S. Mail

Dear Ms. Shelin:

This letter is written on behalf of American Rivers, Citizens for Progress, Earthjustice, Friends of the Clearwater, Borg Hendrickson, Linwood Laughy, Idaho Rivers United, Institute for Fisheries Resources, Pacific Coast Federation of Fishermen's Associations, Save Our Wild Salmon, Sierra Club, and Wild Steelhead Coalition to comment on the Final Environmental Impact Statement ("FEIS") for the Lower Snake River Programmatic Sediment Management Plan ("PSMP") prepared by the U.S. Army Corps of Engineers, Walla Walla District ("Corps"). We appreciate this opportunity to comment on the Corps' FEIS.

Representing the voices of more than 6,000,000 people, these individuals and organizations share a common goal of restoring Snake and Columbia River Salmon to healthy, sustainably harvestable levels. Many of these groups were involved in litigation in 2002 and 2004 over the Corps' previous plans to dredge the navigation channel in the Lower Snake River. That litigation was settled in 2005 to allow interim dredging while the Corps completed a comprehensive long-term study of sediment management options for the navigation channel that would not rely exclusively on dredging. That programmatic sediment management study presented the opportunity to consider a broad range of alternatives to business-as-usual, including an over-emphasis on dredging, in the Lower Snake River and to consider the environmental, economic, and social impacts of a number of different alternatives that allow goods to move to markets, provide for recreational and commercial uses of the river, and that would enhance and restore salmon and steelhead populations.

After nearly ten years and millions of dollars spent, the PSMP and the FEIS fail to accomplish those fundamental tasks. Instead, the Corps' FEIS and PSMP conclude, yet again, that dredging the navigation channel is the only alternative that will satisfy the Corps' narrowlyframed goals and that any and all other alternative actions may be evaluated later. On March 26, 2013, the listed individuals and organizations submitted extensive comment and analysis of the Corps' DEIS for the PSMP. Unfortunately, the Corps has not addressed the deficiencies identified in those comments in this FEIS. While we will return to and expand upon several specific issues in our comments below, because the Corps has failed to address these issues, we refer the Corps to our DEIS Comments and hereby incorporate them by reference.

I. THE CORPS' NARROW STATEMENT OF PURPOSE-AND-NEED STATEMENTIS BASED ON AN ERRONEOUS LEGAL CONCLUSION, AND THE CORPS' RESPONSES TO COMMENTS ARE INADEQUATE.

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The Corps' erroneous legal conclusion that Congress's authorization of a 14-foot navigation channel is somehow a mandate results in a single-minded focus on dredging – now and into the foreseeable future. Our March 26, 2013, comments responding to the Corps' draft environmental impact statement pointed out the Corps' legal error. DEIS Cmts. at 4-6. We adopt those comments in their entirety by reference. The Corps' flawed legal conclusion results in a narrow purpose-and-need statement that renders dredging a foregone conclusion and all other options window-dressing. That framing of the purpose and need – requiring a 14-foot channel immediately and indefinitely – yields a foregone conclusion because the answer to the Corps' narrow question will always be dredging. But the purpose of the navigation component of the Lower Snake River system is to facilitate navigation; the navigation component does not – and the system itself does not – exist to provide a dredged channel as the Corps' inverted reasoning would suggest. Nor does the existence of the navigation component preclude options other than dredging, such as modifying, shifting, or shutting down activities or sites that create a need for dredging but return little in terms of navigation volume or positive economic benefits.

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The Corps' replies to our March 2013 comments are in part unresponsive and are legally inaccurate. Congress passed the Flood Control Act of 1962 with full knowledge that navigation would be unavailable a few months each year. DEIS Cmts. at 4. The Corps' response acknowledges that "Congress has not required that commercial navigation be guaranteed 365 days a year." FEIS App'x G at G-83 (Response to Comment 8684). Simultaneously, the Corps attempts to draw a distinction that "Congress intended for commercial navigation to be possible 365 days a year." *Id.* These statements demonstrate the inherent contradiction in the Corps' position – the idea that even when closed to navigation the channel must be theoretically usable. How maintaining the channel aids navigation – when navigation is suspended – is unclear other than that the Corps believes indefinite dredging is the solution.

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The Corps has also failed to clarify its position as to when navigation can be appropriately suspended. Through its past actions, the Corps has acknowledged that commercial navigation may be suspended for lock maintenance, but the Corps has not specified why navigation could not also be suspended in service of other Congressionally-authorized uses and purposes of the River, such as conservation of fish and wildlife. As our DEIS Comments detail, Congress requires the Corps to consider several purposes – including fish and wildlife conservation, power generation, and recreation. And while navigation is an authorized purpose, Congress has not exalted that purpose above all others such that an uncompromisingdevotion to a 14-foot channel can be justified. At bottom, the Corps' legal conclusion renders absurd results whereby navigation can be suspended for some reasons but not others, without any explanation of why and how, and without explanation of why one of those reasons could not be related to other Congressionally-required purposes for the Snake River system. Nor does the Corps explain how long navigation may be suspended without violation of its alleged Congressional mandate.

The Corps also mischaracterized our comments' comparison of the Corps' treatment of the Snake River system and the Dalles Dam, for which the Corps is authorized to provide a 27-foot channel but has never done so. Our comments did not argue that the 14-foot depth language in the Flood Control Act of 1962 also applies to the Dalles, as the Corps suggests. Instead, the comments highlighted the contradiction in the Corps' use of discretion to depart from Congressionally-required depths in the Dalles with its refusal to do so here. There remains no principle of law or logic that would allow the Corps to claim it is under a mandate to maintain a particular channel depth on the Snake but not on the Columbia, only a few miles downstream.

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The Corps' commitment to a 14-foot channel also conflicts with its later tacit acknowledgment in the economics section that if costs outweighed benefits, maintenance of the channel would not be justified. *See* FEIS at 3-55 (concluding that "ongoing channel maintenance on the lower Snake River is warranted" based on a cursory economic analysis).[1] The channel does not exist to be dredged but to provide a navigation benefit. Surely maintenance of the channel must depend on actual use of the system because the channel is not an intrinsic good. The Snake River system as a whole is established for many purposes, with navigation as one component and a 14-foot channel as one option in the menu of possibilities to serve navigation. There are many ways to transport products that do not require the entire channel and that would retain the non-barging economic benefits port facilities provide.

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The Corps' legal theory results in a "dredge no matter what" outlook. The Corps has not specified when it believes it may suspend navigation, and its narrow purpose-and-need statement results in the untenable position that under all circumstances and in light of all other alternatives, it need only dredge. The Corps' myopic focus on channel depth and dredging improperly limits the alternatives the Corps considers in both the short and long-term.

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II. THE CORPS DID NOT CONSIDER ALL REASONABLE ALTERNATIVES.

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Based in large part on the Corps' improperly narrow purpose-and-need statement – deriving from its belief that it must maintain a 14-foot navigation channel – the Corps did not consider all reasonable alternatives. The Corps dismissed nearly all alternatives out of hand because they would not result in the immediate establishment of a 14-foot channel. Of the two alternatives the Corps considered, it is not legally permitted to take one of the alternatives, leaving the option it selected – Alternative 7, dredging with possible future actions – the only possibility. Nor did the Corps evaluate a dam breaching alternative. Instead, the Corps narrowed the alternatives and essentially eliminated any real choice by concluding that its "policy objectives are clear – maintain a 14-foot by 250-foot navigation channel." FEIS App'x G at G-84 (Response to Comment 8686).

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[1] *See infra* at Section IV.

A. <u>The Corps' "No-Action Alternative" Is Not a True No-Action Alternative and Did Not Receive Adequate Consideration.</u>

In the DEIS Comments, we detailed that: 1) the Corps failed to consider a true no-action alternative and 2) the Corps' consideration of its no-action alternative was inadequate.

Rather than evaluating a true no-action alternative, the Corps considers a "no-action" alternative that involves a tremendous amount of action. Under its "no-action" alternative, the Corps would operate reservoirs as close to minimum operating pool as possible at some times of the year and up to "maximum operating pool."[2] In the Corps' response to comments, it returns to its mistaken purpose-and-need statement to double down on its position that it is currently operating a program with the purpose of providing a 14-foot channel for navigation. *See* FEIS App'x G at G-84 to G-85 (Responses to Comments 8686, 8687). The Corps' program is to
20305 provide transportation of goods in and out of the region consistent with the other purposes of the Snake River system. The "ongoing program" is not the maintenance of a 14-foot navigation channel or a channel of any specific depth or length, and the Corps should have evaluated a no-
20306 action plan that would maintain the system's ability to provide transportation of goods *without* a 14-foot channel that reaches all the way to the Port of Lewiston. Clearly demonstrating the Corps' flawed perception of its program and evaluation of a no-action alternative is that many of the measures in the "no-action" alternatives are incorporated into the Corps' preferred, Alternative 7. A true no-action alternative would not involve navigation-oriented reservoir management and would allow sediment to accumulate in the river.

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Further, the Corps did not provide rigorous analysis of its "no-action" alternative and has not remedied this problem in the FEIS or responses to comments. As with all non-dredging alternatives, the Corps dismissed that alternative without analysis only because it did not maintain a 14-foot channel, though that alternative was nominally retained for further consideration. FEIS at 2-38.

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The Corps failed to consider light-loading barges and other methods that could be used with navigation-objective reservoir operation. The Corps argues that light-loading barges is a reaction by the navigation industry and not an action the Corps itself can take and, therefore, is not something Corps can consider. *Id.* at G-85 (Response to Comment 8691). While the Corps does not physically load barges or determine how much weight to ship on any individual vessel, the Corps is fully capable and authorized to take action that it knows will lead to light-loading. There is no reason the Corps cannot consider anticipated industry reaction to its actions, and indeed the Corps must do so to gain a full picture of the effects of its actions on navigation purposes in the Snake River system. *See infra* Section IV.

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[2] As discussed in the DEIS Comments, this description is itself a fiction since under the terms of the Biological Opinion for the Federal Columbia River Power System, the Corps is prohibited from raising MOP as the Corps envisions.

B. The Corps Rejected Out of Hand Every Non-Dredging Alternative.

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The discussion of Alternatives 2-6 masks a foregone conclusion that dredging with some other theoretical actions would be selected from the alternatives posed. As discussed in the DEIS Comments, the Corps dismissed alternatives 2, 3, 4, and 6 without sufficient analysis based on its determination to dredge a 14-foot channel. DEIS Cmts. at 10-12. When measured against the Corps' erroneous position that it must maintain a 14-foot channel, no option other than dredging a 14-foot channel can suffice. For that reason, the Corps rejected alternatives 2, 3, and 4. Alternative 6's fate was similarly sealed since it is comprised only of two already-rejected alternatives, Alternatives 3 and 4; it would have been a case of alternatives alchemy for Alternative 6 to pass the Corps' 14-foot requirement where its constituent non-dredging parts did not. The Corps automatically dismissed every option but Alternatives 5 (dredging only) and 7 (dredging plus Alternatives 3 and 4). The Corps has not complied with its obligation to thoroughly consider all reasonably available alternatives thoroughly and sufficiently evaluate the alternatives presented.

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The dredging-only option, Alternative 5, also could be dismissed out of hand because it would not comply with the Corps' obligation to develop a programmatic sediment management plan. The 2005 settlement between the Corps and conservation groups requires the Corps to develop a programmatic plan to address sediment. *Nat'l Wildlife Fed'n v. US. Army Corps of Eng'rs*, CV02-2259L, Settlement Agreement at 3 (W.D. Wash. filed Sept. 8, 2005). Implicit in that settlement is that the Corps would not carry forward a plan that involves only dredging, i.e. Alternative 5. For that reason, Alternative 5 was illusory like the other alternatives the Corps rejected.

The Corps rejected Alternatives 2, 3, 4, and 6 due in large part to the Corps' faulty statement of purpose-and-need, and Alternative 5 was rejected because it would not comply with the Corps' obligation to pursue more than a dredging-only programmatic sediment management plan. Given the Corps' self-imposed constraints and its legal obligation under the 2005 settlement, the outcome – and the winning alternative, Alternative 7 – was pre-determined well before the multi-million dollar EIS was completed. All alternatives other than Alternative 7 amount to nothing more than window dressing as the Corps' analysis necessarily funnels to one conclusion.

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While including an illusory array of illusory alternatives (Alternatives 1-6), the Corps also failed to consider other possible, credible alternatives such as, for example, dam breaching. In its response to comments, the Corps argues that considering such an option was precluded by the Corps' perception of the PSMP – maintaining a of a 14-foot channel. FEIS App'x G at G-84 (Response to Comment 8686). The Corps must consider all reasonable alternatives to a proposed action. 42 U.S.C. § 4332(2)(C)(iii); *Alaska Wilderness Recreation v. Morrison*, 67 F.3d 723, 729 (9th Cir.1995). Once again, the Corps' narrow view dismissing a dam-breaching alternative is based on an erroneous legal conclusion. *See supra* Section I. The Corps is obligated to consider all options – such as dam removal – that are reasonable and available. *See id.* Especially when considering the social and environmental costs of the status quo (and the lack of economic and environmental benefits), breaching is a reasonable alternative that would satisfy a properly-defined purpose and need. Even if the Corps did not consider breaching all of the Lower Snake River dams, it should have considered breaching just Lower Granite dam.

Because nearly all of the sediment accumulates behind this single project, breaching Lower Granite dam would eliminate the need for ongoing sediment management. Without Lower Granite pool, any sediment would move downriver and drop out before reaching the next dam. To the extent that other factors could justify the continued operation and maintenance of the other projects, navigation could continue on the other reaches of the lower Snake under that alternative.

C. <u>Alternative 7 Contains No Concrete Actions other than Dredging and Is Not a Real Alternative.</u>

20313 The Corps' selected alternative appears to include a decision to dredge now and into the indefinite future, while kicking any substantive analysis down the road. Alternative 7 contains no commitments and minimal analysis of how the Corps will decide which actions to select in the future. The DEIS Comments characterized this as a "tell you later" approach, which while the Corps has disclaimed that characterization,[3] it is no less accurate. There is no indication that the Corps is undertaking analysis now that will result in the implementation of any of the measures on its list of options, putting off needed analysis and implementation that should be happening now. The Corps indicates that it will consider all of these factors in future analyses that will "tier off" of the FEIS. FEIS App'x G at G-86 to G-87 (Response to Comment 8691a). But in order to do so, the Corps must have a fully developed, adequate analysis in a programmatic EIS. *See generally* 40 C.F.R. § 1508.28. But this FEIS fails to provide any foundation from which the Corps can build. "Tiering" provides a limited opportunity to avoid duplication in the future; it is not an wholesale justification for putting off for tomorrow what can and must be done today. All told, the Corps spent $16 million developing a plan that contains no commitments (other than to dredge) and little guidance.[4]

Under Alternative 7, the Corps would wait for certain triggers to begin analysis and implementation of anything other than dredging, and certain triggers would also require dredging. FEIS App'x G at A-21 to A-30. But even while some future triggers may eventually trigger the Corps to look into options other than dredging, dredging will remain the chosen action for all "immediate need actions" for navigation. *Id.* at A-23. For all such instances, "interim" dredging could go on for 1-3 years. *Id.* For areas that exhibit chronic sediment buildup, the Corps would initiate a "tier-off" analysis to "determine the most cost-effective, technically

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[3] FEIS App'x G at G-86 (Response to Comment 8691a) ("The PSMP is not a 'tell you later' or dredging only plan.").

20314 [4] For example, the FEIS continues the Corps' attempt to delay or downplay any analysis of the current flood risk to the City of Lewiston and any decision or discussion of the need to raise the levees if Lower Granite dam remains in place. *See* DEIS Cmts. at 15-16; 20-21. The FEIS contains contradictory statements regarding the impact on flood risk to Lewiston of dredging the .7 mcy/year (annualized) of material necessary to maintain the channel. Instead, the Corps claims that future study is necessary to determine which of its models is correct and hence, whether (more likely when) raising the levees will be necessary. The Corps' evident reluctance to make a decision on this controversial action (and to consider its environmental and socioeconomic impacts) does not justify its decision to kick this controversial can down the road.

acceptable and environmentally acceptable action(s)." *Id.* at A-24. The Corps, however, has given little indication as to how that process would work and which of its menu of options might be selected and in what circumstances, nor has the Corps given any indication as to whether one of those options could ever beat out dredging in its analysis of cost- and technical-effectiveness, particularly in light of its perceived "duty" to constantly maintain a 14-foot channel. Dredging is the selected option for all immediate need options, and – assuming that the Corps does not change its interpretation of the Flood Control Act of 1962 – it is not clear why it would not remain the favored option for all sediment management into the indefinite future.

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The FEIS improperly includes the Corps' favored dredging action (its "immediate need" action) as part of this programmatic plan. This puts the cart before the horse. NEPA prohibits the Corps from including a proposed action that would commit resources into a programmatic EIS, especially when that EIS has not yet been finalized or adopted by the agency, and the Corps' action is not covered by its own NEPA analysis. 40 C.F.R. §§ 1506.1(c); 1508.28. The Corps' "immediate need" action is not justified outside the scope of the long-term sediment management plan and the Corps may not proceed with dredging this winter based on this as-yet-incomplete programmatic FEIS. The Corps cannot dredge unless and until it at finalizes and adopts the PSMP and the EIS in a Record of Decision and prepares separate, site-specific NEPA analysis (likely an EIS) for the "immediate need" action that satisfies the requirements of the law.

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Rather than provide definite criteria that can be implemented to select between management options – and that would be transparent and predictable for the public – the Corps has provided only a list of possibilities that may or may not ever be used to supplement or replace dredging. While the Corps presents this scheme as a programmatic plan, it effectively amounts to a decision to dredge whenever there is sediment – in 1 to 3 year increments – with some possible but unspecified use of other measures at some possible but unspecified point in the future. The only certainty in the FEIS is an intent to dredge; and even this action is not fully or adequately considered or justified in the FEIS.

III. THE CORPS HAS FAILED TO CONSIDER THE EFFECTS OF CLIMATE CHANGE

We previously detailed at least three ways in which the proposed channel maintenance (in both the short and long term) affect and are affected by, climate change. Unfortunately the Corps continues to ignore each of these in the FEIS. First, increasing temperatures in the Snake River watershed are projected to bring a continued increase in forest fires and hence an increase in the amount of sediment that reaches the river from the upper portions of the watershed. *See* DEIS Cmts. at 18-19. The Corps' own information (included as Appendix D of the DEIS and Appendix F of the FEIS) demonstrates that the frequency and severity of these fires have increased over the past 40 years, and will continue to increase in the future. DEIS, at 1-21 to 1-25. Appendix D of the DEIS concluded that such

> Climate-modulated interactions among vegetation, wildfire, and hydrology suggest that sediment yields will likely increase in response to climate change . . . [and] have the potential to produce sediment yields roughly 10-times greater than those observed during the 20th century. …these elevated sediment yields are probably outside of the range of expectations for downstream reservoirs.

FEIS 0652 Comment 20319

It is at least reasonably foreseeable – and indeed, likely – that the sediment accumulation the Corps is attempting to address in the FEIS will increase and will require additional measures and additional costs over time. The Corps, however, does not factor any of these increases into the Corps' consideration of the environmental impacts from increased needs for channel maintenance over time, nor does the Corps consider the increases in any analysis of the benefits and costs of the PSMP.

Rather than address these likely increases in sediment delivery, or evaluate the economic or environmental consequences, the Corps dismisses any likely increases. The Corps now believes that we have already reached "peak sediment delivery" and that "events such as climate change and forest fires should likely not significantly increase the basin's sediment yield since it appears that present basin climactic conditions might already provide the maximum long-term sediment yield conditions." FEIS App'x G at G-78 to G-79 (Response to Comment 8461) This astonishing contention – that sediment yield will not increase even as more sediment is created through fires – is based entirely on the Corps' misinterpretation of a single chart in the study included in Appendix of the FEIS (Appendix D of the DEIS). *See id*. at G-92 to G-93 (Response to Comment 8705) (interpreting the chart to mean that "[t]he maximum sediment yield generally occurs where the effective precipitation is on the order of 10 inches/year. This annual precipitation is generally experienced over a large portion of the effective drainage basin for lower Granite Reservoir."). But total precipitation (inches/year) is not the only driver for increased sediment delivery. Numerous other factors – including how that precipitation falls, and when it falls – influence sediment delivery. Indeed, the 1958 study[5] underlying this chart explicitly warns that "[n]umerous exceptions to the above generalizations can be cited, especially when glaciation, deforestation, cultivation, or a change in base level become important," and that "[v]ariations in temperature, rainfall intensity, number of storms, and seasonal and areal distribution of precipitation can also affect the yield of sediment." The connection between
20320 climate change and increased sediment delivery is well-documented and far more complex than the Corps asserts. The Corps' continuing failure to consider the environmental and economic consequences of these substantial and reasonably foreseeable sediment increases violates NEPA.

Closely related to this, the Corps continues to ignore the context in which both immediate dredging and long-term maintenance of the channel will occur. As numerous scientific studies have detailed,[6] nearly every element necessary to support healthy salmon and other fish and wildlife populations will continue to decline in most of the Columbia River basin as the continuing effects of climate change are felt throughout the basin. The continued use of the Lower Snake River dams for navigation and other purposes compounds that problem by destroying salmonid habitat and interfering with salmon and steelhead migration to and from

[5] Which, given its date, certainly did not consider climate change or any of the other additional impacts that climate change has on factors such as vegetation and precipitation patterns.

[6] *See* Endangered Species Act—section 7(a)(2) Supplemental Biological Opinion for the Consultation on Remand for Operation of the Columbia River Power System at 152-184 and appendices. That BiOp and related documents are *available at* http://www.westcoast.fisheries.noaa.gov/ fish_passage/fcrps_opinion/federal_columbia_river_power_system.html. Though the Corps is well aware of this BiOp and the studies it summarizes, we incorporate them here by reference.

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cold-water refugia in central Idaho and eastern Oregon. While the Corps recognizes that its reservoirs result in higher and longer lasting water temperatures in the summer, FEIS at 4-73, it fails to analyze its decision to continue maintaining a navigation system that perpetuates this exceedence, nor does it recognize or consider that increasing temperatures from climate change will make this current problem worse over time.[7] In choosing to maintain this waterway, the Corps is making a decision to carry forward (and thereby exacerbate) these impacts and must fully consider them. The FEIS does not do so.

Finally, we have detailed that the continued use of the Lower Snake River navigation channel by barges will result in the emission of greater amounts greenhouse (GHG) gases than shifts to other modes of transportation. DEIS Cmts. at 16 and Attach. A at 19. As detailed in our comments, a comparison of the GHG emissions from barges versus the emissions from trains is not the correct comparison. Instead, the emissions associated with barging goods also include those emissions of transporting those goods to the river to be loaded on barges – by truck. Comparing emissions from trains and barges per ton of cargo does not capture the full emissions picture. As detailed in our comments on the draft EIS, analyses that have actually included this full picture demonstrate that the shorter distances required to reach rail facilities, combined with the efficiencies of rail transport, result in a net reduction of GHG when compared to barging. The Corps' continued narrow focus on emissions from barge tugs alone fails to capture the true impacts of barging and does not consider the relevant GHG emissions of continued reliance on the navigation channel.

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IV. THE CORPS HAS FAILED TO TAKE A HARD LOOK AT THE SOCIETAL AND ECONOMIC EFFECTS OF MAINTAINING THE NAVIGATION CHANNEL.

We presented extensive evidence that the costs of continuing to maintain the navigation channel far outweigh the benefits in our comments on the DEIS. The FEIS includes a single paragraph attempting to justify both its "immediate need" dredging and continued maintenance of the navigation channel in the FEIS. *See* FEIS at 3-55. For the reasons more fully described in Attachment 1 ("Comments On the Lower Snake River Programmatic Sediment Management Plan: Final Environmental Impact Statement," Natural Resource Economics, Inc. (Sept. 2014) ("NRE Comments")), and in many other sources,[8] the Corps' simplistic approach presents a misleading, incomplete, and inaccurate picture of the socioeconomic effects and the true balance between the costs and benefits of the ongoing maintenance of the navigation channel or any of the alternatives that the Corps did consider (or should have considered). In doing so, the Corps

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[7] For example, the Corps has mischaracterized and improperly dismissed our comment about the effect of global warming on the utility of shallow-water habitat created by dredge spoils. FEIS App'x G at G-89 (Response to Comment 8695). Our point was not that the shallow water habitat created by dredge spoils would contribute to the overall warming of waters in the reservoir, but that the shallow water habitat created would become less and less useful over time as the reservoirs warmed. Thus, while we believe that the alleged "benefit" of creating the habitat is unjustified, even if one assumes some benefit, it will disappear as that habitat (along with the rest of the reservoir) becomes too warm for salmon.

[8] *See, e.g.,* Attachment 2. All of these materials are fully incorporated by reference here.

has violated NEPA, its internal regulations, and its own guidance. While the Corps is referred to the attached documents for the details of those violations, the following examples are illustrative:

- As we pointed out in our previous comments, the accumulated sediment motivating the actions discussed in the FEIS is deposited in Lower Granite Reservoir, the vast majority of which occurs at the confluence of the Snake and Clearwater Rivers. The volume of goods shipped from this area of the Lower Granite Reservoir comes from two sources: the Port of Lewiston and Lewis and Clark Terminal. The rest of the volume comes from ports downstream fro which no channel maintenance is proposed. In 2011, the Port of Lewiston shipped approximately 600,000 tons. While the Lewis and Clark Terminal adds to this total coming from this portion of the Lower Granite pool, close to 99% of the
20324 cost (and any purported benefit) of dredging or maintaining the channel relates at most to this total tonnage, not the 3 million tons for the entire Lower Snake River corridor that the Corps utilizes in its purported justification. This error alone, if corrected, would likely demonstrate that the costs of channel maintenance outweigh its benefits. *See also* NRE Comments at 11-12.

- As explained in detail in the attached NRE Comments, the 2002 EIS that the Corps relies on for the entirety of its estimates of transportation savings from dredging is riddled with errors and omissions, assumptions that have proven false over time, and warnings about the limited utility of the analysis that the Corps did not address – let alone correct – in this FEIS. NEPA and its implementing regulations impose a continuing duty on agencies to use up-to-date and accurate information. The Corps may not pretend that it is still
20325 2002 when it makes a decision in 2014 and cannot continue to rely on information and projections that it knows or should have known are inaccurate at the time, and in any event, have certainly proven wrong over the course of the intervening 12 years. *Lands Council v. Powell*, 395 F.3d 1019, 1031 (9th Cir. 2004). Indeed, the available evidence shows that the ton-miles currently attributable to the Lower Snake River falls below the threshold that the Corps elsewhere considers as "negligible," suggesting that analyses would be better focused on disposing of or otherwise abandoning this project, not continuing to funnel scarce public resources into it.

- Contrary to the Corps' position in its response to comments, nothing in 40 C.F.R. § 1502.23 excuses its failure to provide this information or analysis in the FEIS. The Corps' (erroneous) view of its responsibilities under the Flood Control act of 1962, are
20326 not among the "qualitative considerations" that would excuse the Corps from performing a cost-benefit analysis here. Indeed, for all of their flaws, the Corps' previous attempts to comply with NEPA for proposed maintenance actions, at least attempted (however incompletely and misleadingly) to look at the benefits and costs of ongoing channel maintenance. *See, e.g.,* 2002 Dredged Material Management Plan FEIS, Appendix C ("Economics").[9] Given the multi-decade commitment the Corps seeks to make in this

[9] This is not the first time that the Corps has willfully refused to consider and objectively evaluate the true state of the navigation system. As detailed in the attached report and declarations from Anthony Jones from 2002, the Corps in its 2002 dredging and channel maintenance proposal similarly relied on speculative benefits and a an unrealistic optimistic view of future shipping volumes on the lower Snake to justify the economic benefits of continued

FEIS, there is no reason for its failure to perform the analysis necessary to answer the fundamental question – "is all of this worth it?" – in this FEIS.

To correct these deficiencies, as well as all of those outlined in comments on the DEIS, the Corps must start over and transparently evaluate the full suite of socioeconomic impacts of its preferred action and a full range of alternatives rather than relying on general statements and outdated assumptions about the costs and benefits of its preferred course.

V. THE CORPS HAS FAILED TO ADEQUATELY CONSIDER THE IMPACTS OF ITS "IMMEDIATE NEED" DREDGING ACTION.

Dredging affects threatened Snake River salmon and steelhead through potential entrainment in dredge equipment, turbidity, noise, mobilization of toxins, and other water quality impacts. The Corps continues to improperly dismiss those impacts as minimal based on the
20327 simple assertion that dredging during the "work windows" will minimize the number of fall chinook salmon exposed to these impacts. But the Corps has failed to explain how this dismissal accounts for what it elsewhere (and in other decisions) paints as a significant number of fall chinook that overwinter in the reservoirs. Nor does this explanation account for the potentially large number of ESA-listed Snake River steelhead that are also present in the reservoirs during this time, including those moving between reservoirs.[10]

The Corps' attempt to dismiss impacts to chinook based on the belief that they may be found in Little Goose or other reservoirs (a belief for which they offer no evidence and which at least partially contradicts the predictions of benefits from shallow-water habitat created by dredge spoils) highlights the Corps' willingness to parse and localize the impacts of dredging when it comes to fish, but not to do so when it comes to estimating benefits from these channel maintenance. In other words, while the Corps seeks to downplay the harmful impacts of dredging through limiting the scope of its analysis, it does not examine the alleged benefits of its proposed actions in the context of the relatively small amount of freight that comes from the portion of Lower Granite pool where it seeks to dredge. Instead, it arbitrarily relies on a far more sweeping scope to allege benefits from the continued channel maintenance.

We have also explained that dredging will also destroy or adversely modify suitable
20328 spawning habitat for fall chinook. ~~*See* DEIS Cmts. at 14~~. The Corps asserts the same "work-window" response to this issue. ~~*See* App'x G at G-88.~~ But this response continues to ignore potential impacts of dredging and other activities on spawning habitat for Snake River Fall chinook. The Corps' assertion that it will complete these surveys before dredging and reinitiate consultation if any redds are found, ~~*see* App'x G at G-88~~, does not account for the fact that dredging will destroy critical habitat suitable for spawning even if no redds are found in the snapshot survey the Corps promises to conduct.

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operation of the navigation system. *See* Attachment 3 (Report and two declarations of Anthony Jones).

20329 [10] The Corps' "work window" explanation also does not address the potential impacts to ESA-listed white sturgeon and white sturgeon habitat, both of which are present in the areas the Corps seeks to dredge.

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Moreover, although it is unclear – based on the Corps' schizophrenic treatment[11] – whether the Corps believes that the shallow water habitat created by disposal of dredge spoils is intended to mitigate or offset the impacts to ESA listed fish, the FEIs fails to address the concerns raised by our organizations and other entities about the efficacy of that habitat.

Finally, the Corps has failed to follow the requirements of the Clean Water Act for its dredging proposal. Contrary to the Corps' insistence that it need not complete a full public interest review under § 404 of the Clean Water Act, there is nothing in the Act or the case law that permits the Corps to rely on the authorizing legislation – or continuing appropriations for the
20331 project – as satisfying that requirement. The Corps must conduct a full public interest review and satisfy all requirements of § 404(b) of the Clean Water Act before it may proceed with its proposed "immediate need" dredging.

VI. THE FEIS FAILS TO IDENTIFY AND ADEQUATELY ANALYZE CUMULATIVE IMPACTS.

While the FEIS contains several additional pages listing activities that the Corps believes may cause cumulative impacts, merely listing such actions is not the same as considering their
20332 cumulative impacts. For example, while the Corps finally acknowledges the existence of the McCoy unit facility, it provides no detail on the actual socioeconomic effects this and other facilities have and will continue to have in the future. *See infra* at Section IV (discussing impacts and significance of this facility on cargo volumes in the river). *But see* FEIS at 4-84 (asserting – contrary to the existing evidence and without any explanation – that this facility is somehow unlikely to divert grain volume from the barge corridor).[12]

Similarly, while the Corps vaguely alleges that "information available" shows ongoing and potential future economic effects to the Lewiston and Clarkston area due to the current condition of the navigation channel, FEIS at 4-78, it presents absolutely no data to demonstrate what those effects might be, whether they are transitory or expected to increase or decrease in the future, or whether any of those effects may be reasonably foreseeable.[13]

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[11] On the one hand, the Corps emphasizes that this habitat is not intended to mitigate for the impacts of dredging, see App'x G at G-148, but notes elsewhere that habitat creation was developed to "offset" the negative impacts of dredging. *Id.* at G-175.

[12] The FEIS similarly notes the potential significant expansion of Columbia Grain's storage facility at the Port of Garfield's facility far downstream of the primary are proposed for dredging, FEIS at 4-81, but fails to provide any additional detail or any assessment of what this would mean for grain volumes on the river, let alone whether dredging far upstream from this facility would provide any befits in light of this reasonably foreseeable development.

[13] As discussed elsewhere in these comments and in the attached Report from Natural Resources Economics, *see infra* Section IV, this lack of any information is just one of the many problems created by the Corp's wholesale refusal to examine the full scope and extent of the economic impacts of the alternatives in the FEIS.

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The Corps also fails to address the cumulative effects of continued navigation – and the interrelated continued existence of the four Lower Snake River dams – on a host of resources. There is no dispute that the continued existence and operation of the Lower Snake River dams has had and will continue to have a devastating impact on Snake River salmon, steelhead, lamprey, and other species. As discussed previously, those impacts are magnified in the context of continuing climate change, and climate change itself will have reasonably foreseeable impacts of the frequency and volume of the sediment the Corps will need to manage in the upper portion of the Snake River near the confluence. The Corps fails to present any credible information, however, on those impacts, or how its proposals to maintain a waterway affect those resources, or how its alternatives may be affected by these impacts. As numerous courts have made clear, the Corps must *evaluate* the potential additive impacts of future actions and environmental conditions. *See Neighbors of Cuddy Mountain v. United States Forest Service*, 137 F.3d 1372, 1379 (9th Cir. 1998) (NEPA requires that a cumulative impacts analysis provide "some quantified or detailed information" because "[w]ithout such information, neither courts nor the public . . . can be assured that the Forest Service provided the hard look that it is required to provide.").

CONCLUSION

As detailed throughout these comments, the Corps has continued to pursue an approach that betrays an apparent desire to dredge the river – this winter and into the future – without regard to whether the investment is worth it, without considering the direct, indirect, and cumulative impacts of doing so, and while impermissibly dismissing alternatives to its preferred approach. While the agency appears committed to its current path, we urge the Corps to take a step back and reexamine the flawed biological and economic assumptions that it carries forward in the FEIS, and decline to adopt its preferred (or any other listed) alternative. Given the amount of resources and time the Corps has taken to produce its business-as-usual approach, we would urge the Walla Walla District to turn over any further such analysis to independent parties.

If you have any questions about these comments, or would like to discuss any matter discussed in these comments, please contact any of the undersigned.

Sincerely,

/s/

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ATTACHMENT 1

Comments

On the Lower Snake River Programmatic Sediment Management Plan: Final Environmental Impact Statement

September 2014

Natural Resource Economics

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These comments were prepared on behalf of American Rivers, Earthjustice, Friends of the Clearwater, Borg Hendrickson, Linwood Laughy, Idaho Rivers United, Institute for Fisheries Resources, Pacific Coast Federation of Fishermen's Associations, Save Our Wild Salmon, and Sierra Club by Ernie Niemi of Natural Resource Economics, Inc., which is solely responsible for their content.

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I. Executive Summary

The Walla Walla District of the U.S. Army Corps of Engineers (Corps) has published a final environmental impact statement (*FEIS*) for the Programmatic Sediment Management Plan (PSMP) for the Corps' Lower Snake River Project (LSRP). The Corps' Preferred Alternative for the PSMP, if adopted, would provide the programmatic framework for evaluating and implementing potential sediment management measures the Corps will define for an indefinite future period. The Preferred Alternative includes a menu of available measures, including dredging and the construction of new structures, to manage sediment in the river to maintain a navigation channel that would enable barge traffic along the lower Snake River from its confluence with the Columbia River to the Port of Lewiston, Idaho. This activity would focus largely on Lower Granite reservoir. The *FEIS* does not contain analysis and decision-making regarding which of these measures will be implemented in the future. The *FEIS* does, however, address the Corps' proposal to initiate dredging and related activities during the first available in-water work period—which may occur as soon as December 2014—following the approval of the record of decision for the *FEIS*.

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In preparing the *FEIS*, the Corps had an obligation to satisfy at least these 13 requirements established, separately and jointly, by the agency's *Planning Guidance Notebook, the* National Environmental Policy Act (NEPA), and the *Principles and Requirements for Federal Investments in Water Resources*:

1. **Recognize that all aspects of the Principles and Guidelines, including the requirement for a full comparison of costs and benefits, apply to the *FEIS*.**
2. **Use only relevant, accurate, and reliable information.**
3. **Use all the available information that is relevant, accurate, and reliable.**
4. **Demonstrate that the Preferred Alternative will accomplish the federal objective, by producing an increase in the net value of the national output of goods and services, marketed and not marketed.**
5. **Identify the socioeconomic problems the PSMP will solve, the opportunities for doing so, and its specific socioeconomic objectives; and describe its expected ability to achieve them.**
6. **Provide a forecast relevant to the socioeconomic problems and opportunities the PSMP is addressing.**
7. **Provide a detailed EIS to the fullest extent possible and take a hard look at the socioeconomic consequences.**
8. **Make a substantial, good faith effort at studying, analyzing, and expressing the socioeconomic issues in the *FEIS* and the decision-making process.**
9. **Maximize public benefits, with appropriate consideration of costs.**
10. **Design evaluation methods that apply an ecosystem services approach and ensure that investments undertaken under the PSMP will be justified by the public benefits.**
11. **Report fully the basis for selecting the Preferred Alternative for the PSMP.**
12. **Consider both effects that are monetized and effects that are not.**

13: Fully disclose all relevant information to enable the public to understand the rationale for selecting the Preferred Alternative.

The *FEIS* does not satisfy these requirements, or even show that the Corps made a demonstrable effort to satisfy them. Nowhere does it make a substantial, good faith effort at studying, analyzing, and expressing the socioeconomic issues, nor does it take a hard look at the socioeconomic effects of the Preferred Alternatives. Nowhere does the *FEIS* address ecosystem services, consider both monetary and non-monetary effects, or demonstrate that the economic benefits of the Preferred Alternative will outweigh the costs. Instead, it quantifies only one economic indicator by estimating the transportation savings that would result from dredging the channel and shipping cargo by barge rather than by rail or truck and asserting that the savings would exceed the dredging costs. This assessment, which occurs in a single paragraph, is flawed, however. It relies on an analysis that is too old, incomplete, and biased to be either relevant or accurate. Beyond that brief analysis, the *FEIS* contains numerous unsubstantiated statements about the benefits of barge traffic, but fails to provide the description of the competitive effects on the rail and trucking industries that is necessary to yield a full description of transportation-related effects.

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To rectify these shortcomings in the *FEIS*, the Corps must start over. It must identify all the socioeconomic issues—such as the net economic benefits (or costs) of sediment management and the long-term regional impacts on jobs and incomes—relevant for evaluating and choosing among alternatives for managing sediment in the LSRP. It particularly must identify all issues relevant for developing a Preferred Alternative consistent with the *Planning Guidance Notebook*, National Environmental Policy Act, and *Principles and Requirements*. For each issue, the Corps must specify appropriate analytical methods and data for examining the absolute and relative effects of different management approaches. It then must define a baseline scenario that describes, from a socioeconomic perspective, the status of each issue without federal action, and employ appropriate methods and data to describe in detail how each alternative would make the world different. For each alternative, it must, at a minimum, specify relevant assumptions and determine the benefits and costs and the changes in jobs and incomes relative to the baseline scenario, with a full discussion of the significant uncertainties and risks. With this detailed, comparative information in hand, it then must define the socioeconomic criteria appropriate for comparing the alternatives, apply the criteria, and explain, from a socioeconomics perspective, which of the alternatives is the Preferred Alternative. For all of this, the Corps must demonstrate a substantial, good faith effort at studying, analyzing, and expressing the environmental issues, and provide good faith analysis and sufficient information to allow a firm basis for weighing the risks and benefits of the PSMP.

Information readily available today indicates that the costs of continued maintenance of the navigation channel far outweigh the benefits. Some of this information shows the channel-maintenance costs likely will be higher than those the Corps reports in the *FEIS*, insofar as the Corps apparently neglected to incorporate reasonable estimates of the annualized dredging costs, the full costs of operating and maintaining the locks, and the costs associated with the harm to fish that would accompany continued channel maintenance. Conversely, other information neglected by the Corps shows the channel-maintenance benefits likely will be lower than reported in the *FEIS*. For example, the Corps' own data shows that shipping cargo by barge rather than by rail or truck often yields no benefits at all, and substantial investments by the rail and trucking industries have increased the likelihood that shipping by barge would yield no benefits in the future. Even if shipping by barge could yield a benefit per ton of cargo shipped, the Corps' own data shows barges carry far fewer tons of cargo than the Corps assumed in the analysis underlying the *FEIS*.

The *FEIS* presents its economic analysis as several statements in a single paragraph with no substantiating details, preventing readers from making a precise determination of how that analysis would change if it were to incorporate these and other pieces of information. The magnitudes of the omitted information, however, support the conclusion that, whereas the Corps' incomplete analysis implies channel-maintenance benefits exceed the costs, a more complete analysis would reach the opposite result. For example:

Errors in the *FEIS* that Inappropriately Deflate the Corps' Estimate of the Preferred Alternative's Costs

- The *FEIS* asserts channel maintenance costs would total $1–5 million, on an annualized basis. Information developed by the Corps itself, but omitted from its analysis, indicates, however, that annualized dredging costs in Lower Granite pool, alone, would total at least $9 million, and the costs of other actions could increase this amount. Hence, the actual channel maintenance costs will exceed the estimate reported in the *FEIS* by at least 80–900 percent.
- The 2002 report on which the Corps relied when preparing the *FEIS* reported that continued operation of the navigation channel and the four dams would generate passive-use-value costs up to $420 million by preventing the restoration of fish populations associated with more natural habitat conditions. This amount would be larger if converted to current dollars. The *FEIS'* estimate of channel-maintenance costs, $1–5 million, however, disregards these costs and, hence, understates the actual costs that would result from implementation of the Preferred Alternative.
- The Corps' estimate of the cost to maintain the channel, $1–5 million per year, fails to account for the major anticipated costs of completing the rehabilitation and/or replacement of the locks at each of the four dams, which are nearing the end of their expected life.
- The Corps' estimate of the cost to maintain the channel, $1–5 million per year, fails to account for the costs of altering McNary Dam and the four dams on the lower Snake River to compensate for the dams' impacts on threatened and endangered fish. Elsewhere, the Corps has estimated that these costs approach $1 billion.
- The Corps' estimate of the cost to maintain the channel, $1–5 million per year, apparently fails to account for the increasing likelihood of a major failure of one or more infrastructure components of the dams on the lower Snake River and the Columbia River, as adequate federal funding to maintain, refurbish, and replace components becomes harder to secure.

Errors in the *FEIS* that Inappropriately Inflate the Corps' Estimate of the Preferred Alternative's Benefits

- The *FEIS* asserts that maintaining the channel and enabling the shipment of cargo by barge would yield transportation savings of $8.45 per ton. This estimate relies on an economic analysis, in the Corps' 2002 report, that assumed shipping cargo by barge would be cheaper than shipping by rail or truck, despite evidence to the contrary. In the 2002 report, the Corps warned the analytical results should not be used for future decision-making without additional investigation. The Corps, however, has provided no evidence indicating it heeded the warning as it prepared the *FEIS*.

- The *FEIS* asserts that maintaining the channel and enabling the shipment of cargo by barge would yield total transportation savings of about $25 million per year. This estimate results from multiplying the estimated savings per ton, $8.45, times the annual tonnage, which the Corps asserts will be about three million tons per year. The *FEIS* says, though that this tonnage represents current shipments, and the Corps asserts this level will occur in the future. The only source of supportive information it cites is the 2002 report, which gets things backwards by assuming tonnage would be increasing when, in fact, it has been decreasing. Actual tonnage has fallen from 4.0 million tons to 3.2 tons in 2012, not increased to 4.9 million tons as the 2002 predicted. In preparing the *FEIS,* the Corps relied on the incorrect prediction and ignored the empirical record, as well as information that suggests tonnage will continue to fall. This error overstates the potential transportation savings from continuing channel maintenance.
- The 2002 report on which the Corps relied when preparing the *FEIS* states that its analysis overstates trucking costs. Doing so means the *FEIS* overstates the transportation-cost savings that would be realized by maintaining the channel so cargo would be shipped by barge rather than by truck. In the 2002 report, the Corps warns the error was sufficiently important that further study should be undertaken to address the overstatement. The Corps, however, has provided no evidence indicating it heeded the warning as it prepared the *FEIS*.
- The 2002 report on which the Corps relied when preparing the *FEIS* also overstates the costs of shipping cargo by rail and, hence, overstated the benefits of maintaining the channel so the cargo could, instead, be shipped by barge. It does so by misrepresenting shippers' opportunities to load cargo onto trains: assuming one major rail system had only eight facilities, for example, when, in fact, it had 43. The smaller the number of rail-loading facilities, the greater the trucking costs grain producers would have to incur to send their cargo to a facility. This misrepresentation, hence, inflates the Corps' estimates of the benefits from shipping by barge rather than by rail.
- The 2002 report on which the Corps relied when preparing the *FEIS* reveals that the Corps assumed shipping cargo by barge always would be cheaper than shipping by rail or truck when, in fact, it had evidence showing the reverse. This disconnect between the Corps' analysis and reality was sufficiently severe that the 2002 report warns the Corps against future use of its analytical findings, saying it should review this issue and, perhaps, revise its analytical model. The Corps, however, has provided no evidence indicating it heeded the warning as it prepared the *FEIS*.
- The 2002 report on which the Corps relied when preparing the *FEIS* states that shipping costs would increase if the channel were not maintained, largely because, if cargo could not be shipped by barge, the rail and trucking systems would have to make major investments to accommodate the additional shipments. Since the report's publication, however, much of this investment has already occurred, making these systems more competitive vs. the barge system. In concept, the enhanced competitiveness reduces the transportation savings that could be realized in the future by maintaining the channel to allow barge traffic. Empirically, the shift of cargo since 2002 away from the barge system to the rail and truck systems indicates that, for many, shipping by barge would increase, not decrease

transportation costs. The *FEIS* provides no evidence that the Corps accounted for these investments before asserting that barging cargo would be cheaper.

- One such investment in the rail system, the McCoy Unit Train Grain Terminal near Rosalia, Washington, which opened in 2014, has sufficient capacity, if operated at full capacity for about three months, to ship an amount of grain equal to the total grain shipments originating in the Lower Granite pool in 2009. An assessment of the facility concluded that many grain producers would use it rather than other transportation facilities and the resulting reductions in transportation costs would yield economic benefits totaling more than $60 million over the next 20 years. Nonetheless, the *FEIS* concludes—without explanation—that this facility would not induce a single shipper to transfer grain from barge to rail.

II. Background

In August 2014 the Corps' Walla Walla District published a final environmental impact statement (*FEIS*) for the Programmatic Sediment Management Plan (PSMP) for the Corps' Lower Snake River Project (LSRP).[1] Its stated purpose is to adopt and implement actions for emergency, short-term, and long-term management of sediment that interferes with the Corps' interpretation of the authorized purposes of the LSRP. These stated purposes are commercial navigation, recreation, and fish and wildlife conservation and mitigation. The PSMP attempts to provide a programmatic framework to evaluate and implement potential sediment management measures that, if the PSMP is adopted, will be developed in the future.

In developing the PSMP FEIS, the Corps evaluated in detail only these three alternatives:

Alternative 1 - No Action (Continue Current Practices)

> "The No Action alternative represents a continuation of the Corps' current operational practices of managing the LSRP. The Corps would not adopt the proposed PSMP or implement any new sediment management actions (e.g., channel maintenance dredging)."[2]

Alternative 5 – Dredging-Based Sediment Management

> "The Dredging-Based Sediment Management alternative represents a continuation of the Corps' historical practices of using dredging as the primary tool for managing sediment that interferes with existing authorized project purposes of the LSRP."[3]

Alternative 7 – Comprehensive (Full System and Sediment Management Measures)

> "The Comprehensive (Full System and Sediment Management Measures) alternative…provides a suite of all available dredging, system management, and structural sediment management measures for the Corps to use to address sediments that interfere with the existing authorized project purposes of the LSRP."[4]

The Corps has selected Alternative 7 as its Preferred Alternative, asserting that this selection is warranted, from a navigation perspective because it would yield annual transportation savings of about $25 million, i.e., reduce the costs of shipping cargo by this much by enabling cargo to be shipped by barge rather than by rail or truck. The *FEIS* does not, however, provide any analysis supporting its estimate of transportation savings. Instead, it asserts that it does not have to provide an analysis of the benefits and costs of the Preferred Alternative. It does so claiming, based on one statement in the agency's *Planning Guidance Notebook,* that it need only conduct a review of economic indicators to provide the foundation for a determination that continued channel maintenance is warranted from a navigation perspective.[5, 6]

To conduct this review, the Corps reviews only a single indicator, its estimate of transportation savings. To arrive at this estimate, the Corps compares its estimate of the cost of continued

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[1] U.S. Army Corps of Engineers, Walla Walla District. 2014. *Lower Snake River Programmatic Sediment Management Plan Final Environmental Impact Statement.*

[2] FEIS, p. 2-31.

[3] *FEIS*, p. 2-34.

[4] *FEIS*, p. 2-36.

[5] The information in this paragraph comes from *FEIS*, pp. 3-55, G-67, and G-68.

[6] The socioeconomic elements of the *FEIS* do not assert that dredging and related activities are warranted from any perspective other than navigation. In particular, it does not state that dredging and related actions are warranted to lower the risk of flood damage, consistent with the findings of the Corps' hydraulics and hydrology analysis, which include the conclusion that the current risk of overtopping the Lewiston levees is "likely acceptable," and that the risk of overtopping in 50 years is likely "marginally acceptable." (*FEIS,* p. F-17)

channel maintenance, $1–5 million per year, against the transportation savings, which it asserts equals $25 million, or $8.45 per ton times about three million tons, per year for the foreseeable future. The Corps provides no documentation supporting its estimate of channel-maintenance costs. It extracts the estimate of transportation savings per ton from its 2002 *Final Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact* Statement (2002 report). It provides no documentation supporting its estimate of future tonnage.

This casual exercise does not consider the full set of costs and benefits of the dredging and other activities the Corps proposes to undertake to maintain the channel. The Corps justifies its exclusion of costs and benefits, other than those just described, saying that it does not have to consider the overall effects on the economy, and it especially does not have to demonstrate that the PSMP would contribute to national economic development (NED), i.e., increase the net value of the national output of goods and services.

> "A detailed economic analysis, which includes the identification of National Economic Development benefits, is required when developing a recommendation to Congress on whether a new navigation project is feasible and should be constructed. Once a navigation project is authorized and constructed, however, the Corps ensures continued maintenance is economically warranted based on continued commercial use of the navigation system. The Corps is not required to prepare a detailed economics analysis of the type called for in many public comments. Economic studies like those included in feasibility studies are not necessary when evaluating maintenance alternatives for existing projects. Such a study was completed in the Final Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement (LSRJSMFR) dated February 2002 (http://www.nww.usace.army.mil/Library/2002LSRStudy.aspx).
>
> "The focus for cost-analysis under NEPA is on comparison of alternatives, not justification of the proposed project. Cost analysis is required when alternatives are (or should be) compared on a cost basis. Cost analysis is not required when there are more important qualitative considerations for comparing alternatives. 40 C.F.R. 1502.23 states: 'For purposes of complying with the Act [section 102 (42 USC § 4332)], the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations.' The Corps has not identified a need for a cost analysis under NEPA to distinguish between alternatives, as the preferred PSMP alternative (Alternative 7) is a combination of all reasonable measures, and the only measure identified for the current immediate need to reestablish the federal navigation channel (consistent with the PSMP) is dredging.
>
> "Additionally, a detailed economic analysis, which includes identification of National Economic Development (NED) benefits, is not required when the Corps develops O&M plans for existing Civil Works projects. Once a navigation project is authorized and constructed, the Corps ensures continued maintenance is economically warranted based on continued commercial use of the navigation system. … For site-specific navigation channel maintenance actions under the PSMP in the future, the Corps will identify the least costly manner consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process (See, 33 CFR 335/336)." (*FEIS*, pp. G-67 and -68)

In its description of the socioeconomic elements of the Preferred Alternative's environmental effects, the *FEIS* offers these descriptions:

- "[D]redging to re-establish the congressionally authorized federal navigation channel dimensions…would enable commercial navigators to once again operate tugs and barges at full capacity. These factors would result in a positive economic effect on the navigation and related industries in the region." (*FEIS,* p. 4-39)
- "Alternative 7 would have minor, short-term, beneficial direct effects on income and

employment through construction activities associated with the measure's implementation. Alternative 7 would have no long-term effects on population, employment and income. Because Alternative 7 includes actions to maintain current navigation objective operations (and associated economic activities) there would be no adverse effects on transportation and related sectors. This alternative would have a long-term beneficial direct effect on river navigation by maintaining adequate depths in the navigation channels and access channels to ports, moorages, and public recreation areas." (*FEIS,* p. 4-40)

- "Reservoir drawdown to flush sediments from Lower Granite Reservoir would require substantial changes in reservoir operations that would temporarily preclude most barge navigation in the reservoir while drawdown was occurring. This would be a temporary adverse impact on commercial and recreational navigation. … Some shipments would likely shift to other modes (rail, truck), which could adversely affect the capacity of the rail or highway system; however, these measures could have a long-term beneficial effect on navigation by re-establishing the navigation channel.

  "[T]he effect on shippers would be minimal due to the short duration of the drawdown. There may be some loss of grain sales if enough grain cannot be shipped out of the reservoir, but the use of downstream storage facilities and shipping of grain prior to drawdown would minimize economic effects. Other commodities would need to be stockpiled ahead of time. Trucks or rail could be used to transport these commodities for short- term supply. This would temporarily increase costs to those who usually use the river system for the transportation of commodities, but the increases should be small." (*FEIS,* p. 4-40)
- "Sediment and system management measures noted above would generally have a long-term indirect positive effect on regional economies by providing for continuing commercial navigation and movement of commodities, and providing options for commodity shippers. The result would be positive long-term benefits to the communities protected by the levees." (*FEIS,* p. 4-41)

III. Comments

The Corps avows, in response to comments on the socioeconomic elements of the draft environmental impact statement for the PSMP, that "the Corps' considerations reflect…sound economic decision-making." (*FEIS,* p. G95) The actual contents of the *FEIS*, however, prove otherwise. The *FEIS* systemically disregards and contradicts the requirements for sound economic decision-making established by Congress, the President, the Corps, and the courts. To substantiate this conclusion, the comments below describe some of the ways in which the *FEIS* fails to satisfy requirements established by the Corps' *Planning Guidance Notebook*,[7] the National Environmental Policy Act (NEPA), and the *Principles and Requirements for Federal Investments in Water Resources*.[8] Because of these failures, the Corps' description of the socioeconomic effects of the Preferred Alternative is no more than arbitrary guesswork, and the reasoning it uses to select the Preferred Alternative falls apart. The arbitrary and speculative nature of the *FEIS* applies both to the immediate project that would initiate dredging, perhaps as soon as December 2014, and to the long-term expectations of the PSMP.[9] Overall, it is clear that the
20336 Corps' erroneous assumptions, guesswork, and disregard of information that inconveniently indicates otherwise led it to incorrectly state that the Preferred Alternative's benefits outweigh its costs.

A. The *FEIS* Fails To Demonstrate Sound Economic Decision-Making, As Evidenced by Its Failure to Satisfy Analytical Requirements Established by the Corps' *Planning Guidance Notebook*

The Corps recognizes it is subject to the requirements provided by the agency's *Planning Guidance Notebook*,[10] and cites that document as the basis for its determination that continued maintenance of the channel is warranted. (*FEIS,* p. 3-55) The relevance of this document extends much more broadly and establishes a network of analytical requirements. Its statement of purpose says, "This regulation provides the overall direction by which Corps of Engineers Civil Works projects are formulated, evaluated and selected for implementation," (p. 1-1) and its statement of use: "This engineer regulation *provides the requirements* for conducting planning studies [such as an FEIS] within the U. S. Army Corps of Engineers Civil Works program." (p. 1-4, italics emphasis added)

The *FEIS,* however, disregards requirements that extend beyond and contradict the approach it used for determining that continued maintenance of the channel is warranted, asserting instead that "The Corps is not required to prepare a detailed economics analysis of the type called for in many public comments. Economic studies like those included in feasibility studies are not necessary when evaluating maintenance alternatives for existing projects." (*FEIS,* p. G-67)

1. General Requirements of the *Planning Guidance Notebook*

The *FEIS* fails to comply with the fundamental core of the *Planning Guidance Notebook*, which states:

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[7] Engineering Regulation ER-1105-2-100. 22 April 2000.
[8] *See* http://www.whitehouse.gov/administration/eop/ceq/initiatives/PandG.
[9] Unless otherwise noted, these comments apply to both the immediate project and the long-term expectations of the PSMP, and they cover both dredging and other channel-maintenance activities.
[10] Engineering Regulation ER-1105-2-100. 22 April 2000.

- "The Corps of Engineers planning process is grounded in the economic and environmental Principles and Guidelines (P&G) promulgated in 1983…." (p. 2-1)
- "[T]he plans recommended for implementation, in general, are to reasonably maximize net national benefits." (p. 2-1)
- "[T]he Federal objective [National goal] of water and related land resources planning is to contribute to national economic development (NED) consistent with protecting the Nation's environment, in accordance with national environmental statutes, applicable executive orders, and other Federal planning requirements." (p. 2-1)
- "Contributions to national economic development (NED outputs) are increases in the net value of the national output of goods and services…." (p. 2-1)
- "Contributions to NED include increases in the net value of those goods and services that are marketed and also of those that may not be marketed." (p. 2-1)
- A plan will make an NED contribution if it will yield "increases in the net value of the national output of goods and services." (p. 2-1)

These statements, together with detailed supporting statements in the *Planning Guidance Notebook*, define several general requirements the *FEIS* must satisfy if it is to reflect sound economic decision-making. The following paragraphs demonstrate, however, that the Corps did not satisfy these requirements or give them any consideration at all. Instead, it cherry-picked information favorable to continued maintenance but, in doing so, undermined the reasonableness of its determination that continued maintenance is warranted.

Requirement #1: Recognize that all aspects of the Principles and Guidelines, including the requirement for a full comparison of costs and benefits, on an incremental basis, apply to the *FEIS*.

The *FEIS* fails to satisfy this requirement by looking too narrowly when it compares the costs and benefits of continued channel maintenance. The Corps focuses its comparison of costs and benefits using the *Planning Guidance Notebook*'s section 15h(3)(i)(1), which states, "for each ongoing study, a review of *indicator*s of continued economic justification will be conducted." (italics emphasis added) The Corps does not, however, review indicators, as required. Instead it narrows the plural to just the singular and reviews just one indicator: the transportation savings, net of channel-maintenance costs, that would result if cargo were shipped by barge rather than by rail or truck.

For information about this single indicator, the Corps relied on its earlier report, the *Final Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statemen*t (2002 report).[11] This report also identifies other relevant economic indicators, and the Corps does not explain why it ignored them in preparing the *FEIS*. The table of contents for the economics appendix of the 2002 report identifies economic indicators associated not just with transportation but also with power system impacts, recreation use, water supply, anadromous fish, tribal circumstances, flood control, implementation and avoided costs, passive use values, and regional economic development. It also considered risk and uncertainty. Moreover, the 2002 report attempts to merge all these indicators into an integrated comparison of the costs and benefits of each alternative, and includes a 532-page appendix on "Economics." The *FEIS* does not review all these indicators, make use of all the information on individual economic

[11] The Corps acknowledges the relevance of this report, looking to in its response to the *Planning Guidance Notebook*'s section 15h(3)(i)(1). (*FEIS,* pp. 3-55, G-67- and G-68)

indicators available in the 2002 report, or consider the integrated costs and benefits of continued maintenance of the navigation channel. Instead, apart from superficial treatment mention of some of the indicators, it substantively addresses only one. In a single paragraph (p. 3-55), the *FEIS* casually provides information solely about transportation savings and compares them to a general estimate of future channel-maintenance costs. The *FEIS* does not cite the source of either estimate, making it impossible for a reader to trace them. As a result, the *FEIS* fails to provide a sound basis for decision-making about whether or not continued maintenance is warranted.

20337 Moreover, the Corps must determine whether or not continued channel maintenance is warranted not for the entire lower Snake River as a unit, but for incremental segments of the river. The *Planning Guidance Notebook* makes clear the importance of incremental analysis:

> "Incremental analysis is a process used in plan formulation to help identify plans that deserve further consideration in an efficient manner. The analysis consists of examining increments of plans or project features to determine their incremental costs and incremental benefits. Increments of plans continue to be added and evaluated as long as the incremental benefits exceed the incremental costs. When the incremental costs exceed the incremental benefits no further increments are added. For example, fifteen levees, each of a different height, could be designed to find the one with greatest net benefits. This is trial and error. An alternate approach is to start with a levee of low height, then add height in steps or increments (say one foot). For each increment of height the added (incremental) costs and added (incremental) benefits are estimated. As long as the incremental benefits exceed the incremental costs it makes sense to add the foot of height, because the extra foot adds more to benefits than to costs. When incremental costs exceed incremental benefits, no further increments of height are added. This process is more efficient than trial and error, and is thus used in formulating and evaluating most Corps projects." (p. 2-10)
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> "Recommendations for multipurpose projects will be based on a combination of NED [national economic development] benefit-cost analysis, and NER [national ecosystem restoration] benefits analysis, including cost effectiveness and incremental cost analysis." (p. E-8)

The same reasoning applies to segments of river channel. The Corps should determine if channel maintenance is warranted for each segment demarcated by the four dams on the lower Snake River, from McNary pool to Lower Granite pool. An incremental analysis applied to channel segments rather than levee heights would first weigh the costs and benefits of maintaining the Ice Harbor lock and the channel through the Ice Harbor pool. If the benefits, measured as the transportation savings for all barge traffic through the lock, do not outweigh the full costs of delivering the traffic through the lock, then maintenance of the Ice Harbor lock and channel would not be warranted. The full costs should include the local costs for traffic terminating or originating in the Ice Harbor pool, as well as the channel-maintenance and other costs upstream. If, however, the benefits outweigh the full costs, then the incremental analysis would then move to the next channel segment and compare the transportation savings for all barges passing through Lower Monument lock against the full costs of delivering the traffic through the lock. If the benefits do not outweigh the full costs, then maintenance of the Lower Monument lock and channel would not be warranted. Similar reasoning would apply to complete the incremental analysis of Little Goose lock and pool and Lower Granite lock and pool.

At the eastern end of the lower Snake River, it should determine that maintaining the channel in Lower Granite pool (including maintaining and rehabilitating Lower Granite lock) is warranted only if (a) the incremental analyses of lower river segments demonstrate that the benefits of maintaining the channel through Little Goose pool outweigh the costs, and (b) the benefits associated with maintaining the Lower Granite segment of the channel (including maintaining and rehabilitating the Lower Granite lock) outweigh the costs associated with this segment. The incremental analysis of cargo-related benefits for this segment should consider only the cargo originating in Lower Granite pool that would be carried by barge only if this segment of the channel were maintained. Nearly all of this cargo likely will originate at the Port of Lewiston, which has experienced reductions in shipments: wheat shipments have declined from about 800,000 tons in the 1990s, to about 600,000 tons this century; and container shipments have declined from more than 15,000 in the 1990s to fewer than 10,000 in 2003 and fewer than 5,000 since 2009.[12] The port shipped about 600,000 tons, total, in 2011.[13] If the Corps' estimate of the transportation savings, $8.45 per ton, is correct (below I present information demonstrating that the actual savings are likely non-existent), then the incremental benefits from maintaining the Lower Granite channel would total about $5 million. Only if the incremental costs of maintaining this segment of the channel fall below the benefits, should the Corps determine that maintaining this segment is warranted from the navigation perspective.

An incremental analysis of the benefits and costs associated just with the maintenance of the navigation channel from the Port of Lewiston is especially relevant insofar as most of the dredging and other channel-maintenance actions under the Preferred Action likely will focus on sediment in Lower Granite pool. The immediate need for action to maintain the channel, for example, concerns sediment accumulation at the confluence of the Snake and Clearwater Rivers and at the downstream approach at Ice Harbor Dam. The *FEIS* shows that, to maintain the channel at these two locations, the Corps proposes to dredge more than 458,472 cubic yards and 2,337 cubic yards, respectively.[14] (*FEIS*, p. L-3) The proposed dredging in Lower Granite pool represents more than 99 percent of the total volume of sediment and, presumably more than 99 percent of the total channel-maintenance cost. Data published in the *FEIS*, however, shows that Lower Granite pool accounted for less than one-half of the total tonnage shipped on the lower Snake River in 2012. (*FEIS,* p. 3-53). These numbers indicate that the incremental net benefits of maintaining the channel in Lower Granite pool (including the costs of maintaining and operating the lock) would be much smaller than those for other channel segments or for the river as a whole. This outcome, together with other information presented in these comments, shows the Corps overestimated the whole-river benefits and underestimated the whole-river costs strongly suggests the incremental costs of maintaining the channel in Lower Granite pool outweigh the incremental benefits.

By not completing an incremental analysis, the Corps has not demonstrated that the Preferred Alternative is the most efficient and cost-effective option. An option that excludes channel maintenance in the Lower Granite pool (including the costs of maintaining and operating the lock) would be more efficient and cost-effective. In other words, it has not demonstrated that implementing the Preferred Alternative would not waste taxpayers' money and the nation's

[12] Port of Lewiston. 2014. "Shipping Reports." www.portoflewiston.com/wordpress/media-room/shipping-reports/.
[13] Laughy, L. 2013. "Linwood Laughy's Economic Analysis of Navigation Costs from Port of Lewiston." *Lmtribune.com.* January 21. lmtribune.com/blogs/from_the_newsroom/article_a36c23d6-611a-11e2-84bb-0019bb30f31a.html.
[14] The *FEIS* also anticipates that the Port of Clarkston will dredge 14,143 cubic yards and the Port of Lewiston will dredge 4,664 cubic yards.

economic resources. The Corps must complete an incremental analysis before the public and decision-makers can have any confidence in the Corps' selection of the Preferred Alternative.

Requirement #2: Use only relevant, accurate, and reliable information.

The Corps compounds the error of comparing only the benefits of shipping by barge against the
costs of dredging and related channel-maintenance actions by using irrelevant, outdated,
20338 inaccurate, and unreliable information from the 2002 report to make the comparison. The errors
in that report are so numerous and pervasive that the Corps was unable to demonstrate the
reasonableness of the increased cost to transport grain by rail or truck, about $8.45 per ton in
current dollars, it extracted from the report. Errors in the 2002 report also extinguish the
reasonableness of the Corps' estimate in the *FEIS* of future tonnage, about 3 million tons per
year. As a consequence, the Corps did not and cannot demonstrate that the product of these two
numbers, $25 million per year, represents a reasonable estimate of the actual transportation
savings that would accompany continued maintenance of the navigation channel. Indeed, the
errors in the 2002 report's assessment of transportation costs are so egregious that it appears
more likely that continued maintenance of the channel would yield not transportation savings
but higher transportation costs.

The *FEIS* does not demonstrate the 2002 report is even relevant to the matters at hand. The 2002
report focused not on comparing dredging and the other actions included in the Preferred
Alternative against a No Action Alternative but, instead, on evaluating and screening
20339 "structural alternatives that may increase survival of juvenile anadromous fish through the
Lower Snake River Project." (2002 report, Appendix I Economics, "Purpose and Need" no page
number) In particular, it compared an alternative that involved breaching the four dams against
structural alternatives that left the dams in place. The 2002 report did not specifically compare
the full costs of operating and maintaining the locks and channel against the benefits.

Moreover, the 2002 report is irrelevant because it contains an outdated economic analysis, and the *FEIS* does not explain why it considers the 2002 report 's relevant evaluating channel-maintenance alternatives extending from 2014 into an indefinite future.

The 2002 report's forecast of cargo shipments, for example, covers the period, 1997-2017. For subsequent years, the report states: "Due to the degree of uncertainty inherent in long range forecasting, projected volumes were assumed to remain level beyond 2017, no additional growth projected." (p. I3-84) In other words, beyond 2017, the forecast is no more than a guess. Thus, the 2002 report, at best, provides a forecast of commodity shipments until 2017, or only the first two or three years of the period covered by the PSMP. In reality, though, inaccuracies in the forecast until 2017 render it irrelevant, insofar as it anticipates shipments would increase when, in fact, they have been decreasing, as explained in the next paragraph.

Inaccuracies pervade the 2002 report's transportation-cost estimates to an extent that they are unreliable and inappropriate for use in the *FEIS* to determine if continued channel maintenance is warranted. Correcting the errors likely would turn upside down the Corps' assertion that continued maintenance would yield transportation savings. To satisfy the requirement to use only relevant, accurate, and reliable information, the Corps should not have used figures from the 2002 report without correcting the inaccuracies. These inaccuracies are especially important:

- The 2002 report anticipated that grain shipments would increase when, in fact, they have decreased. This error occurred because, in preparing the report, the Corps deliberately ignored data suggesting that grain shipments would decline. The report explained it this way: "[T]he grain forecast is based on a period of record ending in 1996 while data for 1997 was available [because] grain shipments for 1997 were approximately 20 percent lower than shipments in 1996 [and] the downturn in 1997 is judged to be an anomaly and not representative of the long-term trend in grain shipments." This statement could not have been more incorrect. (p. I3-84) Using the truncated data, the forecast anticipated growth in grain shipments, with the 2017 tonnage through Ice Harbor Dam 38 percent higher than the 1997 level. (pp. I3-94 and -95) The *FEIS* does not report data on grain shipments, but data from the Corps' Waterborne Commerce Statistics Center show shipments on the lower Snake River, which are mostly grain, declined sharply between 1996 and 2001, and fell again in 2008.[15] Table 3-14 of the *FEIS* shows that total tonnage through Ice Harbor fell 11 percent from 1996 to 2009. The decline was even greater, 15 percent, for shipments, mostly grain, through the Lower Granite lock. In short, lurking behind the Corps' estimate of the transportation savings associated with continued channel maintenance is an assumption that down would be up. In preparing the *FEIS,* the Corps has not corrected the error. Until it does so, its economic analysis provides an unreliable and unreasonable basis for decision-making about whether or not to continue channel maintenance.
- The Corps' disregard for data not favorable to continued channel maintenance was not the only source of inaccuracies in its tonnage forecast. It developed the 2002 report's forecast of grain shipments by taking an earlier forecast of grain export from the Lower Columbia River and assuming that the Snake River's share of the total would remain constant. When critics questioned the accuracy of this method, the Corps agreed, acknowledging that an analysis of potential shipments of each commodity, by location, "should result in a more reliable long-term forecast," but the agency claimed such an analysis lay outside the report's scope. (p. I3-84)

  The difference in costs of shipping commodities by barge relative to rail and truck varies by location. Hence, the absence in the 2002 report of a reliable, location-specific forecast of commodity flows undermines the reliability of using the forecast to estimate transportation-cost differences in years following 2002. The Corps did not correct this flaw in the 2002 report when it cited the report in the *FEIS* as the basis for its determination that continued maintenance of the channel would yield transportation savings of $8.45 per ton. As a consequence, the lack of reliability in the 2002 report's
20340 commodity forecast carries over to the *FEIS* and undermines confidence in the Corps' determination. Until the Corps corrects the flaw, it is impossible for the Corps, the public, or decision-makers to ascertain the reasonableness of its estimate of transportation savings, $8.45 per ton, or of the selection of the Preferred Alternative based on that estimate.

Multiple errors in the 2002 report's analysis of the savings associated with the potential transfer of grain from barge to rail and truck, if barge traffic were to cease, also discredit the Corps' estimate of transportation savings in the *FEIS*, $8.45 per ton, which it extracted from the 2002

[15] Laughy, L. 2014. "Comments Submitted to U.S. Army Corps of Engineers Inland Waterway Users Board. Walla Walla, Washington. August 14.

report without analytical scrutiny. The estimate rests on several inaccuracies and assumptions that the Corps in 2002 knew were so severe that it warned the analytical results should not be used for future decision-making without additional investigation. Correcting these inaccuracies and erroneous assumptions would reduce the estimate of transportation savings, and potentially eliminate it altogether or reverse it. For example:

- The 2002 report states "it is clear that truck costs are significantly overstated by the current analysis." (p. I3-86) This error in the analysis causes the 2002 report and, hence, the *FEIS,* to overstate the transportation-cost savings that would result from maintaining the navigation channel to allow commodity shipments by barge rather than by truck. The error also overstates the transportation-cost savings from shipping commodities by truck-barge rather than by truck-rail if the latter entails a longer truck haul. The Corps considered the error sufficiently important that it warned, if further study is undertaken "this is an issue that would need to be addressed." (p. I3-86) There is no obvious reason why this warning does not apply to the PSMP, since the same error is embodied in the transportation savings, $8.45 per ton, used in the *FEIS*. The *FEIS* offers no evidence that the Corps heeded its own warning and corrected for the overstatement as it determined that potential transportation savings warrant continued maintenance of the navigation channel.
- The 2002 report also overstates rail costs and, hence, the transportation savings from shifting cargo from rail to barge. It does so via erroneous assumptions about the availability of facilities where grain can be loaded onto unit trains. In its discussion of it findings, the Corps revealed, "The actual number of elevator facilities with unit-train loading capability is significantly greater than the number of facilities included in the model" it used to estimate rail costs. (p. I3-101) The data in Table 3.3-12 of the report shows the Corps assumed there were eight sites on the Burlington Northern Santa Fe system in Washington with adequate facilities to support efficient loading of grain onto trains, and none in Idaho. In reality, there were 39 such facilities in Washington and 4 in northern Idaho. Additional facilities have been built since then. In 2011 and 2012, for example, EGT, LLC built three facilities in Montana with the ability to load grain on unit trains and a facility in Longview, Washington with the ability to transfer the grain from rail to ocean vessel.[16] Also in 2012, the Port of Vancouver completed investments in infrastructure rail facilities capable of accommodating unit trains carrying grain for export, and it has plans for another, similar investment.[17] These facilities enable grain shipments by rail to bypass the Columbia-Snake River inland navigation system entirely, at lower cost. By ignoring the omitted facilities, the Corps' assumed that some grain would have to be trucked further to reach a rail transfer site than is actually the case, and, therefore, its analysis necessarily overstates the costs of shipping grain in the absence of barge traffic. The *FEIS,* however, makes no mention of this error in the 2002 report, of the extent to which it causes the estimate of transportation savings, $8.45 per ton, to overstate the actual savings, or of the likelihood that transportation savings would result not from shifting cargo from rail to barge but from the reverse.

[16] Mull, M. 2011. "EGT To Build Three High-Capacity Shuttle Train Loader Grain Elevators." *The Prairie Star*. September 7.

[17] Port of Vancouver USA. 2014. "WVFA Project 9–Grain Track Unit Train Improvements Phase A." *Projects: Corridor.* www.portvanusa.com/wvfa/projects/part-3/.

- The overstatement of truck and rail costs caused the 2002 report to use erroneous assumptions to describe the amount of grain and other cargo that would shift to rail or truck in the absence of barge traffic, and to estimate the impact on shipping costs. In particular, in preparing the 2002 report, the Corps assumed that cessation of barge traffic would necessarily cause shippers' costs to increase, but its analysis often showed this was not the case.[18] (p. I3-90) Hence, the Corps' model was pointing in the wrong direction: showing transportation costs going up with the cessation of barge traffic when, in reality, the costs go down. Nonetheless, the Corps continued to apply its assumption as it modeled the effects of a cessation in barge traffic and made after-the-fact adjustments to its modeling results. The Independent Economic Analysis Board and others opposed this approach, but the Corps swept their objections aside, arguing it had insufficient time to determine why reality did not match its assumption. (p. I3-90) Recognizing the failure of its modeling to describe reality accurately, however, the Corps warned against relying on its cost estimates in the future, saying, "review of this issue and possible revision of the transportation model should be undertaken." (p. I3-90) The *FEIS* contains no discussion of this warning, however. Nor does it show that the Corps made any effort to investigate the errors in the 2002 report that cause it to overstate the transportation savings as cargo is shifted from rail to barge.
- The 2002 report further overstated the transportation savings from transferring grain from rail to barge by assuming that the rail system would require major improvements to handle more grain and these improvements would be undertaken only if the barge system were eliminated. It assumed improvement costs of \$14–24 million for the mainline railroad, \$20–24 million for short-line railroads, and \$14–37 million for additional rail cars. (I3-105–107) It also assumed costs of \$14.0–16.9 million to upgrade elevator facilities with rail access. In the aggregate, the Corps assumed that, in the absence of the barge system, so many improvements to the rail and highway systems would have to occur that the cost would exceed the market's willingness to pay for the services they would provide. (p. I3-111) In reality, however, many of these improvements have already taken place in the years since 2002, even as grain producers had the option of shipping by barge. These improvements include, for example, the development of a unit-train/shuttle loading facility at Ritzville in 2002, and the McCoy Unit Train Grain Terminal near Rosalia, Washington, in 2014. Construction of the McCoy facility, alone, cost an estimated \$17 million.[19] Though aware of these and related investments, the Corps did not account for their impact on the difference in costs between shipping by barge and shipping by rail or truck. Moreover, it did not account for the likelihood that investors will make additional improvements to the rail and truck systems, regardless of what happens with the navigation channel.

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[18] "A fundamental assumption made for this analysis is that the existing transportation of grain represents the least-cost condition. Therefore, it was assumed that the cost of all movements of grain with dam breaching should be at least as costly as under the base condition. Actual operation of the model, however, showed that this was not the case. The model results showed that a number of grain movements were found to be less costly with dam breaching than with the existing transportation system." (p. I3-90)

[19] Lind, T. 2013. "\$17 Million Grain Elevator Complex Gears Up South of Spokane." (Spokane) *Journal of Business*. October 10. www.spokanejournal.com/local-news/17-million-grain-elevator-complex-gears-up-south-of-spokane/.

In sum, the Corps' description of the relationship between the navigation channel and the transportation of commodities stems from irrelevant, inaccurate, and unreliable information. The basis for this description comes from its 2002 report, which includes out-of-date forecasts of grain shipments and rail/truck investments that are no more than guesswork. The Corps at the time admitted that the 2002 report embodied biased use of existing data (excluding data showing shipments were declining), inaccurate data (failing to count all the rail facilities for shipping grain), inaccurate assumptions (believing that transportation costs must go up with the transfer grain from barge to rail or truck when experience shows them going down), and unreliable modeling (failing to describe a location-specific forecast of grain shipments that would transfer from rail or truck to barge with channel maintenance). These errors, individually
20341 and collectively, make the economic information in the *FEIS* an unreliable, inappropriate basis for its determination that continued maintenance of the channel is warranted. The *FEIS* asserts that continued maintenance would yield transportation savings, when correcting the errors likely would show the reverse. Thus, the *FEIS* represents a disconnect between the Corps' assertions and economic reality.

Requirement #3: Use all the available information that is relevant, accurate, and reliable.

As the Corps prepared the *FEIS*, it possessed but disregarded large amounts of relevant, accurate, and reliable information about the alternatives' socioeconomic effects. Had it used this
20342 information, it likely would not have determined that continued maintenance of the channel is warranted.

The *FEIS*, itself, for example, reports the Corps, on average, will have to dredge about 0.7 million cubic yards (mcy) per year of sediment from Lower Granite pool each year. (*FEIS*, p. F-20) Elsewhere, the Corps has revealed it incurs dredging costs of about $13 per ton.[20] Multiplying these numbers indicates that the agency will, on average, incur dredging costs of about $9 million per year in Lower Granite pool alone. This number, though, contrasts with the cost estimate, $1–5 million, for channel maintenance along the entire lower Snake River. Nor does it include the costs of channel-maintenance actions other than dredging. In other words, the Corps' own numbers demonstrate that it will incur dredging costs 80–900 percent higher than the estimate it used in the *FEIS* to determine that channel maintenance is warranted.

Other information available to, but disregarded by, the Corps reinforces the conclusion that its channel-maintenance costs will far exceed $1-5 million under the Preferred Alternative. Particularly important is the Corps' disregard for the major infrastructure costs and impact-mitigation costs it will have to incur to maintain the channel under the Preferred Alternative. The Corps should have directly and fully discussed infrastructure costs likely to materialize as the Corps faces the challenge of refurbishing, replacing, and maintaining the locks, which are nearing the end of their expected life. The Corps already has incurred substantial costs associated with the Ice Harbor downstream lift gate in 1996, the Lower Granite pivot bearings in 2002, the Little Goose lock in 2007, the locks at Lower Monumental Dam in 2010-2011, and the Little Goose lock in 2014.

The risk of lock failure and major repair costs occurs in the context of an increasing risk of major infrastructure failures throughout the Corps' water-management projects. The National

[20] Barker, E. 2005. "Dredging to begin next week," *Lewiston Morning Tribune*. 12 December. Retrieved 13 March 2013 from http://lmtribune.com/northwest/article_0b952047-4a7e-5808-b30f-f1fd39e15296.html.

Research Council, at the Corps' request, recently highlighted this risk and, regarding the inland navigation system, noted, "The status quo…will entail continued deterioration of the system and eventual, significant disruptions in service. It also implies that the system will be modified by deterioration, rather than by plan."[21] The prospect of major failures makes it imperative that that the Corps (1) explicitly address the risk in the FEIS and incorporate the related costs into the socioeconomic analysis of the alternatives that call for continued channel maintenance and, (2) recognize the increasing likelihood that the Corps will not receive adequate funding to
20343 sustain a functioning navigation channel. The *FEIS* does not demonstrate that the Corps fully accounted for these infrastructure costs as it selected the Preferred Alternative. It must demonstrate that it has corrected this error before the public can have confidence that its evaluation and election of the Preferred Alternative's socioeconomic impacts is reasonable.

As it considered alternatives that would continue the operation of the four dams, the Corps also should have directly and fully discussed major costs associated with its obligations to compensate for the dams' harm to threatened and endangered species. In 2012, for example, the Corps spent $50.7 million for construction of fish-bypass systems to mitigate the impacts of
20344 McNary Dam and the four dams on the lower Snake River. Some portion of these costs, and the costs of maintaining the fish-bypass systems, is attributable to the navigation system. The Corps recently estimated that these costs approach $1 billion.[22] The *FEIS*, however, does not demonstrate that the Corps fully accounted for these costs as it examined the Preferred Alternative. It must demonstrate that it has corrected this error before the public can have confidence that it has satisfied the requirements for a reasonable evaluation of the evaluation of the Preferred Alternative's socioeconomic impacts.

The Corps also disregarded readily available information showing that the transportation savings from channel maintenance would be lower than those reported in the *FEIS*, and likely would disappear altogether. A study completed in 2003, for example, found that, if the navigation system on the lower Snake River were closed, grain shippers would, on average, incur additional costs of about $1–2 million per million tons of grain, or about $1.5–3 million in
20345 2014 dollars.[23] In recent years, the Port of Lewiston has shipped about 500,000 tons of grain per year.[24] These numbers, combined, indicate that, if the tonnage remains at this level, grain shippers would incur additional costs of $0.75–1.5 million per year, if they were unable to ship by barge. In other words, shippers' transportation savings from maintaining the channel through the Lower Granite pool would equal only $0.75–1.5 million per year. This saving falls far short of the estimated cost, $9 million per year, of dredging 0.7 million cubic yards of material per year.[25] The total savings for the entire lower Snake River would be about six times this range, or $4.5–9 million per year, insofar as the *FEIS* shows the tonnage shipped annually through the lower Snake River totals about 3 million tons. (*FEIS*, Table 3-14) The bottom of this

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[21] National Research Council. 2013. *Corps of Engineers Water Resources Infrastructure: Deterioration, Investment, or Disinvestment?"*

[22] *Report of the Secretary of the Army on Civil Works Activities for Fiscal Year 2010*, Walla Walla U.S. Army Corps of Engineers, Walla Walla District. p. 30-7.

[23] The change in price assumes a 3 percent escalation per year, which appears to be what the Corps used, although the *FEIS* does not provide sufficient information to discern how it adjusted past dollar estimates to their equivalent current value.

[24] Port of Lewiston. 2013. "Shipping Reports." Retrieved 11 February 2013 from http://www.portoflewiston.com/wordpress/?page_id=69.

[25] See comments regarding Requirement #1, above.

range of benefits is smaller than the top of the range of channel-maintenance costs, $1–5 million, the Corps estimates in the *FEIS.* The top of this range does not exceed the estimate—derived from the Corps' own numbers—of the expected average annual costs, $9 million, of dredging 0.7 million cubic yards of material in Lower Granite pool, let alone the costs of other channel segments. In short, the costs of maintaining the channel exceed the benefits. Information presented below indicates that the gap between the channel-maintenance costs and the benefits to shippers probably will be even greater, because the amount shipped by barge likely will fall and channel-maintenance costs likely will rise.

Market data support the conclusion that maintaining the navigation channel through the Lower Granite Pool is especially inefficient, with the costs to shippers outweighing their benefits. Table 3-14 of the *FEIS* shows that tonnage through the Lower Granite locks fell from 2.3 million tons in 1994 to 1.5 million tons in 2012. Most of this decline occurred prior to the onset of the Great Recession and, hence, reflects structural trends, with shippers realizing that other modes are less costly, rather than cyclical variations. The overall decline during this period, 35 percent, was considerably greater than the declines at the dams down river: Little Goose (27 percent), Lower Monumental (25 percent), and Ice Harbor (26 percent). If shipments continue to decline, then the total transportation savings from channel maintenance would decline proportionately, increasing the likelihood that they will fall below channel-maintenance costs, or, when they have done so, widening the gap by which costs exceed benefits.

The reductions in shipments by barge have occurred in the context of the barge industry's ability to manipulate prices to retain customers. The 2002 report contains evidence that, although it incurred costs of $3.07 per ton to provide transportation services, it charged customers $6.07 per ton. (p. I3-85) This difference constitutes an excess profit realized by the industry, resulting from its ability to escape having to pay the full costs of the services, such as channel maintenance, it receives from the Corps. These numbers indicate the industry can reduce prices by up to $3.00 per ton, in response to competition from the rail and truck systems, and still retain some excess profit. Yet shippers have switched away from barge to rail and truck, indicating that the benefit they derive from doing so exceeds the barge industry's pricing incentives.

20346 The *FEIS* presents no information to substantiate an expectation that the downward trend of shippers preferring to ship cargo by barge rather than by rail or truck will not continue. Instead, the Corps argues that trends are not its concern as it prepares to spend money on maintaining the channel, and disregards the likelihood that the costs of channel maintenance will exceed the barge-related benefits. If tonnage continues to decline in the future, potential benefits from maintaining the navigation channel, all else equal, will decline as well. Further reductions in shipments through the Lower Granite locks seem especially likely. Many shippers have good substitutes for barge transportation, and, at the margin, the incremental costs of shifting to rail or truck transport are small, or even negative. The *FEIS,* itself, already acknowledges that, when a drawdown would close the channel and block barge traffic, cargo could be shipped by rail or truck and "temporarily increase costs to those who usually use the river system for the transportation of commodities, *but the increases should be small.*" (*FEIS,* p. 4-40, italics emphasis added)

The Corps also has had access to, but disregarded, information about the competition to the barge industry along the Lower Snake River. In 2003, BST Associates found that shipping grain by rail or truck was cheaper for many grain producers on a long-term basis, as more than one-third of the grain produced in the counties tributary to Lower Granite pool is transported to market by rail or truck.[26] A 2006 study described a major shift in competition to barge traffic occurred in 2002, with the completion of a unit-train/shuttle loading facility at Ritzville, concluding that "The facility at Ritzville immediately began to compete for grain volume that previously was shipped…to the river."[27] The authors observed further that, although truck-barge and rail shipping rates for grain north of Ritzville were comparable prior to the facility's completion, truck-barge rates subsequently grew almost 10 cents higher. The percentage of grain shipped from this area via truck-barge fell from 94 percent in 2001 to 65 percent in 2005, as the amount shipped by rail via Ritzville rose from about 3 percent to 30 percent. In their market analysis for further investments in the rail system, the authors offered this explanation for why grain producers and others are investing in rail-system upgrades:

> "The principal and critical constraint on the barge system is a need for continued dredging at the entrances to some terminals and in some parts of the navigation channel. The U.S. Army Corps of Engineers has a plan to provide the required dredging, costing about $2.1 to $4.9 million per year over a 70+ year period, and this plan was partially implemented this winter, due to a compromise between the Army Corps of Engineers and the Tribes/environmental interests. Without dredging, the barges had, in some cases, been loaded light (as much as 35% light), decreasing efficiency and increasing per unit costs to shippers. Shippers and ports had stepped in and contracted for private dredging until this compromise was reached. The future status of this effort remains uncertain.
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> "…The uncertainty surrounding both the halt in annual dredging and the renewed possibility (though extremely low) of breaching of some dams has a direct effect on the CW line. First, the competitive position of the short line railroad is greatly enhanced if either of these actions continues. Secondly, in the extreme case, the need for service from the line is greatly increased since loss of dredging or implementation of a river draw down will both necessitate hauling grains and products to the Tri-City area, if barge is to be accessed and efficiently used in the future. If barge is no longer competitive, then rail movement the full distance to the port becomes necessary…." (pp. 31-32)

The Corps also has had access to, but disregarded information about the competitive effects of the new McCoy unit train facility and related investments in the rail system. These investments can have a substantial effect on competition for grain shipments, as the surrounding region produces almost one-third of Washington's exported wheat. The loading facility offers transportation savings and other benefits even without improvements to the rail line serving it. With the improvements, the benefits would increase, as illustrated by a benefit-cost analysis that found the project would yield these benefits, discounted at 3 percent per year over a 20-year period:[28, 29]

- Net transportation savings of $72.3 million

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[26] BST Associates. 2003. *Lower Snake River Transportation Study Final Report*. June. p. 42.

[27] Casavant, K. and E. Jessup. 2006. Palouse River and Coulee City Railroad: CW Line Market Assessment. Washington State Department of Transportation Office of Freight Strategy and Policy. March. Retrieved 12 March 2013 from http://www.wsdot.wa.gov/NR/rdonlyres/9847F8D2-33B4-4B34-83D8-B34F0ACC70DC/0/PCCMarketAnalysis_Revised_March3.pdf.

[28] Port of Whitman. 2012. *P&L Shortline Railroad Bridge Replacement and Shuttle Loader: TIGER Discretionary Grant*. Retrieved 12 March 2013 from http://www.portwhitman.com/Narrative%20Final.pdf.

[29] Washington State Department of Transportation, S. Peterson, and J. Tee. 2012. *Benefit-Cost Analysis Summary*. Retrieved 11 February 2013 from http://www.portwhitman.com/Benefit-Cost%20Analysis.pdf.

- Net road damage savings of $13.8 million
- Net safety savings of $7.5 million
- Net reduction in CO2 emissions of $519 thousand
- Total net benefits of $67.4 million

Additional information on the competition between barge and rail, was available to, but disregarded by, the Corps. Notable is information from the Port of Whitman County, which supports facilities for both rail and water transportation, that contains this summary assessment of the economic benefits of diverting grain from barge to rail:[30]

> "With the construction of the [McCoy] Shuttle Loader Facility, the projected number of truck trips to the rail loading facility increases as a result of additional bushels being hauled to the shuttle loading facility from farm storage and other commercial grain storage and handling facilities, rather than being hauled to the river for barge transport. This reduces the truck-to-barge mileage. A projected 6,500,000 bushels of wheat will be loaded and shipped directly from storage facilities along the P&L shortline to the private sector loading facility. Another 9,868,000 bushels will be trucked to the loading facility from an average distance of 50 miles round trip. Without the project, all 16,368,000 bushels will be trucked an average of 150 miles round trip to the port at Central Ferry. This project reduces annual truck miles by 2,295,199 and saves 217,431 gallons of fuel, resulting in a net CO2 reduction of 1,259 Mtons." (p. 17)

Information about competition has been available not just about the rail system in Washington. Barge terminals in Lower Goose pool also compete with those in the Lower Granite pool. The former capture about 50 percent of the grain shipped from Whitman County, 75 percent of the grain shipped from Garfield County, and 15 percent of grain from Idaho's Latah County, while the latter capture about 15, 25, and 35 percent, respectively.[31]

In addition, an increasing portion of grain is being transported in larger trucks and, if this trend continues, it likely would make truck transport even more competitive.[32] A shift away from barge transport originating in Lewiston also would have associated benefits for some parts of the road system. The 2003 study observes:

> "The road systems in Idaho, Montana, and North Dakota should also benefit, as the long- distance truck moves to Lewiston are eliminated in favor of rail transport to export elevators. The wear and damage to roadways caused by loaded trucks will be substantially reduced for these states. In contrast, the highway maintenance costs in Washington would increase slightly." (p. 69)

> "Idaho accounts for 49.2% of the grain flowing into the Lower Granite Pool, with most of the grain originating in the area around Lewiston and Southwest Idaho. Washington accounts for 27.0%, with most of the grain originating in Whitman County. The remaining grain originates in Montana (14.2%), North Dakota (6.9%), Oregon (2.5%) and Utah (0.3%)." (p. 44)

To summarize, information readily available to the Corps shows that continued channel maintenance likely would not yield any transportation savings whatsoever. Instead, it would increase transportation costs, by subsidizing an inefficient barge system. Market participants have been demonstrating this reality, analyzing the competitive environment, increasing their rail/truck investments, and reducing their barge shipments. The *FEIS* is divorced from this

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[30] Port of Whitman. 2012. *P&L Shortline Railroad Bridge Replacement and Shuttle Loader: TIGER Discretionary Grant*. Retrieved 12 March 2013 from http://www.portwhitman.com/Narrative%20Final.pdf.
[31] BST Associates. 2003. p. 43.
[32] BST Associates. 2003. p. 11.

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reality and presents none of this information. By not expressing, studying, and analyzing this information, the *FEIS* fails to examine a critically important aspect of the PSMP's socioeconomic consequences.

Requirement #4: Demonstrate that the Preferred Alternative will accomplish the federal objective, by producing an increase in the net value of the national output of goods and services, marketed and not marketed.

The *FEIS* does not satisfy this requirement. The body of the *FEIS* does not even mention the national economic development account (NED) that the Principles & Guidelines specifies the
20348 Corps should use to account for each alternative's effects on the net value of the national output of goods and services. Instead, it discusses the value of only one type of service, by asserting, in a single paragraph and with no analysis, that continued channel maintenance will yield transportation savings. The preceding comments demonstrate the Corps' past failure, in the 2002 report, to accurately assess all the implications for the federal objective of maintaining the four dams and the navigation channel. Its errors include a reliance on incomplete data, biased use of available data, and unreliable modeling regarding channel-maintenance costs, trends in cargo shipments, and the relative immediate costs of barge vs. rail and truck shipments. Moreover, in the 2002 report, the Corps failed to account for infrastructure costs to maintain, refurbish, and replace the locks at the four dams and the costs of compensating for the harm to fish from continued operation of the locks. In the *FEIS*, the Corps maintains the charade regarding the implications for the federal objective of its actions, both those since 2002 and those projected for the Preferred Alternative.

2. Specific Requirements of the *Planning Guidance Notebook*

In "Chapter 1: Introduction," the *Planning Guidance Notebook* states, "This engineer regulation provides the *requirements* for conducting planning studies within the U. S. Army Corps of Engineers Civil Works program."[33] (p. 1-4, italics emphasis added) It then describes several
20349 specific requirements. The *FEIS*, however fails to demonstrate that it conducted a study satisfying these requirements, with respect to socioeconomic issues, as it prepared the proposed plan for managing sediment.

The *Planning Guidance Notebook* describes the several requirements by outlining the process the Corps must follow to develop a plan. In "Chapter 2: Planning Principles," the document offers this summary of the agency's planning process:

> "The Planning Process. The Corps planning process follows the six-step process defined in the P&G. This process is a structured approach to problem solving which provides a rational framework for sound decision making. The six-step process *shall be used* for all planning studies conducted by the Corps of Engineers. (italics emphasis added) The process is also applicable for many other types of studies and its wide use is encouraged. The six steps are:
>
> Step 1 - Identifying problems and opportunities
>
> Step 2 - Inventorying and forecasting conditions

[33] The Corps' planning process "is essentially the same as the National Environmental Policy Act (NEPA) process and similar approaches." Orth, K.D., and C.E. Yoe. 1997. *Planning Primer.* Institute for Water Resources, Water Resources Support Center. November. p. 2.

Step 3 - Formulating alternative plans
Step 4 - Evaluating alternative plans
Step 5 - Comparing alternative plans
Step 6 - Selecting a plan" (p. 2-2)

Requirement #5: Identify the socioeconomic problems the PSMP will solve, the opportunities for doing so, and its specific socioeconomic objectives; and describe its expected ability to achieve them.

In its discussion of Step 1, the *Planning Guidance Notebook* emphasizes the importance of defining the problems and opportunities that a planning document, such as the PSMP and the *FEIS*, must address, and the objectives of the study that must be completed to determine the best ways to do so. Accordingly, it states these requirements:

> "The planning objectives must be directly related to the problems and opportunities identified for the study and will be used for the formulation and evaluation of plans. *Objectives must be clearly defined and provide information on the effect desired (quantified, if possible), the subject of the objective (what will be changed by accomplishing the objective), the location where the expected result will occur, the timing of the effect (when would the effect occur) and the duration of the effect."* (p. 2-1, italics emphasis added)

The *FEIS* fails to satisfy this requirement in its assessment of the socioeconomic effects of the PSMP. Most notably, it fails to do so in its assessment of the effects on transportation. On p. 3-55, the *FEIS* introduces and concludes its discussion of this issue by asserting, in a single paragraph, that continued maintenance of the channel is warranted from a navigation perspective because it would yield transportation savings by allowing shipment of cargo by barge rather than by rail or truck. Nowhere does the *FEIS* satisfy the requirement to clearly define and provide information on the effect desired (quantified if possible) associated with transportation savings.[34] Nowhere does it clearly define and provide information on the subject of any objective to transportation savings. Nowhere does it clearly define and provide information on the location where the expected transportation savings would occur, the timing of the transportation savings (when the savings would occur), and the duration of the savings. Indeed, at no place other than the paragraph on p. 3-55 does the *FEIS* use the term, transportation savings, or even the word, savings.

The *FEIS* makes even less of an effort to define objectives for other socioeconomic effects of the PSMP, related to recreation, fish and wildlife, or other indicators of economic effects identified in the 2002 report. Having defined no objectives, the *FEIS* does not specify the location, timing, and duration of the expected effects of the different alternatives. Nor does it demonstrate why the Corps prefers the selected alternative with respect to these (missing) objectives.

The failure of the Corps to specify its socioeconomic objectives, assess the ability of the different objectives to achieve them, and communicate its findings makes it impossible to know, from reading the *FEIS,* what the PSMP's socioeconomic objective(s) is(are) and how the Preferred Alternative will accomplish it(them). Thus, the *FEIS* fails to provide both the appropriate analysis and sufficient information to enable third-party analysis

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[34] That is, it does not define transportation savings, explain why they are relevant to decision-making, establish criteria for comparing alternatives, develop data and other information regarding the desired effect relevant to the criteria for each alternative, and apply the criteria.

Requirement #6: Provide a forecast relevant to the socioeconomic problems and opportunities the PSMP is addressing.

Plans, by definition, look to the future and provide a detailed proposal for doing something or achieving some objective. To develop the plan and evaluate its reasonableness, the planner must have a forecast of the future without the plan and anticipate how implementation of the plan would alter the future.

The Corps' *Planning Guidance Notebook* reflects this reasoning. In its discussion of Step 2 of the Corps' planning process, it makes clear that a planning document intended to address future problems and opportunities must include a forecast of relevant environmental and socio-economic resources:

> "The second step of the planning process is to develop an inventory *and forecast* of critical resources (physical, demographic, economic, social, etc.) relevant to the problems and opportunities under consideration in the planning area. … *Gathering information about potential future conditions requires forecasts, which should be made for selected years over the period of analysis to indicate how changes in economic and other conditions are likely to have an impact on problems and opportunities.*" (p. 2-3, italics emphasis added)

In its discussion of Step 4, the *Planning Guidance Notebook* offers this guidance for completing the forecasting exercise:

> "Evaluation consists of four general tasks. The first task is to forecast the most likely with-project condition expected under each alternative plan. … *The second task is to compare each with-project condition to the without-project condition and document the differences between the two. The third task is to characterize the beneficial and adverse effects by magnitude, location, timing and duration.*" (p. 2-6, italics emphasis added)

The *FEIS* satisfies none of these requirements. Nowhere does it present a forecast of the transportation of goods with or without on-going dredging and other activities to maintain the navigation channel. Nowhere does it present a comparison of the with-project forecast with the without-project forecast to document the differences between the two. As a consequence, the
20350 *FEIS* contains no information a reader can use to judge the reasonableness of its claims that continued maintenance of the navigation channel would yield transportation savings of $8.45 per ton, future shipments would be about 3 million tons per year, and the total transportation savings would be about $25 million. The *FEIS,* instead, cites the 2002 report, but provides no assessment of its relevance or accuracy. The discussion above demonstrates, however, that it is neither relevant nor accurate. Without a relevant and accurate forecast of shipments with and without channel maintenance that substantiates these claims, they are nothing more than arbitrary speculations. The arbitrary and speculative nature of its claims applies both to the immediate project that would initiate dredging perhaps as soon as December 2014, and to the long-term expectations of the PSMP.

The Corps exacerbates the arbitrary and speculative nature of its assessment of transportation savings with this statement: "Total tonnage on the lower Snake River is currently estimated at about 3 million tons with the majority being grain." (*FEIS,* p. 3-55) The Corps multiplies the 3 million tons times "increased cost to transport grain…about $8.45 per ton" to arrive at "annual transportation savings of approximately $25M can be expected if the navigation system is maintained."

20351 The *FEIS*, however, contains no evidence that future shipments will remain at this level if the navigation system is maintained. Instead, Table 3-14 shows total tonnage passing through the Ice Harbor lock declined from 4.3 million tons in 1994 to 3.2 million tons in 2012. The *FEIS* offers no analysis of the downward trend and no explanation for not assuming that the downward trend will continue and future tonnage will be smaller than 3 million tons.

To the contrary, it ignores evidence that recent improvements to the rail system will increasingly enable it to draw grain away from barges. In particular, the FEIS acknowledges that the new McCoy Unit Train Grain Terminal near Rosalia, Washington, will "provide the capacity to handle about 300,000 bushels of wheat per day (which equates to about 9,000 short tons)." (p. 3-84) If operated at full capacity for about three months, this facility's shipments would equal the total grain shipments originating in the Lower Granite pool in 2009. Nonetheless, the FEIS concludes—without explanation—that this facility "would be unlikely to shift transport of grain substantially away from barge."[35] (*FEIS,* p. 3-84) Absent a detailed, location-specific forecast of grain shipments with and without channel maintenance, this statement is no more than arbitrary speculation. Together, these two statements suggest the Corps lacks a fundamental understanding of the competitive nature of the grain-transportation market. Unless the grain shipped through the McCoy facility comes entirely from an expansion in grain production, it will draw shipments away from other terminals, including those that serve barge traffic. Analysis by the Port of Whitman confirms the competitive advantages of the McCoy facility relative to barge shipments.[36]

The failure to develop relevant and accurate socioeconomic forecasts and use them to support a with-vs.-without analysis pervades the socioeconomic elements of the *FEIS*. For example, in its description of the effects of Alternative 7, it states, "Alternative 7 would have no long-term direct effects to population, employment, and income." (*FEIS,* p. 4-40) Nowhere, however, does it provide any numbers regarding what the future levels of population, employment, and income would be, with and without Alternative 7 or any other alternative. This failure to provide a numerical forecast of the future allows the Corps to substitute broad, unsubstantiated, and contradictory statements for disciplined, quantitative analysis. For example, in quick succession, the *FEIS* states that dredging would have a beneficial effect on the barge industry and those associated with it:

- "Alternative 5 would have a long-term *beneficial impact* on river navigation by providing adequate depths in the navigation channels and access channels to ports, moorages, and public recreation areas." (*FEIS,* p. 4-39, italics emphasis added)
- "Under Alternative 5…dredging to re-establish the congressionally authorized federal navigation channel dimensions… would enable commercial navigators to once again operate tugs and barges at full capacity. These factors would result in a positive economic effect on the navigation and related industries in the region." (*FEIS,* p. 4-39, italics emphasis added) *Under Alternative 7, the socioeconomic effects of dredging* to re-establish the federal navigation channel and of related Port berthing-area maintenance *would be the same* as effects described above under current immediate need action for Alternative 5." (*FEIS,* p. 4-41, italics emphasis added)

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35 These statements come from the FEIS' discussion of cumulative effects.

36 Port of Whitman. 2012. *P&L Shortline Railroad Bridge Replacement and Shuttle Loader: TIGER Discretionary Grant*. Retrieved 12 March 2013 from http://www.portwhitman.com/Narrative%20Final.pdf.

At the same time, though, it does not recognize the symmetry that would come into play if shipments shifted not from rail or truck to barge but from barge to rail or truck. That is, it fails to acknowledge that, while shifting cargo shipments away from the barge industry's competitors would be a good thing for that industry and its shippers, it would be a bad thing for those in and associated with the rail and trucking industries. Instead, it first says that, with channel maintenance, "*no adverse effects would result* to transportation and related sectors." (*FEIS,* p. 4-38, italics emphasis added) In other words, losing business to the barge industry would have no adverse effects on the rail and trucking industries. Then it says that reverse circumstances, i.e., shifting shipments from barge to rail or truck would be bad for the rail and trucking industries: "[With reservoir] drawdown to flush sediments from Lower Granite Reservoir… [s]ome shipments would likely shift to other modes (rail, truck), which could adversely affect the capacity of the rail or highway system." (*FEIS,* p. 4-40) In reality, commodities would shift to the rail and highway systems only if they have unemployed capacity, and the shift would increase the efficiency of these systems by employing the capacity more fully, i.e., yield economic benefits.

In other words, the *FEIS* concludes that increased business for the barge industry would have good socioeconomic effects but increased business for the rail and trucking industries would have bad socioeconomic effects. This conclusion is not the result of careful forecasting and detailed analysis. Rather, it reflects either a poor understanding of the competitive characteristics of the transportation market or an arbitrary disregard for these characteristics. Either way, the *FEIS* yields a biased portrait of the benefits and costs that would accompany the transfer of cargo to barges if the channel were maintained. This bias favors continued channel maintenance and the barge industry and disfavors the rail and trucking industries. If, as the available information suggests, the bias is so extreme that channel maintenance would increase transportation costs rather than create transportation savings, then adoption of the Preferred Alternative also would diminish the nation's economic resources.

B. The *FEIS* Fails To Demonstrate Sound Economic Decision-Making, As Evidenced by Its Failure to Satisfy Requirements Established by the National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) sets the stage for defining the analytical standards the Corps must meet in developing an environmental impact statement (EIS) for the PSMP. It states that federal agencies "to the fullest extent possible" must provide a detailed EIS (42 U.S.C. 4332). In applying this standard, courts have held that, at a minimum, NEPA imposes on an agency a duty to take a "hard look at environmental consequences" (Natural Resources Defense Council v. Morton, 458 F.2d 827, 838 (D.C. Cir., 1972)) and a "requirement of a substantial, good faith effort at studying, analyzing, and expressing the environmental issues in the EIS and the decisionmaking process" (Natural Resources Defense Council v. Morton, 458 F.2d 827, 838 (D.C. Cir., 1972)). A sufficient EIS must provide good faith analysis and sufficient information to allow a firm basis for weighing the risks and benefits of a proposed action (County of Suffolk v. Secretary of the Interior, 562 F.2d 1368 (2nd Cir. 1977), cert. denied, 434 U.S. 1064 (1978)).

Requirement #7: Provide a detailed EIS to the fullest extent possible and take a hard look at the socioeconomic consequences.

20352 The preceding paragraphs demonstrate that the *FEIS* does not describe the socioeconomic effects of the alternatives to the fullest extent possible. Instead, it pays superficial attention to or completely disregards many economic indicators and focuses on only one, transportation services. It mentions potential socioeconomic impacts associated with recreation fish, for example, but provides no analysis. Regarding the transportation-services indicator, the value of transportation services, the *FEIS* provides the most limited information possible, citing the 2002 report for an estimate of the value per ton without assessing the relevance or accuracy of the estimate, making an unsubstantiated assertion that future shipments will be about 3 million tons, and multiplying the two numbers to assert that the annual value will be about $25 million.

Requirement #8: Make a substantial, good faith effort at studying, analyzing, and expressing the socioeconomic issues in the FEIS and the decision-making process.

20353 In its presentation of socioeconomic effects, the *FEIS* includes no mention of any study more recent than the 2002 report. It contains no analysis of the socioeconomic effects of the alternatives. Instead, it merely extracts from the 2002 report an estimate of transportation savings per ton and adjusts it for inflation to current dollars. It limits its numerical discussion of the socioeconomic issues associated with dredging and other sediment-management actions to a one-paragraph discussion of transportation services. It also includes general statements of the Corps' conclusion that maintaining the channel to facilitate the shipment of cargo by barge will have beneficial socioeconomic effects for those in and associated with the barge industry but no adverse effects on those in and associated with the rail and trucking industries that compete with barges. It also includes statements asserting that a decision to maintain the channel and a decision not to do so would have asymmetrical effects: maintenance that would lead to cargo being carried by the barge industry would have a positive economic effect on that industry, but a no-maintenance decision that would lead to cargo being carried by the rail and trucking industries would have negative effects on them.

These characteristics make it impossible for a reader to discern, from the *FEIS,* the socioeconomic effects of each alternative, or even what studies and analyses the Corps conducted to complete the socioeconomics section of the *FEIS.* The *FEIS* does explain that the Corps' assertion that channel maintenance would yield transportation savings was sufficient for the agency to determine that continued maintenance of the navigation channel is warranted. This consideration of a single indicator of economic effects, using irrelevant and inaccurate information from the 2002 report, does not, however, satisfy the requirement for a substantial, good faith effort at studying, analyzing, and expressing the socioeconomic issues in the *FEIS* and the process for selecting the Preferred Alternative.

C. The *FEIS* Fails To Demonstrate Sound Economic Decision-Making, As Evidenced by Its Failure to Satisfy the *Principles and Requirements*

On March 22, 2013, the Council of Environmental Quality issued *Principles and Requirements for Federal Investments in Water Resources (P&R)*, which supersede the Principles & Guidelines. The *Principles and Requirements* went into effect immediately and applies "to a broad range of Federal investments that by purpose, either directly or indirectly, affect water quality or water quantity." (*P&R,* p. 1) The Council also released general guidelines for implementation, which are in draft form until each agency develops a detailed set of guidelines consistent with the general guidelines. The *Guidelines* makes it clear that the *Principles and Requirements* applies to (1) existing as well as potential federal investments, (2) investments having a water resources

purpose or (direct or indirect) effects on water quality or quantity, and (3) investments being made through a project or a program. (Guidelines, p. 23) Regarding a programmatic plan, such as the PSMP, that covers "[k]nown actions similar in nature that can be analyzed under one decision document," the *Guidelines* states that "In a programmatic analysis, the agency characterizes the nature of the proposed actions, their individual and combined effects on water resources, and how those effects perform with respect to the P&R." (*P&R,* p. 21) In other words,
20354 the *FEIS* must show how each of the actions being considered in the Preferred Alternative performs with respect to the several requirements established in the *P&R*.

Requirement #9: Maximize public benefits, with appropriate consideration of costs.

The *P&R* states, "Federal investments in water resources as a whole should strive to maximize public benefits, with appropriate consideration of costs. Public benefits encompass environmental, economic, and social goals, include monetary and non-monetary effects and allow for the consideration of both quantified and unquantified measures." (*P&R,* p. 4). The *FEIS,* however, does not encompass both monetary and non-monetary benefits and costs, or consider both quantified and unquantified measures, and it presents no assessment of the Preferred Alternative's effects on public benefits and costs, relative to the other alternatives. Hence, it is impossible to know, from reading the *FEIS*, if the Preferred Alternative will maximize public benefits, with appropriate consideration given to costs. The preceding comments, however, present a broad set of information—available to but ignored by the Corps—that supports the conclusion that the Preferred Alternative does not satisfy this requirement.

Requirement #10: Design evaluation methods that apply an ecosystem services approach and ensure that investments undertaken under the PSMP will be justified by the public benefits.

The *P&R* states:

> "Evaluation methods should be designed to ensure that potential Federal investments in water resources are justified by public benefits, particularly in comparison to costs associated with those investments. Such methods should apply an ecosystem services approach in order to appropriately capture all effects (economic, environmental and social) associated with a potential Federal water resources investment. By design, such an approach traces the effects of a potential action through the watershed or ecosystem in order to capture its effects and feedbacks and better captures the values that ecosystems or watersheds contribute to our economy and well-being. The ecosystems services approach is a way to organize all the potential effects of an action (economic, environmental and social) within a framework that explicitly recognizes their interconnected nature. The services considered under this approach include those flowing directly from the environment and those provided by human actions. Services and effects of potential interest in water resource evaluations could include, but are not limited to: water quality; nutrient regulation; mitigation of floods and droughts; water supply; aquatic and riparian habitat; maintenance of biodiversity; carbon storage; food and agricultural products; raw materials; transportation; public safety; power generation; recreation; aesthetics; and educational and cultural values. Changes in ecosystem services are measured monetarily and non-monetarily, and include quantified and unquantified effects." (*P&R,* pp. 6-7)

The *FEIS* fails in every way to satisfy this requirement. It does not take an ecosystems-services approach. It does not incorporate evaluation methods that capture, or even recognize, the values that ecosystems or watersheds contribute to our economy and well-being. It does not consider the costs of dredging's effects on many ecosystem services, including, but not limited to: water quality; nutrient regulation; mitigation of floods and droughts; water supply; aquatic and riparian habitat; maintenance of biodiversity; carbon storage; food and agricultural products; raw materials; public safety; power generation; recreation; aesthetics; and educational and cultural values. With the exception of transportation savings, which it measures improperly, the *FEIS* does not measure changes in ecosystem services, either monetarily or non-monetarily.

A particularly important deficiency in the *FEIS* is its failure to evaluate the effects of dredging on the non-use values of fish. Incorporating such values likely would dramatically alter the assessment of the overall benefits and costs of the Preferred Alternative vs. the No Action Alternative. For example, neither the 2002 report nor the *FEIS* bases decision-making on passive use values, which the former defines as "a benefit associated with knowing that a resource exists, even if no use is made of it. These values are typically referred to as passive use, non-use, or existence values." (p. I ES-19) The 2002 report explained that it disregarded these values because "Corps Planning Guidance does not allow passive use values to be included in NED analysis." (p. I ES-19) That is, the agency's planning guidance in effect at that time did not allow incorporating passive use values in the calculation of national economic development benefits consistent with the Principles & Guidelines.

The *Principles and Requirements* abandons this constraint and requires consideration of all the public benefits of each alternative, with consideration of the costs. To satisfy this requirement, the Corps should have looked to the 2002 report, which presented estimates of passive values "as additional information for the decision maker to consider." (p. I ES-19) Of particular importance are these statements: "The average annual passive use value associated with Alternative 4—Dam Breaching, was estimated to range from $22.8 million to $301.5 million per year. The passive use value of a near-natural lower Snake River was estimated at $420 million per year." (p. I ES-19) These amounts represent the additional passive use value under this alternative relative to an alternative that would continue the fish passage facilities and project operations that were in place or under development at the time the Corps initiated its evaluation of the alternatives. In other words, the 2002 report determined that allowing the river to move toward more natural conditions would increase the passive use value relative to operation of the dams and maintenance of the navigation channel, with the passive use values potentially reaching $420 million per year. Conversely, maintaining the navigation channel (and the dams) would prevent the realization of these benefits.

These findings strongly suggest that the No Action Alternative would generate passive use values, insofar as it would see river conditions moving in the direction of natural conditions, and the magnitude of these benefits would move toward $420 million per year (more if this amount were adjusted to current dollars). Conversely, the Preferred Alternative would prevent the realization of these benefits, and the forgone benefits would constitute a cost attributable to this alternative. The magnitude of the potential passive use values is sufficiently large that they, alone, could swamp the benefits, if any, attributable to the Preferred Alternative. The Corps' failure to consider passive use values constitutes an unreasonable, serious inadequacy in the *FEIS'* socioeconomic sections.

Requirement #11: Report fully the basis for selecting the Preferred Alternative for the PSMP.

The *P&R* states:

> "Any recommendation for Federal investments in water resources to address identified water resources needs must be justified by the public benefits when compared to costs. The basis for selection of the recommended plan should be fully reported and documented, including the criteria and considerations used in the selection of the recommended course of action by the Federal government. It is recognized that most of the activities pursued by the Federal government will require an assessment of tradeoffs by decision makers and that in many cases the final decision will require judgment that considers the extent of both monetized and non-monetized effects." (*P&R*, p. 13)

The *FEIS* does not justify selection of Alternative 7 for the PSMP by comparing all of this alternative's benefits against all of its costs. Nor does it assess the socioeconomic tradeoffs associated with the selection of this alternative by comparing it against the other alternatives. For example, it does not trace the negative socioeconomic effects on those in or associated with the rail and trucking industries as it describes the positive effects of channel maintenance on the barge industry. Nor does it trace the negative effects of channel maintenance on future values, jobs, incomes, and population associated with its effects on fish and wildlife.

Requirement #12: Consider both effects that are monetized and effects that are not.

The *P&R* states: "A narrow focus on monetized or monetizable effects is no longer reflective of our national needs, and *from this point forward*, both quantified and unquantified information will form the basis for evaluating and comparing potential Federal investments in water resources to the Federal Objective." (*P&R*, p. 7, italics emphasis added) The *FEIS* contains no attempt to evaluate the nonmonetized of unquantified effects of the Preferred Alternative and determine if they offset the Corps' estimate of the alternatives alleged transportation savings. Hence, the document provides an incomplete assessment of the alternative's public benefits and costs.

Requirement #13: Fully disclose all relevant information to enable the public to understand the rationale for selecting the Preferred Alternative.

The *P&R* states:

> "The rationale supporting Federal investment in water resources at the programmatic or project levels should summarize and explain the decision rationale leading from the identification of need through to the recommendation of a specific action. This should include the steps, basic assumptions, methods and results of analysis, criteria and results of various screenings and selections of alternatives, peer review proceedings and results, and the supporting reasons for other decisions necessary to execute the planning process. The information should enable the public to understand the decision rationale, confirm the supporting analyses and findings, and develop their own fully-informed opinions and/or decisions regarding the validity of the analysis and any associated recommendations. This information should be presented in a decision document or documents, and made available to the public in draft and final forms. The document(s) must demonstrate compliance with the National Environmental Policy Act (NEPA) and other pertinent Federal statutes and authorities." (p. 13)

The comments above demonstrate that the *FEIS* does not provide sufficient socioeconomic information for the public to understand the decision rationale. It omits information about the full costs of going forward with an alternative that will maintain the channel. It offers an estimate of this alternative's transportation savings that relies on the 2002 report even though the Corps, itself, noted that the transportation analysis in the report embodies multiple, serious flaws and warned against using the report's findings without corrective actions. It fails to give details that would allow a reader to examine the data and line of reasoning underlying its estimate of transportation savings and comparison of savings with channel-maintenance costs. Its description of the potential effects of channel maintenance on the competitive transportation industry contradicts itself and treats the barge industry and its competitors asymmetrically. It presents no information regarding the effects of the Preferred Alternative on the supply and value of ecosystem services. It offers no explicit, full comparison of the different alternatives' socioeconomic effects.

D. Conclusions

The assessment of the socioeconomic effects in the *FEIS* is incomplete, biased, arbitrary, and speculative. The *FEIS* lacks a clear statement of socioeconomic objectives and disregards the concept of ecosystem services. It relies on irrelevant and inaccurate information, and it reaches conclusions that lack a foundation and, at times, are nonsensical. It fails to comply with planning, analytical, and communication requirements set by congress and the judiciary, the president, and the Corps itself. Because of these errors, the *FEIS* does not demonstrate that its assessment of the socioeconomic effects of the alternatives provide a reasonable basis for the Corp's decision to prefer Alternative 7 for the PSMP.

To rectify its failure to produce an *FEIS* that satisfies all of the planning, analytical, and communication requirements for a complete, unbiased, and accurate assessment of the socioeconomic effects of managing sediment in the LSRP, the Corps must start over. It must comply with all the regulations of NEPA and the P&R. It must demonstrate that the alternative incorporated into the PSMP will yield public benefits that exceed the costs, accounting for the effects on all ecosystem services, both those measured in monetary terms and those that are not. It must consider passive use values and the full costs of maintaining the four locks in a manner that supports the navigation channel. It must fully describe the steps, basic assumptions, methods and results of analysis, the criteria and results of various screenings and selections of alternatives, peer review proceedings and results, and the supporting reasons for other decisions necessary to execute the planning process. This information should enable the public to understand the decision rationale, confirm the supporting analyses and findings, and develop their own fully-informed opinions and/or decisions regarding the validity of the analysis and any associated recommendations. Instead, the information included in the socioeconomic elements of the *FEIS* is inaccurate and incomplete.

Moreover, correcting the inaccuracies and incorporating the information missing from the *FEIS* would disprove the Corps' conclusion that potential transportation savings from barge traffic warrant a determination that maintaining the channel is warranted. If the *FEIS* satisfied all the requirements listed above, it would show higher costs and lower benefits for maintaining the current system, with the former outweighing the latter. In short, a reasonable socioeconomic assessment would support the conclusion that the current system no longer is economically viable, and the resources the Corps proposes to spend on maintaining the system would be better spent on other things.

ATTACHMENT 2

The Five Most Blatant Myths about Freight Transportation on the Lower Snake River

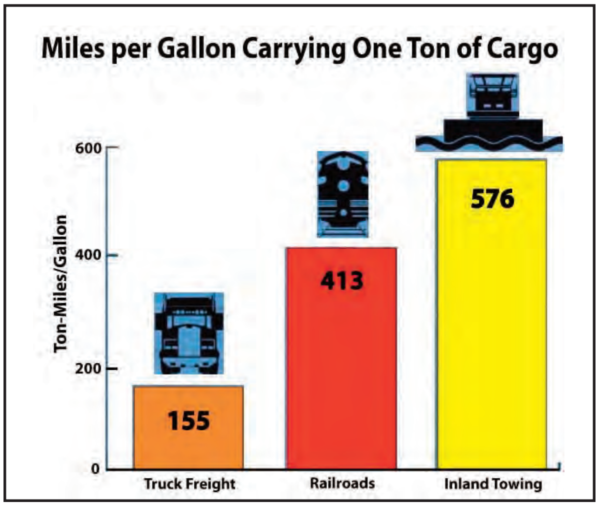
Those who benefit most from government subsidies for commercial navigation on the lower Snake River—the ports, industry associations and their members, and the US Army Corps of Engineers—have plied the public for years with untrue claims that barging is more economical, more fuel efficient, and less polluting than shipping freight by truck or rail. Barging supporters also make exaggerated claims that barging on the lower Snake River preserves highways and plays a critical role in the regional economy. The barging boosters make these claims while ignoring clear evidence to the contrary. In doing so, they are perpetuating myths—otherwise known as *cookin' the books* and *blowin' smoke*—and taxpayers are footing the bill.

The 5 myths:

- **Barge transport is the most fuel-efficient means of transporting cargo.**
- **Barging keeps trucks off our highways saving millions of dollars each year.**
- **Barge transport on the lower Snake is friendly to the environment.**
- **Barging is the cheapest way to move freight.**
- **Barging on the lower Snake is a vital part of the regional economy.**

The factual information on the following 5 pages has been gleaned from a range of research studies and professional literature. A final page summarizes conclusions drawn from this analysis.

This document was prepared by Linwood Laughy, a former educator, author, outfitter and long-time resident of the Clearwater Valley in north-central Idaho. Laughy is a Harvard-educated citizen activist and more recently the co-founder, with his wife Borg Hendrickson, of FightingGoliath.org, an extended network of individuals and organizations that collectively played a significant role in keeping Highway 12 and the Lochsa/Clearwater Wild and Scenic River Corridor from becoming industrialized as a transportation route for giant mining equipment en route to the tar sands of Alberta, Canada.



Northwest barging supporters consider this fuel-efficiency graph industry gospel. It appears on port and association websites, in grant applications, and is continually referenced for print media. Those who use this graph to represent energy savings of barge transport on the lower Snake River are either misinformed or intentionally misleading the public.

Myth 1: Barge transport is the most fuel-efficient means of transporting cargo.

- The ton-miles per gallon (tm/g) information in the above graph is extracted from a study by the Texas Transportation Institute (TTI) done for the National Waterways Foundation, whose officers and trustees are largely part of the barging industry. The graph uses old data from 2001-2005, even though TTI published updated results in a final report.[1] TTI's more complete and more current data set reveals a significant decrease in the perpetually claimed advantage of barge transport over rail.
- Several professional reviewers found the original TTI report and its followup flawed and the results misleading or of limited applicability.[2] For example, the TTI study failed to address circuity; i.e., the more circuitous route rivers often run compared to roads and rail. Typical river circuity is 1.3 times rail or truck. When a correction in the TTI data is made for circuity, the tm/g become 474 for barge and 478 for rail. For a second example, the data in the TTI graph represent national averages. Net tm/g increase significantly as the number of barges in a tow increases. Tows on the Mississippi often range from 15-50 barges, while tows on the lower Snake only 1-4 barges.
- Most of the freight transport in the lower Snake River region is neither barge nor rail, but rather a combination: truck-barge or truck-rail. In a seminal article on freight transport fuel efficiency, Baumel notes that "net-ton-miles/gallon, when used alone, is frequently an *incomplete and misleading measure* for modal fuel efficiency comparisons. It is an accurate measure of comparative fuel efficiency only if the comparative mode shipments are from the same origin to the same destination, the same distance from the origin to the destination, and there are *no intermodal movements* in each shipment."[3]
- Grain is by far the most shipped commodity on the lower Snake, comprising 70% of all freight passing Lower Granite dam in 2011. Using regionally-derived energy coefficients rather than national averages, and BTUs as a measure of energy, Casavant and Ball reported that truck/rail is 24% more fuel efficient than truck/barge when analyzing the transport of wheat in eastern Washington. They concluded that the closure of commercial river navigation on the lower Snake River would save 12.1 billion BTUs of energy use each year.[4]

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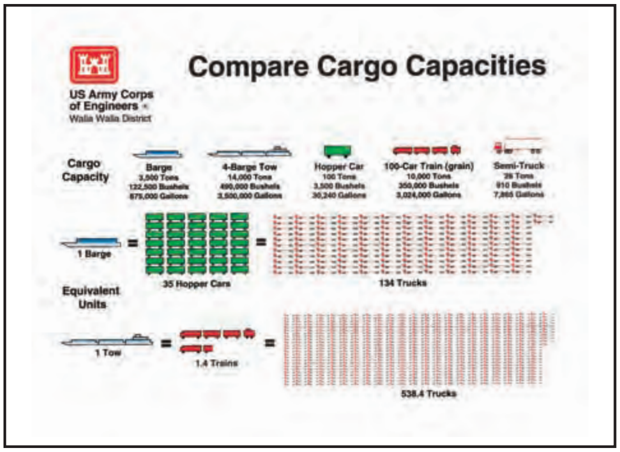
1. Texas Transportation Institute, "A Modal Comparison of Domestic Freight Transportation Effects on the General Public: 2001-2009," February, 2012
2. Institute for Agriculture & Trade Policy, "Myth: Barges Are the Most Fuel Efficient Mode of Transportation for Agriculture Commodities," 2002. See also Nicollet island Coalition, "Big Price, Little Benefit," February, 2010
3. Baumel, Phillip C., "Measuring Bulk Product Transportation Fuel Efficiency," Journal of Transportation Research Forum, Spring, 2011
4. Ball, Trent and Casavant, Ken, "Impacts of a Snake River Drawdown on Energy and Emissions Based on Regional Energy Coefficients," University of Washington Dept. of Civil Engineering and Washington State University Department of Agricultural Economics, 2001



The chart at left is often used to imply barging is more efficient than other means of freight transport because of the volume of freight that can be hauled in a single load. However, the chart no longer accurately reflects the size of many of the rail cars in use today. More significantly, the data in this chart actually says nothing about freight transport cost or efficiency. Telling the public 4 quarts makes a gallon says nothing about the price of milk, nor for that matter, about the cost per ton of shipping grain by truck-barge rather than truck-rail.

Myth 2: Barges keep trucks off our highways—saving millions of dollars each year in energy consumption and road repairs.

- Northwest River Partners (NWRP) frequently tells the public "Barging food and other products downstream keeps 700,000 trucks off our highways and helps keep our skies clean."[1] They and other barging supporters often accompany such claims with the above USACE chart. Here, however, are the facts: 700,000 trucks would transport 18.20 million tons of cargo. Nearly all downstream freight passes through the Bonneville lock. In 2010, total downstream tonnage through Bonneville was 6.34 million tons.[2] This cargo could be transported by 243,846 trucks, or 35% of the number claimed by NWRP—assuming all freight not transported by barge was trucked. However, if even half that freight were transported by rail, a very conservative estimate, the number of trucks "off our highways" would drop to 121,974, or just 17% of what NWRP continually claims.
- In a 2012 application for federal funds to extend its container dock, the Port of Lewiston claimed huge fuel savings as a project benefit based upon the Port's supposed removal of 14,026 trucks per year from highways by 2020 and 24,496 trucks by 2035.[3] Between 2000-2011, container shipments at the port declined steadily, from 17,590 twenty-foot equivalent units (TEUs) to only 3,653 TEUs. All container freight in 2011 could have been hauled by just 2,730 trucks. To meet the port's claim of keeping 14,026 trucks off the highway in 2020, the Port would need a 500% increase in container traffic and the elimination of all container shipments by rail.
- According to the *Lewiston Morning Tribune*, in preparation for a planned 15-week river closure for lock repairs in 2010/2011 the Port of Lewiston stockpiled 300 containers for a container-rail operation. Indeed, a later article noted all cargo that left the Port of Lewiston during the river closure departed by rail.[4]
- Jessup, Ellis, and Casavant studied the impact on rail and trucking from a possible permanent closure of commercial navigation on the lower Snake River.[5] They found the number of ton-miles of grain transported by rail from central and eastern Washington under this circumstance would increase by 93.5%, while truck ton-miles would increase by only 15.5%.
- Agricultural products comprise most of the freight on the lower Snake. In 2011, for example, 99% of outbound traffic from the Port of Lewiston was agricultural, mostly wheat, while grain made up 70% of the traffic passing through the Lower Granite lock. Washington State Department of Transportation's Grain Train Program actually does remove trucks from roadways. Unlike the Port of Lewiston, it is also "a *financially self-supporting* freight transportation program...."[6]

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1. *Northwest Hydropower and Columbia Basin River Benefits—Fast Facts 2013-14,* www.nwriverpartners.org
2. United States Army Corps of Engineers Waterborne Commerce Statistics Center, 2011
3. Port of Lewiston, *TIGER IV Grant Application, Attachment E: Benefit/Cost Analysis,* 2012
4. "Port of Lewiston Prepares for Railroad Traffic," *Lewiston Morning Tribune*, November 10, 2010; See also "River Users Play Catch-up," *Lewiston Morning Tribune*, April 3, 2011
5. Jessup, Eric, Ellis, John, and Casavant, Kenneth, "A GIS Commodity Flow Model for Transportation Policy Analysis: A Case Study of the Impact of Snake River Drawdown," May 1997
6. FreightRail Program, Washington State Transportation Commission, Feb. 22, 2012, p. 24

Myth #3: Barge transport is friendly to the environment.

• Because fuels vary in composition across modes of transport, researchers often use BTUs (British Thermal Units) rather than ton-miles/gallon as the most accurate way to compare energy use. BTUs per ton-mile (BTU/tm) decreased across all transport modes from 1970 to 2008: truck by -11.55%, barge by -23.30%, and rail by -55.86%. Consequently rail has emerged as the most fuel-efficient mode at 305 BTU/tm, followed by barge at 418 BTU/tm and truck at 552 BTU/tm.[1]

• Casavant and Simmons completed an extensive study of the impacts on energy use and fuel emissions of the 15-week closure of Snake River navigation in 2010/2011 due to lock repairs. They found energy use per ton transported during this period decreased by 4.77% due to the heavy use of rail "which consumes less energy per ton-mile than barge and truck."[2]

• As noted in Myth #1, most freight transport in the region involves either truck-barge or truck-rail. When Ball and Casavant used *regional* energy coefficients rather than national averages in their study of energy and emissions impacts of a possible complete closure of commercial navigation on the lower Snake, they found truck-rail had a 24% advantage over truck-barge with respect to energy use. When transporting wheat from eastern Washington, shipping by barge used 368 BTU/ton-mile, while rail used 278. The increased energy savings associated with closing commercial navigation on the lower Snake River would result in a 2.08% *decrease* in fuel emissions.[3]

• The Port of Whitman estimates average annual savings to farmers of $4,942,551 in wheat transportation costs from eastern Washington and parts of Idaho when the McCoy Unit Train Loader near Oakesdale, Washington, comes on line in 2013. Two farmer cooperatives with combined membership of 1390 growers are building the McCoy Loader for $17 million and plan to ship 16.4 million bushels of their own wheat annally through this facility with an additional 4 million bushels expected from other cooperatives. The Washington Department of Transportation (WDOT) projects annual savings of $3,530,000 in road damage from this same project. The Port and WDOT also note this shift from truck-barge to truck-rail will save 1,732 metric tons of CO_2 emissions each year.[4]

Comparing Freight Modes Per Ton-Mile (Grier, 2002)

	Cost Cents	Fuel Use gallons	Hydrocarbons lbs.	CO2 lbs	NOx lbs
Barge	.97	.002	0.09	.20	.53
Rail	2.53	.005	0.46	0.64	1.83
Truck	5.35	.017	0.63	1.90	10.17

Chart used by the Port of Lewiston to support its claim of project benefits and "environmental sustainability" in its 2012 TIGER IV application for federal funding for a container dock extension.

• Despite the availability of sound regional research data, lower Snake barging supporters continue making false claims regarding fuel efficiency and air pollution. For example, in its recent TIGER IV grant application the Port of Lewiston claimed air pollution benefits based on 30-year-old data indicating barge fuel efficiency was more than 2.5 times greater than rail and 8.5 times greater than truck.[5] This data (see above chart), from a 1980 study done for the America Waterway Operators, Inc.,[6] was extracted from a 2002 article by an Army Corps of Engineers staff member.[7] Even the questionable TTI data the port used in their grant application to argue fuel savings (Myth #1) used a barge/truck fuel ratio of 3.7/1, not 8.5/1. The port compounds this emissions misinformation by falsely assuming any freight not hauled by barge would be hauled by truck and by failing to acknowledge barge transport is actually truck-barge transport.

1. *Transportation Energy Data Book*, U.S. Department of Energy, Edition 29
2. Casavant, Ken, and Simmons, Sara "Economic and Environmental Impacts of the Columbia-Snake River Extended Lock Outage," Freight Policy Transportation Institute, Washington State University March 2012.
3. Ball, Trent and Casavant, Ken, *Impacts of a Snake River Drawdown on Energy and Emissions Based on Regional Energy Coefficients*, Transportation Northwest, Final Report TNW2001-06
4. Port of Whitman, "*P & L Shortline Rehabilitation Project, Tiger 5 Discretionary Grant*," 2013
5. Port of Lewiston, "TIGER IV Discretionary Grant Application, Dock Extension Project," 2012
6. *Eastman, S. E.,* "Fuel Efficiency in Freight Transportation," *American Waterways Operators, Inc*. 1980
7. Grier, David, "Measuring the Service Levels of Inland Waterways: Alternative Approaches for Budget Decision Making," *TR News*, Transportation Research Board, July-August 2002

> *Once the thriving centerpiece of 19th- and early 20th-century logistics... the river barge business has become a ward of government largesse. Washington picks up more of the cost of riverborne shipping than any other type of logistics enterprise in the U. S. except, perhaps, resupplying the International Space Station.*
>
> Christopher Helman, *Forbes Magazine* April 15, 2013

Myth #4: Barging is the cheapest way to move freight.

Misinformation about barge fuel efficiency buttresses the most egregious of waterborne commerce myths—that barging is the cheapest way to move freight and saves millions in shipping costs. This statement is not true even when American taxpayers pay approximately 90% of the bill. River freight transportation epitomizes corporate welfare, and the lower Snake River is a giant subsidy slough.

- Nationwide, the Army Corps spends approximately $800 million a year on operations and maintenance of river channels, locks and dams. Barge operators pay a 20 cents/gallon fuel tax into the Inland Waterways Trust Fund, which in 2012 brought in $80 million. The Congressional Research Service reported that from 2000-2008 fuel taxes on the ColumbiaSnake paid for only 6% of the operation and maintenance costs of this waterway.[1] Both Bush and Obama administrations' attempts to raise the fuel tax on barge transport or add a waterway user fee met stiff resistance from the barging industry and congressional members it supports. Barging companies argue that any increase in their costs will render them uncompetitive with other transport modes.
- Over the past 6 years the Corps spent $16 million preparing a Lower Granite Reservoir sediment management plan primarily to maintain a 14-foot deep navigation channel through the Snake/Clearwater confluence to the Port of Lewiston. In April 2013, a Corps spokesman told a news reporter that plan implementation would cost an additional $39 million.[2] Thus the Corps proposes to spend at least $55 million on perpetual dredging and other sediment-related projects primarily to keep open a port whose freight shipments over the past 12 years have declined by more than 50%. At 2011 shipping levels, taxpayers subsidize each barge leaving Lewiston's port by at least $16,000 for dredging alone. Based on Corps' data, the annualized cost for dredging the confluence and up the Clearwater to the POL over the next 20 years will be $3.1 million per year without inflation, or $4 million per year with a 2% inflation factor.[3] This cost does not include the $16 million already spent on sediment management planning, related Corps' administrative and indirect costs, or additional costs of dealing with the predicted increases in sediment load due to the ongoing rapid expansion of forest fire activity in watersheds that feed the confluence.[4]
- In the last 8 years taxpayers spent at least $267 million on Columbia-Snake River System maintenance, including on the lower Snake. This does not include the $188 million spent dredging the lower Columbia to keep Portland area ports viable, without which commercial navigation on the lower Snake would likely cease. The Army Corps recently went to bid on the first phase of a project to shore up jetties at the mouth of the Columbia with a projected cost of $257 million after spending $28 million a decade ago on a temporary fix. According to a Corps spokesperson, the $257 million is "the first step in a larger process." A second round of repairs is expected to run total jetty repair costs to $500 million.[5] According to the Government Accounting Office, the Corps has a well-deserved reputation for *under*estimating project costs.[6]
- As noted earlier, by far the majority of freight transported on the lower Snake is grain. Nearly 1400 growers, some of whom farm within 20 miles of the Port of Lewiston, apparently believe shipping by truck-rail is cheaper than shipping by truck-barge and have placed a $17 million bet they are right with their investment in the McCoy Unit Train Loader. This private investment alone accentuates the fallacy of believing barging is the cheapest way to move freight.

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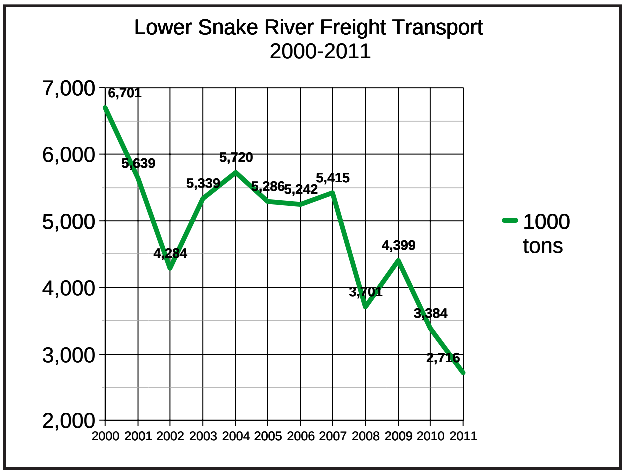
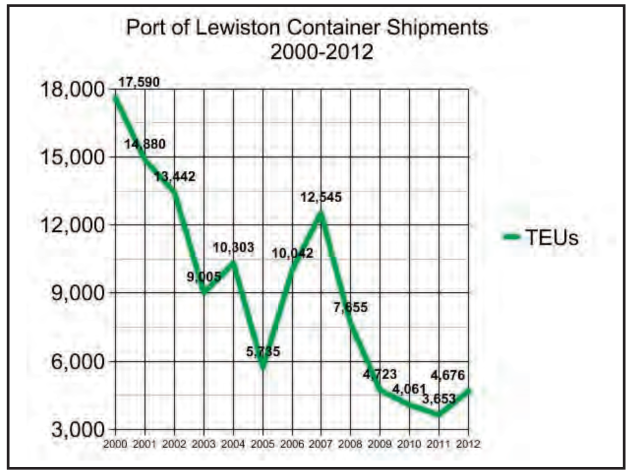
1. Congressional Research Service, *Inland Waterways: Recent Proposals and Issues for Congress*, May 3, 2013
2. Kunz, Aaron, "U.S. Army Corp of Engineers Prepares Snake River Dredging Plans," National Public Radio, April 8, 2013
3. Laughy, Linwood, "The Lower Snake River Programmatic Sediment Management Plan: More Taxpayer Subsides for the Port of Lewiston," January 2013; see also "Sediment and Subsidies: An Update," May, 2013
4. U.S. Army Corps of Engineers, *Lower Snake River Programmatic Sediment Management Plan*, 2012
5. Olson, Erik, "Corps set to begin first stages of Columbia River jetty revamp, *The Daily News Online*, April 29, 2013
6. U.S. General Accounting Office, *Corps of Engineers: Observations on Planning and Project Management Processes for the Civil Works Program*, March 16, 2006





Myth #5: Barging is a vital part of the regional economy.

Fifty years ago, boosters of the Lower Snake River Project promised economic prosperity to the residents of Lewiston, Idaho, and Clarkston, Washington with the arrival of slackwater navigation. Today local residents are still subsidizing port operations, freight transport by barge has declined dramatically since the turn of the century, and federal subsidies for river system maintenance and operations keep rising.

- As noted in the above-left graph, from 2000 through 2011 freight tonnage on the lower Snake River declined by 59%. At the Lower Granite lock, pulp and paper declined by 90%, wood products by 52%, and grains by 40%.[1] Much of this decline occurred prior to the 2008 recession.
- Over the past 12 years bulk and container freight transport from the Port of Lewiston declined by 60%. As noted in the above-right graph, between 2000 and 2012 total container shipments declined by 77%. Port of Lewiston shipping reports for 2007-2012 show a decline in paper shipments of 81%, containerized grain by 95%, and lumber by 100%. Between 2000-2011 bulk wheat shipments declined 45%.[2]
- Most containers shipped upstream on the lower Snake are empty. At the Port of Lewiston, for example, during the 8-year period (2004-2012) for which data is available from the U.S. Waterborne Commerce Data Center, 84% of containers received were empty. The removal of 1 aberrant year from the data set changes this percent to 94.5%. *All* containers arriving at the POL in 2011 and 2012 were empty.[3]
- After more than 40 years of operation the Port of Lewiston continues to require subsidies from local taxpayers. Lewiston's port district has collected $4.5 million over the past ten years in local tax subsidies. As a government entity the port also currently receives over $100,000 a year in state sales tax revenues. The port's budget also indicates the port pays no property taxes on its 246 acres of prime waterfront and commercial property.[4]
- The Lewiston Port District is comprised of all of Nez Perce County. The Idaho Department of Labor lists Nez Perce County's 12 largest employers in its June 2013 Work Force Trends report.[5] Only one employer on the list ships goods by barge, and that manufacturer transports the vast majority of its product by truck and rail. The port employs 7 of the 18,810 people in Nez Perce County's current labor force.
- Unemployment in Nez Perce County ranged from only 2.8%-4.5% for 5 of the last 11 years, between 4.5%-5.5% two of those years, and remained below 7% during the great recession. The health of the economy in Nez Perce County appears unrelated to the 50%-60% decline in barge freight shipments from the Port of Lewiston over that same time period.

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1. U.S. Army Corps of Engineers, Waterborne Commerce of the United States Data Center, 2011
2. Port of Lewiston Shipping Reports, at www.portoflewiston.com
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4. Port of Lewiston, 2013 Budget at www.portoflewiston.com
5. Idaho Department of Labor, "Nez Perce County Workforce Trends," June, 2013

The Five Most Blatant Myths about Freight Transport on the Lower Snake River

Conclusions[1]

- Lower Snake River barging boosters perpetually use false assumptions, old data, and questionable or non-applicable research studies in crafting their support of the *status quo*. The resulting misinformation misleads the public, quashes needed dialogue about important transportation issues, and leads to the misallocation of private and public resources.
- Freight transport on the lower Snake River has declined significantly over the past 13 years. The expansion and increased efficiency of rail in the region will likely continue to reduce the amount of freight hauled on this waterway.
- While freight tonnage has declined, costs for maintaining and operating commercial navigation on the lower Snake, as well as on the entire Columbia-Snake System, have steadily increased, which has greatly expanded the taxpayer subsidy for each ton shipped. These continuously rising costs come at a time when the U. S. Corps of Engineers faces huge financial demands across the nation for the maintenance of aging infrastructure, and when the federal government is making major across-the-board budget cuts.
- Barging on the lower Snake contributes only 5% of total tonnage shipped on the Columbia-Snake System and on a ton-mile basis, accounts for just 1/10th of 1% of U.S. commercial navigation. Barge transport on the lower Snake is not economically sustainable. As noted by the National Academy of Sciences in a study done for the Army Corps of Engineers, the Corps may need to abandon commercial navigation on some waterways in order to maintain those that handle more ton-miles of freight. The Corps faces large, perpetual costs for sediment management on the Columbia and at the river's mouth. Maintaining freight transport on the Columbia may necessitate abandoning commercial navigation on the lower Snake.
- Sediment management at the confluence of the Snake and Clearwater Rivers is now shining a light on cost-benefit ratios involved in lower Snake River commercial navigation. For example, cost savings to farmers for the shipment of agricultural products from the Port of Lewiston are insufficient even to pay for the annualized cost of channel dredging necessary to keep barge operations at that port possible.
- Barging supporters pay limited, if any, attention to river system changes already occurring because of climate change. The rapidly expanding number of square miles of forest land burned in the Snake, Salmon and Clearwater drainages during the last decade are already producing increased sediment loads, and this trend will continue. Resulting lower flows and higher water temperatures will negatively impact anadromous fish, likely requiring lower Snake River reservoirs be kept at minimum operating pool levels as well as mandating more spill. Maintenance costs will increase and river system reliability will suffer. The *status quo* on the lower Snake is no longer possible, and the refusal to give serious attention to alternatives is indefensible.
- Analyses of the maintenance and operational costs of continued freight transport on the lower Snake rarely include other significant costs to taxpayers and regional residents. A few examples: For much of the region, truck-barge transportation results in more damage to highways than truck-rail. Commercial and recreational fishing and related tourism are held far below their potential regional economic benefit. Electricity rate-payers spend over $500 million per year trying to recover fish runs on the Columbia and Snake Rivers with limited if any success. Wildlife suffer the loss of thousands of acres of prime riparian habitat. Native Americans, such as the Nez Perce, have paid and continue to pay high social, cultural and economic costs related to the lower Snake River dams.

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1. All references to ports in this analysis refer only to their freight transport operations. Ports regularly conduct numerous economic development activities, most of which do not involve commercial navigation.

Dredging On The Cheap
The $800,000 Myth

Lower Snake River barging supporters claim perpetual dredging at the Snake/Clearwater confluence and up the Clearwater River to the Port of Lewiston will cost $800,000 on an annualized basis, not the $2 million to $3 million claimed by "those salmon people." Here is the fuzzy logic behind their $800,000 figure:

1. The USACE Corps' cost projection for the next round of dredging, according to the Pacific Northwest Waterways Association, is $6.5 million. Worthy of note in this regard is the Corps' notorious reputation for underestimating project costs as repeatedly demonstrated by the U.S. General Accounting Office.

2. The USACE proposes dredging 491,042 cubic yards of sand and silt from the navigation channel in the confluence area. The estimated dredging cost per cubic yard would thus be $13.23.

3. The confluence and channel was last dredged in 2005/2006. Thus 8 years have passed since the last dredging. If one divides total projected cost for 2013/14 dredging ($6.5 million) by the number of years since the last dredging, the result is $812,500 as an estimated annualized cost of dredging. Round that figure down, and one achieves the $800,000 figure.

Using this approach, the average number of cubic yards that need to be dredged from the Snake/Clearwater confluence and Clearwater River channel on an annualized basis is 61,380. Thus if the Corps dredged about 490,000 cy every 8 years, ignored all other costs such as USACE planning/engineering/contract management, the Corps' indirect charges and future inflation, the annualized cost would be about $800,000. However, a number of problems exist with this position.

First, the $800,000 figure likely represents dredging only, and at a cost of $13.23/cy. In a letter to the Port of Lewiston in April 2013 the USACE estimated dredging cost at $15/cy plus an additional 17% for planning/engineering/contract management.

Second, the USACE in their Lower Snake River Programmatic Sediment Management Plan cites the need to dredge the navigation channel every 3-5 years. If one looks at the history of sediment dredging at the locations in question, which has occurred over 21 years, the average amount dredged per year is 177,800 cy. (The Corps cites this figure as 176,000 cy.) Thus, unless the future amount of sediment reaching the Snake/Clearwater confluence decreases significantly, dredging an annualized 177,800 cy/year is a reasonable estimate of the dredging required. Using this historical average of 177,800 cy and ignoring all other related costs as well as inflation, the projected annualized dredging cost would be $2.35 million.

Third, information in the DEIS that accompanied the LSRPSMP predicts a significant increase in sediment load at the Snake/Clearwater confluence based on a major increase in the amount of forest land that has already burned during each decade from 1970-2010. Information in the DEIS on climate change suggests additional sedimentation from new forest fire activity, snow levels and changes in weather patterns.

Finally, while the USACE's DEIS for their sediment management plan contains contradictory predictions regarding the future amount of sediment that will be deposited at the Snake/Clearwater confluence and up the lower Clearwater River, even the Corps' lowest estimate is higher than the 61,380 cy used by barging supporters to claim their annualized cost of $800,000.

The $800,000 annual dredging myth can be considered a first supplement to the document *Five Myths About Freight Transportation on the Lower Snake River*.

Linwood Laughy

Comments submitted to U.S. Army Corps of Engineers Inland Waterway Users Board
Walla Walla, Washington August 14, 2014

Waterborne Commerce on the Lower Snake River: A 2014 Reality Check

The Lower Snake: New Realities

While no credible evidence exists that commercial navigation on the lower Snake River ever had a positive benefit-to-cost ratio, data from the past 15 years remove all possible doubt. An honest analysis of waterborne commerce on the lower Snake River in 2014 leads to the following conclusions:

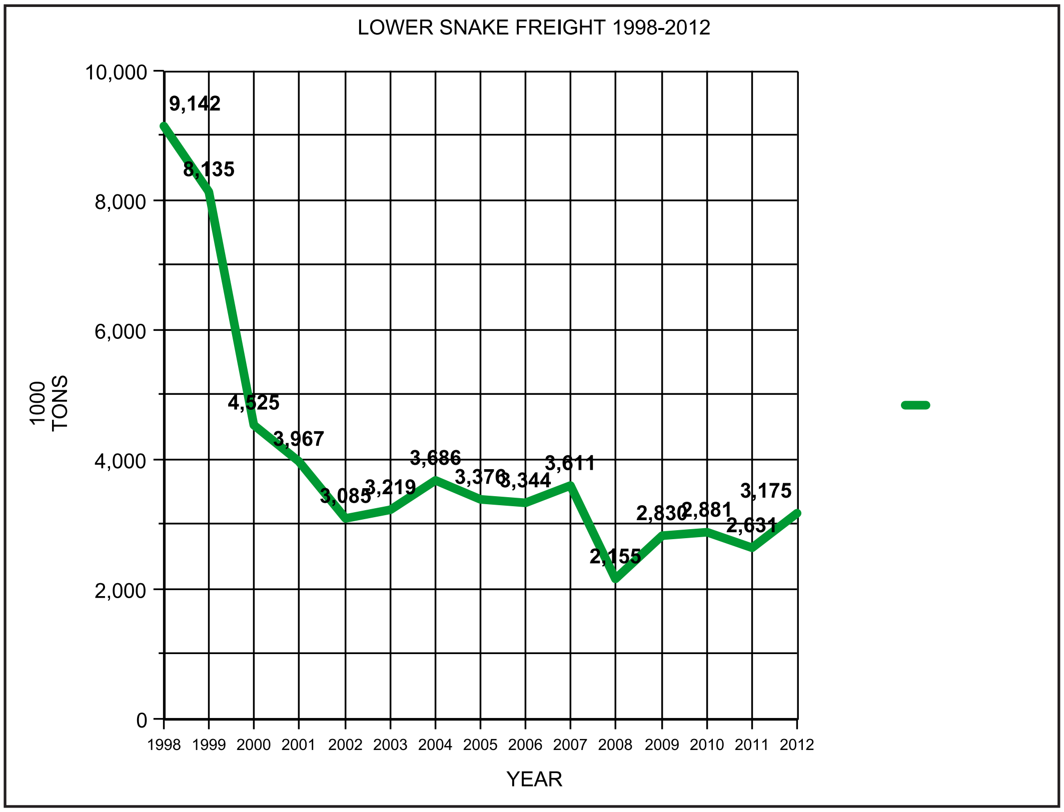
1. Freight volumes on the lower Snake River have declined significantly. This decline has occurred across all commodity categories, and major industry groups have abandoned the waterway almost completely.
2. The costs of maintaining an aging infrastructure and addressing the needs of endangered and threatened fish continue to rise.
3. New challenges to commercial navigation on the lower Snake River are emerging, and existing problems will likely increase in magnitude.
4. Maintaining the status quo on the lower Snake River through further public investment is not economically justifiable, will divert public funds away from more viable rivers such as the Columbia, and will delay the development in eastern Washington and north central Idaho of a 21st century freight transportation system.

The Lower Snake: A Waterway in Decline

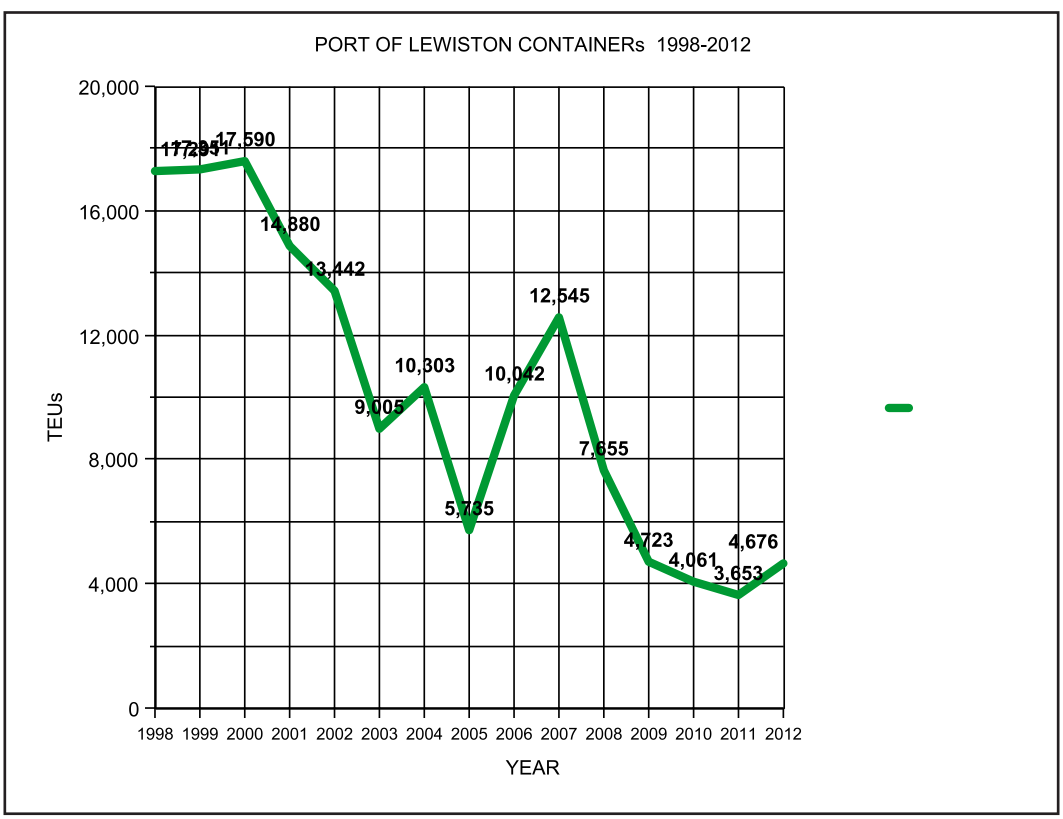
According to the U.S. Army Corps of Engineers' (USACE) Waterborne Commerce of the United States (WCUS) website, freight volume on the Columbia River from 1998 through 2012 remained relatively stable. Freight volume on the lower Snake, however, declined over the same period by 64%, from 9,142 thousand tons to 3,253 thousand tons.

This decline resulted in part from the actual or near abandonment of water transportation by major industry groups. For example, in 2012 wood chips comprised just 4% of total freight, and paper and paperboard just .5%. The WCUS statistical center reported pulp and wastepaper as totaling zero in 2012, and lumber also zero.[1]

The graph below illustrates the significant decline in freight volume on the lower Snake River as recorded by the USACE at Ice Harbor lock and reported at the WCUS Statistics Center. Note that the majority of the decline occurred prior to the 2008-2009 great recession.



The Port of Lewiston (POL) provides container shipping on the lower Snake. From 1998 through 2012, according to the port's website, POL container traffic declined from 17,291 TEUs to 4,676 TEUs, a drop of 73%.[2] For the past several years between 90% and 100% of inbound containers have been empty.



The Lower Snake: Inflated Projections of Future Freight

Over the past dozen years government agencies have over-estimated the volume of freight the agencies believe would be transported on the lower Snake River. These projections are thus consistently wrong. Here are three examples:

In 2002 the USACE published the *Lower Snake River Juvenile Salmon Migration Feasibility Report* (LSRFR). As part of this report the USACE predicted future freight volumes on the lower Snake River as a means of establishing what the Corps believed would be the additional cost of freight transport if the 4 lower Snake River dams were breached. The agency grouped commodities into 5 categories—grain, wood chips and logs, petroleum and petroleum products, wood products, and "other." They then predicted the level of each category that would be shipped on the lower Snake River at 5-year intervals beginning in 2002. Actual shipping data is now available for 2002, 2007 and 2012. The Corps' projections were high for every commodity over every time period. By 2012, grain was down by 25% from its predicted volume, wood chips and logs down by 58%, petroleum and petroleum products by 59%.[3] Wood products and "other" make up an extremely small portion of total freight and are typically shipped by container barge. Container traffic at the Port of Lewiston declined from 2002 through 2012 by 68%.[4]

The *2009 State of Washington Marine Cargo Forecast* contains a section specific to the Snake River, in which the state projected the overall annual growth rate for lower Snake River waterborne tonnage to average .0% from 2002-2030. Actual tonnage 2002 through 2012 declined by 32%.[5]

In 2011, in a grant application for federal funds to extend its container dock, the Port of Lewiston projected an increase in container traffic of 250% over a 20-year period, with volume the first year after project completion predicted to be 6000 TEUs, then 10,000 TEUs just 3 years later.[6] The dock extension project was completed in 2012. The number of TEUs shipped in 2013 was 4,439 TEUs. A recent report on container traffic over the port's $2.8 million newly extended container dock indicated that thus far in 2014 container traffic is even lower, at a level not seen since the mid-1970s.[7]

Projections of future freight volumes on the lower Snake River by those with a vested interest in the status quo and/or by parties wishing to increase public investment in waterborne commerce on this waterway are highly unreliable. The use of these projections can in fact contribute to economic decisions costly to the American people and the environment.

The Lower Snake: Freight Down, Costs Up

Accurately capturing all costs related to commercial navigation on the lower Snake is difficult for a member of the public. Readily available cost information is typically reported in large categories of spending; e.g., combined maintenance for a particular dam and lock for a given year. The fact that the Bonneville Power Administration pays some of the overall costs of operating the 4 Snake River dams, with those costs appearing in BPA budgets rather than Corps' budgets, further complicates the situation. In addition, other government programs provide funds from other federal pockets from time-to-time. For example, for the four years of 2009-2012 the American Recovery and Reinvestment Act funded maintenance projects on the 4 lower Snake River dams totaling $22,868,796.[8] Nevertheless, the trend is clear: costs are rising, and with freight volumes down by more than half, the government subsidy per ton of freight shipped on the lower Snake has risen dramatically.

Some barging supporters disparage the use of the term “subsidy” in this context, claiming that the lower Snake River is a “marine highway” open to all users just like a highway of pavement. However, 88% of the freight hauled in 2012 consisted of agricultural products, almost all of which was wheat. Thus the lower Snake is largely a “special use” waterway for one segment of a single industry that pays little of the cost of operation and maintenance of the waterway. Shippers of other products have apparently found a more cost effective means of getting their products to market.

In a 1999 paper titled *Grain Transportation After Partial Removal of the Four Lower Snake River Dams: An Affordable and Efficient Transition Plan*, Dr. Edward Dickey stated that 10% of the annual cost of maintaining and operating the lower Snake River dams was attributable to commercial navigation. Dickey had for many years served as the Deputy Assistant Secretary of the Army for the Corps’ Civil Works Program. His navigation allocation included 10% of the costs of fish mitigation; i.e., the costs of avoiding breaching by designing and constructing a variety of fish bypass systems referred to in the LSRFR as “implementation costs,” as well as maintenance and operation of the lower Snake River Project’s infrastructure. In 2012 the Corps spent $50.7 million on fish mitigation construction costs for the 4 lower Snake dams plus McNary on the Columbia River.[9] If 20% of this total were attributed to McNary, the Snake River dam fish mitigation costs would be about $40 million for the year. Maintenance and operation costs of the 4 SR dams in 2012 totaled $37,545,408.[10] Thus, according to Dickey, 2012 commercial navigation on the lower Snake River cost taxpayers at least $8.7 million in just fish mitigation construction costs and M & O expenditures.

The Lower Snake River Project is an aging system. The life expectancy of Snake and Columbia River locks was originally estimated to be 50-75 years. For projects completed in the 40s and 50s, as on the Columbia, 2000-2020 is 50-70 years. For locks completed in the 60s and early 70s, as on the Snake, 2010-2030 become critical years. However, some Snake River locks have already required expensive repairs: the Ice Harbor downstream lift gate in 1996 for $6.8 million, Lower Granite pivot bearings in 2002, the 2007 extended closure for work on the Little Goose lock, the 2010-2011 lock gate replacement at Lower Monumental Dam, where at 41 years of age “The gate is cracking itself apart.”[11] That lock gate replacement with 2 others on the Columbia cost a total of nearly $50 million. Emergency repairs to the Little Goose lock in 2014 again closed the waterway for 14 weeks. Wheat farmers are well aware that a problem at any 1 of 8 locks can shut down the river. As stated by the then executive director of the Pacific Northwest Waterways Association in 2010, “the unplanned failure of a lock gate could close the river for a year as a new gate is designed, manufactured and installed.”[12]

The Bonneville Power Administration recently projected a 19% increase in O & M costs the agency plans to pay the USACE from 2013-2017.[13] While this increase addresses hydropower, BPA’s explanatory statement likely pertains as well to other dam and lock operations. BPA’s *Integrated Program Review Kick-off* dated May 28, 2014 states, “As the Corps continues to manage non-routine extraordinary maintenance needs within proposed funding levels, there will continue to be reliability risk and increased O & M cost pressures.” The same report notes a 4-year increase in expenditures for fish and wildlife of around 14%.

Another growing problem on the Snake River waterway is sediment management, particularly in the Lower Granite pool. In January 2013 the Corps released its *Lower*

Snake River Programmatic Sediment Management Plan, which at that time had cost $16 million to develop. As a first step in addressing this perpetual problem the Corps plans in 2014-2015 to dredge the navigation channel through the confluence of the Snake and Clearwater Rivers and up the Clearwater to the Port of Lewiston at a cost of $6.5 million. A Corps spokesman told a reporter with National Public Radio that total Lower Granite sediment management project cost was estimated at $39 million.[14] Based on the volume of sediment dredged over the past 35 years and using actual 2005-2006 dredging costs per cubic yard removed, average annual costs for dredging alone would be $2.27 million. This figure does not include the $16+million in planning costs already spent, nor other planned sediment infrastructure development. If planning costs are amortized over a 20-year period, annualized dredging costs exceed $3 million/year without inflation.[15]

Dicky estimated the subsidy to lower Snake River barge shipping to be $10 million per year in 1998 dollars. A reasonable current estimate would be at least that amount.

The Lower Snake: Significant Problems Ahead

While parties argue about the efficacy of the expensive hardware now hanging from the lower Snake River Dams installed to save threatened and endangered fish, or about the merits of various amounts of spill, a host of new challenges to commercial navigation on the lower Snake River are emerging. Consider these examples:

- As noted above, the locks at the lower Snake River dams have reached or will soon reach their life expectancies and require not just maintenance, as noted above, but also major rehabilitation necessitating both large expenditures and additional extended river closures.
- The cost of saving threatened and endangered fish keeps rising. The construction costs for alterations to McNary and the 4 lower Snake River dams has now expanded from $682.7 million to $955.0 million.[16] Annual maintenance costs on all this added infrastructure will grow as well.
- A major increase in the number of acres burned in the Snake River basin over the past two decades all but guarantees significantly more sedimentation and thus greater sediment management costs.[17]
- Climate change is already creating additional problems related to fish passage and fish mortality requiring further “fixes” and hence expenditures. Scientists predict earlier and higher spring run-offs with low flows during summer months, even greater increases in water temperature, and higher levels of forest-fire activity.
- Commercial navigation on the Columbia River, which carries 94% of the freight transported on the ColumbiaSnakeRiverSystem, also faces growing costs for the maintenance of the river’s dams, locks, channel and sediment management. The 4 Columbia River dams that enable shallow draft commercial navigation were completed between 1938 and 1954, suggesting the need for earlier major rehabilitation than on the lower Snake. The lower Columbia requires perpetual dredging of the channel. The Corps has projected the cost just for repairing the jetties at the mouth of the Columbia River at $500 million.[18]

- Beginning in 2015, major improvements to the Panama Canal will enable the use of larger container ships referred to as New Panamax. These ships carry approximately 12,500 TEUs, more than twice the volume of Post Panamax ships, and industry experts predict a shift of container traffic from west coast ports to ports along the gulf coast and eastern seaboard.

The Lower Snake River: What Happens Next?

The most likely short-term scenario for commercial navigation on the lower Snake River—short of some large infusion of freight sufficient to justify the ever-increasing costs or a lengthy river closure due to a major infrastructure failure—is business as usual. Predictable events include a renewed effort among barging supporters to defend the status quo and secure sufficient federal dollars to keep commercial navigation on the lower Snake River afloat awhile longer. Ports and the barging industry will fight to maintain their existence, though some ports are already pursuing other endeavors ranging from expanding fiber-optic networks to becoming property management and real estate development corporations. Farmers will support barging as long as taxpayers are willing to bear most of the cost while the farmers hedge their bets with calls for government investment in rail and by making their own investments in facilities such as the McCoy unit train loader. Those whose interests lie in seeing the closure of the lower Snake to commercial navigation for various reasons, ranging from saving and restoring wild fish runs to protecting the public purse, will pursue both tried and new avenues that serve their purposes. Meanwhile, some or most of the events and circumstances listed above under the heading “Significant Problems Ahead” will continue to unfold.

A second alternative emerges from Dr. Dickey’s 1999 proposal noted above, made even more salient by the major decline of freight transport on the Snake River and the abandonment of this means of transport by major regional industry groups. Dickey argued that limited-time investments in rail and highway infrastructure would eliminate a perpetual $10 million drain (in 1998 dollars) on the federal budget, actually improve competition in transportation pricing, and attract new manufacturing and other businesses to eastern Washington and north central Idaho for whom good rail and highway access would be an incentive and a lasting asset. Dickey’s approach would also benefit all those who presently transport goods to market by other than waterborne means, which as noted above is almost everyone other than the growers of wheat and pulse. Part of what Dickey proposed 15 years ago has now occurred; e.g., a shift from single rail car transport of grain to multiple units including trains of 100+ cars. The Washington State Department of Transportation’s Grain Train Program provides further illustration as a program which actually does remove trucks from roadways and is “a financially self-supporting freight transportation program.”[19] Dr. Dickey’s analysis provides a clear alternative to business as usual and deserves to be updated in light of the significant changes in regional freight transport over the past 15 years. Such an analysis would only be beneficial, however, if regional leaders gave it a serious read while ignoring the myths frequently expounded by barging boosters.[20]

The USACE has provided a third possible scenario. Recognizing the enormous extent of its infrastructure, the growing rate of deterioration of its facilities, and the decline of federal and agency budgets, the Corps recently asked the National Academy of Sciences (NAS) to prepare a report on possible USACE options. The resulting 2012 publication, *Corps of Engineers Water Resources Infrastructure: Deterioration, Investment, or Divestment?* notes the USACE is in "an unsustainable situation for maintenance of existing infrastructure. This scenario entails increased frequency of infrastructure failure and negative social, economic, and public safety consequences."[21]

One major alternative outlined in the NAS report calls for the divestiture or decommissioning of parts of the USACE's infrastructure. In light of information provided above regarding the decline of freight transport on the lower Snake River and the steadily increasing operational, maintenance and rehabilitation costs, commercial navigation on the lower Snake River appears a possible candidate for such divestiture or decommissioning.

The NAS study provides the following summary with respect to inland navigation in general: "The inland navigation system presents an especially formidable challenge and set of difficult choices. There are stark realities and limited options…"

Those stark realities are increasingly present on the lower Snake River.

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Footnotes

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2. Shipping Reports, Port of Lewiston website, www.portoflewiston.com.
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8. *Report of the Secretary of the Army on Civil Works Activities for Fiscal Year 2012*, Walla Walla U.S. Army Corps of Engineers, Walla Walla District.
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22. Ibid.

Comments to the U.S. Army Corps of Engineers Waterway Users Advisory Board at their meeting of August 14, 2014 in Walla Walla, Washington.

In the 1930s the U.S. Army Corps of Engineers (COE) determined that commercial navigation on the Lower Snake River could not be economically justified. The COE was correct in that decision. Commercial navigation was still not justifiable in 1947 when the COE attempted to create a benefit-cost ratio greater than 1 for the Snake River Project.

In 2002, as part of the Lower Snake River Juvenile Salmon Migration Feasibility Report (LSRFR), the COE determined that breaching the 4 Lower Snake River dams was far more expensive than modifying the dams for better juvenile fish passage. One of the costs of breaching involved projected cost increases for transporting an expanding volume of freight on the waterway by means other than barge. Today we know freight volume on the river has decreased by 50% over the past 15 years and the increased transportation costs attributed to breaching have vanished. Still no economic justification can be found for commercial navigation on the Lower Snake River.

The taxpaying public is told, however, in what amounts to a circular argument, that the Snake River Project is a multiple-purpose project, that one part of the system can justify another. After all, the dams are already here, the water is free, and hydropower pays the bills. Only the water isn't free, and taxpayers spend millions of dollars each year specifically for the operation and maintenance of the waterway. Much more significantly, like Snake River commercial navigation, the 4 Lower Snake River dams' hydropower "benefits" are not economically justifiable.

I worked as a civil engineer for the U.S. Corps of Engineers for 35 years and was the Deputy District Engineer for Programs in the Walla Walla District during the latter stages of the development of the LSRFR. Other employees and I had serious doubts about the validity of the data that led to the decision not to breach the dams. I expressed concerns at that time about omissions, errors, miscalculations and faulty assumptions in the work at hand, but the study progressed to its predetermined and erroneous conclusion that modifying the dams to improve fish passage was the preferred alternative. Breaching the dams would be far too expensive, both short and long term. Actual hard data over the past 15 years confirm the mistakes made in reaching that conclusion. A reanalysis of the 2002 report demonstrates that the projected cost of keeping the dams was understated by approximately $160 million on an average annual basis. Today the reality is not that breaching the dams would be too expensive, but rather that we cannot afford to keep these dams in place in their present configuration.

If the LSRFR study is corrected for errors and omissions, and actual data is substituted for 15-year old projections, the net economic benefit of keeping the dams the Army Corps claimed in 2002 simply disappears. Consider two examples on the cost side of the Benefit/Cost Analysis.

> The Corps initially projected implementation costs for dam improvements in the Walla Walla District necessary for fish survival at $682

> million. Expenditures by the end of 2012 totaled more than $750 million, with the COE's current project estimate of $955 million. Approximately 80% of that cost is attributable to the 4 Lower Snake River dams.
>
> The cost of rehabilitating the 4 dams' turbines presents another understated cost. Turbines have an expected life span of 25+ years and thus require at least 2 rebuilds during the remaining life of the Lower Snake River Project. The LSRFR included expenditures for turbine rehabilitation of $321 million. The first 3 turbines are now undergoing such rehabilitation at a cost of $91 million, leaving 21 more turbines in the first round. In today's dollars, two rounds of turbine rehabs will cost approximately $1.5 billion, or more than a billion dollars over the cost projected in the LSRFS.

When all corrected costs and benefits are added to the 2002 LSRFR balance sheet, the net economic benefit of breaching the dams is somewhere between an annual average benefit of $45 million to $300 million depending in part on the wide range included in the report for the recreational benefit. When these costs and benefits are brought forward to 2014 and projected over the next 100 years, as was done in the 2002 report, the costs of operating the dams approaches $300 million per year and the overall benefits for breaching on an annual average basis range from $130 to 400 million. Trying to justify these dams in terms of navigation or hydropower, or as a multipurpose project, annually robs the American people of at least $130 million in economic benefit and deprives the COE's O & M budget of at least $50 million annually.

Today the Corps of Engineers faces unprecedented financial challenges ranging from an extended and aging infrastructure to extraordinary costs the Corps is already incurring due to climate change. In the Pacific Northwest, major costs of maintaining deep and shallow draft navigation on the Columbia River are rapidly approaching, such as the $500 million needed to repair and replace the jetties at the mouth of the river that make the Port of Portland possible. Meanwhile, the 4 Lower Snake River dams are a money pit. Their costs in terms of navigation have likely always exceeded the benefits, and those costs are growing greater each year. Further, as noted above, the escalating costs of operating and maintaining this aging infrastructure have rendered the multipurpose/hydropower average annual National Economic Development benefits moot. The dams' ongoing costs have already exceeded replacement costs for hydropower.

The American people can no longer afford these dams, whether their costs are measured in dollars or fish, lost opportunity or continued environmental damage. The construction of these 4 dams has been a mistake, and at some point they will be breached. The longer the time before restoring this river to its natural flow, the greater the cost to the American taxpayer.

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HONORABLE ROBERT S. LASNIK

UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF WASHINGTON

NATIONAL WILDLIFE FEDERATION, WASHINGTON WILDLIFE FEDERATION, IDAHO WILDLIFE FEDERATION, IDAHO RIVERS UNITED, PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS, and INSTITUTE FOR FISHERIES RESOURCES, Plaintiffs, v. NATIONAL MARINE FISHERIES SERVICE and UNITED STATES ARMY CORPS OF ENGINEERS, Defendants.	Civ. No. CV02-2259L DECLARATION OF ANTHONY JONES IN SUPPORT OF PLAINTIFFS' MOTION FOR PRELIMINARY INJUNCTION

I, Anthony Jones, declare and state as follows:

1. I am a professional economics consultant. I hold degrees in economics from Idaho State University (B.A.) and University of Washington (M.A.). I am currently a resident of Boise, Idaho.

2. I have over 20 years experience managing programs and advising government leaders and corporate management in the areas of strategic planning, operations planning, marketing, market research, economics, statistics, and finance. Further information on my past employment is provided in the report I prepared for National Wildlife Federation and Idaho Rivers United on the Dredged Material Management Plan Final Environmental Impact Statement ("DMMP/EIS") (Sept. 9, 2002) (hereinafter "Jones Report"), attached as Exhibit 10 to the Declaration of Jan Hasselman. NWF and IRU submitted a copy of this report to the Corps prior to the issuance of the ROD.

3. In addition to my over two decades of economics and management experience, I have had over six years in-depth exposure to economic issues involved in management of the lower Snake River and Columbia River, particularly with regard to the operation of the Snake River dams, hydroelectric system, and navigation system. In 1998, I was retained by Idaho governor Phil Batt, and subsequently by Idaho governor Dirk Kempthorne, to provide an economic audit of the Drawdown Regional Economic Workgroup ("DREW"). The DREW workgroup's studies and activities provided the materials and information for what was to become the Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement ("FR/EIS"). My *curriculum vitae* is attached to this declaration as Exhibit A.

4. I make the following statements on the basis of my professional experience, to the best of my knowledge, and subsequent to extensive review of the draft and final DMMP/EISs,

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their appendices, documents referenced therein, and other documents pertaining to management and economics of Snake River dams. I make this statement to summarize in non-technical terms the limitations, gaps in analysis, failures to consider relevant factors, failures to explain its conclusions, and other shortcomings in the DMMP/EIS economic analysis that are described in more detail in the Jones Report.

OVERVIEW OF DMMP/EIS COST-BENEFIT ANALYSIS

5. The DMMP/EIS includes a “cost-benefit” analysis of the Corps’ maintenance dredging, disposal, and levy construction proposal. In the Corps’ analysis, the “costs” of the project comprise the costs of maintenance, dredging, and levee construction as well as the costs of operating the navigation locks. These are compared to the “benefits” that purportedly arise as a result of these expenditures – namely, the benefits that arise to producers of goods that pay less for shipping through a barge navigation system than they would through a truck or rail system. In theory, comparing the costs of a proposal to its benefits allows a reader to determine whether or not the proposal represents a wise or sound use of resources. Accordingly, a competent and useful cost-benefit analysis (“CBA”) includes every factor that reasonably would influence the outcome of the decision. Omission (or inappropriate inclusion) of costs or benefits skews the analysis and can result in an inaccurate or incomplete portrayal of the cost-benefit ratio, and hence the relative wisdom of moving ahead with a project. Jones Report, 5-7.

6. Equally important is the choice of “baseline” for a CBA, which is the starting point of the analysis. In the case of the navigation system, both the costs and the benefits of navigation have been accruing for several decades. The benefits of navigation result from the ability of barges to move certain commodities more cheaply than other modes of transportation. These benefits are attributable to very large public expenditures, namely, the construction of the lower Snake River dams and navigation locks, which ran into the many hundreds of millions of

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dollars. The construction of the dams also resulted in other costs, for example the destruction of once vibrant commercial, recreational, and tribal fishing industries. These costs continue to accrue today. However, the DMMP analysis does not include any of these costs, past or present, rendering them "invisible." Jones Report, 6. The impact of this problem is described in greater detail below.

7. The integrity of any cost-benefit analysis is dependant upon the integrity of the data used to calculate each of the underlying components. Similarly, inclusion or exclusion of components of costs or benefits skews the analysis and results. Here, the Corps arrived at a benefit-to-cost ratio for this project of 16 to 1. In other words, according to the Corps, for each dollar of spending, sixteen dollars of benefits are produced as a result. As explained in the Jones Report, this conclusion is achieved only by a systematic and serial pattern of over-counting of benefits, and excluding of costs, to the point where the analysis is fundamentally misleading. In fact, by ignoring highly relevant data and considerations, the analysis violates several of the most basic principles of competent economic analysis and presentation. Jones Report, 2. The following paragraphs explain and summarize the findings in my report in non-technical language.

THE INVALID FREIGHT GROWTH FORECASTS

8. Much of the data utilized by the Corps in this CBA comes from another Corps of Engineers EIS, finalized in February 2002. This document, called the Lower Snake River Salmon Migration Feasibility Report and Environmental Impact Statement ("FR/EIS"), evaluates various options for managing the four lower Snake River dams and reservoirs, with a primary goal of evaluating their effectiveness for protecting salmon species that have become threatened with extinction by the operation of the dams. One of the options evaluated in the FR/EIS is the partial removal of all four lower Snake River dams and the restoration of a normative river flow

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regime. This alternative has been promoted by the State of Oregon, several Indian Nations, and hundreds of scientists, biologists, and conservation groups.

9. The FR/EIS relies upon and incorporates freight forecast data used in yet another document, a 1999 evaluation of a proposal to deepen the Columbia River between its mouth and the port of Portland, Oregon, to accommodate deeper ocean-going ships. The study was called the Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement (August 1999) (for purposes of simplicity, it will be referred to here as the "Channel Deepening Study" or CDS), Exhibit B. The CDS estimated that wheat exports from Portland-area ports would grow steadily. Id. at 3-3 ("The Columbia River ports should expect healthy growth in wheat exports.") This forecast data was then incorporated into the FR/EIS.

10. The DMMP/EIS, in turn, adopts this material from the FR/EIS. In the DMMP/EIS and FR/EIS, the CDS export freight data is used by the Corps to make forecasts about the quantities of materials that are likely to be shipped via the Snake River navigation system in the decades ahead. The CDS freight forecasts, incorporated into the DMMP/EIS via the FR/EIS, are used to predict a steady and significant increase in commodity shipping in the Snake River over time. These alleged increases form the basis for the Corps' assessment of benefits offered by the Snake River dredging program. The problem is that the anticipated increases in Snake River freight volumes claimed in the CDS, FR/EIS and DMMP/EIS are not supported by the available evidence. There are several reasons why this is so.

11. As a threshold matter, the use of data that is already years out of date raises serious questions about its reliability. The CDS made guesses about freight volumes during the mid- and late-1990s, and early years of the 2000s, based on data from the years before 1996. Today, there are many years of actual Snake River freight data in existence that could have been

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used to determine what the actual freight volumes were, rather than what they were forecast to be in the late 1990s. The Corps elected to ignore this data, however, even though it is data they maintain at the Waterborne Commerce Statistics Center in New Orleans, and in the Corps' Lock Performance Monitoring System. This is contrary to accepted accounting and analysis norms.

12. Moreover, the CDS forecasts are not accurate for use in forecasting freight volumes in the lower Snake River. Jones Report, at 8. The CDS does not attempt to estimate Snake River freight volumes specifically. Rather, it estimates total projected increases in ocean-bound wheat exports from Portland-area terminals. The Snake River basin is only one of several regions that ship wheat to the Portland-area terminals for export. For example, most of the Columbia basin (downstream of the Snake River) barges its wheat to Portland. Wheat from the Plains states, including Kansas and Nebraska, is shipped to the Portland area via rail. Wheat shipped through the lower Snake River only represents about a quarter to a fifth of this total volume. Exhibit C, FR/EIS, App. I, at 3-94.

13. Thus, in lieu of using the available data that is specific to the Snake River, the Corps estimates Snake River freight volumes by simply assuming that a steady percentage of total Columbia River exports is and will continue to be comprised of Snake River volumes. Exhibit D, U.S. Army Corps of Engineers, Walla Walla District, Lower Snake River Juvenile Fish Mitigation Feasibility Study, Technical Report – Navigation (April 1999) at 41 ("Between 1987 and 1996, the share of wheat and barley exports originating above Ice Harbor has varied between 20.2% and 26.6%. The average for the period is 23.38%. This average is used to project future wheat and barley movements on the Snake above Ice Harbor by applying that percentage to projected exports from the JFA Columbia River deepening study.") Thus, the substantial and steady rate of growth in Columbia port exports is imputed to mean that Snake

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River barge volumes will grow at that same rate. However, there is little actual support for such a forecast in the Corps' own data, which are ignored in this analysis.

14. When the 1995 forecast of growth in wheat exports was made, most of the then-recent export increases from Portland were the result of increases in exports to the Pacific Rim from the Plains states, not the Snake basin. Jones Report, 12. Even leaving aside the accuracy of the report as a general matter, the key point is that the forecast for increased wheat volumes for exports out of Portland-area ports was based on anticipated increases in wheat volumes from places besides the Snake River basin. To whatever extent wheat shipments from the Portland area were increasing at that time, it had nothing to do with increased wheat volumes out of the Snake. The chart below, taken from one of the Corps' own documents, shows that the Snake River's share of total Lower Columbia wheat and barley transport had dropped from 26% in 1988 to just over 20% in 1996. The Corps' own documents demonstrate that wheat traffic via barge on the Snake, in contrast to other areas, has been quite flat for about a decade. Id. at 13.

Table 4-5 Wheat & Barley Exports Off the Lower Columbia Compared With Shipments Off the Snake River Above Ice Harbor, 1987-1996.

Wheat & Barley	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Lower Columbia Exports	12085	14945	10458	11778	12233	12762	13428	14908	14603	13691
Snake River Shipments	2906	3981	2532	3109	3241	2612	2706	3135	3471	2821
Snake River Percentage	0.24	0.266	0.242	0.264	0.265	0.205	0.202	0.21	0.238	0.206

Exhibit D, U.S. Army Corps of Engineers, Walla Walla District, Lower Snake River Juvenile Fish Mitigation Feasibility Study, Technical Report - Navigation (April 1999) at 41; (Jones Report, 12).

15. Using the ratio of total wheat exports to Snake River volume described in the preceding paragraphs, the FR/EIS (and consequently the DMMP) estimates that freight volumes out of the Snake River will grow from just over 3 million tons per year to over 4 million tons per

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year by 2022. Exhibit C, FR/EIS, App. I at 3-95.

16. This estimate conflicts with considerable available data. Scrutiny of the Corps' actual barge data reveals that since the late 1980s, wheat tonnage out of the Snake has increased at a rate of approximately 0.1% per year. Support for this figure is presented in Exhibit E, in which I summarize total freight tonnage data that comes from Waterborne Commerce Statistics Center in New Orleans and the Corps' Lock Performance Monitoring System, as well as Corps annual reports. See Exhibit E.

17. Thus, even though wheat tonnage on the Lower Snake has been averaging just under 3 million tons per year for the last twenty years, at an exceedingly languid rate of growth, the DMMP/EIS benefit estimate is based on a prediction that by 2022, this tonnage will swell to over 4 million tons. There is no support for such a forecast. There is very little additional arable land left in the Palouse region, and no reason to think that increased yields of this magnitude from new crop varieties will be forthcoming. Jones Report, 12, 14. Again, the Corps is only able to make this forecast by erroneously imputing a percentage of the freight volume growth that occurred in the Plains states during the mid-1990s to the Snake River, where very little growth has occurred for quite some time.

18. Applying the 0.1% rate of increase that is supported by the actual data to the calculation of benefits in the DMMP/EIS shows a very modest 2% total increase, to 3.06 million tons, in Snake River freight volumes by 2022. This is, of course, a dramatic departure from the Corps' estimate of over 4 million tons.

19. The FR/EIS, using the 4 million ton volume estimate, determines that the navigation system provides $43.191 million in annual benefits in 2002 dollars, a figure that is simply imported into the DMMP/EIS. DMMP/EIS 1-12; FR/EIS, App. I, at 3-95. This $43

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million figure was generated by one of the Corps' consultants in developing the FR/EIS, using a proprietary computer program that no independent analyst can scrutinize. Thus, it is impossible to determine exactly how the $43 million figure was derived. However, it is reasonable to posit a roughly linear relationship between the amount by which the wheat freight volumes (which make up the vast majority of the transportation savings, DMMP/EIS at 1-12) are overstated and the amount by which the $43 million freight benefit figure is overstated. Such a linear relationship would mean that the $43 million freight benefit figure cited in the DMMP/EIS is overstated by approximately 27%. Thus, a more accurate benefit figure, based on growth in Snake River freight volume using the data ignored by the Corps, would be $31.3 million per year. See Exhibit F (summary of revised cost benefit calculation.)

20. Importantly, this criticism is not new, and is not unfamiliar to the Corps. Jones Report, 14-15. Because the FR/EIS suffers from precisely the same flaw (indeed, the DMMP/EIS simply borrowed this flawed analysis from the FR/EIS), many commenters brought this issue to the Corps' attention during the development of the FR/EIS. During this time, the Independent Economic Analysis Board, and others during the DREW process, criticized the Corps' use of CDS data to estimate Snake River volumes for the very reasons just mentioned. See FR/EIS App. I at 3-84. In its response to these comments, the Corps conceded that the criticism was valid, and that its methods resulted in a less reliable forecast than could be achieved by using volume data specifically from the Snake River. Id. (emphasis added). The Corps stated that:

> The forecasts developed for this study were obtained by simply prorating the forecast presented in the Columbia River Channel study based on the Snake River's historic share of shipments on the lower Columbia River. Critics of this methodology argue that a more accurate basis for the forecast would be an analysis of sources of commodities in the Snake River hinterland. The Corps

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agrees that analysis of the sources of commodities shipped on the Snake River should result in a more reliable long-term forecast.

21. Remarkably, after making the concession in the FR/EIS, the Corps refused to withdraw the analysis or the conclusions that rely on it. Now, the DMMP/EIS imports this admittedly unreliable data into the economic analysis for the dredging project.

22. Finally, as further evidence that the Corps' analysis is fundamentally misleading, it should be pointed out that the 1999 CDS study that forms the foundation for this (already fundamentally misleading) analysis has been largely repudiated by the Corps itself.

23. The Corps' Channel Deepening Study resulted in significant public controversy, primarily as a result of its environmental harms and questionable economic analysis. The Portland Oregonian conducted an in-depth review of the Corps' economic analysis for the proposal, and uncovered numerous and extensive flaws. The Oregonian report triggered even greater public scrutiny and controversy over the proposal, including a lawsuit by conservation groups. After the lawsuit was filed, the federal government withdrew the channel deepening proposal to re-evaluate its impacts, including its economic impacts.

24. In response to this public scrutiny, and while the government was re-evaluating the project, the Corps updated much of its economic analysis for the project. See Draft Supplemental Integrated Feasibility Report and Environmental Impact Statement (July 2002) ("CDS Supplement"), Exhibit G.[1] In this revised study, the Corps abandoned the 1995-era freight forecasts initially used, and developed new forecasts. Significantly, the new freight forecasts almost completely eliminate the old forecasts' predicted increases in commodity shipping. In the new document, the Corps states that "Wheat exports are projected to remain

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[1] The full document is available at <https://www.nwp.usace.army.mil/issues/crcip/CRCIPDSIF/Columbia_main.pdf>.

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relatively flat over the period of analysis." Id. at 3-3; see also Exhibit H, CDS Supplement App. L at 3 ("The Columbia River wheat export projections have been reduced substantially relative to the original analysis . . . .")

25. Thus, not only does the Corps impute freight volume increases to the Snake River from a study that conflicts with available data, but the study itself has been repudiated and the freight volume increases originally forecast have evaporated. The Corps ignores this relevant data in making its projection of the benefits of dredging.

ATTRIBUTING ALL PROJECT BENEFITS TO DREDGING ALONE

26. Navigation of barges between the Columbia River and Lewiston, Idaho is not the result of maintenance dredging in the Snake River. Prior to the construction of the lower Snake River dams, the river was unnavigable by commercial barges of the sizes currently used. It was only after the four dams were built, with their navigation locks and reservoirs which deepened the channel, that commercial navigation on the scale currently employed became available. Jones Report, 16-18.

27. Accumulated costs for construction of the dams, with the inclusion of modifications and renovations, now total approximately $1.135 billion. U.S. Army Corps of Engineers, Walla Walla District, Reports of the Secretary of the Army on Civil Works Activities, Fiscal Years 1976-2001, Table 30-K Snake River, Exhibit I. For a summary and aggregation of past capital costs, see Exhibit J.

28. In return for these government expenditures, the public as well as private entities received various "benefits." One benefit of the existence and operation of the Snake River dams is the generation of hydroelectric power. Another benefit of the existence of the four Snake River dams is the ability to navigate commercial barges as far upstream as Lewiston. A comparison of the costs of the projects to these electricity and navigation benefits certainly

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would be of interest to many observers. This is not, however, what is presented in the DMMP/EIS. Rather, the DMMP/EIS counts all of the benefits of the navigation system but ignores most of the costs of providing those benefits, i.e., the total costs of construction of the dams and associated facilities. The result is a fundamentally misleading economic analysis, and hence questionable conclusion about the wisdom of the current dredging project. Ignoring these capital costs also conflicts with the Corps' methodology in the FR/EIS as well as accepted principles of accounting and economic analysis. Jones Report, 16.

29. In the DMMP/EIS, all of the benefits of the navigation system are counted in the benefits "column" of the cost-benefit analysis. (As noted, these are calculated as the cost to transport goods via truck and/or rail minus the costs to ship those goods via barges: thus, benefits of the navigation system are the cost savings for private entities relative to rail/truck transportation that result from the availability of the navigation system). However, even though these benefits arise only by virtue of the existence of the dams, not simply maintenance dredging, all of the capital costs of the dams are omitted from the "cost" column of the DMMP/EIS cost-benefit analysis. Instead, the only costs included by the Corps are the costs to operate the locks and the costs to dredge (and dump in-river) accumulated sediment.

30. The problem may be best illustrated with an analogy. Imagine an analysis to compare the relative costs and benefits of living in your own house. In counting the "benefits," the analysis looks at the cost savings that result from not having to stay in a hotel every night. In calculating the "costs," however, the analysis counts only the fee for a weekly cleaning service, the utilities and the occasional minor repair but omits the mortgage payment. The outcome would be a cost-benefit conclusion that seriously misstates the overall picture, as the major component of the costs of living in the house – i.e., the mortgage – are left out. As with the

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analogy, the Corps has counted all of the benefits that arise only by virtue of the existence of the dams but ignored almost all of the costs associated with them. Jones Report, 16.

31. The Corps might attempt to argue that in the absence of dredging, navigation would cease, and hence, the benefits of navigation should be attributed wholly to the costs of dredging alone. This is contrary to accepted practice, and omits important considerations and factors: perhaps another analogy will illustrate how. Imagine that you've purchased a car for $30,000. Over time, the tires wear out and new ones are required. Without new tires, the car will not be able to run at all, which would render it useless. Is the "benefit" of installing a new set of tires (which cost a few hundred dollars) really $30,000? And if so, couldn't the same be said of the oil change, the new radiator cap and the replacement brake pads? One could make a virtually endless series of compelling cost-benefit presentations because each minor and incremental repair would have benefits equal to the value of the entire car. Jones Report, 18. However, this is a misleading approach that is contrary to accepted methods of cost benefits analysis.

32. Rather, under accepted cost-benefit analysis norms and the Corps' own methodology elsewhere, expenditures required to maintain the benefits of a large initial expenditure over time are viewed as "operating costs" associated with the functioning of the entire system, rather than independent projects that can be compared to the benefits of the original expenditure. Dredging to maintain the navigation system is only required because there are dams that created the navigation system. The costs of dredging cannot be viewed as some independent project to be compared to the benefits of navigation, but rather as part of the ongoing maintenance and operating costs relative to the construction and operation of the dams. This is the only way to arrive at a true picture of the relative costs and benefits of the navigation

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system – it is simply impossible to take the dams out of the equation. It is also how the Corps views dredging from a budget perspective, where it is considered part of the "operations and maintenance" costs of the dams. Exhibit 7, Hasselman Decl. (Corps budget projections).

33. In Exhibit F to this declaration, I have laid out the skeleton of a cost-benefit analysis that addresses this problem. In it, I use data that is supplied by the Corps itself, primarily in the FR/EIS. While this data has been criticized as well for overstating benefits and understating costs of the dams, I have still used the Corps' own data to the extent possible.

34. The Corps has apportioned the capital costs of each dam to the various project uses, such as navigation and power generation. This apportionment system is used by the Federal Energy Regulatory Commission to determine the rate base used for pricing electricity produced by the Snake River projects. Rate payers only get charged for the "energy" portion of the dams. On average, about 8% of the capital costs of the dams are "tied" to their navigation benefits, the remainder are attributed to their power benefits. This is, again, the Corps' own methodology. Using this figure, we can compare the benefits of the navigation system to the portion of the costs of the dams that the Corps has apportioned to the navigation system. According to FR/EIS and technical work papers, the allocated capital cost of the navigation portion of the four Snake River dams was approximately $106 million. FR/EIS, App. I, 11-2; Exhibit K, FR/EIS-DREW Cost Allocation Working Document (December 1, 1998), at 6.

35. Thus, the benefits of navigation must be viewed in the context of the portion of the costs of the dams that are apportioned to navigation. Using the Corps' own apportionment figures, a constant dollar base, and annualizing these costs over a time period equal to the economic life of the dams (which the Corps assumes to be 100 years), shows that the navigation component of the Snake River dams' construction "cost" about $6.7 million per year, in 1976

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dollars.[2]

36. In the DMMP/EIS, the Corps did not include this cost in its cost-benefit analysis. Jones Report, 17. Rather, it counts all of the benefits attributable to navigation but it does not count the $6.7 million/year in annualized capital costs that the Corps has apportioned to navigation. This is fundamentally misleading and presents a highly skewed cost-benefit conclusion. Inclusion of this relevant figure would result in a very different cost-benefit calculation. See Exhibit F (cost calculations); Jones Report, 18.

OTHER COSTS OF THE DAMS

37. As described above, the Corps counted benefits that arise only by virtue of the existence of the dams but ignored the costs of the construction and operation of those dams, in contravention of its own methodology elsewhere as well as accepted standards. This section further expands upon the same theme. In addition to the costs of building and operating the dams, a vast array of additional costs were imposed as a result of the construction and operating of the dams. While these costs should be built into any credible comparison of the costs and benefits of the navigation system, it should come as no surprise that the DMMP/EIS entirely ignores these too.

38. Construction of the dams did and still does enormous damage to the once highly valuable Snake River salmon fisheries. These fisheries included large commercial catches, a sweeping host of benefits associated with recreational fisheries, and difficult to quantify but very important tribal subsistence and cultural fisheries. Now that all Snake River salmon and

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[2] Benefit-Cost Analysis methodology requires analysts to determine a base period in which to accumulate all benefit and cost streams. The methodology is indifferent as to when that point is, so long as the benefits or costs are reported in "real" terms by appropriately adjusting for inflation between the base period and the time when the costs or benefits occur. It is common to choose a base period somewhere near the beginning of the project. In this case, I chose 1976.

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steelhead runs are either extinct or listed under the ESA, the benefits once arising from the presence of these fish have been very substantially reduced, and in some cases eliminated. Although many factors have contributed to the collapse of these species, most scientists and the Corps itself believe that the construction and operation of the lower Snake River dams have played a lead role.

39. In my work with the DREW process, I estimated that the economic value of fisheries that were wiped out by the lower Snake River dams to be in the neighborhood of $1.6 billion. Even though a part of this loss is a "cost" of the navigation system (which could be apportioned to navigation and power production purposes on the same formula as the capital costs described above), it is ignored in the DMMP/EIS.

40. Even the Corps' own data demonstrates this problem. In the FR/EIS, the Corps concludes that breaching the dams, which would substantially improve the state of these fisheries, would yield over $72 million in annualized benefits through increased commercial fishing and recreation. Another way of saying this is that the cost of not breaching the dams (i.e., costs imposed on commercial fishing and recreation interests by the dams simply by virtue of their continued existence) is $72 million per year. FR/EIS, App. I, at 10-3.

41. The Corps' estimates of these benefits have been criticized as too small by a number of parties for many reasons. Given the $1.6 billion figure that I outlined above for the value of the fisheries destroyed by the dams, it is clearly a substantial understatement. For purposes of this analysis, however, I will accept the Corps' own calculation from the FR/EIS. Thus, the point here is not that the FR/EIS estimate is flawed, which it likely is, but that it highlights relevant factors that were omitted altogether from the DMMP/EIS economic analysis.

42. If one is attempting to make a credible appraisal of the costs and benefits of the

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navigation system under accepted cost-benefit standards, one must include both the capital costs of the construction of the dams as well as the external costs that arose as a result of their construction, such as the harm to commercial fisheries and recreation. As we did above, we must apportion to the navigation system the same portion of these costs that the Corps has determined is appropriate. Thus, the cost to fishing and recreation associated with the existence of the navigation system can be added to the navigation component of the dams' capital costs. Using the Corps' own data and methodology, this total cost figure is approximately $3 million per year in 1976 dollars. Exhibit F.

43. Again, it is no difficult task to build these costs into a credible CBA. To continue with the discussion above regarding the capital costs of the dams, one can compare the benefits of the navigation system (all of which are included in the DMMP/EIS) to the "costs" (both capital and in terms of foregone fisheries/recreation) of the navigation system. Exhibit F. Of course, since these costs are ignored by the Corps in the DMMP/EIS, the Corps' economic analysis arrives at a very different conclusion.

SUDDEN HALT TO NAVIGATION

44. The DMMP/EIS asserts that over $43 million per year is saved by using barges in lieu of trucks and rail. DMMP/EIS at 1-12. This is the figure used by the Corps to quantify the benefits of navigation. (Of course, it is the producers and shippers of goods who receive this benefit, not the public or the U.S. Treasury, in contrast to its costs. But that is a separate issue.) As I showed above, this figure is based on inaccurate assumptions regarding increased freight volumes that even the Corps concedes will not materialize. Accordingly, I have estimated that this annual benefit, when adjusted to reflect an accurate freight forecast, should be approximately $31.3 million per year.

45. The $43 million figure comes from the FR/EIS, a primary purpose of which was

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to evaluate the pros and cons of breaching the dams to restore Snake River salmon runs. Should the dams be breached, of course, large scale commercial navigation on the scale currently employed would be eliminated immediately. Accordingly, it was reasonable to assert in the FR/EIS that these cost savings would be eliminated immediately upon dam breach.[3]

46. In the DMMP/EIS, the Corps uses this very specific FR/EIS figure – the economic impact of totally and immediately eliminating barge navigation – to calculate the benefits of dredging to maintain the navigation system. The figure is quite ill-suited to that task. Jones Report, 19-21.

47. As the Corps itself acknowledges elsewhere in the document, navigation would continue for some time in the absence of maintenance dredging. See ROD at A-22 ("It is possible for navigation to continue, albeit not at full capacity, without dredging.") Siltation occurs gradually over time, collecting in some places more quickly than others. The great bulk of the siltation occurs in the most upstream of the reservoirs, at Lower Granite; sediment accumulation in the other lower Snake pools occurs at a much lower rate. The Corps can respond to this gradual siltation in any number of ways. The easiest is to simply light load barges so that less draft is required. As sedimentation gradually continues, increasingly lighter barges would be required to navigate the channel. Moreover, the Corps can control the operating levels of the dams to raise pool levels, permitting barge navigation even as sediment accumulates.

48. Finally, it is likely that Lower Granite would be unusable for barges long before any of the other reservoirs, all of which have ports and barge loading/unloading facilities.

[3] This should not be taken as an endorsement of the particular figure chosen, or the FR/EIS generally. Rather, it simply intends to show that a figure that is appropriate for a dam breach scenario is not necessarily appropriate for the non-dredging scenario.

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Lewiston would become increasingly uneconomic as sediment accumulation limited shippers to lighter and lighter barges over time, but other facilities in the lower pools could continue functioning economically for much longer. DMMP/EIS 3-46.

49. The Corps did describe some features associated with light-loading barges in the DMMP/EIS. The Corps found that reducing the capacity of the river channel by one foot would increase shipping costs by 10%, and that reducing the capacity of the river channel by two feet would increase shipping costs by 22%. The Corps concluded that the increased costs in the "one foot" scenario are equal to the money saved by not dredging that quantity of sediment. Id. at 1-13. Hence, a loss of one foot in channel depth would have a net economic impact of zero. The Corps found that, in the two-foot scenario, increased shipping costs outweighed the money saved by not dredging.

50. However, this analysis of light-loading was not built into the CBA, which ignores this issue and simply assumes that all of the benefits of navigation will disappear immediately without dredging. Again, the benefits of navigation are overstated as a result, and the Corps' 16-to-1 benefit-cost ratio is inconsistent with the available evidence and fails to address important factors.

51. The impact of the Corps' immediate termination of navigation assumption on the $43 million (actually, as shown above, it is $31.3 million) benefit calculation is difficult to determine precisely, because of the proprietary nature of the computer program used to calculate that number. Nonetheless, one can get a sense of how the cost-benefit ratio might look by decreasing freight volumes over time and seeing how that might impact total benefits. Of course, without a very detailed engineering analysis, no one can know exactly how stopping dredging would affect navigation over time. For purposes of this illustration, I have produced

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two scenarios wherein sedimentation would gradually hinder navigation at a steady rate, rendering navigation unavailable at the end of a specified time. The scenarios include a steadily diminishing freight benefit over a five-year time frame and a ten-year time frame.

52. In the five-year freight reduction scenario, I assumed that freight would be reduced, as a result of siltation effects, by 20 percent in year one, another 20 percent in year two, and so on, until freight, and therefore benefits, ceased in the fifth year. After recalculating the net present value of freight benefits and annualized freight benefits, the annualized freight benefit decreased from $31.36 million to $27.55 million, a decrease of 12%. Exhibit L (summary of freight benefit timing scenarios).

53. In the ten-year freight reduction scenario, I used the same model, only spread out over ten years (thus, freight volumes, and benefits, declined by 10% each year). The resulting annualized freight benefit would have to be decreased from $31.36 million to $ 23.62 million, a reduction of 25%. Ex. L. While these are just estimates of how things could unfold, they present a more realistic scenario than the one presented by the Corps. Jones Report, 20.

54. There is no indication that the cessation of shipping, as a result of siltation, is imminent. Moreover, since the Lower Granite pool will be severely impacted long before the other pools, a gradual decrease in shipping efficiency, with a delayed cost impact similar to the 5- and 10-year scenarios described above, is probably very conservative. The fundamental point is not that I am trying to predict what is going to happen, but that the Corps' failure to consider a gradual rather than an immediate cessation of navigation benefits results in a substantial overstatement of freight benefits, to the detriment of a credible cost-benefit conclusion.

SUMMARY OF REAL COST-BENEFIT ANALYSIS

55. I have addressed the above-described omissions and shortcomings of the Corps in the revised cost-benefit spreadsheet presented in Exhibit F. To the greatest extent possible, I

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have incorporated into this analysis data that was ignored by the DMMP/EIS that come from other sources produced by the Corps itself.

56. Based on this information, it appears that a revised analysis would show some significant differences from the Corps' analysis. Whereas the DMMP/EIS determines that the navigation system produces about $43 million in benefits per year, as discussed above, this relies on data and assumptions that are invalid. First, taking into account a growth forecast that is suggested by the Corps' own Snake River-specific data, a revised analysis would show that the navigation system produces just over $31 million per year in benefits.

57. We can further incorporate into the benefit calculation a conservative ten-year gradual elimination, rather than a sudden halt, to navigation benefits. Incorporating this assumption into the calculation of benefits would show that the navigation system produces approximately $23.6 million per year in benefits. Thus, by ignoring these two highly relevant factors – ones which the Corps has not attempted to dispute – the DMMP's benefits calculation has been overstated by approximately 45%.

58. Similarly, if the Corps' cost estimate of navigation system maintenance were revised to include the capital costs of the dams attributable to navigation, as well the costs imposed on recreation and fishing that the Corps has found to be caused by the navigation component of the dams, there would be additional annual costs of approximately $10.63 million per year in 1976 dollars (for reference, this is equivalent to $33.42 million in 2002 dollars). This can be contrasted to the figure used by the Corps in the DMMP/EIS, which estimates costs at $2.7 million in 2002 dollars but ignores these capital costs and external costs.

59. Converting all of the omitted cost and benefits discussed above to a constant 1976 dollar value, a conservative cost-benefit analysis for maintenance of the navigation system

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through dredging would reflect a comparison of $7.5 million in annual benefits to $10.63 million in annual costs. Such a comparison yields a benefit-to-cost ratio of approximately 0.71 In other words, for every dollar that the navigation/dredging project costs, 71 cents of economic benefits are produced. If the Corps had not ignored the factors outlined above, its cost-benefit calculation would have been much closer to this figure than the 16-to-1 conclusion used by the Corps to justify the project.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Executed this _____ day of November, 2002, at Boise, Idaho.

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HONORABLE ROBERT S. LASNIK

UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF WASHINGTON

NATIONAL WILDLIFE FEDERATION, WASHINGTON WILDLIFE FEDERATION, IDAHO WILDLIFE FEDERATION, IDAHO RIVERS UNITED, PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS, INSTITUTE FOR FISHERIES RESOURCES, and SIERRA CLUB, Plaintiffs, v. NATIONAL MARINE FISHERIES SERVICE and UNITED STATES ARMY CORPS OF ENGINEERS, Defendants.	Civ. No. CV02-2259L REPLY DECLARATION OF ANTHONY JONES IN SUPPORT OF PLAINTIFFS' MOTION FOR PRELIMINARY INJUNCTION

I, ANTHONY JONES, state and declare as follows:

1. I have previously filed a declaration in this case in support of the plaintiffs' motion for a preliminary injunction. In that declaration I described my education, experience, and qualifications as an economics consultant.

2. In this reply declaration I address a number of points raised in the Declaration of Edwin J. Woodruff, which the defendants have filed in opposing the plaintiffs' request for a preliminary injunction. I have reviewed Mr. Woodruff's Declaration carefully and I make the statements in this reply declaration on the basis of my professional experience, to the best of my knowledge, and based on my review of Mr. Woodruff's Declaration and other relevant documents.

3. Briefly, as I explain in more detail below, Mr. Woodruff does not seriously dispute the explanation in my prior declaration that the freight growth forecasts which form the basis of the cost/benefit analysis in the Dredge Material Management Plan Final Environmental Impact Statement ("DMMP FEIS") substantially overstate actual likely future freight growth, and hence the benefits of the DMMP. Second, although Mr. Woodruff explains in his declaration why the U.S. Army Corps of Engineers ("Corps") chose not to consider the costs of construction of the Snake River navigation system in evaluating the costs and benefits of the DMMP, this explanation is not set out in the DMMP FEIS and it misapplies the concept of "sunk costs" in any event. Omission of these costs contributes to a substantially misleading picture of the actual costs and benefits of the DMMP. Third, I address Mr. Woodruff's assertion that the Corps correctly chose to ignore the costs the navigation system imposes on other valuable resources and economic activities, such as commercial and sport fishing, recreation, and Native American cultures. Again, the first point to note is that this explanation is not a part of the DMMP FEIS. In addition, as I explained in my prior declaration, there is even less basis for

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ignoring these costs than there is for ignoring the navigation system's share of construction costs. While the construction costs of the system have already been incurred (but still could be recovered), a portion of the opportunity costs of maintaining the navigation system as it currently exists are incurred again each year that the Corps chooses to continue to operate the system in its current form. Finally, I address Mr. Woodruff's assertion that the Corps' economic analysis did address fully the gradual decrease of freight benefits over time due to shoaling. I explain that while the Corps acknowledges in the DMMP ROD that there will be a gradual decrease in freight benefits, it does not mention this in the DMMP FEIS or evaluate the overall economic effects of this gradual decrease anywhere.

A. Freight Growth Forecasts

4. In my prior declaration, I explained that the DMMP FEIS relies on freight growth forecasts from an earlier Corps study that sharply overstated likely freight growth on the lower Snake River navigation system. Reusing the figures from this earlier study contributes to a significant overstatement of the benefits of the DMMP. Jones Dec. at ¶¶ 8-19. In his response, Mr. Woodruff quotes the Corps' responses to comments on the DMMP FEIS, Woodruff Dec. at ¶ 19, and then concedes that the agency's current projection of freight growth is approximately 25% lower than the projections used in the economic analysis for the DMMP FEIS, id. at ¶ 21. Mr. Woodruff attempts to obscure this key concession by explaining at some length that I did not trace with complete accuracy the trail of the Corps' error through a series of agency studies beginning with a System Operations Review forecast produced in the mid to late 1990s, migrating through an earlier Columbia River Channel Improvement Project (CRCIP) study to the Lower Snake River Juvenile Salmon Migration Feasibility Report/ Environmental Impact Statement (FR/EIS) and then to the DMMP FEIS. The important point, however, is that

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whatever the trail of the agency's error, its forecast of freight benefits had been publicly questioned several times and revised by the Corp at least once, even before release of the DMMP FEIS. A new forecast is now set forth in the most recent CRCIP. None of these revisions, however, were incorporated into the DMMP FEIS.

5. Thus, while I suggested that the percentage overstatement of freight benefits in the DMMP FEIS was approximately 27%, the difference between my estimation and Mr. Woodruff's concession of a 25% overstatement is not the critical point. The critical point is that the Corps now concedes the calculation of benefits and costs on which it relied in the DMMP FEIS overstates the benefits of the project by approximately 25%. While Mr. Woodruff is correct that this error standing alone does not reverse the ratio of benefits to costs, it does reduce it substantially.

6. Mr. Woodruff suggests that this sloppy accounting for freight benefits by the Corps' should simply be ignored because, even after correction, the benefits of the DMMP still so out weight the costs that there is no point in calculating or presenting an accurate freight forecast, including all the incidental and indirect costs, for the DMMP. Woodruff Dec. at ¶¶ 16, 21. He thus observes that even if getting the numbers right changed the benefit to cost ratio from 16:1 to 12:1, or less, the ultimate decision to proceed with the project would be the same. Id. at ¶ 21. This rather cavalier attitude to accurate economic analysis is disturbing coming from a representative of a governmental agency that annually spends billions of taxpayer dollars. An accurate description of the economics of the DMMP would be important even if the Corps' overstatement of freight benefits were the only incomplete or misleading aspect of its analysis. As explained below, however, there are other serious and unexplained omissions in the agency's economic presentation.

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7. An even more troubling aspect of the Corps' somewhat loose approach to economic analysis is that it allows an erroneous analysis to live on for many years into the future even after the agency knows its analysis is inaccurate. The economic analysis in the DMMP FEIS is itself a case in point: The Corps has known that the freight forecast used in the DMMP FEIS was unfounded for at least 4 years. Jones Dec. ¶¶ 11-14. Yet the DMMP FEIS borrowed this inaccurate analysis from the FR/EIS, which got it from the Columbia Channel Deepening Study, which, in turn, borrowed the analysis from an earlier System Operations Review. Id. Even if the initial SOR analysis was accurate at the time it was prepared, to treat it as still valid many years later was a mistake that the Corps knew about and eventually was forced to admit in the revised CRCIP. It is also a mistake that the Corps is now admitting for a second time in Mr. Woodruff's Declaration. Remarkably, however, the Record of Decision for the DMMP still seeks to obscure this mistake and even persists in re-asserting the incorrect 16-to-1 benefit/cost ratio that the Corps calculated based on overstated freight benefits. See DMMP ROD at 20 (responses to comments of National Wildlife Federation which included my original critique of the Corps' economic analysis) ("The benefit/cost ration is approximately 16:1." (emphasis added)). Neither public understanding and trust nor informed agency decision-making are well served by the Corps' approach.

B. The Capital Costs of the Navigation System.

8. In my earlier declaration, I explained that the Corps does not include in its evaluation of benefits and costs for the DMMP the navigation system's share of the construction cost of the system of dams and reservoirs that allows both navigation and the production of hydro-electricity. Jones Dec. at ¶¶ 26-36. I also explained that if these costs had been included they likely would have reduced very substantially the ratio of benefits to costs for the DMMP.

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Id. at ¶ 36. The Corps' response is not to dispute my analysis of how inclusion of these capital costs would impact the benefit/cost ration for the DMMP. Nor does it claim that it discussed or disclosed these costs or how their inclusion would affect the economic analysis in the DMMP FEIS. Woodruff Dec. at ¶¶ 24-30. Instead, Mr. Woodruff argues that under Corps policy guidance, practice, and current law, these costs are treated as "sunk" and can, therefore, be ignored. Id. at ¶¶ 14-17, 24, 28. There are at least two problems with this response. First, in strict economic terms, the navigation system's share of the construction costs of the dams and reservoirs are not genuine "sunk costs" because they can still be recovered should the Corps recommend and Congress choose to do so. Second, the Corps itself treats some of the dam construction costs as "afloat" in some analyses where it serves the agency's purposes, and as "sunk" in others, such as the DMMP FEIS, where it does not. I address each of these topics below.

9. The economic definition of "sunk costs" are costs that have already been paid and **cannot** be recovered. Even the definition of "sunk costs" that Mr. Woodruff provides in his Declaration confirms this point: "[P]ast events have already occurred and cannot be retracted by future action. [Such events] should have no influence on deciding among alternatives . . . ." Woodruff Dec. at ¶ 25 (quoting a standard engineering economics text on sunk costs) (emphasis added). Mr. Woodruff misses the point by focusing on the fact that the main capital expenditures for the dams happened in the past. Not all past costs are sunk costs, however. Indeed, by such a simple measure all prior capital expenditures would be sunk costs, something they clearly are not. Rather, the key word to focus on in the definition is "cannot." When it is a policy or other choice that can be changed, rather than a market-based decision that cannot, that determines whether or not past spending is recovered, the past spending is not properly characterized as a

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"sunk cost."

10. Thus, in economics, the presence of genuine sunk costs usually means there has been a market failure of some sort, often an information failure. For instance, if your car breaks down on the way to the Super Bowl causing you to miss the game, the cost of the tickets is a sunk cost. If you had known the car would break down you could have exercised options upstream of the event to either not buy the Super Bowl tickets, or sell them, thus avoiding the sinking of the cost. If, in this latter instance, you had the chance to sell the tickets but chose to keep them, the cost is still not sunk. The fact that the owner, for whatever reason, chose to keep the tickets when given the opportunity to sell them means that, in generally accepted economic analysis terms, the owner cannot properly treat the costs of the tickets as sunk.

11. In the case of the lower Snake River navigation system, neither the power portion of the original construction costs, nor the navigation portion of these costs, are accurately characterized or treated as "sunk." By economic standards both the navigation and power systems are functioning as designed and both afford viable methods of recovering the full cost of their construction and operation. In fact today, the Bonneville Power Administration ("BPA") sells the electricity generated by the power portions of the dams and uses a portion of the proceeds from these sales to repay the U.S. Treasury for its share of the capital construction costs of the system. (Even so, for many years its rates were considered to be a bargain.) If barge transportation has the cost advantage over other modes of transport that the Corps suggests, shippers could easily afford to pay a toll to lock through the dams and hence also allow the government to recover the navigation share of the capital construction costs.

12. In strict economic terms, therefore, the navigation portion of the costs of the dams and reservoirs simply are not "sunk." Instead, a decision has been made to separate this cost

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stream from the benefit stream after the initial justification phase of the projects.[1] This decision can be changed at any time. Since the cost streams and benefit streams are separated, however, this allows the same benefit stream to be used over and over to justify additional projects in later years without consideration of what it actually costs to provide the benefit, or consideration of whether the full cost of providing the benefit should be recovered now or in the future. There is no economic justification for the Corps' decision to bury these costs when presenting an economic analysis of the DMMP. The decision to bury these costs does, however, obscure the available financial choices and lead to an incomplete and inaccurate economic picture of the DMMP.

13. It is immaterial to a complete and accurate economic analysis that policy choices, or the law as it currently exists, leads to repayment of the capital costs of the hydropower portion of the systems of dams and reservoirs but does not do the same for the navigation share of these costs. See Woodruff Dec. at ¶ 28. It is only through a full and accurate accounting of all of the costs and benefits of a proposed course of action that the agency decision-makers – and ultimately the public and Congress – can make informed decisions about where to spend, and how and whether to recover, capital costs paid by the government. The Corps' decision to treat the navigation systems' share of the capital costs of the dams and reservoirs only as off-the-books, "sunk" costs discourages rather than facilitates fully informed decision-making.

14. To make clear how the economic picture of the DMMP has been skewed by the

[1] This is similar to some of the accounting practices used by Arthur Andersen, Enron, and WorldCom. In some cases these companies separated the debt from the income of their acquisitions. By displaying only the income side of some major transactions they managed to make their companies look more prosperous than would have otherwise been the case. Stock values soared, and then crashed when the practice was exposed. In some of those cases the accounting practice was determined to constitute securities fraud.

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Corps' choice not to address the navigation portion of the capital construction costs for the dams and reservoirs, it is worth considering other economic analyses by the Corps that do address portions of the construction costs of the dams and treat them as "afloat." During the preparation of the analysis for the FR/EIS, the question arose as to how to handle the hydropower share of the capital construction costs of the dams and reservoirs. Many economists had assumed them to be sunk.[2]

15. The Independent Economic Analysis Board (IEAB), the Corps, and BPA all challenged this assumption. It was their contention that the capital construction costs underlying the BPA power rates were still "afloat." To the extent that the capital costs for the power portions of the dams were on the U.S. Treasury Department books and were being paid down by BPA, these entities argued that the capital costs of the hydro portions of the dams were still afloat.

16. Ultimately, in the FR/EIS, the Corps took this position and treated the full cost of providing the entire average annual power production of the lower Snake River Dams, <u>including their capital costs</u>, as costs to be considered in evaluating the benefits of alternative courses of action. Put simply, the Corps' explicit conclusion for purposes of the FR/EIS analysis was that the capital cost of the hydro portions of the dams is still afloat. By this convention, the Corps showed a <u>cost</u> of $271 million per year for the next 100 years if the dams were to be removed because the capital construction costs of the dams would not be recovered. In the FR/EIS this

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[2] These economists believed that, in the absence of the Lower Snake River dams, the difference in power production would be made up on the open market by private power producers for prices similar to those being charged by the BPA for Corps generated power. This is commonly referred to as the opportunity cost approach to valuing the power produced by the dams. This nominal price difference between BPA produced power and open market non-BPA power, the opportunity cost, even included the possibility of a price decline.

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was the single largest number presented as a "cost" of dam removal. It was the largest cost or benefit number in the economic analysis by a factor of 4. Without the assumption that the capital costs associated with the hydro portions of the dams are still afloat, as opposed to sunk, the monetary benefits associated with maintaining the presence of the dams would have dwindled to insignificance and the FR/EIS economic analysis would have presented a very different picture.

17. As Mr. Woodruff explains, the Corps' treatment of the capital cost of the navigation portions of the dams is the reverse of agency's treatment of the hydro power portion of these costs: While the costs related to the power portions of the dams is analyzed by the agency as afloat, the navigation related capital cost are considered to be sunk. Woodruff Dec. at ¶ 28. In the absence of this differential treatment, there is substantial doubt as to whether or not the continued investment in lower Snake River navigation would be judged to be economical or in the public interest.[3] Alternatively, if the Corps had treated the hydropower costs of the dams as sunk in the FR/EIS, as it does the navigation costs in the DMMP FEIS, there is substantial doubt as to whether any continued investment in lower Snake River dams would be judged economical or in the public interest.

18. The ultimate point for purposes of this case, however, is not to argue for one approach or the other but to point out that the costs are treated differently by the agency in different places, that this differential treatment and alternatives to it are not addressed or

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[3] This Corps' treatment of navigation costs is parallel to something called the Concorde fallacy, after the method of funding the supersonic transport jet jointly created by the governments of France and Britain. Despite the fact that the Concorde is beautiful and as safe as any other jet transport, it was very costly to produce and suffered some major marketing problems. Changes in noise restrictions at many airports subsequent to the plane's design limited its potential service area and reduced the demand for the plane. Even though it was apparent that there was no way this machine would make anybody any money, France and England kept investing deeper and deeper, much to the dismay of taxpayers in both countries.

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explained in the DMMP FEIS, and that the differential treatment has profound effects on the picture of the costs and benefits of the DMMP. At a minimum, the Corps should disclose the markedly different economic effects of its different approaches to capital costs when it employs them. Only through such full and complete disclosure of alternative economic approaches can the Corps, the public and, ultimately, Congress determine the appropriate economic and social choices for the use of government funds. In this case in particular, if subsidizing commodity shipments from the Palouse is the goal, the Corps' decision to present the navigation portion of the capital construction costs of the system only as sunk does little to help determine whether or not continued investment in this subsidy for the navigation system is appropriate. Treating the costs only as sunk, without disclosing the effects of treating them as afloat, obscures important economic options and affects a key aspect of the agency's decision.

C. The Opportunity Costs of the Navigation System

19. In my earlier declaration, I explained that the economic analysis for the DMMP ignored the costs that continued operation of the navigation system imposes on other resources and activities. Stated simply, each year the Corps chooses to continue operating the navigation system under its current management and configuration, these operations impose costs on certain kinds of recreation, on sport and commercial fishing, and on other resources and values such as those that could be enjoyed by Native American Tribes. Jones Dec. at ¶¶ 37-43. Mr. Woodruff seeks to dismiss the navigation systems share of these continuing costs by asserting they are like the capital costs of dam construction, i.e., sunk. Woodruff Dec. at ¶¶ 31-35. Mr. Woodruff also states that "[s]topping dredging will not remove the Snake River dams, so the impacts to fish associated with the dams would be essentially the same with or without dredging." Id. at ¶ 35.

20. These responses obscure an important point in the economic analysis of the

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DMMP. The existence of the dams on the lower Snake River was and is justified by two principal benefit streams, hydropower production and cost savings to transportation from the availability of navigation. Indeed, navigation is the sole pillar of support for the navigation portion of the cost of the dams. If either benefit stream is removed, the economic justification for both the continued operation of the dams and for their existence would look very different. Conversely, if all of the costs of providing the navigation benefit stream are not addressed and accounted for, the value assigned to this benefit stream for purposes of determining whether to continue to provide it will be misleading. Thus, the existence of the navigation portion of the dams depends on the transportation benefits the dams provide. According to the Corps, sustaining these transportation benefits, in turn, depends on dredging or some other activity to maintain a navigation channel. The costs of the dams and the costs they impose on other resources simply cannot be separated from the costs of maintaining a navigation channel if the Corps is to present a complete picture of costs and benefits.

21. If, as the Corps asserts, dredging or some other program to maintain the navigation channel makes the transportation savings possible, and these savings, in turn, justify the existence of the dams – which cause environmental damage – the Corps' economic analysis for dredging (and for the continued existence of the dams for that matter) must make and account for these same linkages. For purposes of the DMMP, this means that the Corps' economic analysis must include the cost of that portion of the environmental damage caused by the dams as a portion of the costs of the dredging or other navigation maintenance program because such action is necessary to perpetuate the utility of the dams. No other conclusion provides a complete economic picture.

22. As I explained in my prior declaration, even a very limited assessment of these

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environmental costs shows that including the navigation share of them in the benefit/cost analysis for the DMMP would have a very substantial impact on the ratio of benefits to costs. Jones Dec. at ¶¶ 37-43. Mr. Woodruff does not assert that the Corps considered these cost factors – and it did not. Nor does he explain that my illustrative calculation of what these costs might look like if they were taken into account is wrong. He simply argues that these costs can be ignored in the DMMP FEIS benefit/cost analysis because, like the capital construction costs of the dams, they are "sunk." Woodruff Dec. at ¶¶ 32, 35. As I explain above, this approach is not supported by principles of economic analysis and it leads to an incomplete and misleading account of benefits and costs.

D. The Assumption of an Immediate Halt to Navigation

23. In my comments on the draft DMMP EIS and in my declaration, I criticized the Corps for using dollar figures in its economic analysis that assume transportation on the river will cease completely if dredging does not occur immediately. As I explained, the Corps' original figures that employed this assumption were taken directly from the FR/EIS. In the case of the FR/EIS, it was proper to assume that freight benefits would cease completely at a single point in time because the action evaluated in the FR/EIS was removal of the lower Snake River dams. Jones Dec. at ¶¶ 44-54.

24. I also explained that, in the absence of dam removal, navigation would not cease immediately but decline only gradually as the reservoirs behind the dams silt up and the navigation channel becomes gradually shallower (requiring lighter barges) and shorter (moving the head of navigation slowly downstream). The economic effects of these events would build gradually over time and would not cause the complete cessation of shipping on the river for an unknown number of years into the future. Id. at ¶¶ 47-48. The Corps' estimate of losses

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attributable to reduced shipping on the river, however, does not recognize the smaller costs of not dredging in the early years, the larger costs in later years as the channel silts in, an finally the full cost at some point in the future when the barge companies conclude that it is no longer cost-efficient for them to offer barge services because of the degraded channel.

25. In his declaration, Mr. Woodruff asserts that the Corps did not assume an immediate end to navigation as I had indicated. Woodruff Dec. at ¶ 36. Indeed, he states that their analysis, " . . . assumes shoaling (over time) throughout the lower Snake." Id. (quoting DMMP ROD, Att. A at 70). He then goes on to quote the section from the DMMP ROD explaining that the Corps had made a rough analysis of a gradual cessation of navigation along the lines of my earlier criticism. Id. The summary of this analysis that Mr. Woodruff quotes in his declaration compares freight costs associated with the current 14 foot deep channel, a 13 food deep channel, and a 12 foot deep channel. In this section, the Corps states:

> The COE admits that the result of this analysis, based on 1999 costs, indicated that dredging costs were equal to the estimated increase in barge costs when the channel capacity was reduced by only one foot. However, where channel depths were reduced by two feet, the cost of dredging was about half of the increased cost to barge transportation. In essence, shoaling that reduces the channel depth by one foot represents the "break even" point where maintenance dredging is feasible and cost-effective."

Woodruff Dec. at ¶ 36 (quoting DMMP ROD at 20).

26. With this statement the Corps acknowledges my central point: freight shipments, and attendant benefits, will not cease immediately if dredging does not begin immediately. What the Corps does not do, and despite his statements Mr. Woodruff does not offer anything to the contrary, is use the kind of analysis it has made of the gradual effects of a shallower channel on navigation in its calculation of benefits and costs.

27. The Corps failure to consider the effects of a gradual cessation of navigation may

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sound like minor quibbling, but it is important to a full and accurate economic analysis. The Corps' economic analysis is built on a foundation of discounted cash flows. With discounted cash flows, the distance into the future that a cost occurs may have as much impact on its net present value as does its ultimate future value. For instance, at the Corps' discount rate of 6.875%, the net present value of an event that is worth one dollar today is worth only $0.94 if the benefit is delayed for a year. If the receipt of the dollar is delayed for 10 years its net present value is only $0.51. If the receipt of the dollar is delayed for 20 years its net present value is only $0.26.

28. For this reason, an accurate accounting of when we actually will cease to receive the benefits of navigation as the channel gradually becomes less useful has a significant impact on the present value comparison of benefits and costs. Other than acknowledge in the DMMP ROD – but not the DMMP FEIS – that the cessation of navigation benefits will be gradual if dredging does not occur immediately, the Corps has made no effort to detail the declining trajectory of freight benefits or the extent to which this gradual decline will affect the net present value of future freight benefits.

29. In short, nowhere in the DMMP FEIS, the ROD or Mr. Woodruff's declaration does the agency attempt to estimate how long it will take for the river to silt up to a point where barge operations would cease. Nor does the agency look at a gradual shift of the head of navigation downstream.[4] In the absence of a table, or set of calculations, that details the

[4] The discussion of "average annual costs" and "average annual benefits" in the material from the DMMP ROD that Mr. Woodruff quotes, Woodruff Dec. at ¶ 36, does not address the Corps' assumption of a termination of freight benefits in year one without immediate dredging. Instead, this discussion indicates that the Corps has averaged the costs of dredging over the twenty-year life of the DMMP as apart of calculating net present value. For example, if the Corps expects to incur most of the dredging costs in years one, three, five, etc., it averages these costs over all of the twenty years rather than assigning the full cost to a particular year. This mathematical

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incremental losses of freight benefits year-by-year, and the delayed effect it has on the net present value calculation, as the shoaling of the channel takes effect on predicted freight movements on the river, I have to conclude that the Corps simply ignored the effects of this gradual change. In the absence of such a set of calculations, I also have to conclude that the dollar figure the Corps uses as navigation benefit continues to represents a year one cessation of all freight movement on the river. With the information the Corps has provided, the only conclusion that can be drawn is that, by assuming an immediate cessation of these benefits in the absence of dredging, the agency has overestimated the effects of not dredging. The amount by which these effects are overstated is unclear in the absence of further analysis.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Executed this 2nd day of December, 2002, at Boise, Idaho.

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ANTHONY M. JONES

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exercise has nothing to do with calculating a gradual decline in freight benefits as the utility of the navigation channel declines if dredging does not occur immediately.

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HONORABLE ROBERT S. LASNIK

UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF WASHINGTON

NATIONAL WILDLIFE FEDERATION, et al. Plaintiffs, v. NATIONAL MARINE FISHERIES SERVICE et al. Defendants. and LOWER GRANITE NAVIGATION COALITION, et al. Defendant-Intervenors	Civ. No. CV02-2259L DECLARATION OF ANTHONY JONES IN SUPPORT OF PLAINTIFFS' SECOND MOTION FOR PRELIMINARY INJUNCTION

I, Anthony Jones, declare and state as follows:

1. I am a professional economics consultant. I hold degrees in economics from Idaho State University (B.A.) and University of Washington (M.A.). I am currently a resident of Boise, Idaho. In my prior declarations in this litigation, I discuss my professional qualifications to discuss the economic benefits and costs of dredging and barge navigation, and my extensive experience and familiarity with the Snake River transportation system and I would refer the Court to those declarations for that information rather than repeat it.

2. I make the following statements on the basis of my professional experience, to the best of my knowledge, and subsequent to extensive review of the 2003 supplemental environmental analysis ("2003 SEA"), the draft and final environmental impact statements on the Dredged Material Management Plan ("DMMP/EIS"), their appendices, documents referenced therein, and other documents pertaining to management and economics of Snake River dams. The purpose of this declaration is to discuss how sedimentation in the Snake River navigation channel, associated with reduced dredging, may affect the barge transportation system there. I also briefly discuss the economic benefits of recreational fishing, which is an issue whenever activities are proposed that may harm salmon and steelhead that spawn, rear or migrate in the region.

3. It is my professional opinion, based on extensive research and thorough knowledge of the Snake River transportation system and grain economy, that the current lack of dredging is having negligible, if any, adverse economic impact. Moreover, lack of dredging for another year will also have negligible, if any, adverse economic impact. While owners of barging companies are understandably concerned, there is little evidence that reduced dredging over the coming year will be the disaster they predict. To the contrary, the evidence shows that

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holding off one additional year on maintenance dredging will have very limited impacts that can easily be mitigated. In fact, given the substantial costs of dredging and the limited benefits it provides, especially in the Lower Granite reservoir, it actually would be an economically rational decision to hold off on dredging for another year.

CURRENT NAVIGATION CONDITIONS IN THE SNAKE RIVER

4. The claim is made that grain barges are required to "light-load" in response to a shallower navigation channel caused by sediment inflow over the last few years. I am aware of very little evidence that light loading is occurring. I have searched for data and conducted interviews to identify support for claims that barges are being light loaded, or that prices have changed in response to reduced channel maintenance, and have not found any evidence to support such claims.

5. I conducted four separate telephone interviews with representatives of Foss Maritime Company, Shaver Transportation Company[1] and Tidewater Barge Lines Inc., between August 8, 2004 through August 12, 2004. During these calls, I asked these representatives to elaborate on the extent to which they were light loading barges transporting grain out of the Lower Granite pool. In each case, they responded that they were continuing to fill barges to the predetermined optimal level for each individual barge. They indicated that the optimal level to fill most grain barges results in a draft of about thirteen feet six inches. They indicated that reduced channel maintenance has not changed the volume of grain they load onto the barges.

6. The representatives of the barge companies did indicate that current conditions forced them to be more exacting in their operations, and that an extensively dredged channel

[1] Note: Shaver indicated that it did not operate in the Lower Granite pool. Therefore, all discussions of the impact of siltation on barge companies in the Lower Granite pool are exclusive of Shaver.

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would make their lives easier and barge transportation safer. However, when I asked each company if they had raised, or if they were in the process of raising rates associated with these problems, the answer was uniformly no. When I asked how many years it would be before they would have to start light loading the barges or taking other actions if the Corps does not dredge the channel, they replied that they did not know or could not say.

7. I also have searched extensively for documentation and records that would support claims of light loading. Representatives of barging companies have either refused to provide me with information, or I have been told that such information does not exist. I have been unable to locate any documentation from any source that demonstrates that light loading is occurring, despite an extensive search.

8. In summary, while the barge company's desire for a deeper and wider channel is genuine, there is no indication that they have changed the extent to which they fill the grain barges and no indication that they are experiencing revenue losses or higher costs.

9. This finding is consistent with data on pool elevations in the lower Snake River pools during the last few years. Light loading of grain barges only arises, even as a possibility, during the fish migration season: April through the end of August. Outside of the fish migration season, the U.S. Army Corps of Engineers ("Corps") can manipulate reservoir elevations to provide adequate room for fully loaded barges. Inside the fish migration season, the Corps is required to operate the reservoirs within a foot of minimum operating pool ("MOP"). While it may be the case that a full navigation channel is not currently available everywhere in the system at MOP, the Corps has not complied with this requirement during the last several migration seasons in any event. Instead, it has operated above MOP in order to accommodate barge traffic.

10. Moreover, claims of economic harm are chiefly based on increased shipping costs

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to grain producers. I have surveyed prices charged by barge lines and it does not appear that shipping prices have changed over the last few years as a result of a less-than-complete navigation channel. Even if light loading were occurring, this would mean that any impacts are being absorbed by the navigation interests, not farmers or grain traders. This is consistent with available information indicating that barges currently do not price competitively. See BST Associates, Lower Snake River Transportation Study: Final Report, at 17 ("BST Study").[2] According to one recent analysis of Snake River transportation: "it appears that barges are not forced to price competitively and may have a sufficient margin to price downward if railroads price aggressively in trying to attract Lower Snake River grain traffic." Id. If barge companies have a sufficient margin to price downwards, it follows that they have a sufficient margin to absorb increased costs without raising prices. This is presumably would explain why prices have not risen even if the claims that barges are being light loaded were true (and they do not appear to be).

11. Finally, it is noteworthy that the Corps itself has backed away from its calculations of cost impacts to non-grain products. A survey of Tidewater's rate sheets shows that light loading is an issue for only the grain barges. The subject is not mentioned in the rate sheets for other commodities. This is appropriate. Non-grain barges, such as those carrying petroleum or fertilizer products, have traditionally had a draft of about twelve and one half feet. Similarly, other barges such as those carrying tissue, as a result of the low-density commodities they carry, float much higher in the water than do grain barges. For them a 14-foot navigation channel is unnecessary. In short, to the extent that there is an impact on shipping caused by reduced maintenance, that impact appears chiefly to effect wheat and barley barges, not non-

[2] This study is available in the administrative record for this case, document number 41, page

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grain products.

12. In the next few sections, I assume that there will be some light loading that will be required for grain shipments if dredging does not occur this winter. While it is not even clear that this is a correct assumption, the discussion that follows is intended to show that light loading, even if necessary at all, would have truly limited impacts. In fact, there are a wealth of management options the Corps could take that would continue to allow the unimpeded flow of barge traffic without the necessity of dredging the Lower Granite channel and other pools. Even though they are not explored in the Corps' dredging analysis, they should be taken into consideration into any inquiry into the impacts of reduced dredging over the next year.

GRAIN SEASONALITY

13. Substantial research is available showing the time of the year that grain shipments travel in the Snake River on barges. As noted above, light-loading is only a potential concern during the months of April through August, when the MOP constraint is supposed to be in place. What this data reveals is that even though the fish migration season covers about five months of the year, the substantial majority of grain shipped through the system occurs outside this season. See BST Report at 20 (graph), 54 ("grain shipments tend to peak in the late fall and early winter, and the average volume handled during peak months is 50% higher than in an average month"). Accordingly, reduced channel maintenance presents a much smaller obstacle than often claimed.

14. The Strategic Freight Transportation Analysis ("SFTA") Research Report #5 by Casavant, Jesup, and Clark, documents the actual shipments of wheat and barley from Washington grain handling facilities to their final destination. See Table 12.4, p. 42.[3] In

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897.

[3] The SFTA Report is available at this website: http://www.sfta.wsu.edu/research/reports/pdf/Rpt_5_Dynamics_of_Grain.pdf. Washington accounts

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particular, they show that for the entire state of Washington, nearly two-thirds of the wheat and barley crop is shipped out in the six months between September and February. The remaining one-third trickles out during the following six months. Casavant, Jesup, and Clark further document that for some of the eastern Washington counties, the grain shipment seasonality is even more severe. For the counties of Whitman, Walla Walla, Lincoln, and Adams, grain shipments begin in earnest in July – August and are effectively finished by January - February. SFTA #5, at 15. For example, Whitman County shipped about 74 percent of their wheat during the six months from September through February.

15. The conclusions contained in Casavant et al. are backed up by the Corps' own shipping data, which includes not just Washington grain volumes, but grains from Idaho and other states that use the Snake River barge system. This data reveals a somewhat less lopsided distribution outside of the fish migration season, but nonetheless confirms that the majority of the grain produced moves outside of the fish migration season.

16. The following graph was developed from the Corps data. It shows actual tonnages of grain shipped via barge through the Lower Granite Lock for crop years 2000 through 2003. The graph reveals that total tonnage shipped generally increases rapidly following harvest in the late summer and early fall, and then drops down. This increase in shipping can be as early as August but is often as late as October. Grain tonnage typically reaches its peak somewhere between November and January. March through July are the months in which the fewest tons of grain are moved on the Lower Granite pool.

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for 68.7% of the grain traffic moving on the lower Snake River system. BST Report at 43. Idaho accounts for 22.1%, and the remainder is split between Montana, North Dakota, Oregon, and Utah.

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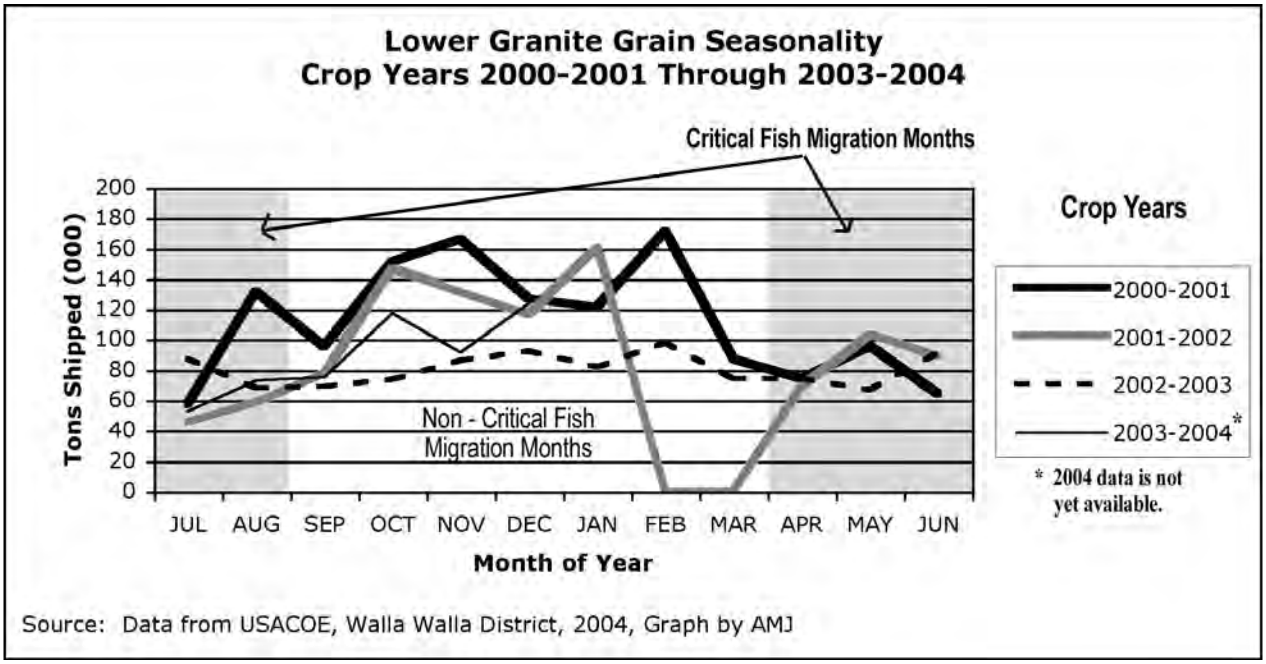

17. In short, it appears that approximately one third of the grain that uses the barge system is in the river during the fish migration season, the only time of year in which light loading may even be an issue during the coming year. Many of the claims of significant harm by the Corps and others neglect to acknowledge this fact.

GRAIN STORAGE

18. As shown above, the bulk of the grain in the system travels outside of the fish migration season and would be unaffected by reduced dredging. Moreover, research demonstrates that there is extensive storage availability at grain elevators in the region served by the Snake River that would help mitigate the impacts for grain that would be potentially affected. See BST Report at 14-15 (listing of barge terminals in lower Snake River pools; 42% of system's storage available in Lower Granite pool). If light loading during the fish migration season appeared to cause costs concerns, the option is available to store the small amount of grain for which shipping would be deferred because of light loading at these facilities until the MOP

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constraint is no longer imposed.

19. In the above mentioned SFTA report, data is presented showing that turnover rates in grain handling facilities in Washington State averages 0.90. SFTA#5, at 41. Turnover is the ratio of storage capacity to throughput. A number less than one means that available storage can accommodate the full year's crop, and once it is in storage, the grain can be shipped to the final destination at any time over the remainder of the crop year. In some counties, such as Whitman County, the options are a bit more limited, but not excessively so. The turnover rate in Whitman County is 1.17, which means that the typical annual crop of grain in the county exceeds the county's storage capacity by 17 percent. This further means that over the course of the year, the various handling facilities in Whitman County ship 17 percent more grain than they can handle at any single point in time. In agricultural terms, this typically means that the grain handling facilities need to ship as much as 17 percent of the grain they receive during the July – August harvest period. Once they have fulfilled that requirement, they have the freedom to ship the rest of the crop at any time they desire over the remainder of the crop year.

20. There is nothing particularly revolutionary about such an approach – in fact it happens fairly regularly. In 2002, for example, Lower Granite dam was shut down for maintenance of the locks for a period of over two months. During that time, all traffic through Lower Granite lock stopped completely. A similar less severe outage occurred between October 22 and December 1, 2003 at Ice Harbor that restricted lockage hours, severely slowed lockage times, and restricted the lockages that did occur to commercial craft. The impacts were readily accommodated by the affected shippers. Because there was advance knowledge of the 2002 constraint, decisions about storage were made ahead of time and the system was readily able to accommodate the shutdown. While presumably not ideal for users of the system, it did not

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present a big problem. Lengthy shutdowns of this nature have occurred regularly throughout the Snake navigation system for years, with limited effects.

GEOGRAPHIC IMPACTS

21. The Corps' assessment of the benefits of the proposed dredging, and the claims made about the impacts that may occur without dredging, imply that all products shipped through the barge system would be equally effected. That is not the case. More than 90 percent of the dredging in 2004-05 will occur in the Lower Granite reservoir – in the navigation channel and in the Ports of Lewiston and Clarkston. Small additional volumes are planned for the Lower Granite and Lower Monumental navigation lock approaches. This implies that the reduced channel maintenance would primarily impact barges that start in the Lower Granite pool.

22. However, only about 38 percent of the grain that uses the Snake River navigation system begins in the Lower Granite pool. Sixty-two percent of the wheat that moves on the Snake River is loaded onto barges downstream of Lower Granite pool. The following chart compares grain volumes originating in each of the pools.

Incremental Tonnage by Project
(Thousands of Tons)

Year	McNary	Ice Hrbr	Lo-Mo	Goose	Grnit	DISTRICT TOTAL	LSR Total	Granite % of LSR	Grnite + Goose % of LSR
1990	1,195	501	139	1,181	1,390	4,405	3,210	43.30%	80.08%
1991	1,659	550	138	1,296	1,388	5,032	3,373	41.15%	79.59%
1992	1,346	502	83	1,019	1,081	4,030	2,684	40.27%	78.23%
1993	1,507	494	93	1,060	1,119	4,273	2,766	40.45%	78.77%
1994	1,673	599	135	1,207	1,261	4,875	3,201	39.38%	77.07%
1995	1,621	650	149	1,338	1,360	5,117	3,497	38.88%	77.14%
1996	2,010	465	188	1,110	1,055	4,827	2,818	37.44%	76.83%
1997	1,775	522	497	1,206	1,041	5,041	3,266	31.87%	68.80%
1998	1,724	569	459	1,317	1,244	5,312	3,589	34.67%	71.35%
1999	1,122	568	386	1,093	1,141	4,310	3,189	35.79%	70.06%
2000	1,629	461	864	939	1,455	5,348	3,719	39.13%	64.37%
2001	1,563	539	566	993	1,192	4,853	3,290	36.21%	66.40%
2002	1,108	263	248	1,072	900	3,591	2,483	36.25%	79.42%
2003	1,376	342	288	1,040	1,021	4,067	2,692	37.94%	76.59%
Average								38.05%	74.62%

Data Source: Walla Walla District Corps of Engineers, NAVIGATION TONNAGE SUMMARY BY COMMODITY as supplied via email by Operations Staff at the Walla Walla District of the Corps of Engineers

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23. If the primarily navigation constraint exists in the Lower Granite pool, as the dredging templates suggest, then it is only effecting a portion of all the grain in the system. A substantial portion of the grain traveling through the system originates downstream of Lower Granite and would not be affected by sedimentation in the Lower Granite reservoir. Moreover, as discussed below, it would involve minimal additional costs to truck products intended for the Lower Granite pool to downstream loading facilities.

24. In fact, one could come to the conclusion that since over 90% of the dredging costs are supporting 38% of the system's grain volume, allowing sedimentation to continue, and shifting loading facilities downstream, might be a rational economic decision. There would, for sure, be losers in such a scenario. There would also be winners. The Port of Lewiston, for example, would lose some barge related activities but could capitalize on its strategic location and further develop its rail and truck handling facilities. Employees of alternative transportation modes and downstream ports would also presumably benefit.

25. Reviewing the analysis above regarding the seasonal fluctuations in grain traffic, the storage capacities available and the grain volumes originating in the Lower Granite reservoir, I can offer the following conclusion: To forego dredging, and to run Lower Granite at MOP, even if necessitates the light loading of barges, or even avoiding shipping altogether during the fish migration season, is an alternative that is not only possible, but is an option that would have very limited impact on existing wheat traffic in the Snake River.

TRUCK, RAIL & BARGE

26. The Corps, in its public statements and in the 2003 SEA, places great emphasis on the relative price of truck, rail and barge per mile for each ton of grain transported. These figures looked at in isolation would lead one to the conclusion that barge navigation is a dramatically

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cheaper mode than other transportation options. The real picture, however, is much more complicated.

27. Except for a handful of farms located immediately adjacent to a rail-loading facility, the vast bulk of the Snake's grain volume has to be transported initially via truck. BST Report at 9. The selection of the most efficient mode of transportation after that will depend on the location of the farm relative to storage and loading facilities. See BST Report at 1 ("The farther away from the river system that grain is grown, the more competitive rail is with the truck/barge combination.") It may be more economical to truck it to a barge loading facility, it may be more economical to truck it to a rail loading facility, or, in some cases, it may be more economical to keep it on the truck to its final destination.

28. According to SFTA Report #5, the truck-barge option for transporting grain from the region decreased significantly between 1994 and 2002. SFTA#5, at 49. In 1994, 62.8% of grain shipments out of the region were shipped via the truck-barge mode. In 2002 the percent of grain shipped via this method had decreased to 46.3% of the grain volume. Similar numbers were published in the BST Report, which states that Columbia River export grain volumes were comprised of 40.7% from barges and 57.4% from rail. BST Report, at 37. This data reveals that trains handle over 50 percent of the grain volume in the region, undercutting the Corps' suggestion that the barge system is invariably more efficient.

29. An increase in barge shipping costs for grain originating in the Lower Granite pool, even if it occurred, would not have dramatic effects on this picture. At most, it would alter the competitiveness of barge navigation relative to rail in a few areas where the two modes are already comparable. Alternatively, it would require producers to leave grain that is already on a truck in that transportation mode for a few additional miles to get it downstream to a port where

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a full navigation channel is available. See id. at 68 (in the event there was no Snake navigation system, approximately half of the grain volume currently using barge would switch to rail, and the other half would be trucked to the Columbia River for loading onto barges there).

30. To my knowledge, the most vocal proponents of dredging have not been the producers of grain, in whose name such dredging is planned. Rather, it is the navigation interests, who feel increasingly threatened by assertive and competitive rail interests. A loss to the barge companies would be a gain to the rail companies, who have enthusiastically asserted that they have the capacity to handle substantial increases in grain volumes. See Exhibit 1 (BNSF Handout to Congress); BST Report at 72 (noting that rail lines would benefit without the barge navigation system, and that "[i]mproving the financial viability of shortline railroads could also improve the economic development opportunities in some parts of Eastern Washington"). In fact, Burlington Northern Railroad has consistently shown that rail could handle all of the grain currently using the barge system, which of course is not a situation presented here. The total elimination of the Snake River barge navigation system would result in one additional 52-car train in each direction through the Gorge Route each day, an 8% increase in traffic. BST Report at 3.

31. The transportation picture in the Snake is in a state of flux. The attractiveness of the barge system is being questioned and other alternatives explored. For example, as discussed below, the Potlatch Corp. has been shifting transportation of its containers from barge to rail. BST Report at 5. The emergence of grain mills in Spokane has induced some growers to truck directly to that market. And, the Washington legislature has recently dedicated significant funds to upgrade short-line rail capacity in eastern Washington, a step that will make rail even more competitive with barges.

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32. In short, even if reduced maintenance of the navigation channel in the coming year does force the use of some light-loading, which is not certain, the impacts are not likely to be significant. At most, it will slightly alter the competitive picture between truck and barge in some locations. Price impacts, if any, should not be dramatic.

BENEFITS OF RECREATIONAL FISHING

33. Any balancing of the risk of harm to the navigation and grain producing interests should also bear in the mind the many economic benefits of a healthy ecosystem, a set of benefits that receive short shrift in the dredging debate. Such benefits are in many cases difficult to quantify, but the available evidence shows that they are significant.

34. While the Corps may desire to gloss over the subject by focusing on its legal obligations not to push species towards extinction, the health and abundance of salmon and steelhead is an issue of supreme importance to residents of Idaho, particularly rural Idaho. One recent study found that fishing for salmon in 2001 was responsible for approximately $90 million in expenditures in Idaho. Don Reading (Ben Johnson and Associates), The Economic Impact of the 2001 Salmon Season in Idaho, Idaho Fish and Wildlife Foundation, April 2003.[4] For some of the state's smallest communities, salmon angler expenditures were a very important contribution to the local economy. In Riggins, for example, the angler expenditures during the 2001 salmon season stimulated 23% of the town's annual sales. Further, the study found that spending generated by the 2001 salmon sport-fishing season contributed $46,262,752 to the economies of Idaho's various river communities. There was a further $43,617,263 in salmon-related spending that benefited the rest of the State.

35. A new report, still in draft form, by the Idaho Department of Fish and Game

[4] The study is available at this web address:

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Seattle WA 98119
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indicates that sport fishing in Idaho is a $438 million dollar industry. In 2003, 400,800 anglers each spent about $112 per day while averaging nearly 10 days of fishing in Idaho.[5] According to Fish and Game Fisheries Chief Virgil Moore, sport fishing "is important to our local economies and perhaps more important than anything, the rural economies of this state."

The $438 million breaks down as follows:

-- $148 million spent at restaurants and on groceries
-- $91 million for transportation
-- $60 million for equipment (boats' camping, etc.
-- $62 million for fishing tackle
-- $45 million on hotels and campgrounds
-- $32 million on outfitters and guides

A regional breakdown indicated that areas known for salmon and steelhead attracted more attention and dollars from anglers than did other Idaho fishing areas. In summary, sport fishing in Idaho is a $438 million dollar economy that is driven to a substantial degree by the salmon and steelhead that survive the migration through the Snake and Columbia River dams. Any action which is known to be harmful to these species threatens this significant economic benefit to the region. Moreover, consideration of the potential economic impacts of reduced dredging should also take these economic benefits into account.

PULP AND PAPER

36. A recurring theme from the Potlatch Corporation over the years is that access to the navigation channel is critical to the competitiveness and profitability of their company. That does not appear to be true. The chart below compares the amount of pulp and paper that Potlatch produces that is subject to shipment versus the Corps' records of what is actually transported.

<http://www.greatlodge.com/idFoundation/FinalReport04-25-03.pdf>

[5] Since the study is not available to the public yet, I have not reviewed it. The data that follows comes from a story printed in the Columbia Basin Bulletin on July 16, 2004, "Idaho Survey Details Fishing Impact on State's Economy." The story can be found at

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Seattle WA 98119
(206) 285-8707

The Potlatch number cited below is the summation of all purchased pulp, plus all pulp sales, plus net paper board and tissue production. The number does not count Lewiston pulp production that is used for the manufacture of paper board or tissue at the Lewiston plant. The pulp and paper shipments number is simply the pulp and paper tonnage movements as reported by the Corps.

Potlatch Pulp and Paper Production
Compared to
Shipments of Pulp and Paper on the Lower Snake River

Total	2000	2001	2002	2003
Potlatch Pulp Sales + Paper and Tissue Production + Purchased Pulp*	586,000	589,000	641,000	642,000
Pulp and Paper Barge Shipments @ Lower Granite**	174,900	135,300	120,600	74,600
Pulp and Paper Tonnage **As a % of Total Potlatch Production**	**30%**	**23%**	**19%**	**12%**

Sources:
* Potlatch Corporation Annual Reports for years 2000 through 2003
** Data Source: Walla Walla District Corps of Engineers, NAVIGATION TONNAGE SUMMARY BY COMMODITY

37. In 2000, about 70 percent of Potlatch's pulp and paper production was shipped by a mode other than the barge system. The two main alternative modes are of course rail and truck. Potlatch's use of the barge system, both in total magnitude and as a percent of total production, decreased each of the last four years. In 2003, only it appears that 12 percent of Potlatch's pulp and paper shipments utilized the barge system.

CONCLUSIONS

38. In conclusion, the SEA does not support claims that a temporary reduction in the navigation channel depth would have significant economic consequences. There may be no

<http://www.cbbulletin.com/Free/20521.aspx>.

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Seattle WA 98119
(206) 285-8707

consequences at all. Even if there are some economic effects, with advance notice, it may well be that any consequences can be mitigated by shipping grain outside of the fish migration season or by using downstream ports. Moreover, the Corps' dredging plan will cost about $2.7 million. If dredging does not occur, this is money that need not be spent. The Corps has the option of seeking authorization from Congress to use this money to help navigation and grain interests to mitigate any impacts from a reduced navigation channel. Finally, if this Court considers the economic impacts of reduced dredging, the Court should also consider the many economic benefits that a healthy salmon fishery can and does provide to the region.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Executed this 25th day of August, 2004, at Boise, Idaho.

/s/ Anthony Jones
ANTHONY M. JONES

National Wildlife Federation
285 First Avenue West
Seattle WA 98119
(206) 285-8707

Final EIS Comment F0653

From:	Mike Jones
To:	PSMP
Cc:	Lindbland Expeditions - Mike
Subject:	[EXTERNAL] Comments to PSMP
Date:	Monday, September 22, 2014 5:02:43 PM
Attachments:	Lindblad PSMP-EIS 09222014.pdf

Please see attached comments from Lindblad Expeditions.

Final EIS Comment F0653

Lindblad Expeditions

U.S. Army corps of Engineers, Walla Walla District, PSMP/EIS
Attn: Sandy Shelin
CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, Washington 99362-1876

Re: Comments on the Programmatic Sediment Management Plan

Dear Ms. Shelin:

Thank you for the opportunity to comment on the Lower Snake River Final Programmatic Sediment Management Plan.

Lindblad Expeditions has operated two small passenger vessels, the National Geographic Sea Lion and National Geographic Sea Bird along the Columbia River and Snake River for 25 years.

Our operation provides a positive economic impact of the communities along the rivers that we visit and provides an excellent education to our clients concerning the history, climate, topography, architecture, flora and fauna of the area.

The positive economic impact to the Columbia and Snake Rivers areas from our vessels would cease to exist if navigable channels were not maintained. Along with our contribution to the tourism along the rivers we realize the grave importance of keeping a navigable channel maintained at all times for transportation, trade, agriculture, forest products and energy.

20444

Please move ahead with implementing long overdue immediate need maintenance dredging and create a plan to constantly keep routine maintenance dredging constantly in motion to maintain the 14 feet deep by 250 feet wide at minimum operating pool in the federal navigation channel. This will greatly benefit everyone along the river on the water and on the land.

We greatly appreciate your efforts and we look forward to dredging to commence this winter and to continue constantly as needed to maintain the navigable channels. Thank you for the opportunity to provide these comments.

Sincerely,

Michael O. Jones

Captain Michael O. Jones
Director of Fleet Operations

LINDBLAD EXPEDITIONS, 1415 WESTERN AVENUE, SUITE 700, SEATTLE, WA 98101
1.866.819.5327; 206.403.1500; FAX: 206.403.1501 WWW.EXPEDITIONS.COM

Final EIS Comment F0655

From:	Amer Badawi
To:	PSMP
Cc:	PNWA - Kristin Meira
Subject:	[EXTERNAL] Snake River Dredging
Date:	Tuesday, September 23, 2014 9:40:35 AM
Attachments:	Support of Inland Channel Dredging.pdf

To: U.S. Army Crops of Engineers, Walla Walla District

Attention: Sandy Shelin

Please find attached Columbia Grain's comments on PSMP/EIS. Feel free to let me know if you have any questions. Thank you.

Amer

Amer Badawi | Vice President, Export & Chartering Mgr.

Columbia Grain, Inc.

1300 SW 5th Ave., 29th Floor

Portland, OR 97204, USA

T (503) 224 8624 | F (503) 241 0296

www.columbiagrain.com <http://www.columbiagrain.com/>

Final EIS Comment F0655

CGI

September 17, 2014

U.S. Army Crops of Engineers, Walla Walla District
PSMP/EIS
Attention: Sandy Shelin
CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA 99362-1876

Re: CGI Comments on PSMP/EIS

Dear Ms. Shelin,

Thank you for allowing us the opportunity to comment and voice our support for proposed inland channel dredging of the Columbia and Snake River System.

Columbia Grain, Inc., along with other PNW grain exporters, relies heavily on the barge operations along the Columbia Snake River System to transport grain to various ports within the Columbia River District. These ports serve as the final point of export to deliver U.S. grain products all over the world.

The Columbia River District Including Portland has been responsible for nearly a third of all U.S. grain exports in recent years. Grain products are a stable and growing market, with demand continuing to increase worldwide. Around 30% of the grain supplied to Columbia Grain, Inc. arrives by barge, including nearly all white wheat supplies delivered from grain elevators in Washington, Idaho, and Oregon. This makes the PSMP EIS of particular interest and concern to Columbia Grain, as it directly impacts a vital supply route for our business.

20445

We appreciate the U.S. Army Corps of Engineers significant research and careful analysis of the proposed project. We feel both the economic and environmental gains justify the costs of this routine dredging. Investment in the maintenance and growth of the inland river systems is vital to continued strength of the grain industry, a resilient component of the U.S. economy.

Thank you for your consideration in this process. We appreciate the Corps continued dedication to the health and success of this region.

Sincerely,

Amer Badawi
Vice President

Columbia Grain, Inc.
1300 SW Fifth Avenue, 29th Floor, Portland, Oregon, 97201, USA
Tel 503-224-8624 - Fax 503-241-0296 - www.columbiagrain.com

Oregon

John A. Kitzhaber, MD, Governor

Parks and Recreation Department
State Historic Preservation Office
725 Summer St NE, Ste C
Salem, OR 97301-1266
Phone (503) 986-0690
Fax (503) 986-0793
www.oregonheritage.org

OREGON STATE PARKS — Nature HISTORY Discovery

September 15, 2014

Mr. Michael Francis
DOA COE Walla Walla District
201 N 3rd Ave
Walla Walla, WA 99362-1878

RE: SHPO Case No. 14-1378
Final Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement (PSMP EIS)
FOE/EIS
COE/DSL/
Walla Walla District (Corps), , County

Dear Mr. Francis:

Our office recently received a request to review an application for the project referenced above. In checking our statewide archaeological database, it appears that there have been no previous archaeological surveys completed within the proposed project area, but archaeological sites are known to exist in the surrounding area. The project area is located on a landform generally perceived to have a high probability for possessing archaeological sites and buried human remains.

In the absence of sufficient knowledge to pinpoint the exact location of cultural resources within your proposed project area, and due to the high likelihood of significant archaeological sites being present, we
20410 suggest that the applicant contact a professional archaeologist to conduct a archaeological survey of the project area. A list of archaeological consultants can be found on our web site (www.oregonheritage.org) by clicking on the Archaeological Services web page and highlighting the section marked Archaeological Consultants Directory. If you have not already done so, be sure to consult with all appropriate Indian tribes
20411 regarding your proposed project.

If you have any questions about the above comments or would like additional information, please feel free to contact me at your convenience. In order to help us track your project accurately, please be sure to reference the SHPO case number above in all correspondence.

Sincerely,

Matt Diederich, MAIS
SHPO Archaeologist
(503) 986-0577
Matthew.Diederich@oregon.gov

Final EIS Comment F0656

Oregon
Parks and Recreation Department
725 Summer Street NE, Suite C
Salem, OR 97301-1266

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Michael Francis
DOA COE Walla Walla District
201 N 3rd Ave
Walla Walla, WA 99362-1878

HLB-T5B 99362

LEWIS-CLARK TERMINAL INC.

1534 3RD AVENUE N. / LEWISTON, IDAHO 83501-1668 / (208) 746-9685

September 19, 2014

U.S Army Corps of Engineers, Walla Walla District
PSMP/EIS
Attention: Sandy Shelin
CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA. 99362-1876

Re: LCT Comments of PSMP/EIS

Dear Ms. Shelin:

Lewis-Clark Terminal, Inc. (LCT) is a cooperative of 2,000+ growers who farm over 17,000 square miles in Palouse and Camas Prairie areas delivering their grain to over 40 country elevators. That grain is then delivered to the ports of Clarkston and Lewiston through the year starting the process of marketing to export companies and delivering wheat to foreign overseas buyers.

Since 1975 LCT has been one of the largest barge shippers on the Columbia-Snake river system operating berths in the Port of Lewiston and the Port of Clarkston.

And contrary to inaccurate and misleading news articles and the attention they have given to individuals that lack any involvement in the grain industry LCT handled its largest crop in 2013, the 4th largest crop in 2012 and the 7th largest in 2011. For LCT shipping by barge is growing.

Today as railroads struggle to meet the demands of moving Bakken oil the ability to ship grain on barges is even more critical. As an example the new McCoy rail terminal has added barge loading operations at Lewiston, Idaho; Central Ferry, Washington; Biggs, Oregon and The Dalles, Oregon to their business.

20446

Trying to safely load and move barges is made more difficult today when trying to guess what the channel or berthing depths might be. Accidents happen. Since the last dredging in 2005 LCT has grounded a barge in March of 2008, two barges in March of 2012, a barge in December of 2012 and a barge in December in 2013 at a drafts ranging from 9 ft. 6 inches to 13 ft. 4 inches!

For all the above reasons and because tug boats leave less of an environmental foot print than any other mode of transportation moving grain LCT supports any and all efforts by the Corps to defend EIS/PSMP and proceed with the 10 year old need to dredge to the congressional authorized (and functional) depth of 14 feet in the Columbia and Snake River navigation channel including the ports of Lewiston and Clarkston berthing areas.

Sincerely,

Arvid Lyons
General Manager
Lewis-Clark Terminal, Inc.

LEWIS-CLARK TERMINAL INC.

1534 3RD AVENUE N. / LEWISTON, IDAHO 83501-1668

SPOKANE WA 990
19 SEP 2014 PM 4 L

White-Throated Sparrow

U.S Army Corps of Engineers, Walla Walla District
PSMP/EIS
Attention: Sandy Shelin
CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA. 99362-1876

99362187601

"The Green Spot of the Columbia Basin"

South Columbia Basin Irrigation District

OFFICE: 1135 E. HILLSBORO, SUITE A

TELEPHONE 509/547-1735, FAX 509/547-8669 • P.O. BOX 1006 • PASCO, WASHINGTON 99301

September 18, 2014

Mrs. Sandy Shelin
United States Army Corps of Engineers
Walla Walla District
201 North Third Avenue
Walla Walla, WA 99362-1876

Dear Mrs. Shelin:

Subject: U.S. Army Corps of Engineers (Corps), Walla Walla District, Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement, Walla Walla, Washington

Thank you for the opportunity to review and comment on the proposed Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement (PSMP/EIS). The South Columbia Basin Irrigation District (SCBID) operates an irrigation pumping plant (Burbank Pumping Plant) on the east bank of the Lower Snake River approximately five miles below Ice Harbor Dam. The Burbank Pumping Plant diverts irrigation water from the Snake River to 1,329.5 irrigable acres of agricultural land (see enclosed map) in the U.S. Bureau of Reclamation's Columbia Basin Project.

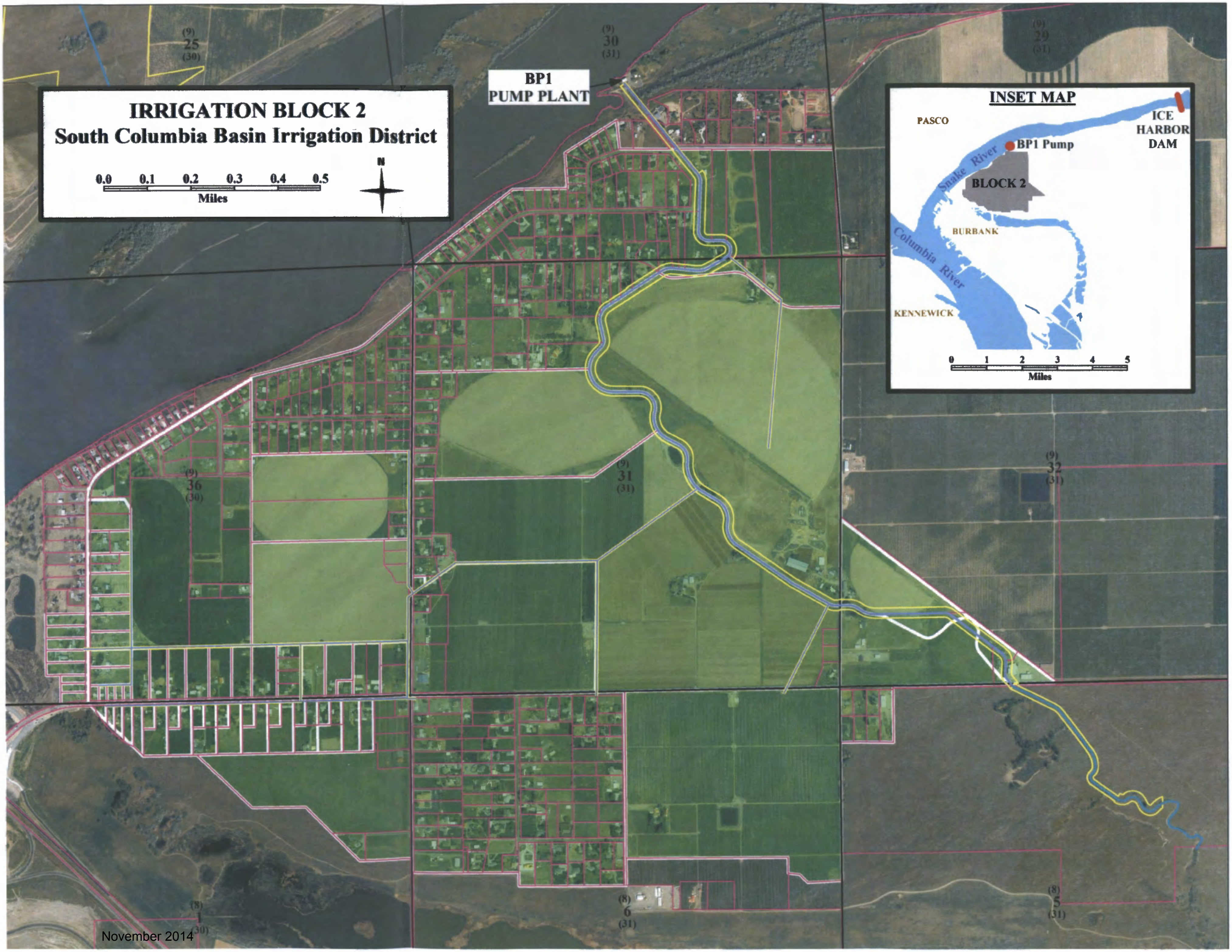
20380 Dredging activities and sediment removal should be done in a manner that creates no adverse effects to the operations, facilities, and resources of the SCBID.

If you have any questions, please contact me.

Sincerely,

David A. Solem
Secretary/Manager

DAS:kgn
Enclosure
File: Fixed Equipment Burbank Pump Plant


IRRIGATION BLOCK 2
South Columbia Basin Irrigation District
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Miles
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BP1
PUMP PLANT
INSET MAP
PASCO
ICE
HARBOR
DAM
BP1 Pump
Snake River
BLOCK 2
BURBANK
Columbia River
KENNEWICK
0 1 2 3 4 5
Miles
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(31)

South Columbia Basin Irrigation District
1135 E. HILLSBORO, SUITE A
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PASCO, WASHINGTON 99301-1006

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09/19/2014
031A 0002310844

Mrs. Sandy Shelin
United States Army Corps of Engineers
Walla Walla District
201 North Third Avenue
Walla Walla, WA 99362-1876

993621876O1

Final EIS Comment F0664

SOUTHEAST WASHINGTON ECONOMIC DEVELOPMENT ASSOCIATION
SEWEDA

845 Port Way
Clarkston, WA 99403
509.751.9144
www.seweda.org

Serving the Washington Counties of Asotin, Columbia, Garfield, and Whitman

September 22, 2014

U.S. Army Corps of Engineers, Walla Walla District
PMSP/EIS, Attn: Ms. Sandra Shelin, CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA 99362-1876

RE: PMSP/EIS Comments

Dear Ms. Shelin:

Thank you for the opportunity to provide input concerning the draft Programmatic Sediment Management Plan (PMSP) and Environmental Impact Statement (EIS). As the lead economic development and planning organization for Asotin, Columbia, Garfield and Whitman Counties, we understand that the outcomes of the PMSP will have profound impacts on the economic development and growth potential for our region, as well as having direct financial impacts on both the agriculture and manufacturing segments of our economy. In making these comments, please note that we are also concerned for the fishing industry as a component of the overall agricultural sector, which we fully support.

20381 We take this opportunity to let you know that we are in support of the Alternative 7-Comprehensive (Full Sediment Management Measures) of the draft PMSP/EIS because we believe it to be the most efficient, cost-effective, quickest and least intrusive solution to a problem that is already impacting barge traffic, and causing detriment to the regional economy. We recognize that barging offers one of the most energy efficient, environmentally beneficial and cost effective ways of moving goods to market. Other alternatives are fraught with high repair and maintenance issues (rail) or cause inefficiencies as well as increased safety issues (truck traffic over public highways). But for the barging to continue, it is imperative that the Corps of Engineers maintain the congressionally authorized 14 foot navigation channel.

20382 While this letter of support addresses the need to maintain the navigable channel open on the Snake and Columbia Rivers, it is noted that the issue of sedimentation is a complex matter; one that requires a multi-jurisdictional approach to sediment reduction closer to the sources of sediment supply to load the river channels. We urge the approach to the resolution of the matter be thoughtful and comprehensive for long-term solutions to be found, with the ability to maintain the channel as paramount within this effort. The interim needs for dredging need to be maintained and completed as per the PMSP/EIS, Alternative 7 option.

Respectfully,

Marshall Doak
Executive Director, Southeast Washington Economic Development Association

Final EIS Comment F0664

From:	Shelin, Sandy L NWW
To:	Grass, Charlene CONTRACTOR @ NWW
Subject:	FW: [EXTERNAL] Letters of Support Attached (UNCLASSIFIED)
Date:	Monday, September 22, 2014 12:36:56 PM
Attachments:	LOS PSMP September 2014 RTPO.pdf LOS PSMP September 2014 SEWEDA.pdf

Classification: UNCLASSIFIED
Caveats: NONE

Charlene,

More PSMP comment letters to process.

Sandy

-----Original Message-----
From: Marshall Doak [mailto:marshall@seweda.org]
Sent: Monday, September 22, 2014 11:58 AM
To: Shelin, Sandy L NWW
Subject: [EXTERNAL] Letters of Support Attached

Attached please find two letters of support from economic development and regional transportation planning regarding the PMSP/EIS for dredging at the confluence – Snake and Clearwater Rivers.

Best regards,

Marshall Doak

Marshall Doak

Executive Director

Southeast Washington Economic Development Association &

Palouse Regional Transportation Planning Organization

845 Port Way, Clarkston, WA. 99403

509-751-9144 (o)

509-780-1030 (c)

E-Mail: marshall@seweda.org

Classification: UNCLASSIFIED
Caveats: NONE

Final EIS Comment F0665

Palouse Regional Transportation Planning Organization

Serving Asotin, Columbia, Garfield, and Whitman Counties

845 Port Way
Clarkston, WA 99403
509-751-9144
www.palousertpo.org

September 22, 2014

U.S. Army Corps of Engineers, Walla Walla District
PMSP/EIS, Attn: Ms. Sandra Shelin, CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA 99362-1876

RE: PMSP/EIS Comments

Dear Ms. Shelin:

Thank you for the opportunity to provide input concerning the draft Programmatic Sediment Management Plan (PMSP) and Environmental Impact Statement (EIS). As the lead economic development and planning organization for Asotin, Columbia, Garfield and Whitman Counties, we understand that the outcomes of the PMSP will have profound impacts on the economic development and growth potential for our region, as well as having direct financial impacts on both the agriculture and manufacturing segments of our economy. In making these comments, please note that we are also concerned for the fishing industry as a component of the overall agricultural sector, which we fully support.

20412 We take this opportunity to let you know that we are in support of the Alternative 7-Comprehensive (Full Sediment Management Measures) of the draft PMSP/EIS because we believe it to be the most efficient, cost-effective, quickest and least intrusive solution to a problem that is already impacting barge traffic, and causing detriment to the regional economy. We recognize that barging offers one of the most energy efficient, environmentally beneficial and cost effective ways of moving goods to market. Other alternatives are fraught with high repair and maintenance issues (rail) or cause inefficiencies as well as increased safety issues (truck traffic over public highways). But for the barging to continue, it is imperative that the Corps of Engineers maintain the congressionally authorized 14 foot navigation channel.

20413 While this letter of support addresses the need to maintain the navigable channel open on the Snake and Columbia Rivers, it is noted that the issue of sedimentation is a complex matter; one that requires a multi-jurisdictional approach to sediment reduction closer to the sources of sediment supply to load the river channels. We urge the approach to the resolution of the matter be thoughtful and comprehensive for long-term solutions to be found, with the ability to maintain the channel as paramount within this effort. The interim needs for dredging need to be maintained and completed as per the PMSP/EIS, Alternative 7 option.

Respectfully,

Marshall Doak
Executive Director
Palouse Regional Transportation Planning Organization

Final EIS Comment F0665

From:	Shelin, Sandy L NWW
To:	Grass, Charlene CONTRACTOR @ NWW
Subject:	FW: [EXTERNAL] Letters of Support Attached (UNCLASSIFIED)
Date:	Monday, September 22, 2014 12:36:56 PM
Attachments:	LOS PSMP September 2014 RTPO.pdf LOS PSMP September 2014 SEWEDA.pdf

Classification: UNCLASSIFIED
Caveats: NONE

Charlene,

More PSMP comment letters to process.

Sandy

-----Original Message-----
From: Marshall Doak [mailto:marshall@seweda.org]
Sent: Monday, September 22, 2014 11:58 AM
To: Shelin, Sandy L NWW
Subject: [EXTERNAL] Letters of Support Attached

Attached please find two letters of support from economic development and regional transportation planning regarding the PMSP/EIS for dredging at the confluence – Snake and Clearwater Rivers.

Best regards,

Marshall Doak

Marshall Doak

Executive Director

Southeast Washington Economic Development Association &

Palouse Regional Transportation Planning Organization

845 Port Way, Clarkston, WA. 99403

509-751-9144 (o)

509-780-1030 (c)

E-Mail: marshall@seweda.org

Classification: UNCLASSIFIED
Caveats: NONE

September 22, 2014

U.S. Army Corps of Engineers, Walla Walla District
PSMP/EIS
Attention: Sandy Shelin
CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA, 99362-1876

Re: Valley Vision Comments on PSMP/EIS

Dear Ms. Shelin:

Valley Vision, Inc., appreciates the opportunity to provide comment on the Lower Snake River Final Programmatic Sediment Management Plan and Environmental Impact Statement (PSMP EIS). We strongly support the Corps' significant effort to produce a very thorough and legally defensible Environmental Impact Statement ("EIS") and final Programmatic Sediment Management Plan for the lower Snake River on this sediment evaluation. We also support the Corps' plan to tackle long overdue routine maintenance dredging in areas of the federal navigation channel which have become constrained.

Valley Vision, Inc. is a private non-profit economic development company created by the business community of the Lewiston, Idaho, and Clarkston, Washington Snake River Valley. Our mission is to foster economic growth for our community through actions that improve the business climate. The ability to move freight up and down the Snake River system is paramount to the success of many of our local companies that create jobs for our residents.

It is critical that our Ports be allowed to complete required maintenance dredging in order to maintain barge access to their facilities. This routine dredging activity has been unreasonably delayed for years, and these delays will have a serious
20383 detrimental economic impact on our local business community. This dredging work needs to occur with-in the upcoming work window. Both agriculture and business interests are best served by maintaining the river transportation system at the congressionally authorized 14 ft. navigation depth. Our businesses view the Lower Snake River System as a critical link in the larger National

transportation network that depends on all modes of transportation working effectively together.

20384 Finally, it is important to emphasize that reservoir "drawdown" on the Lower Snake River is simply not a viable option to address sediment accumulation. As the 1992 test drawdown of the Lower Granite pool demonstrated, a great deal of environmental harm results from this approach, including the demise of thousands of stranded fish. In addition to the environmental devastation caused by the drawdown, severe economic damage also resulted. The 1992 test drawdown rendered the Clarkston Grain terminal useless, impeded barge traffic, obstructed access at the Ports of Lewiston and Wilma, eliminated access at the Port of Clarkston's tour boat dock, and ruined the Red Wolf Marina, which later went bankrupt as a result.

We support authorizing the Ports to proceed with critically needed dredging activity at their locations. We ask that the Corps of Engineers allow this dredging as soon as possible.

Again, thank you for the opportunity to provide these comments. We appreciate the Corps' outstanding work during this lengthy process. We look forward to the Corps' plan to move forward, and for maintenance dredging to occur this winter.

Sincerely,

Doug Mattoon
Executive Director
Valley Vision, Inc.
(208) 799-9083

cc: Port of Clarkston
Port of Lewiston
Port of Wilma

From:	Shelin, Sandy L NWW
To:	Grass, Charlene CONTRACTOR @ NWW
Subject:	FW: [EXTERNAL] PSMP/EIS (UNCLASSIFIED)
Date:	Monday, September 22, 2014 4:10:18 PM
Attachments:	USACE PSMP EIS comments.doc

Classification: UNCLASSIFIED
Caveats: NONE

Charlene,

Another PSMP comment letter to process.

Sandy

From: Doug Mattoon [mailto:dougm@lewiston.com]
Sent: Monday, September 22, 2014 2:14 PM
To: Shelin, Sandy L NWW
Subject: [EXTERNAL] PSMP/EIS

Dear Ms. Shelin,

Please accept the attached document containing our statements in support of the PSMP/EIS.
Thank you,

Doug Mattoon, Executive Director
dougm@lewiston.com
www.lewis-clarkvalley.org <http://www.lewis-clarkvalley.org/>
208.799.9083

Classification: UNCLASSIFIED
Caveats: NONE

Final EIS Comment F0710

U. S. Army Corps of Engineers, Walla Walla District
PSMP/EIS
Attn: Sandy Shelin
CENWW-PM-PD-EC
201 N. 3rd Street
Walla Walla, WA 99362-1876

Dear Ms. Shelin:

20385 Thank you for the opportunity to comment on the PSMP/EIS affecting the lower Snake River. I support the EIS and final PMSP. In particular, I support the use of dredging the navigation channel in order to restore the channel to the appropriate depth and width to facilitate barging and tourism. The sedimentation has been allowed to collect for too long and needs to be removed.

Special interests have managed to manipulate the process and the result is a channel that has become clogged with natural sedimentation and poses a threat to the efficient, safe transport of goods by barge from upper Snake River ports. Ports and shippers have reported several instances of grounding barges due to slight changes in water levels. Tourist boats are often required to disembark in undeveloped shorelines since proper docks are no longer accessible. It is my belief that the river system provides a much needed transportation option. I have read numerous articles describing the difficulty of finding sufficient truck or railroad cars to move products to market, and the absence of a barging option has the effect of increasing the cost of RR and trucking options since price competition from barging is removed from the equation.

Barging carries more cargo, uses less fuel and releases far less carbon into the atmosphere. It is estimated that it would take over 530 trucks to transport the grain shipped in a 4 barge tow. If the nation is truly concerned about controlling carbon emissions, it would seem prudent not to eliminate the barging option due to constraints on dredging the channel to proper width and depth.

20386 It is my hope that you will deny further requests for extension of the comment period and that you will issue the FEIS, PSMP and Record of Decision no later than October 22, 2014, as you originally committed. It is my belief that this region is best served by a transportation model that includes railroad, trucking and barging options and that our regional economy will continue to be positively affected if barging remains an option.

Thank you for the opportunity to contribute my thoughts.
Sincerely,

Mike Thomason

Mike Thomason
3850 Country Club Drive
Lewiston, ID 83501

F0710

Final EIS Comment F0710

Thomason
3850 Country Club Dr.
Lewiston, ID 83501

USACE
PSMP-EIS
CENWW-PM-PD-EC
201 N 3rd Street
Walla Walla, WA
99362-1876

attn: Sandy Shelin

Final EIS Comment F0809

From: David Bean
To: PSMP
Subject: [EXTERNAL] Official Public Comment - PSMP/EIS, Attn: Sandy Shelin, CENWW-PM-PD-EC
Date: Thursday, September 18, 2014 8:59:01 PM

Dear Ms. Shelin

TO: Sandy Shelin, U.S. Army Corps of Engineers
RE: Official Public Comment - PSMP/EIS
September 22, 2014

I advocate to suspend efforts to spit against the wind. Dredging a run of the river wheat shipping opperation at the cost of salmon does not pencil out, if one's charge is the American landscape.

It was in the 1990's that the Idaho chapter of the American Fisheries Society voted unanimously that the Snake River Dams ought to be breached, or we will experience the consequences of functionally extinct salmon runs in the Snake River.

What does that mean? Forest Fires. Can you smell them. Salmon provide the trace minerals that keep forests healthy, and without them... those forests get sick and burn. Bill Bakke was talking about this before the millennium changed.

It does not pencil out! Measure money paid out for dredging. Now measure that against money out in forest fire destruction, and forest fire fighting. It all adds up on the wrong side of the ledger

The Army Corps is destroying our own country, with this policy. Stop It!
20414 I oppose further spending on a money-losing waterway that harms salmon, forest health and taxpayer pocketbooks.

David Bean
3100 SE Tenth Ave.
Portland, OR 97202

Nez Perce

TRIBAL EXECUTIVE COMMITTEE
P.O. BOX 305 • LAPWAI, IDAHO 83540 • (208) 843-2253

September 29, 2014

By Electronic (psmp@usace.army.mil) and Regular Mail

U.S. Army Corps of Engineers
Walla Walla District
PSMP/EIS, Attention: Sandy Shelin,
CENWW-PM-PD-EC
201 North Third Avenue
Walla Walla, WA 99362-1876

Dear Ms. Shelin:

The Nez Perce Tribe appreciates the opportunity to comment on the Final Environmental Impact Statement for the Lower Snake River Programmatic Sediment Management Plan (PSMP/FEIS). The Tribe would like to thank Commander Vail for extending the PSMP/FEIS comment period one week to September 29, and for making your staff available to meet with Nez Perce Tribal staff on September 5 to discuss the Corps' responses to the Tribe's March 26, 2013 comments on the PSMP Draft Environmental Impact Statement. This letter and the attached comments, as well as the Tribe's March 26, 2013 PSMP/DEIS comments which the Tribe incorporates here by reference, constitute the Tribe's comments on the PSMP/FEIS.

Since time immemorial the Tribe has used and occupied the lands and waters of north-central Idaho, southeastern Washington, northeastern Oregon and areas of Montana for subsistence, ceremonial, commercial, and religious purposes. In 1855 the United States negotiated a treaty with the Tribe. Treaty of June 9, 1855, with the Nez Perces, 12 Stat. 957 (1859). In Article 3 of this treaty, the Tribe explicitly reserved to itself certain rights, including "the exclusive right to take fish in streams running through or bordering the Reservation," "the right to take fish at all usual and accustomed places in common with citizens of the Territory; and of erecting temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed lands." These reserved rights include the right to fish within the project area identified in the PSMP/DEIS and the right to take fish passing through the Lower Snake River.

Salmon, steelhead, sturgeon and lamprey are integral to the spiritual, physical and economic health of the Tribe. The Tribe reveres the fishery and the waters that support the life and sustenance these resources have given, and continue to provide Tribal members. The Snake River corridor is an important migratory route for threatened spring, summer, and fall Chinook salmon and steelhead, as well lamprey and sturgeon. Any activities that potentially threaten these important resources are of great concern to the Tribe.

U.S. Army Corps of Engineers
September 29, 2014
Page 2

The Corps is proposing to adopt and implement a Programmatic Sediment Management Plan for managing sediment within the Lower Snake River system to meet the authorized project proposes that are affected by sediment deposition. According to the PSMP/FEIS, the purpose of the proposed action is to establish a programmatic framework to evaluate and implement potential sediment management measures to address problem sediment accumulation that interferes with authorized purposes of the Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Dams and their associated locks and reservoirs located on the Lower Snake River (collectively the Lower Snake River Projects or LSRP). According to the Corps, the "authorized purposes" are the following: (1) commercial navigation by reducing the depth of the Federal navigation channel to less than the authorized depth of 14 feet when operating at minimum operation pool; (2) recreation by limiting water depth at boat basins to less than original design dimensions; and (3) fish and wildlife conservation by sediment accumulation interfering with irrigation water intakes, juvenile ESA-listed fish barge access to loading facilities, and fish barge passage through the reservoirs and locks within the LSRP.

In addition to developing a Programmatic Sediment Management Plan for long-term sediment management within the LSRP, the Corps is also proposing and evaluating in the FEIS an "immediate need action" to reestablish, through dredging of approximately 421, 675 cubic yards during the first available in-water work period (December 15-March 1) following the Record of Decision for the PSMP/FEIS, the navigation channel and port berthing areas at the following four locations: Ice Harbor Navigation Lock downstream approach; Federal navigation channel at confluence of Snake and Clearwater Rivers; Port of Clarkston berthing area; and Port of Lewiston berthing area. The dredged materials will be placed in the Lower Granite reservoir, Snake River Mile 116 just upstream of Knoxway Canyon, for in-water disposal to create additional shallow water habitat for juvenile salmonids.

The Corps identified seven potential alternatives for the project: (1) No Action (required for evaluation under NEPA); (2) Increased implementation of sediment reduction measures; (3) system management; (4) non-dredging sediment management measures; (5) dredging-based sediment management; (6) system management and non-dredging sediment management; and (7) comprehensive (full system and sediment management measures). Following application of several screening criteria, the Corps decided to further evaluate Alternatives 1 (required under NEPA), 5 and 7. The other four alternatives were eliminated from further evaluation (2, 3, 4, and 6) based on the Corps' assertion that they do not meet the project's purpose and need.

Alternative 5 represents a continuation of the Corps' historical practices of using dredging as the primary tool for managing sediment that interferes with authorized uses of the LSRP. Sediment management would consist of dredging and dredged material management. Alternative 7 provides all available dredging, system and structural measures for the Corps to manage sediments that interfere with authorized project purposes. The alternative includes dredging and dredged material management along with other sediment and system management measures.

The Tribe submitted comments on the PSMP/EIS on March 26, 2013 identifying several concerns in the Corps' NEPA analysis. These concerns included an unreasonably narrow purpose and need and insufficient range of alternatives; inadequate examination of impacts to

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Page 3

treaty and cultural resources; and impacts arising from increased river vessel traffic, climate change and environmental justice.

Following a review of the PSMP/FEIS, the Tribe has concluded that the Corps' analysis still falls short from complying with the National Environmental Policy Act in several regards. The Tribe remains opposed to the Corps' preferred Alternative 7 because it because it is a product of an unreasonably narrow purpose and need that relies on dredging while eliminating from consideration viable options such as increased implementation of sediment reduction measures, maintenance of the Lower Snake River navigation channel at the less than 14 feet depth as has been occurring using light-loading of barges, and partial breaching of the Lower Snake Dams. As a result of the narrow purpose and need, the Corps failed to fully evaluate a reasonable range of alternatives. The Corps also improperly included the dredging proposed action with the PSMP, violating NEPA's implementing regulations.

The Corps must also perform additional analysis of the project's impacts. The PSMP/FEIS fails to properly analyze the project's impacts on Tribal treaty rights. The Tribe has significant outstanding concerns about the Corps' lack of analysis regarding the impacts of the "immediate need action" dredging on lamprey, a treaty-reserved, culturally significant species. As a result, the Corps' examination of impacts on lamprey and treaty-reserved rights remains flawed.

The Corps also improperly evaluates the impacts of dredging on river vessel traffic. While the Corps asserts that local economies will benefit from deepening the navigation channel, it also maintains that any increase in vessel traffic from dredging is speculative and therefore does not warrant further evaluation in the PSMP/FEIS.

Given the significant outstanding flaws evident in the Corps' proposal and analysis, the Tribe urges the Corps not to proceed with finalizing the PSMP or proposed dredging until the agency fully addresses the concerns the Tribe has identified.

Sincerely,

Silas C. Whitman
Chairman

3 Attachments

Comments

1. The purpose and need are impermissibly narrow

NEPA's implementing regulations require that a statement of purpose and need "shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action." 40 C.F.R. § 1502.13. Because the purpose and need determine the range of reasonable alternatives, an agency cannot define the purpose and need of a project in unreasonably narrow terms. *See Nat'l Parks & Conservation Ass'n v. Bureau of Land Mgmt.,* 606 F.3d 1058, 1070 (9th Cir.2010). " '[A]n agency may not define the objectives of its action in terms so unreasonably narrow that only one alternative from among the environmentally benign ones in the agency's power would accomplish the goals of the agency's action, and the EIS would become a foreordained formality.' " *Friends of Southeast,* 153 F.3d at 1066 (quoting *Citizens Against Burlington, Inc. v. Busey,* 938 F.2d 190, 196 (D.C.Cir.1991)).

The FEIS identifies the purpose of the proposed action is to adopt a PSMP that includes actions for long-term, immediate need, and emergencies for managing sediment that interferes with the *authorized* purposes of the LSRP. The stated need for the PSMP is to reduce and prevent if possible sediment accumulation in areas of the Lower Snake River reservoirs that interfere with the following federally authorized purposes: (1) commercial navigation by reducing the depth of the Federal navigation channel to less than the authorized 14 feet when operating at minimum operating pool; (2) recreation by limiting water depth at boat basins to less than original design dimensions; and (3) fish and wildlife conservation by sediment accumulation interfering with irrigation water intakes at HMUs, juvenile ESA-listed fish barge access to loading facilities, and fish barge passage access through the LSRP.

In assessing the reasonableness of a purpose and need specified in an EIS, courts consider the statutory context of the federal action. *Westlands Water Dist. v. U.S. Dep't of Interior,* 376 F.3d 853, 866 (9th Cir.2004)("Where an action is taken pursuant to a specific statute, the statutory objectives of the project serve as a guide by which to determine the reasonableness of objectives outlined in an EIS.").

The Corps' interpretation of what Congress intended for commercial navigation on the Snake River system remains flawed. First, although the FCA requires the federal navigation channel to be established at 14 feet deep by 250 feet wide, the Flood Control Act does not *mandate* the Corps to *maintain* the federal navigation channel at 14 feet when operating at Minimum Operating Pool (MOP). Second, neither the Flood Control Act nor any subsequent Congressional documents support an interpretation that Congress intended for the Corps to maintain the channel at no less than 14 feet at MOP year-round. To the contrary, Congress, in authorizing the Snake River Dams, considered and recognized that navigation may not be available year-round. House Doc. 704, 75th Cong., 3rd Sess. At 9, 39. In addition, the Corps has previously acknowledged time periods when full navigation on the Snake River will not be available. The Corps has also recognized that seasonal light loading has occurred and is occurring on the Snake River.

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In the PSMP/FEIS, the Corps acknowledges that that "Congress has not required that commercial navigation be guaranteed 365 days a year." FEIS Appendix G at G-83 (response to Comment 8684). The Corps goes on to maintain, however, "Congress intended for commercial navigation to be possible 365 days a year." *Id.* These statements appear to be incongruent, suggesting that the Corps' interpretation of what Congress intended in authorizing the navigation channel remains unsupported.

2. The PSMP/FEIS does not evaluate a reasonable range of alternatives.

The draft PSMP/FEIS does not provide a reasonable range of alternatives. NEPA requires agencies to "[s]tudy, develop, and describe appropriate alternatives to recommended courses of action, 42 U.S.C. § 4332(e), and to "rigorously explore and objectively evaluate all reasonable alternatives" to a proposed plan of action that has significant environmental effects. 40 C.F.R. § 1502.14(a) (2000). This is "the heart" of an EIS. *City of Carmel-by-the-Sea v. United States Dep't of Transp.,* 123 F.3d 1142, 1155 (9th Cir.1997). "The existence of a viable but unexamined alternative renders an environmental impact statement inadequate." *Citizens for a Better Henderson v. Hodel,* 768 F.2d 1051, 1057 (9th Cir.1985).

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As stated above, by narrowly defining the purpose and need to require maintenance of the navigation channel at *no less* than 14 feet by 250 feet *year-round*, and then applying two levels of screening criteria for the alternatives development that eliminate alternatives which, according to the Corps, interfere with authorized purposes (again maintaining the navigation channel at no less than 14 feet year-round), the Corps has impermissibly limited the range of alternatives it believes it must analyze to just *two* alternatives which both include dredging. These two dredging-based alternatives belie the Corps' assertion that it is stressing a "system based approach" to solve sediment-related problems. Such an excessively narrow range of alternatives for a programmatic document is unreasonable and does not satisfy NEPA.

3. The PSMP/FEIS improperly includes a site-specific action (dredging) that must be evaluated independently in a subsequent EIS.

A federal agency may enact a programmatic approach versus a project-specific approach for a broad program of management activities under its authority PSMP/FEIS at 1-7(citing 40 CFR 1502.4(b)). The purpose of programmatic management is to provide consistency in and a roadmap for future project-specific decision-making. *Id.* The associated programmatic management plan developed by a federal agency requires preparation of a programmatic EIS. *Id.* The PSMP/FEIS includes alternatives that define broad programs for managing sediments through implementation of *future* actions as they relate to maintaining the existing authorized project purposes of the LSRP. *Id* (emphasis added).

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Yet the Corps, under the justification of "efficiency," has adopted a highly unorthodox approach with the PSMP. The Corps is including an immediate site-specific action (dredging) but including it as part of the PSMP/FEIS. *See id.* ("Actions taken to address the current immediate need action (consistent with the PSMP) to re-establish the congressionally authorized dimensions of the federal navigation channel, including regulatory review by the Corps of related port actions, are covered in this EIS at a site-specific level.") The Corps goes on to explain that "[f]uture actions would require project-specific environmental reviews, including preparation of appropriate NEPA documents tiered off of this programmatic EIS." *Id.*

The Corps' radical approach is inconsistent with NEPA. Section 1506.1(c) provides:

> While work on a required program environmental impact statement is in progress and the action is not covered by an existing program statement, agencies shall not undertake in the interim any major federal action covered by the program which may significantly affect the quality of the human environment unless such action: (1) Is justified independently of the program; (2) Is itself accompanied by an adequate impact statement; and (3) Will not prejudice the ultimate decision on the program.

The PSMP, as the Corps expressly acknowledges, is a program statement that is in progress and has been for several years. No Record of Decision has issued, and the proposed dredging is not covered by any other *existing* program statement. As a result, the agency must refrain from authorizing the dredging until it meets all three criteria above. This compliance has clearly not occurred.

Moreover, the Corps' proposed site-specific action is relying on the analysis contained in a pre-decisional document (the PSMP) and therefore cannot tier to it. § 1506.28; *see also Muckleshoot Indian Tribe v. U.S. Forest Service*, 177 F.3d 800,811 (9th Cir. 1999)(rejecting agency's attempt to cure a deficient impact statement by tiering to a document which was not itself a prior EIS)(internal quotations omitted).

The Tribe further observes that by including the proposed dredging action in the PSMP, and committing irretrievable resources to this course of action, the agency is also foreclosing consideration of reasonable alternatives for the proposed dredging that the Corps should have considered, but rejected wholesale. This conduct violates NEPA.

Given these the Corps' approach which is not consistent with NEPA, the Tribe requests that the Corps finalize the PSMP in a Record of Decision and then prepare a separate, site-specific NEPA analysis for the "immediate need" action.

4. The Corps' determination that the PSMP and proposed dredging will have insignificant impacts to treaty-reserved rights remains unsupported.

As the Tribe stated in its DEIS comments, Pacific lamprey are an important cultural and Treaty resource to the Nez Perce Tribe, and in the Snake River Basin, are critically imperiled. To address the plummeting numbers of Pacific lamprey in the Northwest, the Columbia River treaty tribes have created a comprehensive restoration plan for Pacific lamprey that the Columbia Basin has seen. The Tribal Pacific Lamprey Restoration Plan (TPLRP) is the first restoration plan for Pacific lamprey that addresses lamprey restoration through a wide range of mainstem and tributary actions. The most inclusive plan for Pacific lamprey to date, the plan seeks to improve mainstem and tributary passage for juvenile and adult lamprey, restore and protect mainstem and tributary habitat, reduce toxic contaminants, and consider supplementation programs to aid re-colonization throughout the basin.

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Given the enormous importance of lamprey to the Tribe, further assurances are needed that the proposed action will not subject this species to additional hydro-system associated impacts. Such ongoing impacts have been and are significant and long-term. The Tribe agrees with the Corps' assessment that Pacific lamprey may potentially be present during navigation dredging operations and that "juvenile" lamprey (ammocoetes and macrophthalmia) may be impacted during the proposed near-term action. The Tribe also acknowledges that assessing the impact to juveniles and larvae is problematic due to the paucity of project area specific information. Yet, statements and impact assessments made in the PSMP/FEIS and in response to the Tribe's comments tend to trivialize potential impacts without justification. For example, the statement on page 3-16 that "…it is unlikely that juveniles are present in moderate or high numbers within the reservoirs of the lower Snake River due to a paucity of available rearing habitat," is counter to current research observations for the Lower Columbia River.

Further, the statement that there is no evidence that Pacific lamprey have used or currently use the mainstem Snake River for spawning or rearing (Corps 2005; Corps 2010a) is not consistent with your stated approach to use information from the Lower Columbia River and general information to inform the EIS regarding potential impacts to this species within the project area. More specifically, Jolley, et al (2012)[1] found that lamprey larvae of multiple sizes occupied a broad range of areas within the Columbia River mainstem, including Bonneville pool. Jolley et al. (2012) also suggested that reservoirs created by many dams on the Columbia River may create habitats (e.g., relatively slower velocity and increased sediment deposition) that did not exist prior to dam construction or were likely less abundant. Larval lamprey may use these areas at a disproportionately higher rate than occurred prior to dam construction. In fact, the higher detection of larval lamprey at some tributary mouths in Bonneville Reservoir were potentially associated with enhanced rearing conditions in these depositional areas and by tributaries serving as source populations for larvae in the mainstem.

Relatively high production of Pacific lamprey emanating from the Clearwater River system associated with the Nez Perce Tribe's adult translocation initiative, and alluvial deposition, suggest usage and importance of the general Clearwater confluence area for larval rearing. There is no effective "work window" applicable to rearing larval lamprey that can be present in suitable habitat at any time. Therefore, potential impacts from disturbance from dredge activities include direct injury (including mortality) and increased susceptibility to predation.

Accordingly, the Tribe has outstanding concerns about lamprey impacts that the Corps has not adequately addressed. Without further analysis of impacts, it is inappropriate for the Corps to conclude that the project will have insignificant effects on treaty-reserved resources. See FEIS Appendix G-130 (Response 8550)("The proposed LSRP maintenance actions will have no significant or long-term adverse impacts on important treaty resources"). While effects of

[1] Jolley, J.C., G.S. Silver, and T.A Whitesel. 2012. Occurrence, detection, and habitat use of larval lamprey in Columbia River mainstem environments: Bonneville tailwater and tributary mouths. U.S. Fish and Wildlife Service, Columbia River Fisheries Program Office, 2011 Annual Report.

mainstem Columbia and Snake River dredging on juvenile lamprey are largely unknown, the Tribe strongly recommends that the Corps adopt 2010 guidelines established by the U.S. Fish and Wildlife Service related to lamprey and dredging and which the Tribe adopted as part of the TPLRP. These guidelines include the following: (1) conduct seasonal larval surveys within the entire project footprint before, during, and after the project completion using a systematic sampling design such as that employed by Jolley et al. (2010), Jolley et al. (2011a) and Jolley et al. (2011b); (b) conduct multiple surveys throughout the year to assist in understanding temporal changes in lamprey abundance and distribution; (c) assure that mitigation efforts are designed to provide a variety of habitats for lamprey (e.g., backwater and depositional areas for larval and juvenile lamprey); and (d) consider obtaining other information from these surveys (e.g., lamprey distribution, toxicology loads, and genetic data).

5. The PSMP/FEIS fails to adequately examine impacts of dredging on river vessel traffic.

The Tribe's DEIS comments raises concerns about the Corp's failure to properly evaluate the project's impacts on river barge traffic. The Corps' response, however, maintains that any increases in barge traffic would be a function of the economy and not a result of the project. FEIS Appendix G-135(Response 8573).

Notably, the Corps reached a different conclusion in its response to the Tribe's comments on the Port of Lewiston Dock Expansion and Storage Area Development EA and FONSI. There, the Tribe raised concerns that the proposed dock would result in increased barge traffic on the Snake and Clearwater Rivers. *See attached Port of Lewiston Expansion and Storage Area Development Environmental Assessment Summary of Comments Received and Responses to Comments* at 3. There, the Corps responded: "[A]ny increase [in barge traffic] would be primarily the result of the economy (local, regional, and international), market forces, *and changes in the transportation system such as the recently completed deepening of the Columbia River channel allowing deeper-draft ocean-going vessels access to Portland, Oregon.*" Id. (emphasis added). The Corps went on to note: "The Port of Lewiston anticipates the dock expansion would result in increased business, and therefore the Corps is addressing that potential in this response." *Id.*

Unlike the project at issue here, the Corps at least acknowledged in that previous analysis and decision the connection between deepening the river and increasing barge traffic. It also determined that the agency needed to address impacts of increased business because the Port had anticipated that potentiality. Despite similar statements in the PSMP/FEIS about positive
20284 economic impacts from the project, the Corps simply disclaimed any connection causal connection between deepening the river and influencing the economy and declined to do the analysis.

6. The PSMP/FEIS inadequately evaluates the project's impacts on environmental justice.

A Presidential memorandum accompanying Executive Order 12898 cites the NEPA process as an opportunity for agencies to address the environmental injustice of disproportionate impacts. The CEQ also published guidance for environmental justice analyses to determine any disproportionately high and adverse human health or environmental effects to low-income, minority, and tribal populations. One of these principles is to "recognize the interrelated cultural, social, occupational, historical, or economic factors that may amplify the natural and physical environmental effects of the proposed action."

20285 The PSMP/FEIS find that there are not disproportionate impacts of the project on the Tribe or its members. Any impacts on salmon, steelhead, lamprey or other trust resources, will have a disproportionate impact on the Tribe due to their reliance on fish and the importance of fish to Tribal culture, spirituality and economy. Tribal members consume a substantially higher rate of fish than the non-Tribal communities. Given the Corps' inadequate analysis concerning the impacts of the project on lamprey, see above, the Corps cannot conclude that there will be no disproportionate impacts to the Tribe or its members.

7. The PSMP/FEIS fails to take a hard look at economic effects of maintaining the project.

The Tribe's DEIS comments noted that the Corps did not contain any analysis evaluating whether the preferred alternative makes economic sense at a local or regional scale. The Corps possesses substantial information assessing the economics of river navigation, yet none of this information is provided or evaluated in the context of the project. The preferred alternative may result in greater socioeconomic costs than benefits. The reader does not know the answer to this question because the Corps has failed to address it as a socioeconomic consideration. The available information in the PSMP DEIS suggests that the costs of dredging alone may greatly outweigh any perceived benefits captured through facilitating barge, rather than rail or truck, traffic.

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The PSMP/FEIS contains a short, one-paragraph statement relaying on a 2002 document maintaining that annual transportation savings of approximately $25 million is anticipated if the navigation channel is maintained. PSMP/FEIS at 3-55. The Tribe requests that the Corps undertake a more updated economic analysis is warranted that provides the Tribe and public a complete and accurate accounting of the socioeconomic effects of maintaining the navigation channel. The Tribe recommends that the Corps address the items raised in Linwood Laughy's attached document titled, "The Five Most Blatant Myths About Freight Transportation on the Lower Snake River."

BEST MANAGEMENT PRACTICES TO MINIMIZE ADVERSE EFFECTS TO PACIFIC LAMPREY (*Entosphenus tridentatus*)

(Photo courtesy of U.S. Fish and Wildlife Service)

U.S. Fish and Wildlife Service

April 2010

ATTACHMENT A

FOREWORD

The abundance and distribution of Pacific lamprey (*Entosphenus tridentatus,* formerly *Lampetra tridentata*) has significantly declined throughout its range over the past three decades. Many factors have contributed to this decline, including: impeded passage at dams and diversions, altered management of water flows and dewatering of stream reaches, dredging, chemical poisoning, poor ocean conditions, degraded water quality, disease, over-utilization, introduction and the establishment of non-native fishes, predation, and stream and floodplain degradation (Luzier et al 2009). Mitigation and restoration actions focused on habitat restoration of salmonid species within tributary habitats may also have contributed to this decline as they may not have considered needs unique to lampreys.

Pacific lampreys are important for many reasons:

- They have high cultural significance to Native American tribes from California to Alaska and;
- May have served as a primary food source for aquatic, mammal, and avian predators that also prey on ESA-listed salmonids and other recreational and commercially important fish species.

In July, 2008 the four treaty tribes within the Columbia River basin (Umatilla, Warm Springs, Nez Perce, and Yakama Nation) released a draft of the Tribal Pacific Lamprey Restoration Plan for the Columbia River Basin (CRITFC 2008). This plan described an explicit and time-sensitive path over the next ten years for implementing conservation actions in both the mainstem Columbia/Snake Rivers and associated tributary rivers and streams. The ultimate goal of the plan is to restore Pacific lamprey populations to levels supportive of their unique cultural and ecosystem values.

In 2004 and 2008, the treaty tribes held Summits that included the executives from federal agencies who have authority and/or legal obligations for managing fish and aquatic habitats within the basin. At these Summits, tribal leaders communicated the urgency to begin implementing protective measures and restoration of Pacific lampreys using their authorities and funding. The executives agreed to implement the Tribal Plan and various agency actions are currently underway, including incorporation of the Tribal Plan into the U.S. Fish and Wildlife Service's Rangewide Conservation Plan for Pacific Lampreys.

For aquatic restoration actions on federally-managed lands, the primary emphasis is to improve tributary habitat for salmonids. While these aquatic strategies are consistent with meeting the needs of Pacific lamprey, changes made to a project for protection of salmon or other ESA- listed aquatic species should incorporate additional adjustments to prevent direct adverse effects to individual lampreys or populations of Pacific lamprey residing in the affected areas. These adjustments should be made at the project design phase to accommodate lamprey passage, lamprey spawning periods, existence of nests, upstream and downstream movement, and avoid direct mortality to ammocoetes burrowed in the substrate.

The purpose of this document is to provide information on Best Management Practices for Pacific lamprey that can be incorporated into any stream disturbing activity (e.g., aquatic habitat restoration, prescribed fire, recreational development, grazing, gravel extraction/mining, water diversions, etc.) on lands managed by the Forest Service and Bureau of Land Management throughout the range of Pacific lamprey. In addition, this information can help other federal, state, tribal and private land managers with implementing stream disturbing activities that also afford protection for individual lamprey and lamprey populations.

This document will be updated periodically as research and management activities increase our knowledge of the species and standardized sampling, passage and screening methods are developed.

Compiled by:
Jody K. Brostrom and Christina Wang Luzier, U.S. Fish and Wildlife Service
Katherine Thompson, U.S. Forest Service

Introduction

The Pacific lamprey (*Entosphenus tridentatus* formerly *Lampetra tridentata)* is an anadromous and parasitic fish widely distributed along the Pacific coast of North America and Asia. Historic runs of Pacific lamprey in the Columbia River basin numbered in the hundreds of thousands at Bonneville Dam as recently as 1965 (Figure 1) but the distribution and abundance of lampreys have been reduced by construction of dams and diversions as well as degradation of spawning and rearing habitat (Quigley et al. 1996). Pacific lamprey returns to coastal streams have shown a similar decline.

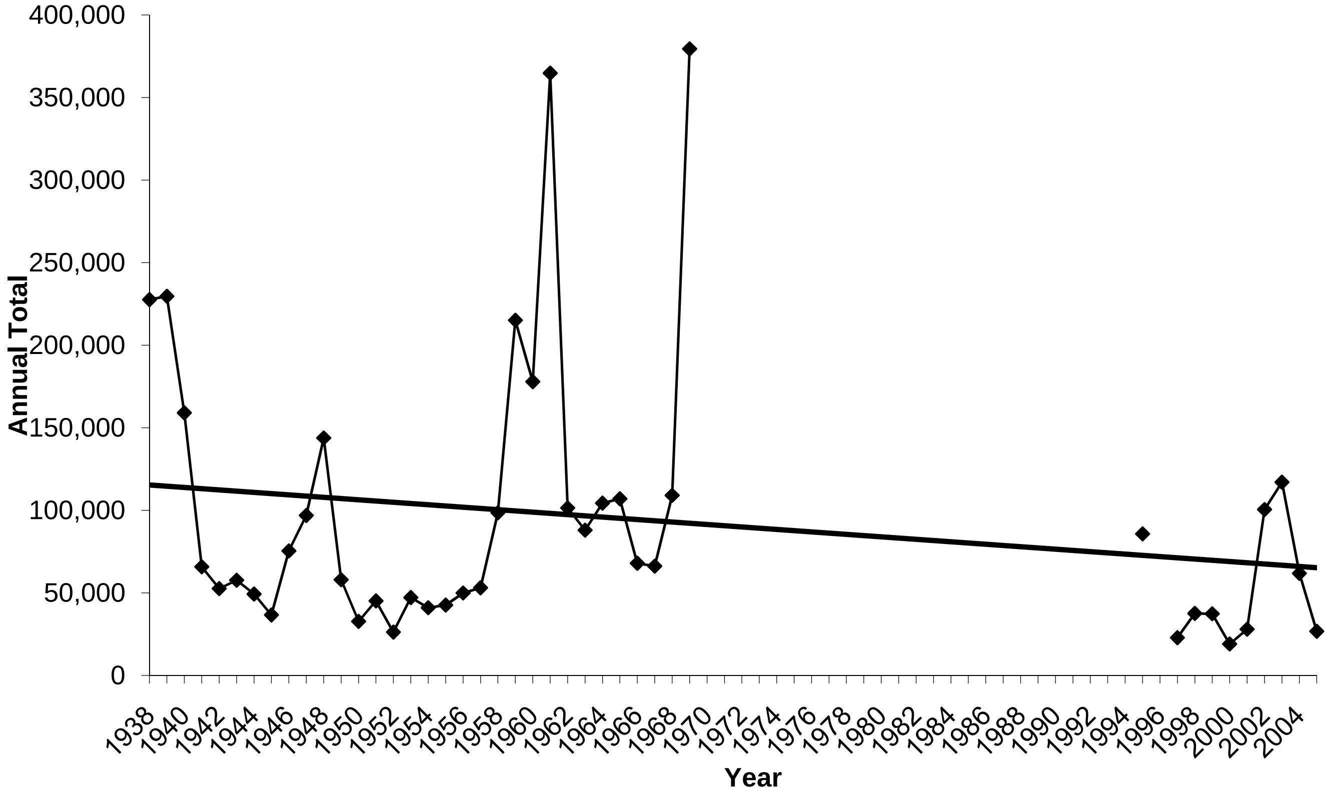


Figure 1. Pacific lamprey adult upstream passage day counts at Bonneville Dam, OR (USACE 2006). Trend line fitted through regression. From Cochnauer and Claire 2009.

The Pacific lamprey is included as a State sensitive species in Oregon and Washington, state-listed endangered species in Idaho, designated tribal trust species, and a ‘species of special concern’ for the U.S. Fish and Wildlife Service (USFWS). The Pacific lamprey has been designated as a Forest Service Sensitive Species in Regions 1 and 4, and is classified as a Type 2 species (Rangewide/Globally imperiled) by the Bureau of Land Management.

A petition in 2003 (Nawa 2003) to list the Pacific lamprey under the Endangered Species Act was determined to be not warranted. However, in their determination, the USFWS acknowledged that Pacific lamprey have declined in the Columbia River Basin and in many parts of their range. The Pacific lamprey has and continues to face a variety of threats associated with: passage and entrainment at dams and water diversion structures, altered stream flows including dewatering of stream reaches, dredging, chemical poisoning, degraded water quality, poor ocean conditions, disease, over-utilization, introduction and establishment of non-native fishes, predation, and stream and floodplain degradation/simplification (Luzier et al 2009).

For the purposes of this document, only those threats to upstream and upriver lamprey habitat on federal lands will be discussed. However, it is worth noting that passage issues within the Columbia and Snake River basin have been identified as significant threats to lamprey persistence, for many of the same reasons associated with the decline of salmonids. It should also be noted that declines in Pacific lamprey have occurred in coastal, undammed streams and rivers so the entire suite of threats needs to be addressed in efforts to restore this species throughout their range.

Pacific Lamprey Life History Synopsis

The following is a general description of Pacific lamprey life history. Like salmonids, factors such as latitude, elevation, hydrology, distance from the ocean and climate introduce variability and influence adaptations in life history expression. Figure 2 depicts the generalized life cycle of Pacific lamprey (Streif 2009).

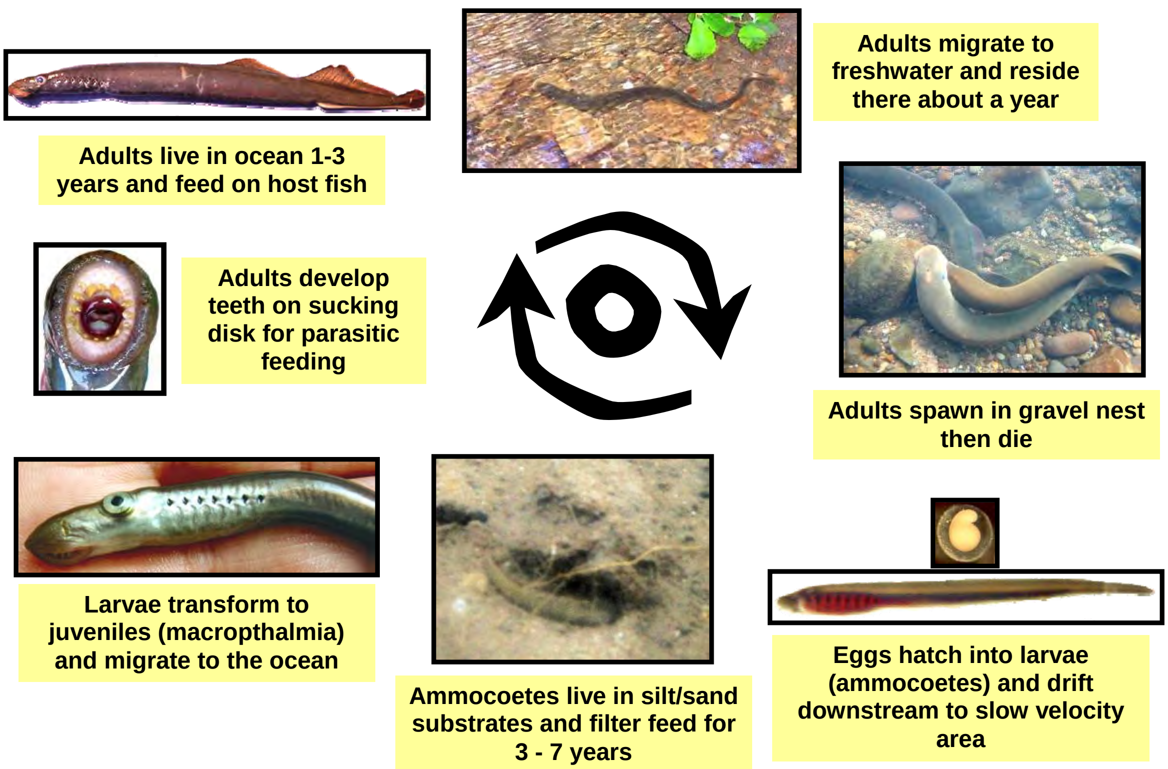


Figure 2. General life cycle of Pacific lamprey (Streif 2009).

The physical form of Pacific lampreys plays a major role in their life history and habitat requirements. Pacific lampreys are jawless fishes which lack paired fins, vertebrae or a swim bladder and possess an elongated, cylindrical body and suctorial disk mouth. Swimming is accomplished through rhythmic lateral undulations of the body axis from nose to tail, or anguilliform swimming (Mesa et al 2003). Adult Pacific lampreys cannot jump, but can pull themselves over obstacles if the surface is wetted and they are able to get a complete seal with their suctorial disk. The suctorial disk allows Pacific lampreys to cling to surfaces, thus propelling themselves forward with a burst and attach pattern, especially in higher velocities. Lampreys avoid light, so most movement occurs during hours of darkness (Chase 2001).

After spending between 6 months to 3.5 years in the marine environment (Beamish 1980, Kan 1975), Pacific lampreys return to fresh water primarily during spring and summer months. They often spend about 1 year in freshwater habitat before spawning, usually holding under large substrate (e.g., large boulders, bedrock crevices) associated with low water velocities until the following spring, when they move to spawning areas. Adults observed in freshwater range in size from 350 mm to 650 mm (Beamish 1980).

Adult lampreys spawn generally between March and July in gravel bottom streams (Figure 3a, 3b, 3c), usually at the upstream end of riffle habitat near suitable habitat for larvae (ammocoetes), and die after spawning (Beamish 1980). Suitable habitat for ammocoetes includes low velocity pools and stream margins with a dominant substrate of fine silt, sand, or small gravels (Torgerson and Close 2004, Graham and Brun 2005). Low to moderate gradient stream reaches with a mix of silt and cobble substrate may offer optimal spawning and rearing habitat. Streams and rivers where natural flows are low velocity, such as those in low gradient reaches, are important characteristics associated with lamprey presence (Kostow, 2002). Pacific lamprey are often sympatric with native freshwater mussels (Bettaso and Goodman 2008; J.Dunham personal communication),

The incubation period has been observed to be between 18-49 days (Brumo 2006) and ammocoetes drift downstream to areas of low stream velocity and burrow into sand or silt substrate (Figure 4a and 4b). They are mostly sedentary, remaining burrowed in the stream substrate for 3 to 7 years, filter feeding on algae, diatoms, and detritus. Generally, depositional areas with soft substrate near stream margins associated with pools, alcoves and glides are where most ammocoetes burrow (Graham and Brun 2007) as seen in Figure 5a, 5b, 5c and 5d. Ammocoetes move downstream during high flow events or if disturbed.

Metamorphosis of ammocoetes (Figure 6a) into the sub-adult form or “macropthalmia” (Figure 6b), occurs generally from July through November but is variable depending on distance from salt water. Out-migration to the ocean occurs during or shortly after transformation (Beamish 1980). Out-migration generally peaks with rising stream and river flows in late winter or early spring (Kostow 2002). Larval lampreys generally begin transforming to the sub-adult stage when they are 100 mm in length but it is variable depending on location (Kan 1975). Most downstream movements occur at night (Gritsenko 1968 cited in Potter 1980),

The onset of parasitism in Pacific lampreys occurs during metamorphosis when the foregut lumen has opened and tooth development is complete (Richards and Beamish 1981). Thus macrophalmia can begin parasitic feeding prior to entering saltwater. Pacific lampreys enter salt water after transformation. They have been documented to move quickly off shore, into waters up to 70 m deep (Beamish 1980) but there is little information regarding their ocean residence beyond this study. Adults in saltwater feed on a variety of marine and anadromous fish, and are preyed upon by sharks, sea lions, birds, and other marine mammals (USFWS 2004).

a. *(photo courtesy of U.S. Fish and Wildlife Service, Christina Luzier)*

b. *(photo courtesy of Oregon Department of Fish and Wildlife, Michael Gray)*

c. *(photo courtesy of U.S. Geological Survey, Steven Clark)*

Figure 3. Photos of Pacific lamprey nests in a) Cedar Creek, Washington; b) Coastal Oregon and c) Western Washington. Lamprey nests are similar to salmonid redds, and can be difficult to distinguish from salmonid redds where both animals occur.

a. *(European brook lamprey photo courtesy of Bernt René Voss Grimm)*

b. *(photo courtesy of Oregon Department of Fish and Wildlife, Michael Gray)*

Figure 4. Photos of (a) larval European brook lamprey in substrate and (b) larval Pacific lamprey sampled from substrate. Pacific lamprey use substrate similar to European brook lamprey.

a. *(Photo courtesy of Confederated Tribes of the Warm Springs Reservation, Jen Graham)*

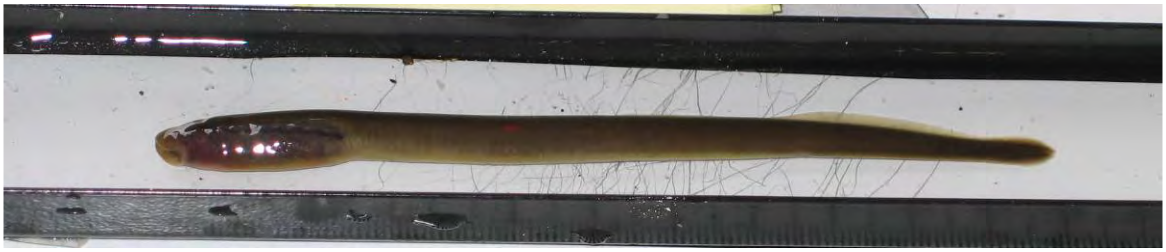
b. (*Photo courtesy of U.S. Geological Survey, Steven Clark)*

Figure 5. Typical habitat where ammocoetes are found in (a) Deschutes River Basin, Oregon, (b) Western Washington.

c. *(Photo courtesy of Idaho Department of Fish and Game, Christopher Claire)*

d. (Photo courtesy of U.S. Fish and Wildlife Service, Damon Goodman)

Figure 5 continued. Typical habitat where ammocoetes are found in (c) Clearwater Drainage, Idaho and (d) Northern California.



a. (photo courtesy of U.S. Fish and Wildlife Service, Gregory Silver)

b. (photo courtesy of U.S. Fish and Wildlife Service

Figure 6. Photos of (a) Pacific lamprey ammocoete and (b) Pacific lamprey macropthalmia after transformation.

Threats to Pacific Lampreys Residing in Upper Portions of Stream/River Habitats

Ammocoetes spend most of their time burrowed in stream substrates, moving during flow events and mostly at night. Many age classes can concentrate together in the same areas because of habitat preference, making ammocoete populations particularly susceptible to activities that involve dredging/excavating, stranding and use of toxic chemicals. Adults also prefer to move at night, hiding in large rock and boulder substrate during the day. Activities posing a threat to lampreys include:

Passage and entrainment. Culverts, water diversions, hydroelectric dams and other passage barriers can impede upstream migrations by adult lampreys and downstream movement of ammocoetes and macropthalmia. Culverts that have a drop at the outlet, high velocities, inadequate attachment surfaces or insufficient resting areas, will block upstream passage (Figure 7a) but those that simulate streams (Figure 7b) will provide passage for all life stages. Fish ladders designed for salmonids are usually impediments to lamprey passage as they do not have adequate surfaces for attachment, velocities are often too high and there are inadequate places for resting (Figure 8a). Rounding corners, providing resting areas or providing a natural stream channel or wetted ramp for passage over the impediment (Figure 8b) have been effective in facilitating lamprey passage. Ammocoetes and macropthalmia may also become entrained at un-screened water diversions due to their size and weak swimming ability and adults can be blocked from moving upstream (Figure 9). All life stages can be impinged on screens resulting in injury or death. At present, there are no criteria for lamprey when designing fish screens.

De-watering and streamflow management from water diversions, instream projects and hydropower peaking can cause rapid fluctuations in stream water levels and strand ammocoetes in the substrates. A single event can have a significant effect on a local lamprey population. Upstream passage can also be impacted, and nests can be dewatered, killing eggs and larvae.

Dredging from construction, channel maintenance and mining activities can impact all age classes of ammocoetes. Removal of substrate with a backhoe or trackhoe could remove several hundred lamprey per bucket load.

Chemical poisoning from accidental spills or chemical treatment can harm or kill ammocoetes burrowed in streams. As ammocoetes spend 3 – 7 years filter feeding, they may have a higher propensity for accumulating toxins such as PCBs, mercury, and other heavy metals (Bettaso and Goodman, 2008).

Poor water quality. Water temperatures of 22^{o} C (72^{o} F) or higher may cause significant mortality or deformation of eggs or ammocoetes (Meeuwig et al 2005). Accumulated toxins in the lower reaches of streams and rivers may affect ammocoetes because they are often found in these areas.

Stream and floodplain degradation (channelization, loss of side channels, scouring) can result in the loss of riffle, suitable stream edge and side channel habitats, reducing areas for spawning and ammocoete rearing.

a. *(Photo courtesy of U.S. Forest Service)*

b. *(Photo courtesy of U.S. Forest Service)*

Figure 7. (a) Culvert that would block upstream passage for Pacific lamprey, and (b) stream simulation culvert that would provide passage to all life stages of Pacific lamprey.

a. *(Photo from Moser et al 2004)*

b. *(Photo courtesy of Bob Heinith)* c. *(Photo courtesy of Bob Heinith)*

Figure 8. (a) Fish ladder built for salmonid passage impedes lamprey passage due to the 90 degree angles and corners, high velocity chutes, minimal resting areas; (b) Constructed natural stream channel that is the approach to a (c) wetted sloped ramp that provides lamprey passage over a steep dam. Arrow denotes adult Pacific lamprey climbing sloped ramp.

(Photo courtesy of Idaho Department of Fish and Game, Paddy Murphy)

Figure 9. Irrigation diversion that blocks upstream movement, entrains lamprey and other fish into the ditch, and dewaters downstream reaches.

General Considerations for Pacific Lamprey When Designing Instream Activities

Instream activities resulting from aquatic habitat restoration, prescribed fire, recreation, grazing, gravel extraction, water diversions, etc. can impact tributary habitat important for Pacific lamprey. For aquatic restoration actions on federally-managed lands, the primary emphasis is to improve tributary habitat for salmonids. To ensure the long-term protection of these aquatic habitats, the US Forest Service and Bureau of Land Management have adopted the riparian and stream management principles outlined in the PACFISH and INFISH (Forest Service only) Environmental Assessments and associated Decision Notices (1995) within the Interior Columbia River basin. West of the Cascades, the Northwest Forest Plan's Record of Decision (1994) put in place an Aquatic Conservation Strategy that applies to both Oregon and Washington.

These aquatic habitat conservation strategies have been incorporated into agency land use plans and provide Standards and Guidelines for all categories of management actions (recreation, roads, grazing, restoration, etc.) to ensure impacts to riparian and instream habitats are minimized. While these aquatic strategies are consistent with meeting the needs of Pacific lamprey, changes made to accommodate salmon or other ESA- listed aquatic species should incorporate additional adjustments to prevent direct adverse effects to individual lampreys or populations of lampreys residing in the affected areas. Examples of changes to protect ESA-listed salmonids include:

- Instream work periods (e.g., work in specific times of the year are avoided to protect spawning salmonids and their redds);
- Dewatering regimes with specific design criteria implemented to avoid stranding juvenile salmonids and/or meeting Clean Water Act requirements;
- Modifications to structure design to accommodate salmon and steelhead swimming abilities.

Further adjustments to minimize adverse effects to Pacific lamprey should be made at the project design phase to accommodate lamprey passage, lamprey spawning periods, existence of nests, upstream and downstream movement, and avoid direct mortality to ammocoetes burrowed in the substrate. See Streif (2007) and Streif (2009) for a discussion of what can be done to minimize impacts.

Steps that can be taken to minimize adverse effects to lampreys at the initiation of the planning phase include (Streif 2007):

- Consider lampreys in all stream disturbing activities;
- Identify locations within streams where activities have the greatest potential to affect lampreys (both positive and negative effects);
- Modify project design to protect lampreys (refer to sections below);
- Modify passage project designs to accommodate lamprey passage
- Post-project, monitor and document successes and failures for items 2 and 3. Provide this information to the US Fish and Wildlife Service: http://www.fws.gov/pacific/fisheries/sp_habcon/lamprey/index.html).

In addition, the attributes of desirable habitat characteristics for lampreys should be considered in the design of projects. Desirable habitats include:

- Stream and river reaches that have relatively stable flow conditions (sustained increases or decreases that take place over days and weeks rather than hours) and that are not extreme or flashy, offer the best opportunities to support all life stages of lampreys;
- Large substrates (i.e. very large cobble and boulders) submerged in low or no flow areas of rivers and streams may provide high quality adult overwintering habitat.
- Areas of small to medium cobbles, free of fine sediment, serve as spawning habitats. Spawning habitats created or enhanced for salmonids are generally compatible with the needs of lampreys;

- Depositional areas, including alcoves, side channels, backwater areas, pools, and low velocity stream and river margins that recruit fine sands and silts, downstream of spawning areas, provide ideal ammocoete rearing areas and should not be reduced.
- A mix of deep pools, low velocity rearing areas with fine sand or silt, and silt-free cobble areas upstream of rearing areas, all combined with summer temperatures that rarely or never exceed 20^{o} C (68^{o} F) , is believed to provide high quality habitat conditions for all life stages.
- Studies with European lamprey species have shown that the occurrence of substantial areas of juvenile lamprey habitat may not signify presence of lamprey populations as populations have a disparate distribution (King et al 2008). However, it is important to maintain the integrity of these areas as their use by lamprey may vary temporally.

Best Management Practices for Instream Activities to Avoid Adverse Effects to Pacific Lampreys

1. Consult with local federal, state and tribal biologists to obtain information on known lamprey populations in the drainage. Perform a site reconnaissance to identify locations of lamprey spawning and rearing habitat, and if possible, lamprey presence with nest surveys or methods outlined in Attachment A. This information will facilitate planning the project and influence work windows.

2. Timing of instream activities is critical to avoid adversely affecting spawning adults and dewatering or disrupting existing nests. Critical time periods include the following:

- Dependent on location within their distribution range, adult lampreys can be present at spawning areas and preparing to spawn from **February to September**. The peak period within the Columbia River basin is primarily from ***March 1 through July*** 1 in lower and mid elevation reaches;
- Nests present: March 1 through August 1 but time period is dependent on geographical location within the range of lamprey and elevation of spawning sites;
- Embryos hatch in approximately **19 days at 15^{o} C (59^{o} F)**;
- Emergence and settling into suitable habitat: **April to August** but time period is dependent on geographical location within the range of lamprey and elevation of spawning sites

Instream operating windows to avoid adverse effects to anadromous fish is most commonly from July 1 through August 15, which under most conditions would be sufficient to protect Pacific lamprey nests, eggs, and emerging larvae. Exceptions may include high elevation river and stream reaches (>5,000 ft), where spawning would be expected to occur later in the spring, or if information obtained during the planning phase indicates different timing. If this is the case, surveys for nests should be initiated, and if found, defer instream work until August 1.

Recommendation:

- ***Avoid working in stream or river channels from March 1 to July 1 in low to mid elevation reaches (<5,000 ft). In high elevation reaches (>5,000 feet), avoid working in stream or river channels from March 1 to August 1. If either timeframe is incompatible with other objectives, survey affected area for nests and lamprey presence, and avoid disturbing them.***

3. Temporary dewatering associated with instream channel work, stream crossing replacement, etc. can result in the loss of an entire population of ammocoetes and many year classes as lampreys often occur in large clusters in discrete sites where habitats are optimal.

- Ammocoetes are present at all times of the year;
- They remain burrowed in stream substrates for 3 – 7 years primarily moving seasonally and with flow events;
- They can and will move IF flows decrease slowly enough for them to respond.

Recommendation:

- ***Avoid dewatering stream reaches where lampreys are known to exist.***
- ***Survey using methods outlined in Attachment A to determine ammocoete presence, preferably at the project planning stage and when the project is implemented.***
- ***Ramping flows, particularly during hours of darkness, can be effective in encouraging ammocoetes to move out of areas of impact.***

4. Dewatering associated with instream or channel construction/reconstruction and stream crossing upgrade projects is often a required design criterion for avoiding adverse effects to ESA-listed salmonids.

- Salvage techniques for salmonids are often not effective for salvaging ammocoetes;
- Ammocoetes may not “emerge” from dewatered substrates until they begin to desiccate; which is often at night after other fish salvage operations have ceased. They are difficult to see in dewatered areas (Figure 10).

(Photo courtesy U.S. Fish and Wildlife Service)

Figure 10. Ammocoete stranded during dewatering.

Recommendations for Dewatering Reaches Where Lampreys Are Present:

- ***Attempt salvage using methods outlined in Attachment A before dewatering, and move ammocoetes to a safe area;***
- ***Dewater slowly over several days or at a minimum overnight;***
- ***Identify areas adjacent to ammocoete habitat outside of the disturbance area but within the channel and dig holes (e.g., few scoops with a backhoe, etc.) where ammocoetes may take refuge as dewatering occurs. Cover these ‘refuge’ holes to protect them from predators;***
- ***Anecdotal information suggests ammocoetes will move into areas that retain water;***
- ***Try an experimental technique – there is some evidence to suggest that if straw bales are placed in habitats where ammocoetes are present, they will move into the straw as dewatering occurs and can be safely removed the next day. If successful, document and provide this information to the US Fish and Wildlife Service.***

5. Instream channel reconstruction, re-routing, dredging, and other activities that disturb or remove substrate materials may result in ammocoetes being trapped or killed.

- Ammocoetes burrowed in the substrate can and will move if disturbed but are very susceptible to being trapped given their reluctance to move and propensity to avoid light;
- Timing restrictions do not address this risk of direct mortality.

Recommendations:

- ***Avoid these activities where ammocoetes are known to exist. Where this is not possible, salvage efforts using methods outlined in Attachment A should be attempted prior to activity***
- ***Sift through the removed substrate and salvage any ammocoetes within and return them to the stream away from the construction activity.***

Best Management Practices for In-Channel Diversion Structures to Minimize Adverse Effects to Pacific Lampreys

1. Diversion of water into irrigation canals and ditches removes water from the stream channel.

- Reduced flows decrease the amount and quality of habitat available to Pacific lampreys;
- Flows that are diverted **quickly** into canals and ditches may strand ammocoetes and migrating macropthalmia as occupied habitats are dewatered;
- Flows that are diverted may result in desiccation of lamprey nests.

Recommendations:

- ***Negotiate water savings and ditch consolidation wherever possible to provide more instream flow.***
- ***Avoid reduction in streamflows of a magnitude that nests would be exposed and desiccated.***
- ***When diversion structures are opened for irrigation, request that they are opened during the day and operated slowly to allow ammocoetes to escape to a watered area.***
- ***When shutting off a diversion, do so slowly, ideally starting at night and lasting for several days, so the lamprey can escape if they are between the headgate and any fish screen, or trapped behind the screen in the ditch. Start by cutting flow to 50% for the first 24 hours, and then to 75% over the next two days. Then, drop flow to 80-90% for a few days with the screen lifted (if applicable). This technique is also used for salmonids. The goal is to keep a continuously wetted channel between the diversion point and downstream wetted area in the ditch to facilitate movement out of the ditch.***
- ***Salvage using methods outlined in Attachment A.***

2. Diversion of water at water diversion structures may result in impingement of larval and juvenile lampreys (both ammocoetes and macropthalmia) on screens installed to prevent juvenile salmonids from moving into ditches, canals, and hydropower turbines.

- Approach velocities greater than 0.40 ft/s for active screens or 0.20 ft/s for passive screens have been shown to make it difficult if not impossible for ammocoetes and macropthalmia to avoid the structure (Dauble et al. 2006);
- Ammocoetes were found to become impinged on bar screens at hydroelectric facilities at velocities of 1.5 ft/s or higher (Moursund et al. 2001);
- In testing three types of screen materials, no lampreys became permanently stuck on 3/32 inch bar screen in front of turbines (Moursund et al. 2001).

Recommendations:

- ***Different screen types (materials, orientation and siting) may have different effects on lamprey. At present (2009) little is known about what types of screens, water velocities, orientations of the screen and screen material are effective at reducing impacts to lampreys. Criteria developed for salmonids may or may not be appropriate for protecting lamprey. As criteria are developed for lamprey, step up replacement of fish screens at diversion structures known to entrain or cause mortality to lamprey with those that prevent entrainment of lamprey, in streams where lamprey are known to exist.***
- ***Use methods outlined in Attachment A to determine if lamprey are being entrained in an irrigation ditch.***

3. Diversion structures and dams may block adult lampreys migrating upstream or result in diversion into ditches and canals.

- Flows greater than 5 - 6 ft/s have been found to be difficult to negotiate and swim through for adult Pacific lamprey (Mesa et al. 2003).
- Adults may encounter difficulties negotiating structures with square corners (Moser et al. 2004) because they cannot form a complete seal with their oral disks. Rounded corners are more suitable because they provide more surface area for attachment and a tighter seal.

Recommendation: Provide passage over irrigation diversions or dams that currently block upstream migration of Pacific lamprey. There are existing designs of structures that will pass lampreys*. *Contact the US Fish and Wildlife Service for assistance in choosing a passage structure.

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ATTACHMENT A
Electrofishing Recommendations for Sampling Larval Pacific Lampreys

(*Photo courtesy of U.S. Geological Survey, Steven Clark)*

(Photo courtesy of Confederated Tribes of the Warm Springs Reservation, Jen Graham)

Electrofishing Techniques for juvenile Pacific lamprey

Electrofishing Recommendations for Sampling Larval Pacific Lampreys
(from: Moser et al. 2007; and G. Silver and C. Luzier, USFWS, personal communication)

a. Most surveys rely on a backpack or shore-based electrofishers in small streams, most effective in waters less than 0.8 m in depth.

b. Generally three types of electrofishers are suitable for ammocoete sampling: 1) AbP-2 "Wisconsin" electrofisher (ETS Electrofishing, Verona, WI); 2) Smith-Root LR-24 model electrofisher with lamprey settings; and 3) conventional electrofisher traditionally used for salmonids.

c. Electrofishers used for ammocoete sampling should be set with two wave forms, a lower frequency "tickle" wave form to coax ammocoetes out of the substrate and a higher frequency "stun" wave form to immobilize ammocoetes for netting.

d. Effective sampling involves this 2-stage method:
   i. First stage: use 125V direct current with a 25 percent duty cycle applied at a slow rate of 3 pulses per second, to induce ammocoetes to emerge from the sediment.
   ii. Use a pattern of 3 slow pulses followed by a skipped pulse (bursted pulse) helps ammocoetes to emerge.
   iii. Second stage: immediately after ammocoetes emerge, use a fast pulse setting of 30 pulses per second to immobilize and net them.

	Bursted Slow Pulse Primary Wave Form	**Standard Fast Pulse Secondary Wave Form**
Voltage	125 v	125 v
Pulse Frequency	3 Hz	30 Hz
Duty Cycle	25%	25%
Burst Pulse Train	3:1	X

e. A conventional electrofisher can be used but the 2-stage settings/method described above should be used. Conventional electrofishing gear set for salmonid capture uses higher voltage and frequencies which potentially causes electronarcosis of buried ammocoetes, resulting failure to emerge and therefore a recording of false absence. Additionally, a conventional electrofisher has only one switch making the transition from slow (tickle) to fast (stun) pulse pattern more difficult as the switch needs to be released and pressed again. This technique can be learned with practice

f. Avoid exposing ammocoetes to extended periods of electrofishing as it has also been linked to electronarcosis.

g. Use dip nets to capture ammocoetes where they are readily visible. Where not visible, seines may be effective.

h. Capture efficiencies may vary according to site characteristics, electrofishing gear used and electrofishing techniques.

i. Within each reach, electrofishing should be conducted in a downstream to upstream direction (for the purpose of reducing turbidity/maintaining visibility) with one person operating the electrofisher and at least one person netting ammocoetes. Each reach should be thoroughly and slowly sampled, with more effort directed at suitable lamprey rearing habitat and less effort in areas with hard substrates or high water velocity.

j. Using the 2-stage method described above, the electrofisher should mainly be operated in the lower frequency output mode to irritate ammocoetes out of the substrate. When necessary, the higher frequency mode should be activated for capturing emergent ammocoetes.

k. Multiple electrofishing passes should be made to ensure a more complete removal of ammocoetes. A fifteen minute break between passes should be taken to reduce the chance of electronarcosis.

The Five Most Blatant Myths about Freight Transportation on the Lower Snake River

Those who benefit most from government subsidies for commercial navigation on the lower Snake River—the ports, industry associations and their members, and the US Army Corps of Engineers—have plied the public for years with untrue claims that barging is more economical, more fuel efficient, and less polluting than shipping freight by truck or rail. Barging supporters also make exaggerated claims that barging on the lower Snake River preserves highways and plays a critical role in the regional economy. The barging boosters make these claims while ignoring clear evidence to the contrary. In doing so, they are perpetuating myths—otherwise known as *cookin' the books* and *blowin' smoke*—and taxpayers are footing the bill.

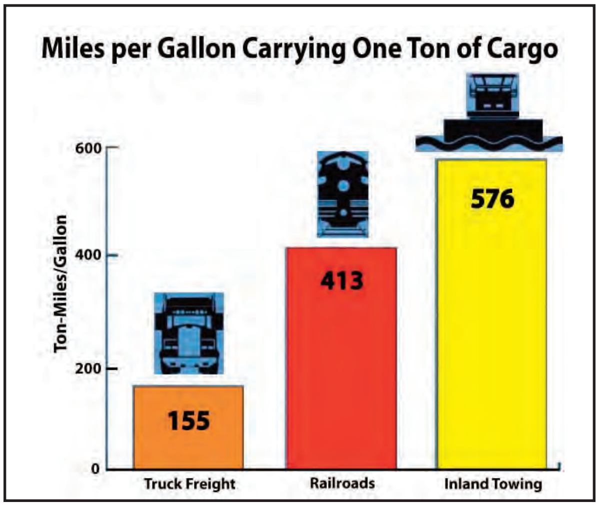
The 5 myths:

- **Barge transport is the most fuel-efficient means of transporting cargo.**
- **Barging keeps trucks off our highways saving millions of dollars each year.**
- **Barge transport on the lower Snake is friendly to the environment.**
- **Barging is the cheapest way to move freight.**
- **Barging on the lower Snake is a vital part of the regional economy.**

The factual information on the following 5 pages has been gleaned from a range of research studies and professional literature. A final page summarizes conclusions drawn from this analysis.

This document was prepared by Linwood Laughy, a former educator, author, outfitter and long-time resident of the Clearwater Valley in north-central Idaho. Laughy is a Harvard-educated citizen activist and more recently the co-founder, with his wife Borg Hendrickson, of FightingGoliath.org, an extended network of individuals and organizations that collectively played a significant role in keeping Highway 12 and the Lochsa/Clearwater Wild and Scenic River Corridor from becoming industrialized as a transportation route for giant mining equipment en route to the tar sands of Alberta, Canada.

ATTACHMENT C



Northwest barging supporters consider this fuel-efficiency graph industry gospel. It appears on port and association websites, in grant applications, and is continually referenced for print media. Those who use this graph to represent energy savings of barge transport on the lower Snake River are either misinformed or intentionally misleading the public.

Myth 1: Barge transport is the most fuel-efficient means of transporting cargo.

- The ton-miles per gallon (tm/g) information in the above graph is extracted from a study by the Texas Transportation Institute (TTI) done for the National Waterways Foundation, whose officers and trustees are largely part of the barging industry. The graph uses old data from 2001-2005, even though TTI published updated results in a final report.[1] TTI's more complete and more current data set reveals a significant decrease in the perpetually claimed advantage of barge transport over rail.
- Several professional reviewers found the original TTI report and its followup flawed and the results misleading or of limited applicability.[2] For example, the TTI study failed to address circuity; i.e., the more circuitous route rivers often run compared to roads and rail. Typical river circuity is 1.3 times rail or truck. When a correction in the TTI data is made for circuity, the tm/g become 474 for barge and 478 for rail. For a second example, the data in the TTI graph represent national averages. Net tm/g increase significantly as the number of barges in a tow increases. Tows on the Mississippi often range from 15-50 barges, while tows on the lower Snake only 1-4 barges.
- Most of the freight transport in the lower Snake River region is neither barge nor rail, but rather a combination: truck-barge or truck-rail. In a seminal article on freight transport fuel efficiency, Baumel notes that "net-ton-miles/gallon, when used alone, is frequently an *incomplete and misleading measure* for modal fuel efficiency comparisons. It is an accurate measure of comparative fuel efficiency only if the comparative mode shipments are from the same origin to the same destination, the same distance from the origin to the destination, and there are *no intermodal movements* in each shipment."[3]
- Grain is by far the most shipped commodity on the lower Snake, comprising 70% of all freight passing Lower Granite dam in 2011. Using regionally-derived energy coefficients rather than national averages, and BTUs as a measure of energy, Casavant and Ball reported that truck/rail is 24% more fuel efficient than truck/barge when analyzing the transport of wheat in eastern Washington. They concluded that the closure of commercial river navigation on the lower Snake River would save 12.1 billion BTUs of energy use each year.[4]

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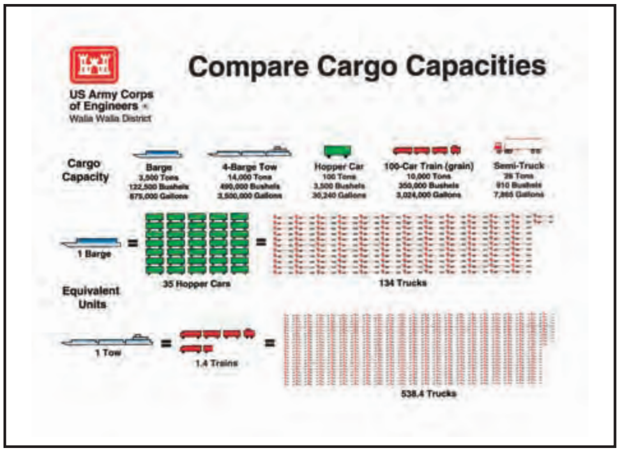
1. Texas Transportation Institute, "A Modal Comparison of Domestic Freight Transportation Effects on the General Public: 2001-2009," February, 2012
2. Institute for Agriculture & Trade Policy, "Myth: Barges Are the Most Fuel Efficient Mode of Transportation for Agriculture Commodities," 2002. See also Nicollet island Coalition, "Big Price, Little Benefit," February, 2010
3. Baumel, Phillip C., "Measuring Bulk Product Transportation Fuel Efficiency," Journal of Transportation Research Forum, Spring, 2011
4. Ball, Trent and Casavant, Ken, "Impacts of a Snake River Drawdown on Energy and Emissions Based on Regional Energy Coefficients," University of Washington Dept. of Civil Engineering and Washington State University Department of Agricultural Economics, 2001



The chart at left is often used to imply barging is more efficient than other means of freight transport because of the volume of freight that can be hauled in a single load. However, the chart no longer accurately reflects the size of many of the rail cars in use today. More significantly, the data in this chart actually says nothing about freight transport cost or efficiency. Telling the public 4 quarts makes a gallon says nothing about the price of milk, nor for that matter, about the cost per ton of shipping grain by truck-barge rather than truck-rail.

Myth 2: Barges keep trucks off our highways—saving millions of dollars each year in energy consumption and road repairs.

- Northwest River Partners (NWRP) frequently tells the public "Barging food and other products downstream keeps 700,000 trucks off our highways and helps keep our skies clean."[1] They and other barging supporters often accompany such claims with the above USACE chart. Here, however, are the facts: 700,000 trucks would transport 18.20 million tons of cargo. Nearly all downstream freight passes through the Bonneville lock. In 2010, total downstream tonnage through Bonneville was 6.34 million tons.[2] This cargo could be transported by 243,846 trucks, or 35% of the number claimed by NWRP—assuming all freight not transported by barge was trucked. However, if even half that freight were transported by rail, a very conservative estimate, the number of trucks "off our highways" would drop to 121,974, or just 17% of what NWRP continually claims.

- In a 2012 application for federal funds to extend its container dock, the Port of Lewiston claimed huge fuel savings as a project benefit based upon the Port's supposed removal of 14,026 trucks per year from highways by 2020 and 24,496 trucks by 2035.[3] Between 2000-2011, container shipments at the port declined steadily, from 17,590 twenty-foot equivalent units (TEUs) to only 3,653 TEUs. All container freight in 2011 could have been hauled by just 2,730 trucks. To meet the port's claim of keeping 14,026 trucks off the highway in 2020, the Port would need a 500% increase in container traffic and the elimination of all container shipments by rail.

- According to the *Lewiston Morning Tribune*, in preparation for a planned 15-week river closure for lock repairs in 2010/2011 the Port of Lewiston stockpiled 300 containers for a container-rail operation. Indeed, a later article noted all cargo that left the Port of Lewiston during the river closure departed by rail.[4]

- Jessup, Ellis, and Casavant studied the impact on rail and trucking from a possible permanent closure of commercial navigation on the lower Snake River.[5] They found the number of ton-miles of grain transported by rail from central and eastern Washington under this circumstance would increase by 93.5%, while truck ton-miles would increase by only 15.5%.

- Agricultural products comprise most of the freight on the lower Snake. In 2011, for example, 99% of outbound traffic from the Port of Lewiston was agricultural, mostly wheat, while grain made up 70% of the traffic passing through the Lower Granite lock. Washington State Department of Transportation's Grain Train Program actually does remove trucks from roadways. Unlike the Port of Lewiston, it is also "a *financially self-supporting* freight transportation program...."[6]

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1. *Northwest Hydropower and Columbia Basin River Benefits—Fast Facts 2013-14,* www.nwriverpartners.org
2. United States Army Corps of Engineers Waterborne Commerce Statistics Center, 2011
3. Port of Lewiston, *TIGER IV Grant Application, Attachment E: Benefit/Cost Analysis,* 2012
4. "Port of Lewiston Prepares for Railroad Traffic," *Lewiston Morning Tribune*, November 10, 2010; See also "River Users Play Catch-up," *Lewiston Morning Tribune*, April 3, 2011
5. Jessup, Eric, Ellis, John, and Casavant, Kenneth, "A GIS Commodity Flow Model for Transportation Policy Analysis: A Case Study of the Impact of Snake River Drawdown," May 1997
6. FreightRail Program, Washington State Transportation Commission, Feb. 22, 2012, p. 24

Myth #3: Barge transport is friendly to the environment.

- Because fuels vary in composition across modes of transport, researchers often use BTUs (British Thermal Units) rather than ton-miles/gallon as the most accurate way to compare energy use. BTUs per ton-mile (BTU/tm) decreased across all transport modes from 1970 to 2008: truck by -11.55%, barge by -23.30%, and rail by -55.86%. Consequently rail has emerged as the most fuel-efficient mode at 305 BTU/tm, followed by barge at 418 BTU/tm and truck at 552 BTU/tm.[1]
- Casavant and Simmons completed an extensive study of the impacts on energy use and fuel emissions of the 15-week closure of Snake River navigation in 2010/2011 due to lock repairs. They found energy use per ton transported during this period decreased by 4.77% due to the heavy use of rail "which consumes less energy per ton-mile than barge and truck."[2]
- As noted in Myth #1, most freight transport in the region involves either truck-barge or truck-rail. When Ball and Casavant used *regional* energy coefficients rather than national averages in their study of energy and emissions impacts of a possible complete closure of commercial navigation on the lower Snake, they found truck-rail had a 24% advantage over truck-barge with respect to energy use. When transporting wheat from eastern Washington, shipping by barge used 368 BTU/ton-mile, while rail used 278. The increased energy savings associated with closing commercial navigation on the lower Snake River would result in a 2.08% *decrease* in fuel emissions.[3]
- The Port of Whitman estimates average annual savings to farmers of $4,942,551 in wheat transportation costs from eastern Washington and parts of Idaho when the McCoy Unit Train Loader near Oakesdale, Washington, comes on line in 2013. Two farmer cooperatives with combined membership of 1390 growers are building the McCoy Loader for $17 million and plan to ship 16.4 million bushels of their own wheat annally through this facility with an additional 4 million bushels expected from other cooperatives. The Washington Department of Transportation (WDOT) projects annual savings of $3,530,000 in road damage from this same project. The Port and WDOT also note this shift from truck-barge to truck-rail will save 1,732 metric tons of CO_2 emissions each year.[4]

Comparing Freight Modes Per Ton-Mile (Grier, 2002)

	Cost Cents	Fuel Use gallons	Hydrocarbons lbs.	CO2 lbs	NOx lbs
Barge	.97	.002	0.09	.20	.53
Rail	2.53	.005	0.46	0.64	1.83
Truck	5.35	.017	0.63	1.90	10.17

Chart used by the Port of Lewiston to support its claim of project benefits and "environmental sustainability" in its 2012 TIGER IV application for federal funding for a container dock extension.

- Despite the availability of sound regional research data, lower Snake barging supporters continue making false claims regarding fuel efficiency and air pollution. For example, in its recent TIGER IV grant application the Port of Lewiston claimed air pollution benefits based on 30-year-old data indicating barge fuel efficiency was more than 2.5 times greater than rail and 8.5 times greater than truck.[5] This data (see above chart), from a 1980 study done for the America Waterway Operators, Inc.,[6] was extracted from a 2002 article by an Army Corps of Engineers staff member.[7] Even the questionable TTI data the port used in their grant application to argue fuel savings (Myth #1) used a barge/truck fuel ratio of 3.7/1, not 8.5/1. The port compounds this emissions misinformation by falsely assuming any freight not hauled by barge would be hauled by truck and by failing to acknowledge barge transport is actually truck-barge transport.

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1. *Transportation Energy Data Book*, U.S. Department of Energy, Edition 29
2. Casavant, Ken, and Simmons, Sara "Economic and Environmental Impacts of the Columbia-Snake River Extended Lock Outage," Freight Policy Transportation Institute, Washington State University March 2012.
3. Ball, Trent and Casavant, Ken, *Impacts of a Snake River Drawdown on Energy and Emissions Based on Regional Energy Coefficients*, Transportation Northwest, Final Report TNW2001-06
4. Port of Whitman, "*P & L Shortline Rehabilitation Project, Tiger 5 Discretionary Grant*," 2013
5. Port of Lewiston, "TIGER IV Discretionary Grant Application, Dock Extension Project," 2012
6. *Eastman, S. E.,* "Fuel Efficiency in Freight Transportation," *American Waterways Operators, Inc*. 1980
7. Grier, David, "Measuring the Service Levels of Inland Waterways: Alternative Approaches for Budget Decision Making," *TR News*, Transportation Research Board, July-August 2002

> *Once the thriving centerpiece of 19th- and early 20th-century logistics... the river barge business has become a ward of government largesse. Washington picks up more of the cost of riverborne shipping than any other type of logistics enterprise in the U. S. except, perhaps, resupplying the International Space Station.*
>
> Christopher Helman, *Forbes Magazine* April 15, 2013

Myth #4: Barging is the cheapest way to move freight.

Misinformation about barge fuel efficiency buttresses the most egregious of waterborne commerce myths—that barging is the cheapest way to move freight and saves millions in shipping costs. This statement is not true even when American taxpayers pay approximately 90% of the bill. River freight transportation epitomizes corporate welfare, and the lower Snake River is a giant subsidy slough.

- Nationwide, the Army Corps spends approximately $800 million a year on operations and maintenance of river channels, locks and dams. Barge operators pay a 20 cents/gallon fuel tax into the Inland Waterways Trust Fund, which in 2012 brought in $80 million. The Congressional Research Service reported that from 2000-2008 fuel taxes on the ColumbiaSnake paid for only 6% of the operation and maintenance costs of this waterway.[1] Both Bush and Obama administrations' attempts to raise the fuel tax on barge transport or add a waterway user fee met stiff resistance from the barging industry and congressional members it supports. Barging companies argue that any increase in their costs will render them uncompetitive with other transport modes.
- Over the past 6 years the Corps spent $16 million preparing a Lower Granite Reservoir sediment management plan primarily to maintain a 14-foot deep navigation channel through the Snake/Clearwater confluence to the Port of Lewiston. In April 2013, a Corps spokesman told a news reporter that plan implementation would cost an additional $39 million.[2] Thus the Corps proposes to spend at least $55 million on perpetual dredging and other sediment-related projects primarily to keep open a port whose freight shipments over the past 12 years have declined by more than 50%. At 2011 shipping levels, taxpayers subsidize each barge leaving Lewiston's port by at least $16,000 for dredging alone. Based on Corps' data, the annualized cost for dredging the confluence and up the Clearwater to the POL over the next 20 years will be $3.1 million per year without inflation, or $4 million per year with a 2% inflation factor.[3] This cost does not include the $16 million already spent on sediment management planning, related Corps' administrative and indirect costs, or additional costs of dealing with the predicted increases in sediment load due to the ongoing rapid expansion of forest fire activity in watersheds that feed the confluence.[4]
- In the last 8 years taxpayers spent at least $267 million on Columbia-Snake River System maintenance, including on the lower Snake. This does not include the $188 million spent dredging the lower Columbia to keep Portland area ports viable, without which commercial navigation on the lower Snake would likely cease. The Army Corps recently went to bid on the first phase of a project to shore up jetties at the mouth of the Columbia with a projected cost of $257 million after spending $28 million a decade ago on a temporary fix. According to a Corps spokesperson, the $257 million is "the first step in a larger process." A second round of repairs is expected to run total jetty repair costs to $500 million.[5] According to the Government Accounting Office, the Corps has a well-deserved reputation for *under*estimating project costs.[6]
- As noted earlier, by far the majority of freight transported on the lower Snake is grain. Nearly 1400 growers, some of whom farm within 20 miles of the Port of Lewiston, apparently believe shipping by truck-rail is cheaper than shipping by truck-barge and have placed a $17 million bet they are right with their investment in the McCoy Unit Train Loader. This private investment alone accentuates the fallacy of believing barging is the cheapest way to move freight.

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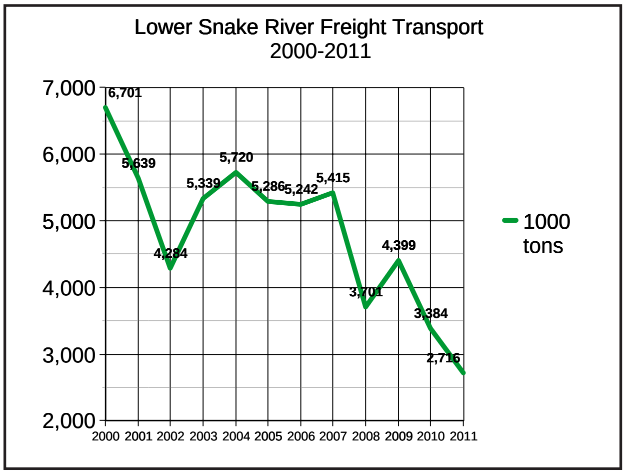
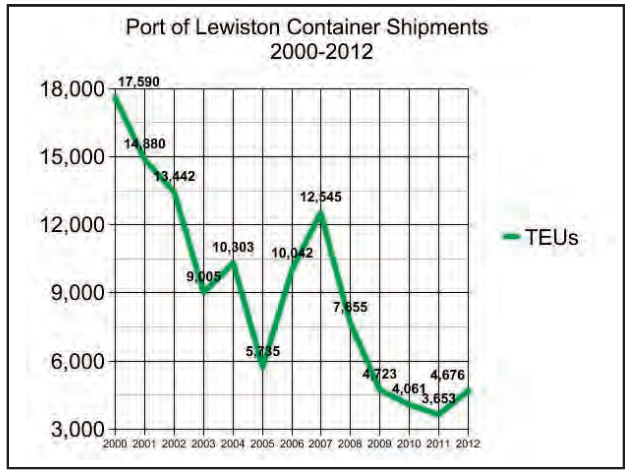
1. Congressional Research Service, *Inland Waterways: Recent Proposals and Issues for Congress*, May 3, 2013
2. Kunz, Aaron, "U.S. Army Corp of Engineers Prepares Snake River Dredging Plans," National Public Radio, April 8, 2013
3. Laughy, Linwood, "The Lower Snake River Programmatic Sediment Management Plan: More Taxpayer Subsides for the Port of Lewiston," January 2013; see also "Sediment and Subsidies: An Update," May, 2013
4. U.S. Army Corps of Engineers, *Lower Snake River Programmatic Sediment Management Plan*, 2012
5. Olson, Erik, "Corps set to begin first stages of Columbia River jetty revamp, *The Daily News Online*, April 29, 2013
6. U.S. General Accounting Office, *Corps of Engineers: Observations on Planning and Project Management Processes for the Civil Works Program*, March 16, 2006





Myth #5: Barging is a vital part of the regional economy.

Fifty years ago, boosters of the Lower Snake River Project promised economic prosperity to the residents of Lewiston, Idaho, and Clarkston, Washington with the arrival of slackwater navigation. Today local residents are still subsidizing port operations, freight transport by barge has declined dramatically since the turn of the century, and federal subsidies for river system maintenance and operations keep rising.

- As noted in the above-left graph, from 2000 through 2011 freight tonnage on the lower Snake River declined by 59%. At the Lower Granite lock, pulp and paper declined by 90%, wood products by 52%, and grains by 40%.[1] Much of this decline occurred prior to the 2008 recession.
- Over the past 12 years bulk and container freight transport from the Port of Lewiston declined by 60%. As noted in the above-right graph, between 2000 and 2012 total container shipments declined by 77%. Port of Lewiston shipping reports for 2007-2012 show a decline in paper shipments of 81%, containerized grain by 95%, and lumber by 100%. Between 2000-2011 bulk wheat shipments declined 45%.[2]
- Most containers shipped upstream on the lower Snake are empty. At the Port of Lewiston, for example, during the 8-year period (2004-2012) for which data is available from the U.S. Waterborne Commerce Data Center, 84% of containers received were empty. The removal of 1 aberrant year from the data set changes this percent to 94.5%. *All* containers arriving at the POL in 2011 and 2012 were empty.[3]
- After more than 40 years of operation the Port of Lewiston continues to require subsidies from local taxpayers. Lewiston's port district has collected $4.5 million over the past ten years in local tax subsidies. As a government entity the port also currently receives over $100,000 a year in state sales tax revenues. The port's budget also indicates the port pays no property taxes on its 246 acres of prime waterfront and commercial property.[4]
- The Lewiston Port District is comprised of all of Nez Perce County. The Idaho Department of Labor lists Nez Perce County's 12 largest employers in its June 2013 Work Force Trends report.[5] Only one employer on the list ships goods by barge, and that manufacturer transports the vast majority of its product by truck and rail. The port employs 7 of the 18,810 people in Nez Perce County's current labor force.
- Unemployment in Nez Perce County ranged from only 2.8%-4.5% for 5 of the last 11 years, between 4.5%-5.5% two of those years, and remained below 7% during the great recession. The health of the economy in Nez Perce County appears unrelated to the 50%-60% decline in barge freight shipments from the Port of Lewiston over that same time period.

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1. U.S. Army Corps of Engineers, Waterborne Commerce of the United States Data Center, 2011
2. Port of Lewiston Shipping Reports, at www.portoflewiston.com
3. Waterborne Commerce Data Center, U.S. Army Corps of Engineers, 2011
4. Port of Lewiston, 2013 Budget at www.portoflewiston.com
5. Idaho Department of Labor, "Nez Perce County Workforce Trends," June, 2013

The Five Most Blatant Myths about Freight Transport on the Lower Snake River

Conclusions[1]

- Lower Snake River barging boosters perpetually use false assumptions, old data, and questionable or non-applicable research studies in crafting their support of the *status quo*. The resulting misinformation misleads the public, quashes needed dialogue about important transportation issues, and leads to the misallocation of private and public resources.
- Freight transport on the lower Snake River has declined significantly over the past 13 years. The expansion and increased efficiency of rail in the region will likely continue to reduce the amount of freight hauled on this waterway.
- While freight tonnage has declined, costs for maintaining and operating commercial navigation on the lower Snake, as well as on the entire Columbia-Snake System, have steadily increased, which has greatly expanded the taxpayer subsidy for each ton shipped. These continuously rising costs come at a time when the U. S. Corps of Engineers faces huge financial demands across the nation for the maintenance of aging infrastructure, and when the federal government is making major across-the-board budget cuts.
- Barging on the lower Snake contributes only 5% of total tonnage shipped on the Columbia-Snake System and on a ton-mile basis, accounts for just 1/10th of 1% of U.S. commercial navigation. Barge transport on the lower Snake is not economically sustainable. As noted by the National Academy of Sciences in a study done for the Army Corps of Engineers, the Corps may need to abandon commercial navigation on some waterways in order to maintain those that handle more ton-miles of freight. The Corps faces large, perpetual costs for sediment management on the Columbia and at the river's mouth. Maintaining freight transport on the Columbia may necessitate abandoning commercial navigation on the lower Snake.
- Sediment management at the confluence of the Snake and Clearwater Rivers is now shining a light on cost-benefit ratios involved in lower Snake River commercial navigation. For example, cost savings to farmers for the shipment of agricultural products from the Port of Lewiston are insufficient even to pay for the annualized cost of channel dredging necessary to keep barge operations at that port possible.
- Barging supporters pay limited, if any, attention to river system changes already occurring because of climate change. The rapidly expanding number of square miles of forest land burned in the Snake, Salmon and Clearwater drainages during the last decade are already producing increased sediment loads, and this trend will continue. Resulting lower flows and higher water temperatures will negatively impact anadromous fish, likely requiring lower Snake River reservoirs be kept at minimum operating pool levels as well as mandating more spill. Maintenance costs will increase and river system reliability will suffer. The *status quo* on the lower Snake is no longer possible, and the refusal to give serious attention to alternatives is indefensible.
- Analyses of the maintenance and operational costs of continued freight transport on the lower Snake rarely include other significant costs to taxpayers and regional residents. A few examples: For much of the region, truck-barge transportation results in more damage to highways than truck-rail. Commercial and recreational fishing and related tourism are held far below their potential regional economic benefit. Electricity rate-payers spend over $500 million per year trying to recover fish runs on the Columbia and Snake Rivers with limited if any success. Wildlife suffer the loss of thousands of acres of prime riparian habitat. Native Americans, such as the Nez Perce, have paid and continue to pay high social, cultural and economic costs related to the lower Snake River dams.

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1. All references to ports in this analysis refer only to their freight transport operations. Ports regularly conduct numerous economic development activities, most of which do not involve commercial navigation.

Port of Lewiston Dock Expansion and Storage Area Development Environmental Assessment

Summary of Comments Received and Responses to Comments

This report provides a summary of the comments received by the Walla Walla District Corps of Engineers (Corps) on its *Port of Lewiston Dock Expansion and Storage Area Development* Environmental Assessment (EA) and draft Finding of No Significant Impact (FONSI), and the Corps' responses to those comments. The Corps distributed the EA and draft FONSI for a two week review which was extended for another two weeks. The Corps received a total of 57 e-mail messages or letters, of which 18 were requests for an extension in the comment period. Of the remaining 39 messages, one stated they had no comment, one provided information in support of the proposed action, and 37 were opposed to the proposed action. The Corps also received comments through Government to Government consultation with the Nez Perce Tribe on April 2, 2012. The Corps also received copies of 18 letters sent to the Port of Lewiston (Port) supporting the dock expansion project.

The comments provided in the 37 e-mail messages or letters and the consultation with the Nez Perce Tribe have been separated into 40 distinct comments. These comments are listed below. The Corps' response is included below each comment. The Corps' response also indicates if the EA was revised in response to the comment.

Comment 1: Expansion of the dock will result in increased barge traffic on the Snake and Clearwater Rivers and adversely affect fish.

Response: See the attached Corps' Regulatory Division Memorandum for Record: Department of the Army Environmental Assessment and Statement of Finding for Above Numbered Permit Application (Regulatory MFR), Section 3.e.(2), response to Comment 12.

As stated in the Environmental Assessment, an increase in barge traffic associated only with the dock expansion is not guaranteed. Any increase would be primarily the result of the economy (local, regional, national, and international), market forces, and changes in the transportation system such as the recently completed deepening of the Columbia River channel allowing deeper-draft ocean-going vessels access to Portland, Oregon. The Port of Lewiston (Port) anticipates that the dock expansion would result in increased business, and therefore the Corps is addressing that potential in this response. Any increase may not exceed the amount of business the Port has experienced in the past – with its current facilities The Port has had more business in the past and the system has the capacity to handle that amount of business. There is no indication that is the maximum amount of business that the system could accommodate. The level of barge traffic at the Port is currently low compared with levels in the 1990's. From March through July barge use of the dock averages about one barge per week. From August through February barge use is higher, averaging about 1-2 barges using the dock per week. This use can be represented by the amount of cargo currently being handled at the dock. In 2011 the total container cargo handled by the Port with its current dock was 3,653 Twenty Foot Equivalent Unit (TEU's). When the Port was experiencing higher usage in the late 1990's and early 2000's, the number of TEU's handled each year was about 17,000 TEU's (See Port webpage http://www.portoflewiston.com/wordpress/?page_id=69), which is about five times the current amount of cargo. The number of barges needed to handle that level of cargo averaged about 3-4 barges per week (one barge per day on three or four separate days) using the existing dock. If the amount of cargo handled at the Port increased to levels similar to that of ten years ago, the number of barges using the Port's dock could double to 2-4 barges per week. This would not be considered an increase in use but a return to levels that were experienced for several years.

An increase in the number of barges using the Port's dock does not necessarily equate to increased barge traffic and increased environmental effects. Most of the environmental effects are caused by the passing of a tow, not the number of barges. In the Snake River, tows can consist of between one and four barges and each barge can be destined for a different port facility. Four barges per tow is the maximum number that can be accommodated by the locks of the Snake River dams. Additional barges destined for the Port of Lewiston does not necessarily mean more tows, but instead could result in more barges in the tow (up to the maximum of four). Since the proposed dock expansion would allow two barges to be handled at a time, the number of tows could possibly be reduced as one tow could pick up or drop off both barges at one time instead of making two separate trips.

If the amount of barge traffic were to increase, it could have potential increased effects on fish through noise level, chemical contamination, and wave action. Effects on fish are tied to the number of tows. An increase in number of barges would not have as much of an effect on fish as the number of tows as it is the passing of a tow that increases the noise level in the river and creates the wave action. As stated in the National Marine Fisheries Service (NMFS) Biological Opinion for this project, dated March 28, 2012, p. 27-28 "the amount of noise level produced would be similar to what is already being produced by the passing of the existing barge traffic, which should then remain within the background sound level and within current sublethal effects." If larger tows (more barges per tow) use the dock, noise levels would not necessarily increase as there would still be just one tug pushing the tow and generating the noise through operation of the motor and propellers.

While NMFS acknowledges increased barge traffic would increase the potential for risk of spills or other chemical contamination (Biological Opinion, p. 27-28), they also state "barging would continue to operate under the existing safety and operational guidelines and should not significantly increase that risk. " The cargo handled at the existing dock is containerized or break bulk cargo and not petroleum products (Dave Doeringsfeld, Port Manager, personal communication, April 9, 2012), therefore any spills or releases would be the fuel needed to operate the tug.

NMFS also acknowledges in their Biological Opinion that increased barge traffic would increase the amount of wave action, which could affect fish through increased shoreline erosion, physical damage to fish, and stranding. In the Port area, this effect would be minimal. Much of the shoreline in the Port area is armored with riprap, therefore there would be little erosion or turbidity from erosion. Barge traffic can affect salmon eggs, but the area "does not contain spawning habitat" so "salmon or steelhead eggs would not be present". Stranding can occur when the water displaced by ocean-going vessels "causes long run-up of the waves onto large stretches of flat beaches" which can result in stranding of juvenile fish. However, "freshwater barges do not displace the same volume of water as the ocean-going vessels, and the Lewiston area does not have large stretches of flat beaches, but instead has large areas or riprap and levee system which would not present the same run-up and potential stranding issues found in the lower Columbia River."

Turbidity could also be generated by prop wash from the tows. This would be most likely when a tow first gets underway. This could happen 3-4 times per week if barge traffic increases to the level of the late 1990's (one barge per day for 3-4 days.). Tows leaving the Port dock could generate turbidity, but the plume would be short-lived and would not extend downstream very far. Any fish in the area would be able to easily avoid the plume.

The U.S. Fish and Wildlife Service (USFWS) Biological Opinion for this project, dated January 4, 2012, did not identify any effects to bull trout critical habitat from barge traffic expected to use the proposed expanded dock.

The EA has been updated to address these points.

Comment 2: The dock expansion project will increase the frequency of "mega loads" and other truck traffic on U.S. 95 and Hwy 12, which will increase traffic hazards and road maintenance and negatively affect travel/tourism, scenic rivers/roads and wildlife.

Response: See the Regulatory MFR, responses to Comments 21-28 and 33 regarding effects from use of the highways.

The purpose of the Port's proposed project is to increase efficiency and safety of dock operations. Any increase in cargo handled would be the result from market/economic forces. The Port has already accommodated nine barges (36 modules) of roll on/roll off (mega loads) with its current dock facilities. As stated in the EA, the Port does not have any current contracts providing for additional mega load off-loading and any future contracts are not reasonably certain to occur.

Even if an increase in barge traffic and/or increase in cargo can be linked to the dock expansion, such an increase is not expected to result in significant impacts. The existing dock handles containerized and break bulk cargo and the majority of the cargo is exported – barges bring empty containers upstream to the Port and take filled containers downstream. Cargo to be exported is brought in to the Port primarily via truck. Of that cargo, about 90% is shipped out on barges with the remaining cargo shipped out via rail (Dave Doerinsgfeld, Port Manager, personal communication, April 9, 2012). Historically the transportation system supporting Port activities handled 3-5 times the amount of cargo currently being handled, so any increase in the amount of cargo up to that historic level would not represent an increase in the capability of the system or an increase in impacts to that system.

There are multiple transportation routes that could be used to haul any of the cargo that would be loaded or off-loaded at the Port - no specific transportation route has been identified for any of the cargo. Both U.S. Highway 12 and 95 are already being used for cargo that is currently moving through the Port, including oversize loads. Use of the highways for transporting materials and equipment is regulated by the respective state transportation departments. Any use of the highways would need to comply with the applicable requirements, restrictions, and permits.

The EA has been updated to address these points.

Comment 3: The expansion project would allow transportation of equipment to Canada (Tar Sands) and contribute a rise in global warming that is the result of burning this dirtiest oil on the planet.

Response: The dock in its current configuration has already been used for offloading equipment bound for Canada, therefore expanding the dock is not necessary to allow for transportation of this equipment. While expanding the dock would make offloading of this oversized cargo easier and more efficient, the Port has stated they do not have any future contracts to handle this type of cargo.

The use of Highway 12 for the transportation of the equipment for oil extraction is addressed in the attached Regulatory MFR response to Comment 21. Use of the highway is regulated by the State of Idaho Transportation Department and special permits needed for oversized cargo have been and would continue to be issued by that agency.

Comment 4: Expansion of the dock will result in increased truck traffic and railcar transport from the area.

Response: See the response to comments 1 and 2 above. If the Port experiences an increase in cargo from what is being shipped currently, there could be an increase in rail traffic. However, as noted above, the transportation system has historically handled up to five times the amount of cargo that is currently being shipped. Also, rail is used for shipping out only about 10% of that cargo.

Comment 5: The Corps needs to analyze the possible decrease in rail traffic, and highway traffic that will occur on Interstates 84 and 90 as a result of increased barge traffic.

Response: See the response to comments 1, 2, and 4 above. The amount of traffic would be dictated by the economy and market forces. Shipment by barge is more fuel efficient than shipment by rail or truck, therefore if fuel prices continue to rise, there could be more shipment of bulky or oversized cargo by barge. However, this could occur regardless of the proposed expansion of the Port's dock. The Corps was unable to identify any methodology to determine the effect of potential increased barge traffic on use of Interstates 84 and 90 resulting solely from the dock expansion. Any increase or decrease in the use of other transportation modes caused by the dock expansion would not be expected to be great. Again, historically the Port handled five times the amount of cargo it is handling now, using the current facilities.

Comment 6: Expending taxpayer dollars on a steadily declining entity would be a foolish investment. The expansion project is unnecessary given the decrease in the amount of barge traffic in recent years and is therefore a poor business decision.

Response: It is not the Corps' responsibility, as part of the permits/approvals being requested, to analyze the soundness of the Port's business decisions. The Port has expressed a need for the project to increase safety and efficiency, which could also make the Port more competitive with other modes of transportation. Whether Port funds should or should not be expended on the dock expansion is an issue between the Port, its revenue base, and grant agencies.

Comment 7: The expansion project would require additional, unnecessary, funding by residents.

Response: See the response to comment 6 above. The Port intends to fund the $2.9M dock expansion project through a revenue bond (loan), existing revenue sources, and a state grant. The Port is also hoping to receive a Federal grant (Tiger Grant), but is budgeting for the project without the Federal grant. The Port cannot unilaterally increase its tax revenues from local residents. Any increase in tax revenues requires a public review and approval process. Such an increase (if it does occur) is therefore not an indirect effect associated with the Corps' permit/approval, as any increase is not reasonably likely to occur and the Corps permit/approval cannot be viewed as the proximate cause of such tax increase.

Comment 8: If the dock expansion occurs it could make the Port more "competitive" and result in competition between local ports and a decline of trucking and rail industries.

Response: See the response to comments 1, 2, 4, and 5 above. The three ports in the area (Port of Lewiston, Port of Clarkston, and Port of Whitman at Wilma) do not generally compete with each other as each port tends to specialize in one type of activity or cargo. The Port of Lewiston specializes in containerized cargo – neither of the other two ports handles containers, so there is no competition locally for that shipping method. However, there is some overlap in the type of cargo handled by each port facility. Expanding the Port of Lewiston's container dock would not necessarily increase competition between the local ports for shipment of cargo.

Comment 9: The EA ignores all but one alternative to the no action option: expand the dock.

Response: The National Environmental Policy Act (NEPA) requires analysis of reasonable alternatives. The EA considered the "No Action" alternative and five action alternatives, including the preferred alternative of expanding the current dock. The Corps identified screening criteria related to the purpose and need for the project. Four of the alternatives did not meet the screening criteria, therefore they were not considered viable (reasonable) and were not carried forward for further consideration. The preferred alternative was the only action alternative that met the criteria and was considered viable, therefore it was carried forward for consideration. The No Action alternative was also carried forward for comparison as required by NEPA.

Comment 10: Port expansion will result in additional barge traffic and increased need to dredge the Clearwater River.

Response: See the response to comment 1 above regarding additional barge traffic. Also see the attached Regulatory MFR response to Comment 11.

Neither the proposed dock expansion nor any potential increase in barge traffic would require any increase in navigation channel maintenance of either the port berthing area in the Clearwater River or the Federal navigation channel in the Clearwater or Snake Rivers. The footprint of the dock expansion is within the current berthing area that has historically been maintained at the authorized depth through periodic dredging. No additional maintenance or dredging would be needed, either in the footprint of the dredged area or frequency of dredging or quantity of material to be removed. No additional maintenance of the Federal navigation channel would be needed to support use of an expanded dock. Maintenance of the berthing area and Federal channel is tied to sediment accumulation decreasing the water depth, not number of barge loads. Maintenance is performed because navigation is one of the authorized project purposes of the lower Snake River projects. Maintenance is needed regardless of the number of barges or tows using the system.

The expanded dock would not increase the amount of sediment deposition in the Federal channel or the berthing area. The current dock is located on the right bank of the Clearwater River on a straight stretch that is parallel with the flow of the river. Lower Granite reservoir bathymetry information collected in September 2011 indicates that sand wave bedload transport in this stretch of the river occurs mostly towards the center of the river with very little occurring along the right bank in the vicinity of the existing dock. Some sediment does deposit along the sheetpile wall of the existing dock and the riprap along the right bank immediately downstream of the dock. An eddy currently exists at the downstream end of the existing dock which encourages some deposition of sediment. Constructing the proposed dock expansion would transfer the deposition of sediment from the riprap in the footprint of the dock expansion to the outside of the new sheetpile wall, but would not result in additional deposition from what currently occurs. The eddy at the downstream end of the existing dock would be pushed downstream to the end of the dock extension, but would not change sediment deposition patterns or quantities.

The barges that would use the dock would not require increased water depth. Barges using the Snake River are limited in size by the size and depth of the water over the sills of the navigation locks at the dams. Larger barges requiring greater water depth would not be used as they would not be able to enter and exit the navigation locks of the lower Snake River dams to reach the Port.

Comment 11: The deeper port available just downstream should be used instead of expanding the Port of Lewiston dock.

Response: See the attached Regulatory MFR response to Comment 15. The proposed dock expansion is to address the Port's needs, not to facilitate off-loading of oversized cargo, particularly mega loads. Use of a different port site would not meet the purpose and need for the Port's action.

Comment 12: Port expansion will increase siltation in the river during the lifetime of the dock.

Response: See the response to comment 10 above. The proposed dock expansion would not result in increased sediment deposition.

Comment 13: The Corps only considered a single resource in the region as being relevant to its cumulative effects analysis.

Response: The Corps followed the guidance from the Council on Environmental Quality when determining which resource or resources to evaluate for cumulative effects. The Corps determined that the aquatic environment was the only resource for which cumulative effects could be attributed by the proposed project. As discussed in comment responses 1, 2, 4, and 5 above, the Corps has determined it cannot reasonably attribute increased transportation effects to the proposed dock expansion project.

Comment 14: The EA did not explain why there were no significant impacts. The Corps should have prepared an Environmental Impact Statement (EIS).

Response: Through this comment summary report and revisions to the EA, the Corps has tried to present a more clear explanation of why it has determined the proposed dock expansion would not have significant impacts and why an EIS is not required.

Comment 15: Request a public hearing on this proposal.

Response: The Corps held a public hearing for this project on October 19, 2011. The scope and scale of this proposed action does not warrant a second public hearing.

Comment 16: Dock expansion is premature given the ongoing development of a Programmatic Sediment Management Plan (PSMP) for the Lower Snake River. Until the Corps issues its Record of Decision for the dredging EIS, no action concerning the proposal should be taken which would: (1) have an adverse environmental impact; or (2) limit the choice of reasonable alternatives. The Corps has also failed to analyze the cumulative effects of the proposed project on the Lower Snake River PSMP for which the Corps is currently preparing a Draft EIS.

Response: The PSMP and the proposed dock expansion are independent actions. The PSMP is evaluating alternatives and measures that could be used to manage sediment deposition in the lower Snake River. The Port's project would not affect sediment deposition or the need for sediment management in the Clearwater River or the Snake River navigation system and would not influence or limit the alternatives or measures being considered in the PSMP. The dock expansion project does not rely on the PSMP to be a viable project.

As stated in the EA, the Corps has determined the proposed dock expansion project would have a few adverse effects, mostly associated with water quality and the aquatic environment, and none of them would be significant. The Corps determined the proposed project could adversely affect several Endangered Species Act-listed fish species and their critical habitat, and requested formal consultation with NMFS and USFWS. The Corps received a Biological Opinion from NMFS dated March 28, 2012. The Biological Opinion included an Incidental Take Statement as NMFS estimated a total of 123 juvenile fish could potentially be harmed or killed by the in-river activities associated with the filling behind the sheetpile bulkhead. Of these 123 fish, 41 are steelhead and 82 are Chinook salmon. The Smolt-to-Adult-Return (SAR) ratio for both species between 2000 and 2011 has ranged from 0.92 to 2.08 for steelhead and 0.22 to 2.74 percent for Chinook (Fish Passage Center website at http://www.fpc.org/survival/css_annual_sars_SNK_COL_queryv3.html). This means the juvenile salmonid take estimated by NMFS represents up to possibly one or two returning adult fish for each species. NMFS listed two Reasonable and Prudent Measures that must be followed and the Terms and Conditions that must be implemented. These are to be complied with through the Department of the Army Section 404/10 permit the Corps is considering issuing to the Port.

The Corps received a Biological Opinion from USFWS dated January 4, 2012. The Port already committed to performing conservation measures to minimize effects on bull trout critical habitat.

See the response to comment 10 above regarding the need for additional channel or berthing area maintenance, including the use of dredging. The proposed dock expansion would have no effect on the need for navigation channel maintenance and would therefore have no effect on the alternatives the Corps is considering for management of sediment deposition in the lower Snake River. There would be no cumulative effects on the PSMP as the dock expansion would not change sediment deposition rates or increase the footprint of river bed in which channel maintenance would be needed.

Comment 17: The use of a separate decision document for the Section 404/10 permit is a bifurcation/ segmentation of this single project in violation of the NEPA process. The EA analyzes the Section 408 construction permit but not the Section 404 or Section 10 permits.

Response: The EA has been modified to clarify that this EA is intended to be comprehensive and include all actions by the Corps associated with the Port's dock expansion project. The separate decision document and environmental review prepared for the Section 404 and 10 permits is a requirement of the District's Regulatory program (33 C.F.R. 320 and Appendix B to Part 325). This comprehensive EA has been prepared in accordance with the Corps' Civil Works NEPA regulations (33 C.F.R. 230). The reviews may (in part) be redundant, but it is not bifurcation/segmentation.

Comment 18: The Port's demand for higher elevations at Lower Granite will likely become more frequent if the dock extension is implemented. Port expansion will require the Lower Granite pool to be operated above minimum operating pool (MOP) for more and heavier barges, which has a negative effect on fish by increasing outmigration travel times and water temperature and possibly violate the Federal Columbia River Power Supply (FCRPS) Biological Opinion (Bi-Op).

Response: The proposed dock expansion would have no effect on the Corps' operation of Lower Granite reservoir above MOP during the juvenile salmonid outmigration. The Corps' decision to operate above MOP is made based on the need to provide for navigation in the reservoirs and is done in compliance with the 2008 FCRPS Bi-Op Reasonable and Prudent Alternative item 5 (RPA #5).. The RPA states the lower Snake River projects, including Lower Granite, "will be operated at minimum operating pool (MOP) with a 1-foot operating range from April 3 until small numbers of juvenile migrants are present (approximately September 1) unless adjusted to meet authorized project purposes, primarily navigation." In recent years the Corps has been operating Lower Granite reservoir from MOP +1 foot to MOP+2 feet to provide additional depth over the high spots caused by sediment deposition in the navigation channel. This deviation is in compliance with RPA #5 as it is implemented to provide for safe navigation within the reservoir. The Corps would return to operation of the reservoir within one foot of MOP once it can restore the authorized depth of the navigation channel to 14 feet deep as measured at MOP.

See response to comments 1 and 10 above. The dock expansion would not result in additional channel maintenance. There would be no additional sediment deposition as a result of the dock expansion. Channel maintenance is performed in response to sediment deposition and need to maintain the navigation system, not the number of barges using the system. The dock expansion would not result in heavier barges requiring more than the 14-foot deep authorized navigation channel. Such barges would not be able to enter or exit the navigation locks of the Snake River dams.

Comment 19: Additional storage space isn't crucial to improving the Port's economic position.

Response: The 2.1 acre additional storage space area is located within the Port's existing easement area. The easement requires the Corps to approve the work, but the decision – from a land management standpoint -- is based on whether the work is associated with port and industrial use (public interest) and not contrary to the Corps mission. Additionally, this 2.1 acres is adjacent to seven (7) acres of additional storage space (on Port property) the Port has already constructed. There are negligible environmental effects associated with the 2.1 acres of additional storage space as it is located entirely within a prior dredged material disposal area.

Comment 20: Corps approval should prohibit over-wide, and/or over-length, and/or over-weight cargo, i.e. no "megaloads."

Response: The Corps has no authority to approve the type of dimension of cargo transported on the Snake River. The Corps is reviewing the request by the Port as required by the Port's easement with the Corps, 33 U.S.C. 408 for modification of an existing Corps structure (the levee), and the Corps' regulatory authority under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899.

The Corps is not "approving" the transportation of megaloads. Any necessary approvals would be for the transportation of those loads on public highways and those approvals would be issued by the appropriate state highway department (see the attached Regulatory MFR Memorandum for Record: Department of the Army Environmental Assessment and response to Comment 21).

Comment 21: Public funds should be used to address the long-term risk of flooding in the Lewiston-Clarkston area and not a port expansion.

Response: See responses to comments 6 and 7 above. The Corps is not funding the Port's dock expansion project. The Corps is not required to consider flood risk in the Lewiston and Clarkston area as an alternative to the Port's dock expansion project. Consideration of flood risk will not satisfy the purpose and need stated in the EA. Additionally, the two issues are independent actions. Factors contributing to flood risk in the Lewiston and Clarkston area (if they exist) will persist with or without the project. The small amount of fill needed for the proposed dock expansion would not have any effect on the flood risk for the Lewiston and Clarkston area.

Comment 22: Dock expansion is expected to increase the size of barges and the material they carry. Currently, the water depth at the dock is very low. This suggests that if the dock expansion has the results desired by the proponents, then more dredging will be required.

Response: See response to comment 10 above. The proposed dock expansion would not result in deeper-drafting barges or additional dredging.

Comment 23: In coming up with the purpose and need, the agency has defined the issues to preclude a reasonable array of alternatives. The purpose and need of a NEPA document cannot be so narrow as to constrain consideration of reasonable alternatives. A reasonable alternative, that of using the much deeper port of Wilma, was not analyzed because the purpose and need was too narrowly constructed. We urge consideration of an alternative that emphasizes the Port of Lewiston's road and rail operations, as opposed to further investment in a waterway with steadily declining use. An additional alternative of replacing the old oil/water separator was not evaluated either

Response: The comments received on this issue did not identify how the Corps had defined the purpose and need (P&N) in unreasonably narrow terms. A reasonable range of alternatives depends on the nature and scope of the proposal and the facts in each case. The Corps must consider all reasonable alternatives within the P&N it has defined. The Corps may not define the P&N of a project in unreasonably narrow terms, but that has not occurred in this case. The action/proposal being considered by the Corps is not part of a coordinated plan to deal with a broad problem, which would require the range of alternatives to be evaluated to be broadened (e.g., Increased use of the Port of Wilma). The P&N is appropriately focused on the Port of Lewiston and its need for additional dock and storage space, which would improve efficiency and safety and may enable the Port to remain competitive with other modes of freight transportation. With that P&N in mind, the Corps identified three (3) alternatives, in addition to the proposed action and no action alternatives, to the dock expansion – relocate dock, additional barge berth, and improved productivity (no build). The Corps also considered development of a storage area at a different location. The alternatives considered by the Corps, when considering the nature and scope of the proposed action and P&N, constitute a reasonable range of alternatives. The expansion of the Port's "road and rail operations" would not satisfy the P&N

because the dock in question is primarily an export terminal for containerized cargo, with rail operations being only a small part thereof. Additionally, the addition of an oil/water separator is not a viable alternative, as the P&N is not focused on improving water quality. The proposed dock expansion project will, as a side benefit, improve the Port's storm water discharge system, but that is not the purpose of the project.

Comment 24: Why didn't the EA evaluate listed spring/summer Chinook, listed Sockeye, and the rare sturgeon?

Response: The EA initially did not evaluate spring/summer Chinook or sockeye as they are not listed under ESA in the Clearwater drainage. The EA has been revised to address these fish species.

White sturgeon were mentioned in the EA in section 5.2. This section of the EA has been revised to include additional evaluation of sturgeon.

Comment 25: Fish that rest over near the confluence of the Snake and Clearwater River, in either river, in their travel up the Snake River could be harmed by increased sediment from the construction project and other activities, including construction and noise, of the dock.

Response: See the response to comment 1 above for the effect of noise from barge traffic on ESA-listed fish. In their March 28, 2012 Bi-Op, NMFS also addressed the effect of underwater noise during construction on ESA-listed fish (p. 24-26). NMFS stated in the Bi-OP "given the lack of applicable criteria, the lack of observed injury from vibratory driving, and the fact that the adult salmon are only moving through the area, thereby reducing their duration of exposure, NMFS assumes that vibratory driving of sheet piles will not pose a risk of physical injury to listed salmon." NMFS stated that naturally-produced fall Chinook juveniles may not have migrated through the action area by July 1, however, "NMFS expects the effects on these fish to be minor and that neither injury nor mortality is expected.

See Section 5.1.2 of the EA for a description of turbidity expected from the construction of the dock expansion. There would be some turbidity during installation of the sheet pile and the Clean Water Act Section 401 Water Quality Certification issued by Idaho Department of Environmental Quality requires the Port to use best management practices (BMP's) and to monitor the effectiveness of those BMP's. Once the sheet pile is in place, it would act as a cofferdam and prevent further release of turbidity into the Clearwater River.

See the response to comment 10 above regarding sediment deposition. The proposed project would not increase the amount of sediment deposition that occurs in this reach of the Clearwater River.

Comment 26: The EA also includes no Biological Opinion for either steelhead or fall Chinook, but does include one for bull trout. Why not?

Response: At the time the EA was distributed for public review, the Corps had received a draft Biological Opinion from NMFS for fall Chinook and steelhead. The Corps does not attach draft Bi-Ops to its EA's, only final Bi-Ops. Based on discussions with NMFS, the Corps did not anticipate major changes between the draft and final Bi-Op and therefore released the EA using information from the draft Bi-Op. The Corps has since received the final Bi-Op from NMFS and has revised the EA accordingly.

Comment 27: Why didn't the EA look at the losses in terms of local and national tax-payers for the massive subsidy, not only for this dock but for a barge system where traffic is declining? Keeping river shipping viable at the Port will require the ongoing investment of additional public funds into the future in order to maintain the river channel.

Response: See the responses to Comments 6, 7 and 21 above. The Lower Snake River Navigation system is a viable system and will continue regardless of this dock expansion. The need to maintain the navigation channel exists today, as it will in the future, with or without the Port's dock expansion.

Comment 28: Rather than a dock along the Clearwater, having a more natural river bank could be a boon to the local economy.

Response: See the responses to comments 6, 7, 21 and 28 above. Removal of the dock and restoration of the river bank is not a reasonable alternative to the Port's dock expansion project. Doing so would not satisfy the P&N stated in the EA.

Comment 29: Expanding the dock to enhance the handling of megaload shipments will have a direct and negative impact on the Outstandingly Remarkable Values of the Clearwater/Lochsa Wild and Scenic Rivers. [

Response: The Middle Fork of the Clearwater River has been designated as a Wild and Scenic River starting at Kookia, Idaho, and going upstream to include the Lochsa and Selway Rivers. Kookia is about 73 miles upstream of the Port of Lewiston.

The Port has already accommodated nine barges (36 modules) of roll on/roll off (mega loads) with its current dock facilities. As stated in the EA, the Port does not have any current contracts providing for additional mega load off-loading and any future contracts are not reasonably certain to occur.

The proposed dock expansion is to improve efficiency and safety for the Port, regardless of the type or size of cargo handled at the dock. Megaloads are just one type of cargo that have been and could be handled at the Port.

See the attached Regulatory MFR response to Comments 21, 23, and 24.

Comment 30: The COE is responsible for the operations of its storm water system at the Port. The COE should immediately investigate its storm water system and implement corrective actions.
Response: See the responses to comments 24-29 above. The P&N is not focused on Corps storm water system or improving water quality. The proposed dock expansion project would, as a side benefit, improve the Port's storm water discharge system, but that is not the purpose of the project. The Port is responsible for storm water from its facilities that discharges into the Corps' collection pond/system. The Port and the City of Lewiston are working through Clean Water Act National Pollutant Discharge Elimination System (NPDES) requirements associated with the Port's storm water discharges.

Comment 31: The Corps assessment of affects to ESA-listed Snake River fall chinook and Snake River steelhead based on a draft biological opinion from National Marine Fisheries Service, and the lack of analysis or conclusions from that agency, makes it difficult for the Corps to assess, or the public to provide meaningful comment on, such impacts at this stage.

Response: See the response to comment 26 above. The Corps has since received the final Bi-Op from NMFS. NMFS expanded their discussion of effects on listed species, but did not change their conclusion that the proposed project "is not likely to jeopardize the continued existence of Snake River Basin steelhead and Snake River fall Chinook salmon, or result in the destruction or adverse modification of their designated critical habitat".

Comment 32: Expansion of the Port's dock and yards could secondarily and cumulatively impact many environmental and social factors: Clearwater and Snake river shoreline erosion and modification, floodplains and wetlands, water quantity and quality, fish and wildlife populations, riparian flooding hazards and protective measures, private and historic properties, area land use, aesthetics, and recreation, energy production and conservation, the regional economy and public resources, and the safety and welfare of Idaho, Montana, Oregon, and Washington citizens.

Response: This comment does not clearly identify what these effects are or how the project would result in these effects, so response is difficult. As stated at the beginning of Section 5 of the EA, the Corps described the environmental resources the Corps determined were relevant to the alternatives being considered and evaluated the effects of the alternatives on those resources. The comment responses described in this summary provide additional rationale why other resources or effects were not considered to be relevant.

Comment 33: Approving Port dock expansion prior to release of the dredging EIS and its findings would inappropriately overlook sediment issues that could arise during construction of an expanded dock and/or with continued Port operations.

Response: See response to comments 1, 10, and 16 above. Corps staff preparing the PSMP were consulted during preparation of the EA for the proposed dock expansion project and did not identify any issues with the dock project that would affect the PSMP. Some of the data collected for the PSMP was used to evaluate the effects of sediment deposition from the proposed project. The Corps' analysis of that data indicated there would be no additional sediment deposition associated with the dock expansion project.

Comment 34: The Corps should deny the Port's request for a dock expansion because citizen protests and legal challenges have caused corporations seeking to offload megaloads at the Port to rethink their proposed land routes through Idaho and Montana.

Response: See the responses to comments 6, 7 and 28 above. This comment directly refutes other comments received that conclude the dock expansion will increase oversized cargo at the Port of Lewiston. Regardless, the project is not focused on allowing the Port to accommodate oversized or roll-on/roll-off cargo. The Port can already do that. The Port has in the past accommodated 36 "megaload" modules and could do so again if necessary in the future. Additionally, the lack of such cargo does not make the dock expansion unnecessary. The dock in question is primarily used for the export of containerized cargo.

Comment 35: The Corps' plans to expand the Port of Lewiston dock to accommodate more and larger barge traffic when the traffic lanes in the area do not currently allow for existing barge traffic is flawed.

Response: The Port is proposing to expand the dock, not the Corps. The Port has requested approval of their proposed project from the Corps based on the Corps' land managing and regulatory authorities.

See the response to comment 10 above. The amount of sediment deposition within the navigation channel interfering with navigation triggers the need for channel maintenance, not the number of barges. Larger (deeper draft) barges would not be used at the Port's expanded dock as barges drafting more than the current industry standard of 14 feet would not be able to enter or exit the navigation locks on the lower Snake River dams.

Comment 36: The project will likely increase the type and frequency of barge traffic on the Snake River, resulting in impacts to treaty and cultural resources not only in the Snake River, but on Tribal interests located along U.S. Highway 12.

Response: See the response to comment 1 above regarding the frequency of barge traffic and the effect on fish. If the economy and/or markets improve, there may be more barges using the

Port's dock, but that does not necessarily mean there would be more tows going to the Port. Also, since the Port has historically handled more barge traffic and cargo using the existing dock, the Port could experience more business without the expanded dock.

The dock expansion itself would not result in any increased channel maintenance. Any channel maintenance needed in the future would be limited to those areas previously disturbed. Any disposal of dredged material would be designed to avoid affecting known cultural resource sites.

The amount of barge traffic would have no direct effect on cultural resources. Tows can indirectly create shoreline erosion through wave action, but an increase in the number of barges would not necessarily result in an increase in the number of tows. Much of the lower Snake River shoreline is armored with riprap, which limits erosion. If shoreline erosion affects cultural resources sites, the Corps could be expected to take action similar to what it has taken in recent years at several sites along the river to prevent further erosion. Any increase in barge traffic associated solely with the dock expansion is not expected to increase such remedial actions. The shoreline of the Clearwater River in the vicinity of the Port is already armored with riprap, so no erosion would be expected.

See the attached the Regulatory MFR response to Comment 30 regarding the effect of the use of Highway 12 on treaty rights.

Comment 37: The Corps' assertion that fall Chinook and steelhead smolts will not be in the vicinity of the dock expansion project during the construction period (July 1-September 30) is incorrect.

Response: The EA has been revised to indicate smolts could be in the Port area during the summer construction period.

Comment 38: The screening criteria that were developed violate NEPA. Indeed, the criteria it set up excluded all action alternatives except the proposed action.

Response: See the response to comment 24 above. As a rule, if an alternative does not satisfy the P&N for the action, it should not be included in the environmental effects analysis. Development of screening criteria is appropriately used to assist an agency in identifying those alternatives that will satisfy the actions P&N. CEQ regulations acknowledge that alternatives can be removed from detailed study if they do not satisfy the P&N (40 C.F.R. 1502.14(a)). The Corps developed five (5) screening criteria, which were used to identify alternatives that did not satisfy the P&N. Application of the screening criteria did eliminate all but the proposed action (and no action) from further analysis, but that by itself does not constitute a violation of NEPA. The comments received on this issue did not identify which of the criteria were inappropriate or how application of such criteria inappropriately excluded alternatives. After additional review of the criteria, it is the Corps position that the criteria developed, and application of such criteria, was appropriate given the P&N and facts in this case.

Comment 39: The dock expansion would result in more barge traffic using the river which could present a safety hazard to Tribal fishermen exercising their treaty fishing rights on the Snake River at night.

Response: See the response to comment 1 above regarding the potential for increased barge traffic. The Corps is unaware of this type of conflict occurring on the Snake River reservoirs in the past and any increase in barge traffic related solely to the dock expansion would not be expected to create such a problem. All river users would be expected to follow boating regulations and be alert to prevent boating accidents.

Comment 40: By expanding its dock, the Port will not only increase the ability to safely and efficiently handle cargo, it will also create jobs and build revenue for the state of Idaho.

Response: The EA indicates the proposed project would improve efficiency and safety of the Port's dock operations.

From: Marlene Trumbo
To: PSMP
Subject: [EXTERNAL] Nez Perce Tribe"s Comments re PSMP/FEIS
Date: Monday, September 29, 2014 4:32:12 PM
Attachments: Best Management Practices_lamprey_USFWS.pdf
Linwood Laughy_Five Myths_LSR Waterway.pdf
POL_Dock Expansion_CorpsSummary of Comments.pdf
29SEP14 NPT_ACOE_PSMP-FEIS_comments.pdf

Ms. Schelin: I have attached the Nez Perce Tribe’s comments on the Final Environmental Impact Statement for the Lower Snake River Programmatic Sediment Management Plan and 3 attachments.

If you have any problems opening the documents please let me know.

Marlene Trumbo

Office of Legal Counsel

Nez Perce Tribe

P. O. Box 305

Lapwai, ID 83540

(208) 843-7355

(208) 843-7377, fax

Final EIS Comment F0947

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
ECOSYSTEMS,
TRIBAL AND PUBLIC
AFFAIRS

September 29, 2014

Richard Turner
Project Manager
US Army Corps of Engineers
Walla Walla District
201 North Third Avenue
Walla Walla, WA 99362

Re: The Environmental Protection Agency's comments on the Lower Snake River Programmatic Sediment Management Plan Final EIS. EPA Project Number 05-055-COE.

Dear Mr. Turner:

The EPA has reviewed the final EIS for the Lower Snake River PSMP encompassing the states of Idaho, Oregon, and Washington. Our comments are provided in accordance with our responsibilities and authorities under Section 309 of the Clean Air Act and the National Environmental Policy Act.

The purpose of the programmatic plan is to evaluate a long-term sediment management strategy for the Lower Snake River by employing a comprehensive watershed approach. The project area covers more than 32,000 square miles and includes the Snake River from the confluence with the Columbia River to the upstream limits of the Lower Granite Reservoir. The Final EIS evaluates a no action alternative (continued monitoring) and two action alternatives- Alternative 5 (dredging based management) and Alternative 7 (full system and sediment management measures). The action alternatives also include a specific proposal to dredge in 2014/2015. The Final EIS identifies Alternative 7 as the Corps' preferred alternative.

20287

The EPA continues to support a watershed scale management of sediment sources affecting the Lower Snake River Basin. Throughout plan development, we have had numerous conversations and meetings with the Corps, exploring options for analysis, methodology and strategies for basin-wide sediment management. We commend the Corps for devoting significant time to resolving issues raised in our draft EIS comments. We believe that our objection to the draft EIS will be resolved with the Corps' commitment to engage with stakeholders in a technical forum on an ongoing basis. The purpose of the technical forum, either through the Local Sediment Management Group or other potential stakeholder group, would be to share sediment monitoring data throughout the watershed, collaborate on comprehensive planning for any future dredging/disposal needs, and discuss potential opportunities to reduce sediment loads near the sources.

While we are extremely pleased with the Corps' commitment to coordinate with stakeholders for long-term planning, we have identified some issues that we believe could be addressed either through the ongoing collaboration or by refining the Sediment Management Plan. Our recommendations include

Final EIS Comment F0947

providing clarifying information regarding adaptive management, monitoring, the preferred alternative, and the CWA § 404 process. Our detailed comments are attached.

We appreciate the Corps' coordination and consideration of our comments on the final EIS. Please feel free to contact me at 206-553-1601 or Lynne Hood of my staff at 208-378-5757 or via email at hood.lynne@epa.gov for any questions.

Sincerely,

Christine B. Reichgott

Christine B. Reichgott, Manager
Environmental Review and Sediment Management Unit

Enclosure:

1. Detailed Comments on the Lower Snake River Programmatic Sediment Management Plan Final Environmental Impact Statement

Final EIS Comment F0947

Detailed Comments on the Lower Snake River Programmatic Sediment Management Plan Final Environmental Impact Statement

The final EIS includes the Corps' Programmatic Sediment Management Plan (hereafter referred to as the Plan) in Appendix A. This document is the key component to specifically direct management decisions and for plan implementation. For this reason, the majority of our comments focus on the Plan.

20288

We strongly support the Corps' statement that coordination and information sharing with other land management agencies and groups within the watershed is an integral part of long-term planning and the adaptive management approach. We acknowledge that this commitment is reflected in the Plan as well as the Corps' intention to continue leading the Lower Snake Management Group and explore opportunities for other regional coordination. To demonstrate this commitment, the Corps will provide staff expertise for participation under the Regional Sediment Management Program. This pledge is the cornerstone of the EPA's long-standing support for a holistic watershed management approach. We are also pleased that the Corps will work with stakeholders to update the LSMG charter to reflect its ongoing role. We believe this follow-up engagement is crucial for meaningful and successful participation.

Adaptive Management

In our comments on the draft EIS we raised a concern regarding the lack of detail on adaptive management planning. The Plan includes a discussion of adaptive management that we believe captures key steps in the process. The Plan would be even more effective by providing clear direction on how sediment management adjustments will be made as additional monitoring data come in.

The adaptive management plan should be detailed enough so that practitioners can make decisions regarding which activities should be implemented, which ones should be modified, and when further analysis is warranted. Inherent in the decision-making process would be an understanding of the uncertainties in the data and analyses.

20289

The Plan states that future forecast actions would be analyzed through a tiered NEPA analysis. However, there is a lack of specificity regarding components (e.g., action/measure, responsible entity, relevant program/statute, documentation, and method for updating the plan). The draft Plan included an attached table, "Implementation Process Summary," with specific details such as: Implementation Step, Activities/Outcome, and Documentation. However, this level of detail was removed from the final EIS. As currently presented, we believe that the adaptive management plan does not clearly outline key steps in a concise and easily accessible format. We encourage the Corps to refine the adaptive management plan to address the need for additional detail regarding management direction.

Monitoring

The Plan outlines monitoring measures (Section 3.2) that are limited to the navigation channel. We continue to believe that monitoring information gathered by agencies and groups throughout the watershed has relevance for managing sediment in the navigation channel. Although the Plan acknowledges the need to be proactive rather than reactive, the monitoring as described does not appear to provide support for proactivity. We recommend that the monitoring section of the Plan clearly include the intention to use available, upland monitoring information as part of the data bank considered in adaptive management.

20290

Final EIS Comment F0947

The final EIS concludes that upland management activities would not measurably alter sediment management in the channel. As discussed in our comments on the draft EIS, we continue to disagree with this assertion. For example, we believe that restoring or decommissioning problem roads could be a relevant measure for cumulative sediment reduction. To illustrate, recent storm events in August, 2014 resulted in road washouts that delivered high volumes of sediment and increased turbidity to ten times the normal range in Idaho streams. We agree that fire can result in mass wasting, generating large sediment flows. Preventive management measures could be implemented in fire prone areas to reduce the risk of mass wasting (e.g., road siting and design, culvert replacement, or vegetation management).
20291 Additionally, we believe that the Corps should continue to solicit information on sediment monitoring data, which could aid in further understanding the sediment budget (e.g., presently, unknown sources are between 21% and 33%). We believe this issue can be addressed as described by the Corps' commitment to engage in data sharing with stakeholders throughout the watershed and by considering potential implications of upland activities.

The draft Plan included a section on monitoring validation and evaluation. This section provided information such as status and trend monitoring, review of screening criteria used in selecting measures, and review period for project specific monitoring results. In addition, the draft Plan included a six step monitoring program that outlined key steps. These sections were removed from the final Plan. We
20292 recommend that the Plan include these sections or a similar level of information describing monitoring validation and specifics of the monitoring program (question of interest, media to be sampled, parameter, responsible party, and reporting/analysis plan) to provide a clear understanding of the program.

Preferred Alternative

The preferred alternative (Alternative 7) allows the Corps to use a comprehensive management approach. We support a comprehensive approach. In our comments on the draft EIS we expressed concern regarding the prioritization of in-stream measures. We stated that there is a potential for significant environmental degradation to the Snake River habitat from the preferred alternative that could be addressed by project modification such as strategically prioritizing actions based on a more regional sediment management approach. We emphasized the need to consider sediment data from sources throughout the watershed. To address this issue, the Corps has committed to sharing and considering data from other sources in long-term management and continuing to engage with stakeholders through the LSMG or other forums. However, the preferred alternative described in the
20293 final EIS (Section 2.2.5.7 and Table 2-4) eliminated these important aspects as part of the available measures. After discussing this issue with the Corps, we understand that this was an oversight and the actual Plan described in Appendix A does feature these components. To reconcile this issue, we recommend that the Record of Decision include the activities described in Appendix A, (Sections 1.7 and 4.2) and the Corps' dedication to the principles of Regional Sediment Management.

Another aspect of the preferred alternative is the potential for upland or in-stream disposal of dredged material in the future. The final EIS states that future actions would be addressed in tiered NEPA
20294 analyses. We continue to encourage the Corps to consider future disposal needs/locations so that a suite of options may be identified for comprehensive planning. We also encourage the Corps to prepare for any sediment quality testing so that the testing protocols can be better aligned with subsequent NEPA analyses. This will provide greater assurance of a proactive approach to sediment management.

Final EIS Comment F0947

CWA Section 404

The EPA believes that sediment should be managed as a resource in the river system, working with natural transport processes wherever possible, ultimately moving toward environmentally protective and ecologically sustainable sediment management in the Snake River watershed. To support this approach, the Corps is proposing in-stream disposal of dredged material for the purpose of creating shallow water habitat. NOAA concurred with this design. We support beneficial use of sediment. However, we have questions regarding the applicable regulations and permitting processes, particularly related to future disposal needs.

20295

The Plan states that dredged material may be disposed of in-water or upland, or may be beneficially used for other purposes, such as habitat creation. The disposal method is ultimately identified through evaluation of disposal alternatives under the substantive provisions of CWA Section 404(b)(1), guidelines established by the EPA and Corps regulations. The final EIS states that the federal standard for disposal of dredged material is defined as "The least costly alternatives consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process. . . . (33 CFR 335.7)". The document states that when in-water disposal is proposed, the Corps is required to utilize lowest cost and the least environmentally damaging, practicable alternative (LEDPA) as the disposal method.

The EPA agrees that compliance with 404(b)(1) guidelines and identification of the LEDPA is applicable for placement of fill material in waters of the U.S.; however, we are unclear how compliance with the Guidelines is compatible with a requirement to use the lowest cost method. Lowest cost is not an essential component of the 404 evaluation when determining the LEDPA. As currently written, these two processes appear contradictory. We recommend that the Record of Decision clearly disclose which statutes apply and provide information on the process for evaluating disposal methods. If, for example, Section 10 of the Rivers and Harbors Act (e.g., appropriate for dredging and beach nourishment) applies and directs the agency to select the lowest cost method, the document should clearly disclose how the various statues are applied. This will be useful for future projects and public notices.

Other

20296 ***Appendix A, Section 3.3.2, Page A-22.*** This section refers to Section 3.2.3 for a description of actions that may be implemented in response to triggers. The document does not include a Section 3.2.3. We believe the correct section should have been 3.3.3. To further clarify, we recommend that the Corps develop a table defining triggers, action, responsible entity, and any follow-up measure.

20297 ***Appendix A, Section 3.3.4.2, footnote 7.*** The text states that minor actions may be covered under a categorical exclusion referencing footnote 7. The footnote refers the reader to footnote 1, Section 1.5. However, there is no footnote in Section 1.5 and footnote 1 is present in Section 1.2, which relates to the supplement to NOAA's biological opinion. We are unclear what referenced information was intended to be included regarding CATEX.

Final EIS Comment F0947

From:	Shelin, Sandy L NWW
To:	Grass, Charlene CONTRACTOR @ NWW
Subject:	FW: EPA Comments on Lower Snake PSMP FEIS (UNCLASSIFIED)
Date:	Tuesday, September 30, 2014 8:41:35 AM
Attachments:	05-055-COE Lower Snake PSMP FEIS.pdf

Classification: UNCLASSIFIED
Caveats: NONE

Charlene,

In case Richard hasn't already forwarded this to you, here is the EPA letter for processing.

Sandy

From: Reichgott, Christine [mailto:Reichgott.Christine@epa.gov]
Sent: Monday, September 29, 2014 5:56 PM
To: Turner, Richard C NWW; Shelin, Sandy L NWW
Cc: Hood, Lynne; Anderson-Carnahan, Linda; Allnutt, David
Subject: [EXTERNAL] EPA Comments on Lower Snake PSMP FEIS

Hello Richard and Sandy,

EPA's comments are attached. We are also sending a hard copy.

Thank you so much for engaging us in recent discussions to resolve our outstanding issues. We are very much encouraged that improved sediment management in the Lower Snake Watershed will have multiple benefits for navigation and the environmental condition and processes of the river.

Teena Reichgott

Manager, Environmental Review and Sediment Management Unit

Office of Ecosystems, Tribal and Public Affairs

EPA Region 10 ETPA-202-3

1200 Sixth Avenue, Suite 900

Seattle, WA 98101-3140

206-553-1601

Classification: UNCLASSIFIED
Caveats: NONE

Final EIS Comment F0995

From: Sally Nunn
To: PSMP
Subject: [EXTERNAL] Official Public Comment - PSMP/EIS, Attn: Sandy Shelin, CENWW-PM-PD-EC
Date: Friday, September 19, 2014 11:57:14 AM

Dear Ms. Shelin

TO: Sandy Shelin, U.S. Army Corps of Engineers
RE: Official Public Comment - PSMP/EIS
September 22, 2014

I am writing to submit my official public comment on the U.S. Army Corps of Engineers' proposed plan to dredge the lower Snake River navigation waterway (the Programmatic Sediment Management Plan FEIS).

I am submitting a speech I gave before the Army Corps of Engineers at the Dam Removal Hearings in Portland, 2003

Benjamin Disraeli once said, "There are three classes of lies: lies, damned lies and statistics."

That said, the verdict is in. No more studies need be done. No more panels spending taxpayer money to tell us what we already know but don't want to face… are necessary.

The wild runs of Snake River Salmon are about to follow the Passenger Pigeon, the Great Auk & countless other species that had flourished for centuries, into the oblivion of extinction.

We are responsible for this crisis. We have tortured the landscape of the West to conform to needs both economic & political but all distinctly human-oriented. We have chosen to ignore any physical preconditions other species might depend on to survive. Certainly we have ignored indigenous people's needs.

Where was the wisdom in trading 20,000 jobs in the fishing industry for 100 jobs on the dams?

Why would we risk the retribution of lawsuits that will surely ensue if treaties are broken and the laws embodied in the Clean Water Act defied?

When our reasonable NW rates slip away from us, what do we say to people on fixed or low incomes, that those in the Aluminum Industry were more important than they were?

Who says we need dams for recreation? I support the type of recreation that depends on a free flowing river.

What do we say to future generations, that we tinkered with what was perfect to begin with and lost all of the fish, but we sure watered a lot of onions?

Others here will have perfect logic and excellent figures to back up their well-reasoned justifications for maintaining the status quo. But for myself, the bottom line to the statements in the All-H Paper and the Corps DEIS is that the dams do little good and much harm to all citizens of the natural world and, to quote a famous American writer Wallace Stegner: "something will have gone out of us as a people if we
20415 allow it to happen." We need to breach the dams.

And will somebody please tell Helen Chenowith to give up the party line and start promoting real freedom? The days of Manifest Destiny have passed & we need Salmon in our future.

Sally Nunn
Eugene, OR

Final EIS Comment F0995

Sally Nunn
1026 Jackson
Eugene, OR 97402

Final EIS Comment F1088

From: Richard Till
To: PSMP
Subject: [EXTERNAL] Official Public Comment - PSMP/EIS, Attn: Sandy Shelin, CENWW-PM-PD-EC
Date: Monday, September 22, 2014 12:42:17 PM

Dear Ms. Shelin

I encourage the Corps of Engineers to cease on this opportunity to potentially reduce government waste, take action to support economic growth, and improve the health of our economy and our environment.

20416 Please undertake a thorough and methodologically sound (i.e. actual peer review) economic analysis of the costs and benefits of maintaining the Snake River dam system, including dredging that is necessary to prevent flooding. The Corps should be let sound decision making lead its analysis, not political agendas that favor the status quo and reliance on assumptions that may ignore enormous government subsidies for barging instead of alternative uses for public resources.

Thanks,

Rick Till
Portland

Richard Till
2515 SE 51st, #15
Suite 300
Portland, OR 97206

Supporting Documents
Biological Opinions for
Programmatic Sediment Management Plan

U.S. Fish and Wildlife Service Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Washington Fish and Wildlife Office
510 Desmond Dr. SE, Suite 102
Lacey, Washington 98503

NOV 13 2014

In Reply Refer To:
01EWFW00-2014-F-0660

Lieutenant Colonel Timothy R. Vail
Department of the Army
Walla Walla District, U.S. Corps of Engineers
201 North Third Avenue
Walla Walla, Washington 99362-1876

Dear Lieutenant Colonel Timothy R. Vail:

This letter transmits the U. S. Fish and Wildlife Service's Biological Opinion on the proposed Lower Snake River Sediment Management Plan for the Snake and lower Clearwater Rivers in southeast Washington and northern Idaho, and its effects on bull trout (*Salvelinus confluentus*) and critical habitat for the bull trout. Formal consultation on the proposed action was conducted in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your July 30, 2014, request for formal consultation was received on August 5, 2014.

The enclosed Biological Opinion is based on information provided in the July 30, 2014, Biological Assessment (BA) and other sources of information, as cited in the Biological Opinion. A complete record of this consultation is on file at the Eastern Washington Field Office in Spokane, Washington.

If you have any questions regarding the enclosed Biological Opinion or our shared responsibilities under the Endangered Species Act, please contact Michelle Eames at (509) 893-8010.

Sincerely,

for Thomas L. McDowell, Acting Manager
Washington Fish and Wildlife Office

Enclosure

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Endangered Species Act – Section 7 Consultation

Biological Opinion

U.S. Fish and Wildlife Service Reference Number:
01EWFW00-2014-F-0660

Consultation for the Lower Snake River Programmatic Sediment Management Plan In Idaho and Washington

Agency:	U.S. Army Corps of Engineers Walla Walla District Walla Walla, Washington
Consultation Conducted By:	U.S. Fish and Wildlife Service Eastern Washington Field Office Spokane, Washington

FM Thomas L. McDowell, Acting Manager
Washington Fish and Wildlife Office

13 Nov. 2014
Date

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LIST OF ACRONYMS

BA	Biological Assessment
BMP	best management practices
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHU	Critical Habitat Unit
Comp Plan	Lower Snake River Fish and Wildlife Compensation Plan
Corps	U.S. Army Corps of Engineers
CREP	Conservation Reserve Enhancement Program
cy	cubic yards
DMMP	Dredge Material Management Program
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*)
FCRPS	Federal Columbia River Power System
FMO	Forage, Migration, and Overwintering Habitat for Bull Trout
FR	Federal Register
HCP	Habitat Conservation Plan
HMU	Habitat Management Unit
IDFG	Idaho Department of Fish and Game
LSMG	Local Sediment Management Group
LSRP	Lower Snake River Projects
MOP	Minimum Operating Pool
NEPA	National Environmental Policy Act of 1969, as amended
NMFS	National Marine Fisheries Service
NORO	navigation objective reservoir operation
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
Opinion	Biological Opinion
PAH	Polycyclic Aromatic Hydrocarbons
PCE	Primary Constituent Element
PIT	passive integrated transponder
RM	Rivermile
Service	U.S. Fish and Wildlife Service
SEV	severity of effect
SMA	Shoreline Management Act
SPL	sound pressure levels
SRF	Snake River Fall Chinook Salmon
TMDL	Total Maximum Daily Load
U.S.C.	United States Code
WDFW	Washington Department of Fish and Wildlife
WDOE	Washington State Department of Ecology

INTRODUCTION

This document represents the U. S. Fish and Wildlife Service's (Service) Biological Opinion (Opinion) based on our review of the proposed Lower Snake River Programmatic Sediment Management Plan (PSMP) for the Snake and lower Clearwater Rivers in southeast Washington and northern Idaho, and its effects on the bull trout (*Salvelinus confluentus*) and critical habitat for the bull trout in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*)(ESA). Your July 30 2014, request for formal consultation was received on August 5, 2014.

This Opinion is based on information provided in the July 30, 2014, Biological Assessment (BA) on the Lower Snake River PSMP Environmental Impact Statement (EIS) and other sources of information. A complete record of this consultation is on file at the Eastern Washington Field Office in Spokane, Washington.

The proposed action is a programmatic sediment management plan developed by the U.S. Army Corps of Engineers (Corps). The purpose of the PSMP is to provide a comprehensive framework for Corps maintenance actions to manage and prevent, if possible, the accumulation of sediment that interferes with existing authorized purposes of the Lower Snake River Project (LSRP) (i.e., commercial navigation, recreation, fish and wildlife conservation, and flow conveyance at Lewiston, Idaho). The PSMP is a long-term plan that forms the basis of the Corps' decision-making process for future sediment management activities needed to maintain and meet existing authorized project purposes of the LSRP. The PSMP is intended to be a proactive adaptive management plan, addressing both the immediate near term problems and anticipated future problems before they are critical and solutions become limited. The PSMP will guide only those actions taken by the Corps within the project boundaries of the LSRP that are within the Corps' authority.

The PSMP does not authorize or implement any site specific action or activity, but rather provides the decision-making framework for future site specific decisions at a later date. Thus, there are no direct or immediate effects to listed species from the PSMP. The effects to listed species will occur only when future site-specific actions are authorized under this framework, and the Corps conducts a site specific consultation with the Service when these projects or activities are proposed. Even though there are no direct effects from the PSMP, the Service has analyzed the possible effects of actions that may be carried out under this plan to ensure Corps compliance with section 7(a)(2) of the ESA.

The plan-level guidance in the PSMP consists of a planning process that will be used to develop future site-specific activities; a description of sediment management measures that might be developed under the PSMP; and conservation measures that would be applied to each particular type of activity. When future actions are proposed under the PSMP, those actions will require project-level consultation.

The amount of detail differs for various measures considered under the PSMP; the level of analysis in this Opinion is commensurate with the amount of detail provided in the BA. The predicted effects of some PSMP measures are based on the results of past sediment management activities (for example, dredging quantities and frequencies for navigation dredging activities). Other potential measures have effects that will vary greatly depending on the locations and site specific designs and thus are less predictable at the PSMP scale. Because the PSMP is an overarching planning and process document, we are treating this planning-level consultation as a first tier consultation. The second tier would consist of project-level consultations for actions proposed under the PSMP. Each subsequent project that may affect listed species in the action area pursuant to the PSMP would be evaluated in the future at the site-specific level. These second tier biological opinions would refer back to this Opinion to ensure that the effects of those site specific actions, taken together with all other site specific actions, are consistent with the effects anticipated in this Opinion. With each subsequent second tier biological opinion, the cumulative total of incidental take exempted would be tracked along with all other take that has been exempted.

In the BA, the Corps determined that implementation of the PSMP would adversely affect the bull trout (*Salvelinus confluentus*) and critical habitat for the bull trout. In the BA, the Corps also determined that certain aspects of the proposed action, such as sediment removal from irrigation screens at Habitat Management Unit (HMU) intakes, would result in “not likely to adversely affect” determinations for the bull trout and its critical habitat. While the Service may be able to concur with those determinations during subsequent, second tier consultations, information is currently inadequate to concur on those subset actions at this time. In the Corps’ cover letter and BA, the Corps determined that the proposed action would have “no effect” on pygmy rabbit (*Brachylagus idahoensis*), Canada lynx (*Lynx canadensis*), gray wolf (*Canis lupus*), Ute ladies’-tresses (*Spiranthes diluvialis*), Spalding’s catchfly (*Silene spaldingii*), greater sage-grouse (*Centrocercus urophasianus*), yellow-billed cuckoo (*Coccyzus americanus*), Umtanum Desert buckwheat (*Eriogonum codium*), and White-Bluff’s bladderpod (*Physaria douglasii* ssp. *tuplashensis*). The determination that there will be “no effect” to listed species rests with the action agency, and no concurrence by the Service is required. The Corps also made a “may affect, not likely to adversely affect” determination for the Washington ground squirrel. The Washington ground squirrel is a candidate species and the Corps did not request a conference report for that species; therefore, that determination rests with the action agency.

CONSULTATION HISTORY

The Corps has previously consulted with the Service on the potential effects of proposed dredging activities in the lower Snake River to the bull trout and, prior to final designation of critical habitat, to proposed critical habitat for the bull trout, as well as to several other federally listed species. The following is a summary of previous consultation efforts to address effects to listed species and critical habitat from various recent dredging activities proposed or undertaken by the Corps in the lower Snake River.

On July 3, 2001, the Service received a request from the Corps (dated June 27, 2001) for informal consultation on proposed winter 2002-2003 dredging activities in the lower Snake River and the programmatic Dredge Material Management Program (DMMP) over its anticipated 20-year span, a BA addressing potential project effects, and an Executive Summary of the Preliminary Draft Environmental Impact Statement for the DMMP. On August 22, 2001 the

Service submitted a concurrence letter to the Corps addressing potential effects to listed species from the proposed near-term dredging activities and the overall DMMP, and concluded that the proposed activities "may affect, but [were] not likely to adversely affect" the bull trout, bald eagle (*Haliaeetus leucocephalus*), or Ute ladies'-tresses (*Spiranthes diluvialis*). Due to changes to the proposed action, and changes to the schedule, the Service responded to two reinitiations of consultation with letters of concurrence, one dated June 27, 2002, and one dated September 11, 2003. On June 15, 2004, the Service submitted a letter to the Corps agreeing that rescheduling the action to winter 2004-2005 represented a minor revision to the proposed action that would not require reinitiation of consultation.

On September 7, 2004, the Service received a request from the Corps (dated September 3, 2004) for formal consultation regarding proposed winter 2004-2005 dredging activities in the lower Snake River and the potential effects to listed species. This request for formal consultation was based on new information concerning the status and distribution of bull trout in the Snake and Clearwater Rivers.

The Service issued an Opinion on October 18, 2004 (13410-04-F-0027), to the Corps addressing potential effects to listed species from the proposed winter 2004-2005 dredging activities in the lower Snake River, and concluded that the proposed activities were "not likely to jeopardize the continued existence" of the Columbia River distinct population segment (DPS) of bull trout or the bald eagle. Critical habitat for the bull trout was not addressed in this previous biological opinion because, at that time, no critical habitat for bull trout was identified within the action area. On May 23, 2005, the Service received notification from the Corps (dated May 19, 2005) that the near-term dredging activities were being rescheduled for winter 2005-2006 and there were several other changes to the proposed activities. The Corps concluded that these changes represented a minor revision to the proposed activities that would not require reinitiation of section 7 consultation. On June 3, 2005, The Service submitted a letter to the Corps concurring that rescheduling the near-term dredging activities to winter 2005-2006, along with the other proposed changes, represented a minor revision to the proposed activities that would not require reinitiation of section 7 consultation. During the winter of 2005-2006, the Corps dredged roughly 571,000 cubic yards (cy) of sediment from five sites in the lower Snake and Clearwater Rivers.

Over several years the Corps developed the PSMP. On April 12, 2012, the Service received a request from the Corps (dated April 9, 2012) to confirm that consultation on the Corps' PSMP for the lower Snake River was not currently preferred due to lack of detail in the PSMP, but that the Service would consult on specific actions to be conducted in association with the PSMP once there was sufficiently detailed project information available. The Service agreed to this approach by electronic mail on May 29, 2012.

On December 26, 2012, the Service received a request from the Corps (dated December 17, 2012) for formal consultation on proposed winter 2013-2014 dredging activities in the lower Snake River, a BA addressing potential Project effects, and a Draft EIS for the Corps' proposed PSMP for the lower Snake River. On May 22, 2013, the Service received a request from the Corps (dated May 21, 2013) for informal consultation on proposed additional sediment sampling for the 2013-2014 dredging action and overall PSMP, and a BA addressing potential project effects; the Service concurred that the proposed activities "may affect, but [were] not likely to adversely affect" the bull trout or bull trout critical habitat on June 17, 2013. The 2013-2014 Dredging action was delayed due to the sampling and project design changes, and then the consultation was "re-started" after receipt of a letter from the Corps on February 25, 2014, that also explained that the dredging was re-scheduled for winter 2014-2015. Additional information was provided from the Corps through several letters, emails, and phone conversations. This consultation is not yet complete.

On August 5, 2014, after discussions with the Corps regarding consulting at the programmatic level, the Service received a BA (dated July 30, 2014) for the PSMP, with a request for section 7 consultation. Additional information was provided from the Corps through telephone conversations and emails, including one email from Ben Tice with the Corps; Walla Walla office on September 22, 2014, providing updated conservation measures.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Corps proposes to adopt and implement a PSMP to guide the management of sediment within the lower Snake River system to meet the authorized project purposes of the Lower Snake River Project (i.e., commercial navigation, recreation, fish and wildlife conservation, and flow conveyance at Lewiston, Idaho). The PSMP describes potential sediment management actions to address locations in the Snake River where sediment accumulation interferes with navigation, recreation, fish and wildlife conservation, or flow conveyance. Under the PSMP, the Corps will follow a process of monitoring and problem identification to plan and implement site-specific actions, and carry out those actions after both project-level National Environmental Policy Act (NEPA) analysis and ESA section 7 consultation are completed. The period of time for which PSMP direction will remain in effect is indefinite.

The following discussion describes (1) the management measures described in the PSMP for addressing sediment issues, (2) areas where sediment issues have previously occurred and are likely to recur, (3) the framework set out in the PSMP for identifying actions to respond to specific sediment issues, (4) conservation measures to be implemented when sediment management actions are taken, and (5) the potential frequency, duration, and magnitude of specific actions described in the PSMP.

PSMP Management Measures

Through a collaborative process that included a series of workshops involving technical experts from the Corps and other agencies, and input from scoping and stakeholders, the Corps developed a broad range of management measures that could address sediment accumulation problems in the Snake River. The management measures fall within four general categories: dredging and dredged material management, structural management, system management, and upland sediment reduction displayed in Table 1 (transposed from Table 4 of the BA). These categories are summarized in the following subparagraphs, which also provide generally a worst-case description of quantities and frequency associated with each measure to facilitate ESA consultation. The actual/anticipated quantities/frequencies associated with such measures may be much less.

Table 1. Management Measures

Measure	Description
Dredging and Dredged Material Management	
Navigation and Other Dredging	Dredging typically consists of excavation, transport, and placement of dredged sediments. The excavation process for the lower Snake River generally involves the removal by mechanical means (e.g., a barge-mounted “clamshell” dredge scooping sediments from the reservoir bottom) to restore the intended dimension or use of the area where sediment has accumulated. Removal of material by hydraulic means (e.g., suction or water induced vacuum) may also be considered for recreation and HMU irrigation facilities when potential adverse effects to ESA listed fish is unlikely. This measure would also have ancillary benefit for flow conveyance through the Lewiston levee system.
Dredge to improve conveyance capacity	This measure differs from the “Navigation and Other Dredging” measure in that it involves removal of substantially greater quantities of sediments from areas outside the navigation channel, access channel and port berthing areas, and/or recreation facilities. The excavation process involves sediment removal by mechanical means at the Snake and Clearwater Rivers confluence to improve flow conveyance.
Beneficial use of sediment	Beneficial use of dredged material includes a wide variety of options that utilize the dredged material for some productive purpose such as habitat restoration/enhancement, construction and industrial use, etc and can apply to upland or in-water disposal options. The Corps views dredged material as a valuable and manageable resource and seeks opportunities to use it beneficially whenever possible. The Corps has beneficially used dredged material in the past to create fish habitat. Other potential beneficial uses include: habitat restoration/enhancement, beach nourishment, aquaculture, parks and recreation, agriculture, forestry, horticulture, strip mine reclamation, landfill cover for solid waste management, shoreline stabilization, erosion control, construction, and industrial use. Beneficial use of dredged material generally requires a cost-share sponsor (See ER 1105-2-100), unless it is the least cost, environmentally acceptable alternative.
In-water disposal of sediment	In-water disposal of dredged sediment is the discharge of dredged material back into the waterway. Typically, dredged material is transported to a previously identified in-water location selected to minimize impacts and released into the water.
Upland disposal of sediment	In upland placement, dredged material is placed on land, above high water, and out of wetland areas. The dredged material is typically placed in a cell behind levees/dikes that contain and isolate it from the surrounding environment. The dredged material is dewatered through evaporation and/or settling with the effluent discharged as clean water.
Structural Sediment Management	
Bendway weirs	Bendway weirs are rock sills located on the outside of a stream or river bend that are angled upstream into the direction of flow. With the weirs angled upstream, flow is directed away from the outer bank of the bend and toward the point bar or inner part of the bend. This redirection of flow occurs at all stages higher than the weir crest. Where there is sufficient velocity and volume, the redirection of flow generally results in a widening of the channel through scour of the point bar. Bendway weirs are typically used to maintain navigation channels.

Measure	Description
Dikes/dike fields	Dikes are longitudinal structures used to maintain navigation channels through effects on channel depth and alignment. Dikes constrict low and intermediate flows, causing the channel velocity to increase within the reach, thereby scouring a deeper channel. Dikes are typically built of rock, but can also be constructed using other materials.
Agitation to resuspend	This technique involves the deliberate agitation and resuspension of deposited sediment; the sediment is then carried downriver as part of the suspended load of the river. This technique requires both some form of agitation mechanism, and sufficient river flow (velocity and volume) to carry the additional sediment load away from the targeted area. There are numerous potential means to mechanically agitate and resuspend sediment, including high pressure air and water pumps and using propellers to move sediment.
Trapping Upstream Sediments (In-Reservoir)	This measure would involve excavating a pit, or sediment trap, in a depositional part of the upstream reach of a river or reservoir to trap incoming sediment, thus reducing the sediment available to deposit in other areas where it may interfere with existing authorized project purposes. Sediment would have to be periodically removed from the trap and managed by one of the measures described above (i.e., beneficial use, in-water or upland placement).
System Management	
Navigation Objective Reservoir Operation	This measure involves operating reservoirs of the LSRP at water surface elevations that would provide a 14-foot deep channel within the Federal navigation channel. The Corps would manage pool levels within the preset operating range for each reservoir to maintain 14 feet of water depth over areas where sediment deposition has occurred in the channel. Currently the Corps operates the LSRP at minimum operational pool (MOP), or as close to MOP as possible, during the juvenile salmonid outmigration season (typically from April through August, but as late as October in Lower Granite reservoir), and at varying levels within each reservoir’s 3 or 5-foot operating range through the rest of the year. This measure would provide the Corps the option of operating above MOP and even at the upper end of the operating range year-round as needed to maintain the 14-foot deep navigation channel.
Reconfigure affected facilities	This measure applies only to Corps facilities affected by sediment and could include a range of facility modifications. Examples include water intake structures, mooring facilities, docks, boat ramps, and loading/unloading facilities that could potentially be extended to reach out beyond nearshore areas where sediment deposition is occurring. In addition to reconfiguring water intake structures, alternative water sources for irrigation could be explored. Reconfiguration of recreation facilities may also include consideration of repurposing; temporary, partial or full closing; and/or reducing the scope of the facility.
Relocate affected facilities	Moving or relocating affected facilities affected by sediment deposition is potentially suitable for navigation facilities, recreational boating facilities, and water intake structures. In addition to relocating water intake structures, alternative water sources for irrigation could be explored. The Corps’ ability to consider/study the feasibility of reconfiguring or relocating port facilities is limited and generally requires a cost-share sponsor and specific authority. The Corps could consider/study reconfiguration or relocation of port facilities, if requested by the Ports, subject to availability of authority and funding.
Raise Lewiston Levee to Manage Flood Risk	Current analysis indicates that flood risk is within acceptable limits, however if future sediment accumulation changes the flood risk to Lewiston by raising the water level in the reservoir, raising the levee would be an option for reducing flood risk. Location and height of change would be determined through detailed site- and time-specific studies.

Measure	Description
Reservoir Drawdown to Flush Sediment)	In this measure, flow would be temporarily modified to increase the capacity of the river system to scour and carry sediment, thereby flushing deposited sediments downstream. The ability of a river system to carry sediment is determined by the river's velocity and volume. Flow modification would be created by a drawdown of a reservoir to increase velocity. Drawing down the pool elevation by 10 to 15 feet during a 30- to 45-day period in an effort to flush sediments from the navigation channel. Flow modification would be created by a drawdown of the Lower Granite reservoir. Lower Granite reservoir is the only LSRP reservoir in which this measure would be effective. Flow modifications would be temporary and would be timed to take advantage of naturally-occurring periods of high flows.
Upland Sediment Reduction (Expanded)	
Local Sediment Management Group (LSMG) Coordination Meetings	The LSMG is an information exchange forum comprised of the Corps and Federal and state regulatory agencies, tribal governments, local governments, and non-governmental organizations (e.g., barge operators, Ports, Pacific Northwest Waterways Association).

Dredging and Dredged Materials Management

Dredging involves physical removal of sediments from one location, and placement of the dredged material in another location. The dredging process typically consists of excavation, transport, and placement of dredged sediments. Excavation would generally be by mechanical means (i.e., physically scooping sediments with a clamshell or backhoe). Removal of material by hydraulic means (e.g., suction or water induced vacuum) may also be considered for recreation and HMU irrigation facilities when potential adverse effects to ESA listed fish are unlikely. Once dredged, sediments are transported to a disposal or placement area. Dredged material may be disposed of in-water or upland and may be beneficially used for purposes other than disposal only, such as habitat creation. The disposal method is ultimately identified through evaluation of disposal alternatives under the substantive provisions of Section 404(b)(1) of the Clean Water Act, guidelines established by the Environmental Protection Agency (EPA) (40 CFR 230) and Corps regulations.

Dredging

Dredging is a measure that is applicable to almost any sediment accumulation issue. Dredging technologies can be scaled to address small or large quantities of sediment and can be applied in almost any environment. A corresponding measure to manage dredged sediments must be available (see "Dredged Material Management" below).

Dredging consists of removal, transport, and placement of dredged sediments. For the purposes of this analysis, the term "dredging" will refer to the excavation process, as placement and disposal options are discussed separately. The excavation process involves the removal of deposited sediment as part of maintenance activities. After excavation, the sediment is transported from the dredging site to a site where it will be used or permanently placed. This transport operation is typically accomplished by the dredge itself or by using additional equipment such as barges. Use and/or placement can occur in-water or in an upland area.

Backhoe and bucket (such as clamshell, or dragline) are types of mechanical dredges. Clamshell buckets are the most commonly used dredges in the lower Snake River. Mechanical dredging has been used primarily due to concerns about potential entrainment of fish associated with hydraulic, or suction, dredging. Sediments excavated with a mechanical dredge are generally placed onto a barge or truck (for near-shore excavations) for transportation to the use or disposal site.

Dredging has historically been the most common method used to remove sediment and maintain navigation channels, recreation areas, berthing areas, and flow conveyance capacity. Additionally, due to concerns over potential effects to listed endangered anadromous species and other aquatic resources, dredging in the lower Snake River is typically limited to a winter in-water work window of December 15 to March 1. Summer dredging may also be considered for other off-channel areas such as boat basins, swim beaches, or irrigation intakes on a case-by-case basis. These shallow-water areas would be expected to have elevated water temperatures during the summer and would not likely have salmonid fish present. The material dredged from these sites would probably be disposed of at an upland location since the in-water disposal areas are located in the main river channel and may have salmonid fish present during the disposal activity.

On a case-by-case basis, hydraulic dredging may be considered for off-channel areas such as boat basins, swim beaches, or irrigation intakes, when potential adverse effects to ESA listed fish are unlikely. This would probably be done in the summer when salmonid fish are less likely to be found in these off-channel areas because of elevated water temperatures. The dredged material would exit the dredge as a slurry that is likely to be 65 to 80 percent water and would not be suitable for in-water disposal as described above. Instead, this slurry could be incorporated into the wildlife habitat planting areas or used to restore eroded streambanks near the intakes.

Navigation and Other Dredging: Dredging typically consists of excavation, transport, and placement or disposal of dredged sediments. The excavation process for the lower Snake River generally involves the removal by mechanical means (e.g., a barge-mounted “clamshell” dredge scooping sediments from the reservoir bottom) to restore the congressionally authorized navigation channel dimensions or use of non-navigation areas where sediment has accumulated.

Removal of material by hydraulic means (e.g., suction or water induced vacuum) may also be considered for recreation and HMU irrigation facilities when potential adverse effects to ESA listed fish are unlikely. This measure would also have ancillary benefit for flow conveyance through the Lewiston levee system.

The Corps anticipates that dredging 200,000 to 500,000 cy of material, primarily from the Snake-Clearwater Rivers confluence area, will be needed every 3 to 5 years, unless longer-term solutions are identified. The Corps anticipates dredging 500 to 15,000 cy of material from other areas (recreation or fish and wildlife sites) every 3 to 9 years. For additional information on potential actions that may be taken in response to sediment accumulation, see Section 3.4.3 in BA.

Dredging to Improve Flow Conveyance: This measure differs from the "Navigation and Other Dredging" measure in that it involves removal of substantially greater quantities of sediments from areas outside the Federal navigation channel, access channel and port berthing areas, and/or recreation facilities. The excavation process involves sediment removal by mechanical means at the Snake and Clearwater Rivers confluence at the upstream end of Lower Granite reservoir to improve flow conveyance.

Flow conveyance dredging in the Lower Granite reservoir would extend from the Port of Wilma near Snake rivermile (RM) 134 to the U.S. Highway 12 Bridge located upstream of the confluence of the Snake and Clearwater Rivers, near Snake RM 139.5. The Clearwater River dredging would extend from the Snake River confluence upstream to RM 2.0. The priority areas for dredging within the template are depicted in Figure 1.

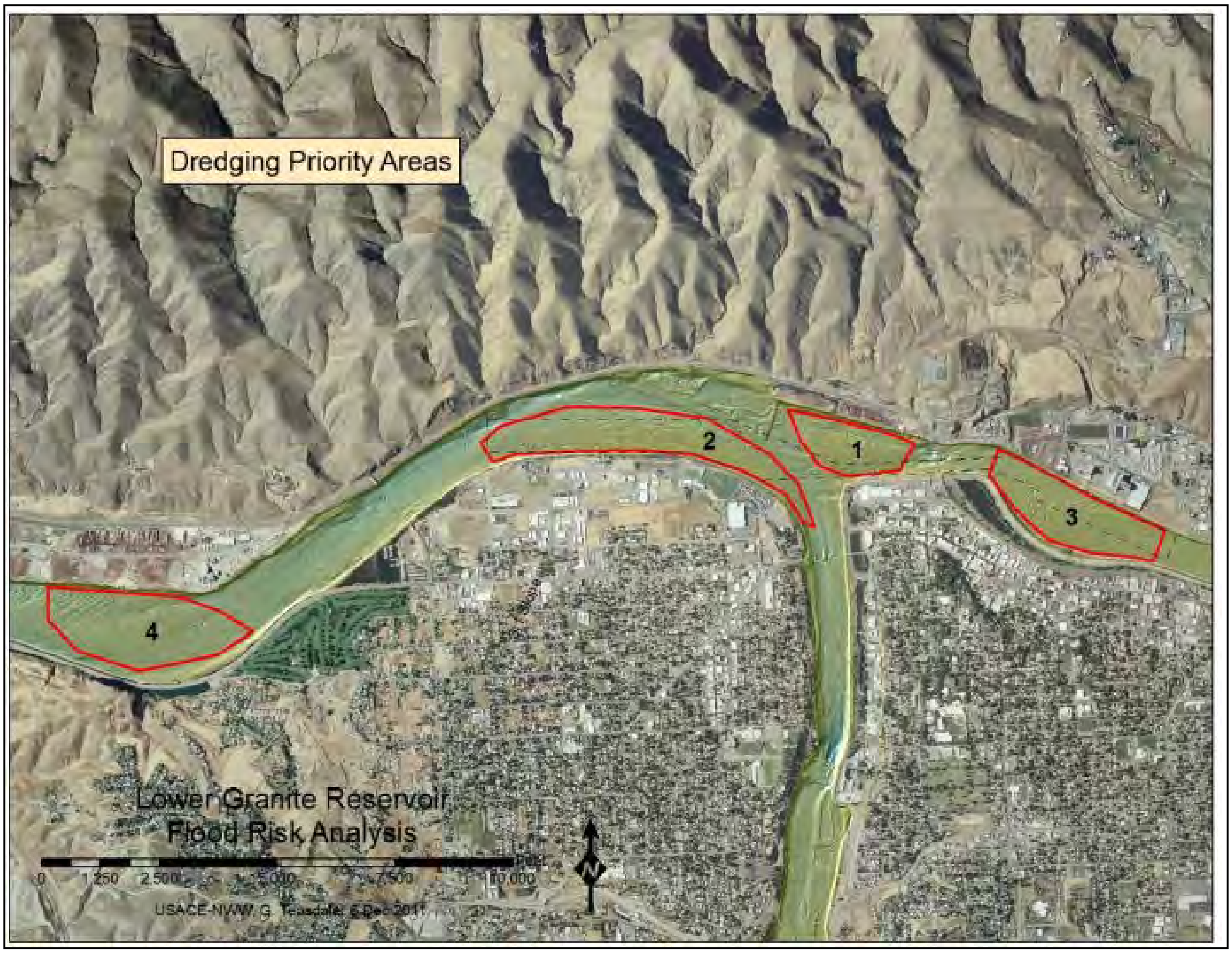

Figure 1. Dredging Priority Areas for Flow Conveyance

The Snake and Clearwater Rivers confluence area dredging template varies in width from 300 feet, near the Port of Wilma, to 1,700 feet in the Clearwater River confluence area. The average dredging width on the Snake River within this area would be 750 feet. Material would be removed to about elevation 708, which is 25 feet below MOP. Material would not be removed from the original riverbed or shoreline.

The Corps anticipates dredging in the confluence area would require annual removal of between 750,000 to 1,000,000 cy of material to maintain the current conveyance capacity. See also Section 3.4.3 in the BA.

Dredged Material Management

Disposal options available to the Corps for dredged materials are identified in accordance with Corps regulations (33 CFR 335-338). The “Federal Standard” for disposal of dredged material is defined as “The least costly alternatives consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process. . . ." (33CFR 335.7). The Corps considers both upland and in-water disposal alternatives when dredging is proposed. For proposed in-water disposal, the disposal method is ultimately identified after evaluation of disposal alternatives under the substantive provisions of Section 404(b)(1) of the Clean Water Act, associated EPA guidelines (40 CFR 230) and Corps regulations. When in-water disposal is proposed, the Corps is required to identify and utilize the lowest cost, least environmentally damaging, practicable alternative as its disposal method. The alternatives analysis in the Section 404(b)(1) evaluation is incorporated into the NEPA process and ultimately identifies the Corps proposed/preferred disposal alternative. Additionally, it is the Corps’ policy to always consider beneficial use of dredged material when evaluating disposal options (Engineer Manual 1110-2-5026).

Beneficial Use of Sediment: Beneficial use of dredged material includes a wide variety of options that utilize the dredged material for some productive purpose and can apply to upland or in-water disposal options. Broad categories of beneficial uses based on the functional use of the dredged material include:

- Habitat restoration/enhancement (wetland, upland, island, and aquatic sites including use by ESA-listed fish)
- Beach nourishment
- Aquaculture
- Parks and recreation (commercial and noncommercial)
- Agriculture, forestry, and horticulture
- Landfill cover for solid waste management
- Shoreline stabilization and erosion control (fills, artificial reefs, submerged berms, etc.)
- Construction and industrial use (including port development, airports, urban, and residential)
- Fill for other uses (dikes, levees, parking lots, and roads) (USACE 1992; USACE 2007b)

It is Corps practice to secure the maximum practicable benefits of dredged material within authority and funding limitations. The Corps views dredged material as a valuable and manageable resource and seeks opportunities to use it beneficially whenever possible. The

Corps has beneficially used dredged material in the past to create fish habitat in the lower Snake River. Specific applications are dependent on opportunities available at the time the dredging is occurring. Opportunities for beneficial use would be identified and evaluated as part of the planning for any dredging activity.

Beneficial use of dredged material is applicable to a wide variety of settings and uses when it is determined to be the preferred disposal method consistent with environmental reviews and the Federal Standard. Often, a local sponsor must be identified as part of the beneficial use.
If the Corps were to implement beneficial use of dredged materials to create shallow water habitat, the Corps would likely select sites based on proximity to dredging site, potential to provide suitable resting/rearing habitat for juvenile salmonids if the river bottom were to be raised, the site could not interfere with navigation, and could not impact cultural/historic properties, and must be of sufficient size to accommodate the anticipated dredged sediment disposal volume.

In-water Disposal of Sediment: In-water disposal of dredged material is simply the discharge of dredged material into the waterway for purposes of disposal (as opposed to placing it in-water for a beneficial purpose). Typically, dredged material is transported to a suitable location in a bottom dump barge, and released into the water at the upstream end of a deep-water area. All dredged material is a candidate for in-water disposal if it meets the requirements of the Federal Standard. For future actions, the Corps would perform all required sediment sampling and analysis and determine suitability for in-water disposal. If the sediment sampling and analysis results showed the sediments had unacceptable concentrations of chemicals of concern that would preclude using unconfined in-water disposal, the Corps would either not dredge the area or would pursue an alternate acceptable disposal method.

In-water disposal of sediment is applicable to most dredged material management needs in the LSRP. The Corps has identified multiple locations with sufficient capacity to accept the volumes of dredged material that could be generated by potential dredging activities in LSRP. In-water sediment disposal is contingent on examination of sediment samples and finding that toxic chemicals are below State water quality standards or thresholds established by the 2009 Sediment Evaluation Framework for the Pacific Northwest, the 2013 Dredged Material Evaluation and Disposal Procedures User Manual, or any subsequent revisions or successors to these documents.

Upland Disposal of Sediment: Upland disposal of sediment is the placement of dredged material on land, above high water and out of wetland areas, but not for a beneficial purpose. The dredged material is typically placed in a cell behind berms that contain and isolate it from the surrounding environment and it is dewatered through evaporation and/or settling and discharge of clean water. There may be other uses of the land during and after the site is used for dredged material placement.

Upland disposal can be used for any dredged material, coarse or fine-grained. The material would be transported to and placed on the upland site using methods such as scooping it out with a clamshell bucket, using an auger or a conveyor belt, or hydraulic pumping. Upland disposal is an option for disposal when it is determined to be the preferred disposal method consistent with environmental reviews and the Federal Standard. Depending on dredged material quantities, upland disposal could require a fairly large area with proximity and good access to the waterbody being dredged. Site development, including a containment berm and dewatering channels, is typically required.

Structural Sediment Management

Structural sediment management measures seek to control the location and rate at which sediment is deposited at a specific location, in order to reduce or eliminate the magnitude of the sediment interference with existing authorized purposes of the LSRP. Examples of structural management measures include weirs and sediment traps, which prevent sediment from accumulating in certain areas or intercept and collect sediment that may otherwise interfere with existing authorized project purposes. Such measures would require site-specific NEPA analysis and ESA consultation, and may require additional congressional authority and funding to implement. The upper end of Lower Granite reservoir is the only location where structural measures would be effective. The purpose of the structure would be to restrict/reduce the reservoir flow area to maintain sediment transport velocities. The structure length could be up to half the existing reservoir cross-section distance at the confluence.

Bendway Weirs

Bendway weirs would be placed at strategic locations along the banks of the Lower Snake to redirect water flow in a manner that would prevent problem sediment accumulation and maintain navigation channel dimensions. Bendway weirs are rock structures located on the outside of a stream or river bend, angled upstream into the direction of flow. Water flowing over the bendway weirs is redirected at an angle perpendicular to the middle of the weir. With the weirs angled upstream, flow is directed away from the outer bank of the bend and toward the point bar or inner part of the bend. This redirection of flow occurs at all stages higher than the weir crest. Where there is sufficient velocity and volume, the redirection of flow generally results in a widening of the channel through scour of the point bar (Figure 2). Other possible effects include:

- Deposition at the toe of the *revetment* (river bank stabilization armoring) on the outside of the bend, thus increasing bank stability.
- Scouring on the point bar creating a flow path on the inside of the bend.
- Surface water velocities are more uniform across any cross-section.
- Flow patterns in the bends are generally parallel with the banks (not concentrated on the outer bank of the bend).
- The *thalweg* (deepest, continuous line in river) of the channel is moved from the toe of the outer bank revetment to the stream ends of the weirs.

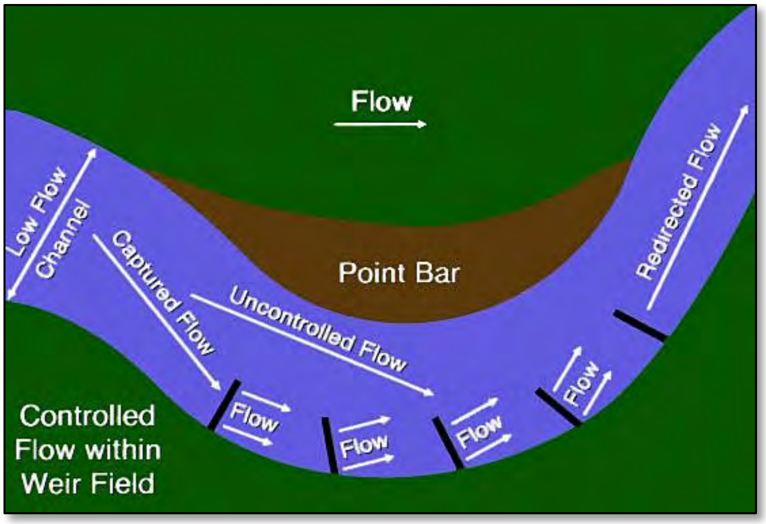

Figure 2. Schematic of Bendway Weirs

Weirs are generally built in sets (4 to 14 weirs per bend) and are designed to act as a system to control velocities and current directions through the bend and well into the downstream crossing. Typically, bendway weirs are applied to unimproved or revetted bends where growth of the point bar is restricting the navigation channel width, or an improved navigation channel alignment is desired. Bendway weirs are commonly used on both navigable rivers and smaller streams.

Bendway weirs are applicable in locations where there is sufficient flow and velocity to sustain sediment transport (and possibly mobilize accumulated sediments) through the area of influence of the structures. For the LSRP, bendway weirs could be applicable in locations like the main river channel through the Snake and Clearwater Rivers confluence where flow velocities are relatively high. Bendway weirs would generally not be effective in off-channel or backwater locations, like some recreation sites or at locations further downstream within the reservoirs where flow depths are larger and flow velocities smaller. Bendway weirs would require sufficient lead time to plan, design, and implement.

Dikes/Dike Fields

Dikes would work in a similar manner as bendway weirs to redirect river flows and velocities and prevent problem sediment accumulation and maintain navigation channel dimensions. Dikes are linear structures used to maintain navigation channels through effects on channel depth and alignment. Dikes constrict channels at low and intermediate flows, causing the channel velocity to increase within the reach and thereby scour a deeper channel. Dikes are typically built of rock but may be constructed with other suitable materials (Figure 3).

Dikes are generally used to contract river channels at low and intermediate flows, forcing all flow through a narrower width. The resulting increased velocity erodes or scours the bed to a lower elevation. Scour is commonly needed only to provide navigable depths during periods of low flow; therefore, low dikes are more desirable than high dikes, which can cause excessive scour at high flows. Scour can also be greater for dikes angled upstream rather than perpendicular to flow or angled downstream.

Maintenance of open water areas in dike fields can be encouraged through variations in the design, such as notches or rootless (e.g., not attached to the riverbank) dikes. Dikes have traditionally been designed to induce sediment deposition within the dike fields although stone dikes do not necessarily have to fill with sediment to be effective.

Figure 3. Dike on the Mississippi River

Agitation to Resuspend

Agitation to resuspend sediments involves the deliberate agitation and resuspension of deposited sediment. Following agitation, the sediment is carried downriver as part of the suspended load of the river. This technique requires both some form of agitation mechanism, and sufficient river flow (velocity and volume) to carry the additional sediment load away from the targeted area. There are numerous potential means to mechanically agitate and resuspend sediment, including hydraulic dredges, high pressure air and water pumps, and using propellers to move sediment. In this technique, jets of air and/or water are applied to the deposited sediments at sufficient pressure to dislodge them from the bottom causing the sediments to become resuspended in the water column and carried downriver by the current.

The effectiveness of this measure is dependent on the ability of the agitation mechanism to resuspend the deposited sediment and the ability of the river to carry the resuspended sediment a sufficient distance downriver to avoid problems with resettling. The Corps has used this method before in the lower Snake River. It is suited to addressing smaller, localized sediment issues with fine sediments. Assuming conditions are met for the measure to work, agitation and resuspension could be used as a short-term sediment management measure. The measure would not prevent sediment from depositing in the same location in the future, nor does it control where resuspended sediment is transported and potentially resettles.

Agitation to resuspend sediments is applicable only in those areas where there is sufficient flow, both in terms of volume and velocity, to transport resuspended sediments away from areas where they interfere with authorized project purposes of the LSRP, such as locations within the main channel of a reservoir. In addition, hydraulic conditions downstream should be such that the resuspended (and transported) sediment does not interfere with an authorized project purpose in another location.

Trapping Upstream Sediments (In-Reservoir)

Trapping upstream sediment involves creating a location within a depositional reach at the upstream end of a reservoir where sediments settle and are captured, thus preventing them from reaching other locations where they may interfere with authorized project purposes of the LSRP. A pit in the river bottom would be excavated to create the trap. Sediment caught in the trap would need to be periodically removed through dredging or other means. The removed sediment would be managed using one of the dredged material management measures described above. This technique has been successfully applied on small river systems (Lipscomb et al. 2005). Trapping upstream sediments (in-reservoir) would require sufficient lead time to plan, design, and implement.

This measure is applicable in areas where there is sufficient space and hydraulic conditions allow for the capture of sediment upstream of where sediment interferes with authorized project purposes of the LSRP.

The Corps performed a sediment load analysis that showed the volume of sand delivered to Lower Granite reservoir from the Snake River is about 600,000 cy per year. A large part of this load is bedload which is evident from the sand waves that form upstream from the Lewiston Levee System on the Snake River as seen in the 2009 and 2011 bathymetries. Potentially, substantial volumes of sand bedload can be trapped and harvested in the channel, thereby reducing the amount of sediment that accumulates below the confluence. A possible location for a sediment trap is immediately upstream from the right bank levee on the Snake River at RM 140.7 (Figure 4). This location is advantageous because narrowing of the channel produces a local backwater effect that reduces the amount of sand carried in suspension.

Figure 4. Location of a Potential Sediment Trap on the Snake River
Lewiston, Idaho is on the right and Clarkston, Washinton is on the left.

The Corps evaluated the efficiency of a sand trap at this location. A trap about 1900 feet long would hold about 770,000 cy of sediment. The Corps estimates about 300,000 cy of material would be trapped over a two year period. An equal amount of sediment would need to be removed from the trap every 2 years to maintain its usefulness. Further analysis and detailed hydraulic modeling of alternative sediment trap configurations would be needed before an actual sediment trap could be designed and constructed.

System Management

System management measures modify reservoir operations (such as pool depth) or facilities so that sediment deposition does not adversely affect existing authorized purposes. Examples of system management measures include reconfiguring or relocating navigation facilities, managing reservoir water levels for navigation, and modifying flows to flush sediments from problem areas. It should be noted that measures for reconfiguring or relocating recreation and irrigation intake facilities apply only to facilities operated and maintained by the Corps.

Navigation Objective Reservoir Operation

This measure involves operating reservoirs of the LSRP at water surface elevations that would provide a 14-foot-deep channel within the federal navigation channel. When sediment accumulation is affecting navigation, as an immediate need, the Corps would first implement operational changes, (i.e., raising the reservoir elevation, adjusting spill patterns, or releasing water at one or more of the dams) as in interim action, as needed, to provide a 14-foot navigation channel. These actions could remain in effect until the Corps could implement a dredging action to remove the accumulated sediment. The Corps would manage pool levels within the preset operating range for each reservoir to maintain 14 feet of water depth over areas where sediment deposition has occurred in the channel. This measure would provide the Corps the option of operating above MOP and even at the upper end of the operating range as needed to maintain the 14-foot deep navigation channel. Raising the operating pool as part of this measure provides a temporary means to provide desired water depths; however, there are physical limits as to how much the pool levels can be raised based on design specification for the dams. For example, the operating range of Lower Granite reservoir is 733 to 738 feet above mean sea level and the Corps does not have the authority to raise the pool above 738 above mean sea level. Once the pool has been raised to the maximum level, it cannot be raised further and the measure ceases to be effective. Additionally, raising the operating pool in a reservoir has a greater effect near the dam than upriver due to the normal change in elevation moving upstream.

The McNary reservoir and lower Snake River reservoirs are typically operated within a three to five-foot range with the lowest end of the range designated as the MOP. Currently the Corps operates the lower Snake River reservoirs at MOP or near MOP during the juvenile salmonid outmigration season, typically from April through August, and as late as October at Lower Granite, to ensure compliance with the National Marine Fisheries Service (NMFS) Federal Columbia River Powers System (FCRPS) Biological Opinion. Under this measure, the Corps would operate the projects as needed at a pool level above MOP to provide temporary relief from sediment accumulated in the navigation channel. The Corps would coordinate with NMFS when proposing to operate above MOP during the juvenile salmonid outmigration season.

The Corps could also adjust operation of the dams to influence water depth at the downstream entrance to the navigation locks. An example would be adjusting operation of the dam to temporarily increase water releases from the dam to provide sufficient depth for a barge tow to enter or exit the navigation lock.

This measure is applicable within the operating range of the reservoirs, and subject to ESA compliance.

Reconfigure/Relocate Affected Facilities

Facilities affected by unwanted sediment deposition may be relocated or otherwise modified to avoid those areas where sediment deposition tends to accumulate and interfere with facility uses. This measure could include a range of facility modifications, such as extending a dock or mooring facility, changing the entrance to a boat basin, or adding an inlet to provide water circulation within a boast basin. It could also include temporarily or permanently closing Corps-managed recreation facilities. Moving or relocating affected facilities is potentially suitable for commercial navigation facilities, recreational boating facilities, and water intake structures. It is not practicable to move the existing navigation channels, locks, or lock approach channels.

Water intake structures and some docks could potentially be extended to reach out beyond near-shore areas where unwanted sediment deposition is occurring. This technique has been successfully used on several water intake structures in the program area. In lieu of reconfiguring or relocating water intake structures, alternative water sources for irrigation that would alleviate the need for the intake, such as a well, could be explored. Other facilities, such as boat ramps, would likely need to be completely relocated. The effectiveness and applicability of this measure is highly site-and facility-specific and would have to be determined on a case-by-case basis.

This measure would be applicable where the use of the affected facility can be replaced, relocated, or potentially closed, and it would be more economical than managing sediment that affects its use. The Corps' ability to consider the feasibility of reconfiguring or relocating port facilities is limited and generally requires a cost-share sponsor and specific authority. This measure is primarily applicable to Corps-managed facilities.

Reconfiguring or relocating affected facilities would require sufficient lead-time to plan, design, and implement modifications to infrastructure.

Raise Lewiston Levee to Manage Flood Risk

This measure involves raising critical portions of the Lewiston levee system to limit the risk of being overtopped during a high flow event. The Lewiston levee system is an upstream extension of Lower Granite dam and was designed to protect parts of Lewiston, Idaho from being flooded by the creation of the reservoir and from inundation during the standard project flood. The Corps' criteria for managing flood risk at facilities like the Lewiston levee has changed over time. Currently, the Corps uses risk analysis to determine the appropriate approach to managing flood risk. Current analysis indicates that flood risk is within acceptable limits, however if future sediment accumulation changes the flood risk to Lewiston, raising portions of the levee system would be a viable option for reducing flood risk, subject to authority. Location and height of change would be determined through detailed site- and time-specific studies. Based on past analysis of levee modification, any future levee raise would likely involve raising the earthen embankments or building low walls on portions of the existing levees, and modifying surrounding roads and other infrastructure affected by the levee raise (USACE 2002).

Raising levees would be applicable if other means of managing flood risk per the Risk Analysis for Flood Damage Reduction Studies (January 2006) were determined infeasible or otherwise unacceptable. This measure would only be applicable in the existing area of the Lewiston levee system. Lewiston levee raise would require sufficient lead-time to plan, design, and implement modifications to infrastructure.

Reservoir Drawdown to Flush Sediment

The reservoir drawdown to flush sediment would draw the Lower Granite reservoir down 10 to 15 feet below MOP (measured at the confluence of the Snake and Clearwater Rivers) and would occur on a one-time basis for up to 6 weeks sometime during the period of late April through late June. This period takes advantage of naturally high spring freshet flows and corresponds with the juvenile salmonid outmigration season. Drawing down Lower Granite reservoir would create a high flow and velocity condition that would scour and transport accumulated sediment from the confluence of the Snake and Clearwater Rivers. Most of the sediment scour would occur within the main channel of both rivers and the scoured sediment would be transported downstream and redeposited. Much of the sediment would likely redeposit within Lower Granite reservoir or in the upper reaches of Little Goose reservoir. Sediments could potentially deposit in areas where they would interfere with authorized project purposes of the LSRP. There must be adequate high flow prediction and modeling allowing the Corps to conduct drawdown operations in a timely manner for this measure to function effectively.

Drawdown would be most effective during high flow conditions, such as those resulting from spring snowmelt and runoff, when scouring and transport of sediments would be greater. Drawdown affects an entire reservoir and mobilizes sediments from area(s) where they interfere with authorized project purposes of the LSRP, as well as, other locations in the reservoir. Drawdown would be applicable only to Lower Granite reservoir where it could address accumulation of sediment in the Snake and Clearwater Rivers confluence area. Reservoir drawdown would require sufficient lead-time to plan, design, and implement modifications to infrastructure.

<u>Upland Sediment Reduction (Expanded)</u>

Local Sediment Management Group (LSMG) Coordination Meetings: The only upland sediment reduction measure carried forward into the PSMP by the Corps is continued LSMG meeting coordination. The Corps would continue to coordinate meetings with all applicable land use management agencies and groups through the annual LSMG meeting. The LSMG meeting would serve as an information exchange forum between the Corps and Federal and State regulatory agencies, tribes, local governments, and other stakeholders. The primary purposes of the meeting would be to share data and compare trends observed by each agency, identify potential opportunities to improve each agency's independent sediment reduction practices, and analyze trends on a watershed basis. Information gained from LSMG meetings may be used by the Corps to adapt PSMP measures. The Corps may also participate in other regional coordination meetings hosted or facilitated by other agencies (e.g., EPA) or stakeholders concerning sediment management in the lower Snake River basin.

<u>Sediment Accumulation Areas</u>

The Corps evaluated locations where sediment accumulation could interfere with the LSRP authorized purposes. The Corps identified 48 locations in the LSRP where sediment accumulation historically has affected authorized purposes or sediment accumulation may potentially be a problem in the future (Table 2). Table 2 is not intended to be an exhaustive list.

This list is not static and may be modified as new sites are identified or problems are resolved. Flow conveyance (as it relates to flood risk management through the Lewiston levee system) and navigation are affected project purposes at the Snake and Clearwater Rivers confluence.

Table 2. Potential Sedimentation Problem Areas

Reservoir	River	Approx. River Mile	Site Name	Purpose
McNary	Snake	0	Sacajawea State Park	Recreation
		1.5	Hood Park Boat Ramp	Recreation
		9.2	Ice Harbor Lock Approach/Nav Coffer Cells	Navigation
		0.0–1.5	Snake River Entrance	Navigation
		2.0–10.0	Nav Channel Below Ice Harbor	Navigation
Ice Harbor	Snake	10	North Shore Boat Ramp	Recreation
		11.5	Charbonneau Park	Recreation
		13.5	Levey Park	Recreation
		15	Big Flat Habitat Management Unit (HMU)	Fish and wildlife
		18	Fishhook Park	Recreation
		23	Lost Island HMU	Fish and wildlife
		24.5	Hollebeke HMU	Fish and wildlife
		29.0–33.3	Walker's Elevator	Navigation
		39	Windust Boat Ramp	Recreation
		41	Lower Monumental Lock Approach	Navigation
Lower Monumental	Snake	48	Skookum HMU	Fish and wildlife
		51	Ayer	Recreation
		55	55-Mile HMU	Fish and wildlife
		56.5	Joso HMU	Navigation
		59.5	Lyons Ferry Park	Recreation
		66	Texas Rapids Boat Basin	Recreation
		68	John Henley HMU	Fish and wildlife
		70	Little Goose Lock Approach	Navigation
Little Goose	Snake	76	Ridpath HMU	Fish and wildlife
		81	New York Bar HMU	Fish and wildlife
		82.5	Central Ferry Park	Recreation
		83	Port of Garfield Access	Navigation
		83.5	Port of Central Ferry	Navigation
		88	Willow Landing HMU	Fish and wildlife
		93	Rice Bar HMU	Fish and wildlife
		95	Swift Bar HMU	Fish and wildlife
		100.0-102.0	Navigation Channel at Schultz Bar	Navigation
		103.5	Port of Almota	Navigation
		103.5	Illia Landing	Recreation

Reservoir	River	Approx. River Mile	Site Name	Purpose
		105.5	Boyer Park and Marina	Recreation
		107	Lower Granite Lock Approach	Navigation
Lower Granite	Clearwater	1.0-2.0	Port of Lewiston	Navigation
		3	Clearwater Boat Ramp	Recreation
	Snake/	131.5-139.5/	Snake River at Mouth of Clearwater River	Navigation, conveyance
	Clearwater	0.0-2.0		
	Snake	128-130	Silcott Island	Navigation
		132	Chief Timothy HMU	Fish and wildlife
		137	Hells Canyon Resort *	Recreation
		139	Port of Clarkston	Navigation
		139.5	Greenbelt Boat Basin	Recreation
		140.5	Southway Boat Ramp	Recreation
		141.5	Swallows Park Boat Basin and Swim Beach	Recreation
		142.5	Hells Gate State Park	Recreation
		146	Chief Looking Glass Park	Recreation

Triggers for Action

Problem identification may “trigger” the need for action(s) to address problem sediment at the sites shown in Table 3. There are two trigger levels, immediate need and future forecast need, which are described below.

Immediate Need. An immediate need action is warranted when sediment accumulation is currently impairing an existing authorized project purpose of the LSRP.

Future Forecast Need. A future forecast need warranting initiation of an analysis of long-term solutions to reoccurring sediment deposition problems occurs when sediment accumulation that impairs an existing authorized project purpose has occurred at a particular location(s) more frequently than once in the past 5 years or is anticipated to reoccur more than once in the next 5 years. The PSMP does not restrict the Corps’ ability to initiate other future forecast need studies when warranted.

The Corps will continue to withdraw the same amount of water at each of the irrigated HMUs (from approximately April 1 to September 30) each year to irrigate wildlife habitat in the existing HMUs to mitigate impacts to fish and wildlife resulting from the lower Snake River dams under the Lower Snake River Fish and Wildlife Compensation Plan (Comp Plan). The Corps did not request consultation on the use of the water for the Comp Plan purposes at this time, but more specifically on managing sediment that interferes with irrigation intake structures.

Table 3. Triggers and Actions in Response

Management Purpose	Triggers	Actions in Response to triggers
Navigation	• Navigable depth in the Federal navigation channel is less than 14 feet deep at MOP and is impairing the safe movement of tug and multi-barge tows and other commercial vessels through the navigation system. • Navigable depth is less than 14 feet deep at MOP within the Federal navigation channel and is impairing access to any of the four navigation locks on the lower Snake River.	**Immediate Need** 1. Use navigation objective reservoir operation (NORO) as interim measure. . 2. Dredge area(s) of problem sediment deposition **Future Forecast** • dredging. • dredge to improve conveyance capacity. • beneficial use of sediment.(in-water or upland) • bendway weirs. • dikes/dike fields. • trapping upstream sediments (in reservoir). • navigation objectives reservoir operations. • reconfigure/relocate affected facilities. •reservoir drawdown to flush sediment.
Recreation	• Boat basin depths at MOP are less than the original design criteria and boats are having difficulty maneuvering within the basin. • Sediment has built up at the entrance to boat basins, blocking access.	**Immediate Need** 1. Use agitation to resuspend problem sediment; or. 2. Dredge area(s) of problem sediment deposition. **Future Forecast** • dredging. • beneficial use of sediment.(in-water or upland) • agitation to resuspend.sediment • navigation objectives reservoir operations. • reconfigure/relocate affected facilities.
Fish and Wildlife Mitigation	• Sediment has buried an irrigation intake at a Corps-managed HMU • Sediment is clogging an irrigation intake at a Corps managed HMU	**Immediate Need** 1. Clear problem sediment by lifting/raising the intake out of the sediment, moving/shifting intake, or limited excavation (e.g., by hand). 2. Install temporary irrigation intake line or use other available water source (Interim). 3. Dredging **Future Forecast** • dredging. • beneficial use of sediment.(in-water or upland) • agitation to resuspend sediment. • reconfigure/relocate affected facilities.
Flow Conveyance	• Consecutive surveys show an accelerated rate of sediment accumulation in the channel near Lewiston *and* • Hydraulic modeling indicates a heightened risk of overtopping the Lewiston levees during extreme floods within 5 years if the rate of accumulation continues and • The risk of flooding cannot be reduced to acceptable levels with normal reservoir operations prescribed in the authorized water control manual.	**Immediate Need** 1. Use reservoir operations during high flow event to lower reservoir water surface and increase capacity, in accordance with the Lower Granite Project Water Control Manual (Interim). 2. Conduct bathymetric surveys and develop new hydraulic models for the confluence area. 3. Dredging. **Future Forecast** • dredging • beneficial use of sediment.(in-water or upland) • trapping upstream sediments (in reservoir). • raise Lewiston levee to manage flood risk. • reservoir drawdown to flush sediment.

Proposed Conservation Measures

The Corps proposes the following conservation measures as part of the proposed action in order to minimize potential adverse effects related to implementation of the proposed action. These conservation measures are not meant to be mitigation for the proposed action, but are integral to the reduction of impacts (potential adverse effects) that may be incidental to the proposed action, and must be considered when analyzing the potential effects of the proposed action.

General

- The Corps will observe appropriate in-water work windows. In-water work would be conducted during either the winter window of December 15 to March 1, or a summer window in backwater areas when the water temperature is above 73 °F.
- The Corps will comply with applicable State water quality standards.
- The Corps will comply with applicable site/action-specific conservation measures when implementing subsequent actions.
- Worksite isolation would be used as a minimization practice if practicable. Worksite isolation could consist of several measures meant to decrease fish exposure to the effects of construction activities.
- No in-water disposal in summer for actions.
- The Raise Lewiston Levee to Manage Flood Risk measure would not involve in-water placement of materials.

Conservation measures associated with minimization of identified effects of the action include:

Dredging

- Sediment sampling – The Corps will perform sediment sampling and analysis prior to dredging as required by applicable regional agreements such as the 2009 *Sediment Evaluation Framework for the Pacific Northwest, the 2013 Dredged Material Evaluation and Disposal Procedures User Manual, or any subsequent revisions or successors to these documents..*
- Work Windows:
  - Winter in-water work window December 15 to March 1
  - Summer in-water work window (when water temps are above 73 °F) in backwater areas
- Mechanical dredging will be used for mainstem actions and either mechanical or hydraulic dredging will be used in backwater areas.
- Employ an experienced equipment operator.
- All dredged material from summer dredging will be placed upland.

- A qualified biologist trained in identification of Washington ground squirrel burrows would survey potential upland disposal areas within the range of Washington ground squirrel prior to disposal.
- The Corps will avoid any Washington ground squirrel burrows found by a qualified biologist.

Turbidity

The Corps will implement a number of techniques to minimize turbidity effects resulting from project operations.

- The Corps would monitor turbidity levels and modify dredging operations to avoid prolonged negative effects.
- If water standards for turbidity are exceeded the Corps will employ one or more of the following bucket control best management practices (BMPs):
  - No reopening to fill a partially filled bucket.
  - Do not overfill the bucket.
  - Close the bucket as slowly as possible on the bottom.
  - Pause before hoisting the bucket off of the bottom to allow any overage to settle near the bottom.
  - Hoist load very slowly.
  - Pause bucket at water surface to minimize distance of discharge.
  - "Slam" open the bucket after material is dumped to dislodge any additional material that is potentially clinging to the bucket.
  - Ensure that all material has been dumped from the bucket before returning for another bite.
  - Do not dump partial or full buckets of material back into the waterway.
  - Vary the volume, speed, or both of digging passes to minimize siltation to the maximum extent practicable.

Snake River Fall Chinook Redds

- To prevent disturbance or harm to potential Snake River Fall (SRF) Chinook redds when dredging in an area that might have redds, the Corps will conduct underwater surveys of the proposed dredging site and within 900 feet downstream of the navigation locks when dredging below the dams, once in November and once during the first two weeks of December prior to commencing dredging. Techniques similar to those used by Battelle from 1993 to 2008 will be employed (Dauble et al. 1996; Dauble et al. 1994; Dauble and Watson 1997; Mueller and Coleman 2007; Mueller and Coleman 2008). This technique has used a combination of a boat mounted underwater video camera tracking system to look at the bottom of the river to identify redds. The Corps will compile the results prior to December 15, at which time the Corps can communicate results to NMFS for appropriate action.

- If no redds are located, then the Corps will proceed with proposed dredging within the boundaries of the surveyed template.
- If one or more redds are located within the proposed dredging template and such redds are verified with video, then the Corps will coordinate with NMFS to determine if dredging can proceed without harming or disturbing the redd(s) or needs to be delayed until fry are able to move out of the area.

Spills

- All over-water construction vessels would be fueled at existing commercial fuel docks. Such facilities have existing spill prevention systems in place that would be adequate to avoid spills or immediately address any accidental spills that might occur.
- Equipment will be inspected and cleaned prior to any instream work.

Suspension of Chemicals of Concern

- Conduct dredging and disposal when listed salmonids are least likely to be in the work area.
- The Corps will not use in-water disposal/placement for any material that is not determined to be suitable for in-water placement in accordance with the *2009 Sediment Evaluation Framework for the Pacific Northwest, the 2013 Dredged Material Evaluation and Disposal Procedures User Manual*, or any subsequent revisions or successors to these documents.
- Use BMPs to prevent spills of fuel, or hydraulic leaks during the dredging and disposal operation.
- The Corps would use BMPs at disposal locations to prevent remobilization of sediments, and subsequent turbidity, through dewatering activities or storage.

Entrainment

- Dredging activities at locations and times of the year when ESA-listed fish would likely be present (e.g. the mainstem of the Snake and Clearwater rivers) would be accomplished using mechanical means which are slow enough to frighten fish and give them time to move away.

Summary of Proposed Action

Table 4 displays a summary of actions that may be implemented under the PSMP, with expected quantities, frequencies, and other details if known. The table was generated from Appendix A in the BA.

Table 4. Summary of Actions under the PSMP

Activity	Sediment Quantity	Location	Timing	Duration	Frequency
Navigation dredging	6000-7200 cy/day total quantities up to 500,000 cy	Snake River RM 0-139; Clearwater River RM 0-2	Dec 15-Mar 1	77[1]days	3-5 years
Beneficial use of navigation sediment (upland or in-water disposal)	6000-7200 cy/day	Sites may vary	Dec 15-Mar 1	77days	3-5 years
Flow conveyance dredging	1 million cy/yr for first 10 yrs, 350,000-500,000 cy/yr afterwards	Confluence of the Snake and Clearwater Rivers from Snake River RM 131.5-139.5 and Clearwater River RM 0-2	Dec 15- Mar 1	77 days	annually
Recreation Dredging	1,000–15,000 cy	Snake River RM 0-146 and Clearwater River RM 0-3	Dec 15 - Mar 1 or during summer window if appropriate	Several days	3-9 years
Recreation disposal of sediment (Upland or in-water; no in-water disposal in summer)	1,000–15,000 cy		Dec 15 - Mar 1; upland disposal only in summer	Several days	3-9 years
Fish and Wildlife Mitigation Dredging	100-1000 cy	12 Corps HMUs, between Snake River RM 15-132	Summer irrigation season	Several days	7-15 years
Wildlife Agitation to resuspend	<500 cy		Summer irrigation season	Several days	7-15 years
Wildlife; Reconfigure or Relocate Affected Facilities; immediate need (ie: short-term fix)	NA		Summer irrigation season	Several hours	Annually
Bendway weirs	Unknown	near or upstream of the confluence with the Snake and Clearwater rivers	Dec 15-Mar 1	1 year per site	1 time per site
Dike/ Dike Fields	Unknown		Dec 15-Mar 1	1 year per site	1 time per site
trapping upstream sediments in reservoir	250,000-350,000 cy	upstream of the confluence of the Snake and Clearwater rivers	Dec 15- Mar 1	75 days	annually

Activity	Sediment Quantity	Location	Timing	Duration	Frequency
Reconfigure/relocate affected facilities	Unknown	To be determined	In-water work : Dec 15 - Mar 1 Upland work: appropriate construction season	1-3 years	1 time per site
Recreation facility closure	Unknown	Same as existing	Anytime	Indefinite; or 1 year	1 time per site
Raise Lewiston Levee up to 3 feet to manage flood risk	NA	Same as existing levee	Outside of summer recreation season, if possible	1 year	1 time
Reservoir drawdown to flush sediment	Unknown	NA	late April through late June	6 weeks	1 time
Recreation; Agitation to resuspend sediments	500-1500 cy	Snake River RM 0-146 and Clearwater River RM 0-3	Dec 15 - Mar 1 or during summer window if appropriate	77 days	3-9 years
Navigation Objectives Reservoir Operations	NA	System-wide	During juvenile salmonid outmigration season (typically from April through August, but as late as October)	Several months	Annually
Wildlife; Reconfigure/Relocate Affected Facilities; future need (ie: long-term fix)	Unknown	To be determined	Outside of summer irrigation season	Several days- several months	1 time per site

[1]The BA listed 75 days for the work window, but a worst case is inclusive of December 15 and March 1, and is 77 days.

Action Area

The action area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). In delineating the action area, we evaluated the farthest reaching physical, chemical, and biotic effects of the action on the environment.

The downstream end of the action area begins at the confluence of the Snake River (river mile (RM) 0) and the Columbia River. The action area extends upstream within the Snake River to the confluence with the Clearwater River (approximately RM 146 of the Snake River). Within the Clearwater River, the action area extends from the mouth (RM 0) to approximately RM 3. The action area also includes all Corps lands adjoining the rivers within the action area where upland disposal or action implementation staging may occur. These boundaries represent the uppermost locations where proposed activities may occur and the entire lower Snake River navigation channel due to the effects of navigation by large vessels (consisting almost exclusively of barge traffic) that is facilitated by dredging. The effects of the proposed action in regards to changes in barge traffic will not be detectable downstream of the confluence of the Snake and Columbia Rivers. Navigation in the Columbia River is not dependent on transport in the Snake River. The direct effects of activities conducted under the PSMP are also not expected to reach beyond the mouth of the Snake River (the most downstream location of potential PSMP activities is 4000 feet above the mouth).

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this Opinion relies on four components: (1) the *Status of the Species*, which evaluates the bull trout rangewide condition, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the bull trout in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the bull trout; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the bull trout ; and (4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the bull trout.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the species' current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the species in the wild.

The jeopardy analysis in this Opinion emphasizes consideration of the rangewide survival and recovery needs of the bull trout and the role of the action area in the survival and recovery of the bull trout. It is within this context that we evaluate the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

In this consultation on the top tier, the jeopardy determination is made for the general effects of the types of actions described in the PSMP. The effects of specific actions under the PSMP shall be evaluated in subsequent second tier section 7 consultations.

Adverse Modification Determination

This Opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

In accordance with policy and regulation, the adverse modification analysis in this Opinion relies on four components: 1) the *Status of Critical Habitat*, which evaluates the range-wide condition of designated critical habitat for the bull trout in terms of primary constituent elements (PCEs), the factors responsible for that condition, and the intended recovery function of the critical habitat overall; 2) the *Environmental Baseline*, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; 3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PCEs and how that will influence the recovery role of affected critical habitat units; and 4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the PCEs and how that will influence the recovery role of affected critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed Federal action on bull trout critical habitat are evaluated in the context of the rangewide condition of the critical habitat, taking into account any cumulative effects, to determine if the critical habitat rangewide would remain functional (or would retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat) to serve its intended recovery role for the bull trout.

The analysis in this Opinion places an emphasis on using the intended rangewide recovery function of bull trout critical habitat and the role of the action area relative to that intended function as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the adverse modification determination.

STATUS OF THE SPECIES and STATUS OF CRITICAL HABITAT: BULL TROUT

The status of the species for bull trout, and status of bull trout critical habitat are described in Appendix A.

ENVIRONMENTAL BASELINE: BULL TROUT

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation, and the impacts of State and private actions which are contemporaneous with the consultation in progress.

The Corps was authorized by the River and Harbor Act of 1945 (Public Law 79-14) to create and maintain a Federal navigation channel, the portion of an inland navigation waterway on the lower Columbia and Snake Rivers maintained by the Corps. The Flood Control Act of 1962 (PL 87-874) established the navigation channel within the lower Snake River at 14 feet deep by 250 feet wide at MOP level, and provides the Corps with authority to maintain the channel at those dimensions. Since completion of the lower Snake River dams in the 1960s and early 1970s, the Corps has periodically used dredging at various locations to maintain the navigation channel at the authorized width of 250 feet and depth of 14 feet below the MOP established for each reservoir. The LSRP also provide aquatic and shoreline recreational opportunities, as well as mitigation for the losses of fish and wildlife resources and their habitat, as well as fish and wildlife oriented recreational opportunities caused by the construction of the four lower Snake River dams. The fish and wildlife mitigation is expected under the Comp Plan.

Condition of the Action Area

The lower Snake River is confined and controlled by four hydroelectric, concrete, run-of-the-river dams, all part of the Federal Columbia River Power System (FCRPS). The three lower dams, Ice Harbor, Lower Monumental and Little Goose each create a reservoir that extends upstream to the next dam. The fourth dam, Lower Granite creates a reservoir that extends 46 miles upstream to Asotin, Washington. At RM 139.2, the Clearwater River enters the reservoir at Lewiston Idaho. Each dam is described briefly below:

- *Ice Harbor Dam and Reservoir:* Located at RM 9.5, construction began in 1955, and was completed in 1961. The reservoir is known as Lake Sacajawea and stretches upstream 32 miles to the base of Lower Monumental Dam, 32 miles upstream. The Wallula Channel, formed from the backup of the Snake River entering the Columbia River, runs 10 miles (16 km) downstream from the base of the dam.

- *Lower Monumental Dam and Reservoir:* Lake Herbert G. West, which extends 28 miles (45 km) upstream (east) to the base of Little Goose Dam, is formed behind the dam. Construction began in 1961 with the dam and three generators completed in 1969.

- *Little Goose Dam and Reservoir*: Construction began in 1963. The main structure and three generators were completed in 1970. The reservoir, Lake Bryan, runs upstream 37 miles to Lower Granite Dam.

- *Lower Granite Dam and Reservoir*: Located at RM 107.5, construction on Lower

Granite Dam began in 1965 with the main structure and three generators completed in 1972. This is the most upstream dam in the Snake River system that has a fish ladder to allow anadromous fish to migrate upstream for spawning. Lower Granite Lake [hereafter referred to as Lower Granite Reservoir] extends upstream from the dam 39 miles to Lewiston, Idaho, into the lower Clearwater River. The reservoir influence on the Snake River ends shortly upstream of Clarkston, Washington and the next dam, Hell's Canyon is at RM 247. From Clarkston, Washington upstream approximately 110 miles to the Hell's Canyon Complex, the Snake River is relatively free flowing. Flows range can range from highs of over 150,000 cfs in the spring to lows around 16,000 cfs in the winter. The reservoir has an average channel width of 2,080 feet. Water depth averages 56 feet and ranges from less than 3 feet in shallow shoreline areas to a maximum of 137 feet (Tiffan and Hatten 2012). Under current operations, the normal pool elevation typically has a maximum potential fluctuation of about 5 feet. To protect roads and railways, much of the shoreline is lined with riprap (Tiffan and Hatten 2012). In the lower one-half of the reservoir, natural shorelines are generally steep, often characterized by cliffs and talus substrate with little riparian vegetation.

All of the dams on the lower Snake River are operated by the Corps as run-of-the-river facilities primarily for navigation, hydropower production, and flood control. Under current operations, the pool elevations of the reservoirs within the action area have a maximum potential fluctuation of about five feet. The reservoir shorelines throughout the action area are often steep and characterized by cliffs and talus substrate, while much of the remaining shoreline areas are lined with riprap to protect adjacent structures. Relatively little riparian vegetation remains along the shorelines within the action area and the remaining riparian areas are highly fragmented.

Current conditions within much of the mainstem Snake and Clearwater Rivers are degraded relative to historic conditions. Dams and their associated reservoirs have modified much of the mainstem habitat downstream of the Clearwater River confluence. Formerly complex habitats in the mainstem and lower tributaries of the Snake River have been reduced, for the most part, to single channels with reduced or disconnected floodplains, side channels or off-channel habitats (Sedell and Froggatt 1984; Ward and Stanford 1995). A study of the available salmon rearing habitat in Lower Granite Reservoir by Tiffan and Hatten (2012) estimated that 44 percent of the shoreline of the reservoir is lined with riprap. Most riprapped shorelines were located along the road and railway along the north side of the reservoir and along the roadway on the south side of the reservoir from Silcott Island to Clarkston. The entire shoreline of the Clearwater River within the action area (RM 0 to 1.9) is lined with riprap. In addition, estimates of shallow water rearing habitat, areas less than six feet deep found only 217 acres or 2.2 percent of the reservoir area is suitable shallow water rearing habitat for juvenile salmonids.

Hydroelectric dams have eliminated or reduced mainstem habitat for bull trout and other salmonids and have altered the normal flow regime of the Snake and Clearwater Rivers, decreasing spring and summer flows, increasing fall and winter flow and altering natural thermal patterns (Coutant 1999). Power operations cause fluctuating flow levels and river elevations, affecting fish movement through the reservoirs, disturbing shoreline or shallow water areas and possibly stranding fish in shallow areas when flows recede quickly. The altered habitats in many reservoirs reduce salmon smolt migration rates and create more favorable habitat conditions for fish predators, including native northern pikeminnow, nonnative walleye and smallmouth bass (ISG 1998; NRC 1996). Larger non-native piscivores may prey on bull trout.

In the Lower Snake River and the lower reach of the Clearwater River, dams have changed food web interaction both directly and indirectly. Impoundments have directly increased predation risk for anadromous salmon and steelhead (*O. mykiss*) smolts by delaying downstream migration, thereby prolonging their exposure to piscivorous birds and fishes. Impoundments have also changed trophic interaction indirectly by creating extensive new habitat (e.g., riprap banks) that favors some native piscivorous fishes like northern pikeminnow and providing new opportunities for non-native piscivores like walleye and smallmouth bass (Beamesderfer and Rieman 1988; Kareiva et al. 2000; Petersen and Poe 1993).

In addition, numerous anthropogenic features or activities in the action area (e.g., dams, ports, docks, roads, railroads, bank stabilization, irrigation withdrawals, and landscaping) have become permanent fixtures on the landscape, and have displaced and altered native riparian habitat. Consequently, the potential for normal riparian processes (e.g., litter fall, channel complexity, and large wood recruitment) to occur is diminished and aquatic habitat has become simplified. Shoreline development has reduced the quantity and quality of nearshore salmon and steelhead habitat by eliminating native riparian vegetation, displacing shallow water habitat with fill materials, and by disconnecting the Snake River from historic floodplain or side channel areas. Further, riparian species that evolved under the environmental gradients of riverine ecosystems are not well suited to the present hydraulic setting of the action area (i.e., static, slackwater pools), and are thus often replaced by invasive, non-native species. The riparian system is fragmented, poorly connected, and provides inadequate protection of habitats and refugia for sensitive aquatic species.

Under historic river conditions, the deposition of heavier materials (e.g., gravel, rocks, boulders) in the lower Snake River was highly dependent on daily, seasonal, and multi-year flow patterns, while finer-grained suspended sediments tended to be deposited on the river floodplain, high on the channel margins, and in low velocity side channels and off-channel areas. Under these conditions, the riverbed was a complex mosaic of substrates with a variety of pools, runs, and shallow areas that were built and rebuilt repeatedly depending on continuously fluctuating flow patterns. The four lower Snake River dams have severely disrupted the sediment transport cycle of the historic river system. Since construction of the dams, formerly complex habitats in the mainstems of the lower Snake and Clearwater Rivers, as well as some of the lower reaches in the neighboring major tributaries, have been inundated. These impacts generally reduce rivers to single, relatively deep channels with much smaller or disconnected floodplains, side channels, and off-channel habitats (Sedell and Froggatt 1984; Ward and Stanford 1995; Ward et al. 1999). Currently, there are very few shallow water, sandy shoals downstream of the confluence of the Snake and Clearwater Rivers.

The confluence of the Snake and Clearwater Rivers causes both rivers to lose much of their energy at the extreme upstream portion of Lower Granite Reservoir, resulting in ongoing deposition of large quantities of transported sediment in this area. The materials deposited at the confluence are primarily coarse to fine sand, with most of the larger materials dropping out farther upstream in the Snake and Clearwater Rivers and most of the finer sediments dispersing throughout the main body of the reservoir downstream of the confluence. The Corps estimates that the lower Snake River transports approximately three to four million cubic yards of new sediments each year, and 100 to 150 million cubic yards of sediment have been deposited in the lower Snake River, mostly in Lower Granite Reservoir, since construction of the dams in the mid-1900s.

Historically, the Corps has periodically removed some of this material by dredging to provide access to ports and to maintain the navigation channel. In the past, the Corps has used dredge material to create shallow water benches, primarily for subyearling SRF Chinook salmon habitat. This approach was used in 1989 to construct a 0.91 acre island in Lower Granite Reservoir (Centennial Island RM 119) (Chipps et al. 1997) and in 2006 to create shallow water habitat at Knoxway Bench (RM 116.6). The shallow-water habitats surrounding Centennial Island are heavily used by subyearling Chinook salmon and Knoxway Bench is also used (Tiffan and Connor 2012). The Corps' current definition of shallow-water habitat is water less than 20 feet deep; however with recent information on the higher use of habitat less than 6 feet deep, this criterion continues to be evaluated as part of research efforts ((Tiffan and Connor 2012).

Numerous chemical contaminants can be found in Snake River and Clearwater River sediments. The contaminants can become resuspended in the water column when sediments are excavated, disturbed, or deposited. The Corps identified polycyclic aromatic hydrocarbons (PAHs), organophosphates, chlorinated herbicides, ammonia, oil, grease, glyphosate, AMPA, dioxin, heavy metals, and others as potential contaminants that have frequently been found in Snake River sediments. Sediment samples collected in 2011 in the main navigation channel in the confluence area indicate that sand is the dominant material in the navigation channel combined with small amounts of silt near the mooring (shoreline) areas. At the Ice Harbor navigation lock, the dredged material is mostly gravel and cobble, from 2 to 6 inches and larger, similar to the riverbed materials in adjacent areas outside the navigation channel and below the dam. The Corps believes the source of this material to be a redistribution of local riverbed material caused by flow passing through the spillways during high flows and sloughing from the steep slopes of the channel through hydraulic action of barge guidance in the lock and passage through the lock.

Snake River Navigation Channel

The Corps maintains a navigation system in the Snake River that enables barges, and other large vessels that require a minimum depth of 14 feet, to travel upstream in the Snake River, from Ice Harbor Dam to Lewiston, Idaho. The Snake River navigation channel extends approximately 140 miles, from the confluence of the Columbia and Snake Rivers at Pasco, Washington, to the confluence of the Clearwater and Snake rivers, and a short distance upstream in the Clearwater River to the Port of Lewiston, at Lewiston, Idaho. Approximately 10 million tons of commercial cargo is transported on the lower Snake River each year with an annual value of between $1.5 and $2 billion (Corps 2012). Movement of grain from upstream ports toward the Columbia River accounts for most of this cargo, the largest share of which is wheat. Approximately half of all the wheat exported from export terminals on the Lower Columbia River arrives by barge. Commercial barge traffic on the lower Snake River fluctuates from year to year, depending on crop production, the state of the U.S. economy, and trends in world trade. Over the last 20 years the total tonnages of cargo moved through the lower Snake River (and including the Columbia

River portion of McNary Reservoir since cargo statistics do not differentiate between the Snake and Columbia River portions of McNary Reservoir) has ranged from a high of 8,670 million tons in 1995 to a low of 5,301 million tons in 2008.

The effects of barge operations on salmonids include spillage or leakage of contaminants (such as fuels, oils, or grease), generation of wakes and turbidity by moving vessels, and through creation of overhead shade when shipping vessels are moored. Barge traffic has likely caused minor effects to fish through direct impacts of moving vessels, and the habitat effects described above. Effects of shipping vessels are limited in severity due to physical characteristics of the Snake River and the size of the vessels that can navigate the river. While the river is relatively wide the 14-foot depth of the navigation channel limits commercial traffic to barges which have a shallow draft that is not capable of producing high-amplitude wakes that might strand fish or cause trauma from the wave energy. Moored barges may provide cover for predatory fish.

Status of the Bull Trout in the Action Area

Within the broader region encompassing the action area, foraging, migration, and over-wintering habitats for bull trout primarily occur in the mainstems of the Snake, Clearwater, and Columbia Rivers and in the middle to lower reaches of major tributaries to these rivers, while spawning and rearing habitats occur in the extreme upper reaches of the major tributaries (USFWS 2002b, pp. 10-16). Within the action area there are no defined core areas or local populations of bull trout. Any foraging, migrating, or over-wintering bull trout that occur within the action area originate from, or potentially interact with, the local populations within the major tributaries in closest proximity to the action area.

One major tributary near the action area that is used by bull trout is the Tucannon River, which drains southern uplands in the Blue Mountains along the Washington / Oregon border and enters the Snake River at Snake River mile 63, roughly 8 miles below Little Goose Dam. Two other major tributaries used by bull trout in the broader region include Asotin Creek, which is upstream of the action area and enters the Snake River roughly 6 miles above its confluence with the Clearwater River (Snake River mile 145), and the Walla Walla River, which is downstream of the action area and enters the Columbia River roughly 10 miles below its confluence with the Snake River (Columbia River mile 314). The status of bull trout within the mainstems of the lower Snake and Clearwater Rivers and the status of the local populations within each of these four neighboring watersheds are addressed separately, below. In the following sections we describe the watersheds and where relevant the bull trout core areas, that may use the action area for forage, migration and overwintering. Relevant core areas are listed in Table 5, comparing the former draft recovery plan (USFWS 2002a) and the current 2014 revised draft recovery plan (USFWS 2014).

Table 5. Comparison of current and former core areas are recovery units

Current Core Area	Current Recovery Unit	Former Core Area	Former Recovery Unit
Touchet River	Mid Columbia	Touchet River	Umatilla-Walla Walla River Basins
Tucannon River	Mid Columbia	Tucannon River	Snake River

			Washington
Walla Walla River	Mid Columbia	Walla Walla River	Umatilla-Walla Walla River Basins
Asotin Creek	Mid Columbia	Asotin Creek	Snake River Washington
Seven Upper Clearwater Core areas, and Clearwater FMO Habitat Area	Mid-Columbia	Seven Upper Clearwater Core areas	Clearwater River

Mainstems of the Lower Snake and Clearwater Rivers

Historically, the mainstems of the lower Snake and Clearwater Rivers were used as foraging areas, migration corridors, and over-wintering habitats by fluvial bull trout that originated in tributary streams throughout the broader region. Presently, different portions of the mainstems are used to varying degrees by bull trout depending on the status of the local populations within the neighboring tributaries and the condition of migration corridors that connect the tributaries to the Snake and Clearwater Rivers. Currently, foraging, migrating, and over- wintering adult and subadult bull trout could occur in the lower Snake River reservoirs at any time of year, depending on the availability of suitable water temperatures, but are most likely to be present from November through May. Bull trout would be expected to occur primarily in areas of abundant food resources and cold water refugia while in the mainstems of the rivers, and would likely avoid areas of slack water, limited cover, or where predation by larger fish is possible, such as near docks and riprap.

The Corps regularly conducts fish counts at passage facilities on all four of the lower Snake River dams to monitor various salmonid populations. The Corps' salmonid monitoring program focuses on timing and runs for anadromous fish and was not developed to address bull trout; the anadromous fish monitoring does not continue throughout the year, notably excluding December through February when over-wintering bull trout would be expected to occur in the mainstem. Nevertheless, from 2006 through 2013, a total of 4, 125, 413, and 35 bull trout were documented in the fish ladders at the Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Dams, respectively (Table 6). While the collection of these data was relatively consistent and can be considered comparable among the Dams, they should be viewed with some caution as individual fish were not marked and may have been counted more than once. From 1998 through 2013, a total of nine, three, and two bull trout were also opportunistically documented in juvenile bypass structures during anadromous smolt monitoring activities at the Lower Monumental, Little Goose, and Lower Granite Dams, respectively (Wills, in litt. 2014). Finally, the Service has also monitored individual bull trout in the lower Snake River that were marked using passive integrated transponder (PIT) tags (Wills, in litt. 2014). Between 2006 and 2011, a total of eight PIT-tagged bull trout were detected on 19 separate occasions, including the detection of the same two fish at the Ice Harbor and Lower Monumental Dams, five individuals at Little Goose Dam, and three at Lower Granite Dam (including two in common with the Little Goose Dam detections). The bull trout ranged in size from 135 mm (5.3 inches) to 410 mm (16.1 inches).

Table 6. Fish ladder counts of bull trout at Corps dams on the lower Snake River (2006 – 2013)

Dam Facilities	Total Number of Bull Trout Recorded by Year								Total
	2006	2007	2008	2009	2010	2011	2012	2013	
Ice Harbor	0	0	0	0	0	3	0	1	4
Lower Monumental	2	4	2	5	12	47	27	26	125
Little Goose	3	6	27	37	73	161	42	64	413
Lower Granite	2	8	8	6	8	1	2	0	35
Total	7	18	37	48	93	222	63	91	579

Studies have also documented bull trout originating from local populations in the upper Clearwater River watershed migrating downstream as far as Lewiston, Idaho (USFWS 2008b, p. 33), which is at the upper end of the action area just above the confluence of the Snake and Clearwater Rivers. The mainstem of the lower Clearwater River provides potential connectivity of these local populations to occupied areas within the broader region of the Snake and Columbia Rivers. Migratory corridors such as these also provide bull trout in the broader region with access to unoccupied but suitable habitats, enhanced foraging areas, and refuge from disturbances in other watersheds (Saunders et al. 1991).

Predatory fish occur in the action area. During recent sampling of all four reservoirs in the lower Snake River, studies found that smallmouth bass were the most common predator of all of the eight predatory species (northern pikeminnow, smallmouth and largemouth bass, walleye, yellow perch, white and black crappies, and channel catfish) (Seybold and Bennett 2010). Smallmouth bass were most abundant in Lower Granite reservoir, while northern pikeminnow were more abundant at sampling stations downstream of Lower Granite Dam. Walleye were only caught in Lower Monumental and Ice Harbor reservoirs. Largemouth bass, crappies, yellow perch, and channel catfish were most frequently caught in Lower Monumental and Ice Harbor reservoirs, though catch rates were low. Only the largest predatory fish would prey on bull trout in the action area.

Tucannon River

Genetic analyses indicate that there are currently five local populations of bull trout, and possibly a sixth, within the core area of the Tucannon River watershed (USFWS 2008b, p. 4). These local populations are fairly isolated from local populations in other regional tributaries (USFWS 2010a, p. 427). Both resident and migratory forms of bull trout still occur in the Tucannon River watershed (Martin et al. 1992; WDFW 1997), and some migratory bull trout likely use the mainstem of the Snake River in the general vicinity of the Tucannon River confluence on a seasonal basis (Kleist, in litt. 1993; Underwood et al. 1995; WDFW 1997). The Corps' fish count data (Table 6) and other opportunistic bull trout observations (i.e., incidental captures and PIT tag studies) suggest that most of the bull trout documented in the lower Snake River likely originate from the Tucannon River core area, although records also indicate that some of these bull trout originated from other local populations in the Grande Ronde, Salmon, Asotin, or Clearwater Rivers.

Bull trout still occupy most of their historic range in the Tucannon River watershed and, prior to around 2000, this population was considered relatively large (USFWS 2010a, p. 428). However, redd counts and capture records suggest that the population had undergone a pronounced decline by around 2007. For example, the average number of redds documented annually in the upper watershed dropped from over 100 during the early 2000s to less than 20 by 2007 (Mendel et al. 2008), while the number of migrating bull trout documented annually at the Tucannon Hatchery trap (located at approximately Tucannon River mile 35) went from over 250 to around 50 during the same time period (Mendel, in litt. 2008). Many of the bull trout captured in 2007 were also considered in poor health with new or recent injuries (cuts and scrapes) around their heads and gills. The cause(s) of this decline and the poor condition of some of the captured fish are unknown, although two large fires occurred in the Tucannon River watershed during the mid-2000s that resulted in higher sediment delivery to streams in the core area (USFWS 2008b, p. 6). Loss of nutrients and a declining prey base from dwindling anadromous salmonid populations and physical (e.g., dams, fences, nets, weirs) or temperature barriers in the mainstem Tucannon River and its tributaries are also likely contributing factors. More recent information indicates that the Tucannon River population may have rebounded somewhat since 2007, with over 230 bull trout observed annually during trapping and survey activities in 2012 and 2013 (WDFW 2013, p. 7; WDFW 2014, p. 10).

The local populations of bull trout within the Tucannon River watershed can still generally move freely among their natal streams, which largely occur in protected areas of the upper watershed that limit activities that could threaten bull trout (USFWS 2008b, p 12). However, there are likely seasonal temperature barriers in the migratory corridors from the river mouth upstream for roughly 30 miles of the lower reaches during the summer (USFWS 2008b, p. 6). The Tucannon Hatchery trap may also be a partial barrier to bull trout movements during the trapping season from January to September. In addition, recreational dams on several Tucannon River tributaries have been known to block migration of bull trout in the watershed. Ongoing threats within these migratory corridors likely prevent bull trout in this core area from recovering (USFWS 2008b, p. 12). These threats include crop production, irrigation withdrawals, livestock grazing, logging, hydropower production, management of non-native fish species, recreation, urbanization, and transportation networks.

The following are brief descriptions of planning and management actions specific to the Tucannon River watershed that may generally improve conditions for bull trout in this core area.

The final Tucannon River Model Watershed Plan, developed by the Bonneville Power Administration (BPA) in cooperation with the Natural Resource Conservation Service, Washington Department of Fish and Wildlife (WDFW), and Columbia Conservation District, was completed in 1995. The initiative identified various projects that could address limiting factors for salmonids in the Tucannon River, and represents a grass-roots planning effort that has resulted in local landowner support and participation.

Within the Tucannon River watershed, there are a number of landowners enrolled under the Conservation Reserve Enhancement Program (CREP) administered by the U.S. Department of Agriculture (USFWS 2008b, p. 10). These contracts help protect over 1,000 acres of land and 50 miles of riparian habitat in the watershed. There are also various program efforts to improve the efficiency of irrigation projects within the watershed, which have helped maintain roughly 11 cubic feet per second (cfs) of water in the river and placed roughly 951 acre-feet of water under conservation trust agreements. In addition, there have been 48 irrigation diversion screens installed and six diversion pump sites eliminated in the watershed.

The Broughton Land Company Habitat Conservation Plan (HCP) has facilitated various measures to improve habitat conditions for bull trout in the Tucannon River watershed (USFWS 2008b, pp 10-11). In addition to enrolling lands under the CREP and irrigation efficiency programs discussed above, other measures implemented for this HCP include establishing riparian buffers, improved grazing management, and developing off-stream livestock watering sites.

In association with various projects, including floodplain restoration work by the Snake River Salmon Recovery Board, the U.S. Forest Service and WDFW have added large woody debris to several streams in the Tucannon River watershed (USFWS 2008b, p. 6). Work to remove or mitigate potential fish passage barriers (e.g., under-sized culverts, recreational dams) in this core area has also been undertaken. In general, ongoing management actions by these resource agencies will improve instream habitat, water temperature, large woody debris, and passage conditions for bull trout in the Tucannon River watershed.

Asotin Creek

Historically, bull trout distribution in the Asotin Creek watershed was thought to be extensive and this core area supported both resident and migratory life forms (USFS 1998; WDFW 1997). Anecdotal accounts describe anglers catching large (less than 20 inch) bull trout from Asotin Creek in the early 1970s (USFWS 2010a, p. 439), and the large sizes of these fish indicate that they probably used the mainstem Snake River to forage, migrate, and over-winter. Currently, a single local population of bull trout is known to occur in the Asotin Creek watershed, although there may be other as yet undetected local populations still present (USFWS 2010a, p. 439). Based on the relatively small sizes of surveyed fish and their occurrence primarily in headwater locations, it is possible that only resident bull trout remain in this core area and that they are largely isolated from other local populations (USFWS 2008b, pp. 17-18; USFWS 2010a, p. 439). However, recent trapping operations have documented a small number of juvenile and migratory adult bull trout near the mouth of Asotin Creek. It is unknown if the adult fish originated from Asotin Creek or from local populations in other core areas (e.g., Grande Ronde River, Upper Clearwater River) that utilize lower Asotin Creek seasonally as a cold water refuge or for foraging. Genetic samples have been collected from these fish, but they have not been analyzed so the source core area(s) of these fish remains uncertain.

Recent redd counts in the Asotin Creek watershed, although inconsistent, indicate this population may have further declined since about 2000. For example, in 1999 a total of 68 redds were observed in the two upper watershed tributaries known to support bull trout spawning and rearing, while only 12 redds were documented in these same two tributaries in 2006 (USFWS 2008b, p. 19). Bull trout numbers in the Asotin Creek watershed are considered to be at critically low levels (Martin et al. 1992; WDFW 1997; USFS 1998; G. Mendel, pers. comm. 2002).

In general, bull trout in this core area have the potential to move freely among their natal streams, however, their movements throughout the lower watershed and into the mainstem Snake River are likely limited due to unsuitable water temperatures during the summer, sub-surface flows of some tributaries due to water withdrawals, and the existence of Head Gate Dam near the mouth of Asotin Creek and several smaller dams on upper tributary streams within the watershed (USFWS 2008b, pp. 20-22). In addition, the lower reaches of Asotin Creek are becoming increasingly urbanized. Residential development in this area has been identified as a primary limiting factor to migratory bull trout. Stream channels near these residential areas are heavily used by domestic animals and humans and are typically altered with riprap or by diking, which can result in increased water temperatures and degraded stream complexity, cover conditions, and prey populations. Finally, the upper portion of the Asotin Creek watershed has been identified as a high fire-prone landscape by the U.S. Forest Service.

Based on the limited amount of known spawning and rearing habitat and the very low population size of primarily resident fish, threats from dewatering, water quality impairments, legacy effects from past forest management practices, and potential fire within spawning and rearing habitats all contribute significantly to threaten bull trout within this core area (USFWS 2008b, p. 26). To reverse the currently depressed condition of bull trout in the Asotin Creek watershed, occupied habitat would need to be further protected and enhanced, while unoccupied habitat would need to be restored so that the population could expand via natural reestablishment, or possibly via a supplementation program (USFWS 2010a, p. 439).

The following are brief descriptions of planning and management actions specific to the Asotin Creek watershed that may generally improve conditions for bull trout in this core area.

The final Asotin Creek Model Watershed Plan, developed by BPA in cooperation with the Natural Resources Conservation Service, WDFW, and Columbia Conservation District, was completed in 1995. The initiative identified various projects that could address limiting factors for salmonids in Asotin Creek, and represents a grass-roots planning effort that has resulted in local landowner support and participation.

There have been hundreds of acres of riparian habitat and several miles of stream reaches protected under CREP in this core area. In addition, various other agency and private conservation activities have taken place, including reduced or modified grazing practices throughout most of the basin, upgraded culverts, road closures and obliteration, and riparian fencing (USFWS 2008b, pp. 22-25). Several recent initiatives to purchase and protect key areas for salmonid populations or to establish easements to address development or other land use activities are also ongoing in Asotin County. These efforts should generally contribute to improving the condition of aquatic habitats for bull trout throughout the watershed.

Walla Walla River

There are at least five local populations of bull trout in the Walla Walla River watershed, two of which occur in the Walla Walla River core area and three of which occur in the Touchet River core area (an occupied tributary of the Walla Walla River). Currently, there is no evidence that bull trout move between these core areas (USFWS 2008b, p. 47). In addition, recent genetic analyses indicate that bull trout within these two core areas are genetically distinct and have remained relatively isolated from one another for some time. There is no apparent genetic differentiation between the migratory and resident forms of bull trout within each core area (USFWS 2008b, p. 49). Migratory bull trout from both core areas have been detected moving into the Columbia River (USFWS 2008b, pp. 44 and 63), including an estimated 192 individuals from 2007 through 2009 (Barrows et al. 2012, p. 9). However, only a very few bull trout have ever been known to return to the Walla Walla core area or to move upstream in the Columbia River to the mouth of the Snake River (Barrows et al. 2014, p. 1).

The Walla Walla River core area still supports both resident and migratory forms of bull trout and is considered a stronghold population within the broader region (USFWS 2010a, p. 410). During the early 2000s, the bull trout population in this core area was considered fairly large with total annual redd counts exceeding 300. However, recent studies suggest that one local population may have experienced a slight decline while the other may have declined by over 50 percent by the late 2000s (USFWS 2008b, pp. 45-46). Further, these apparent declines were mainly due to a loss of migratory bull trout. The available information indicates that adequate winter flows in the upper Walla Walla River watershed are the main factor in maintaining migratory bull trout in this core area, yet the reliability of these flows may be threatened by recent management actions (USFWS 2008b, p. 50). While bull trout have been documented moving throughout the Walla Walla River core area on a seasonal basis and connectivity between the local populations is possible, current habitat conditions (e.g., high water temperatures, low flows due to water diversions) severely limit bull trout from moving freely in much of the lower and middle reaches of the river from about June through November.

Resident and migratory bull trout also still occur within the Touchet River core area (USFWS 2008b, p. 59). The local populations of bull trout within this core area are genetically distinguishable from one another (USFWS 2008b, p. 65). Based on redd surveys, bull trout in the Touchet River core area may have declined slightly during the mid-2000s, but appear to have remained relatively stable since about 1998 (Mendel et al. 2014, pp. 47-49). Very few bull trout have been documented at any time of year in the lower Touchet River below roughly river mile 44 near Waitsburg, Washington (USFWS 2008b, p. 61).

Several factors likely contribute to the depressed conditions of the local populations of bull trout within the Walla Walla River watershed (USFWS 2008b, pp. 63-65). These include construction of small recreational and irrigation dams, mining, road construction and maintenance, local fires, urban development, channelization, irrigation, and flood control measures. In various reaches throughout the watershed, these impacts have led to increased water temperatures and sedimentation levels, inadequate seasonal flows, reduced habitat complexity due to a lack of large woody debris and deep pools, and an increase in non-native predatory or competitive fish species.

The following are brief descriptions of planning and management actions specific to the Walla Walla River watershed that may generally improve conditions for bull trout in these core areas.

With regard to Federal actions, the Service entered into a settlement agreement in 2000 with three local irrigation districts to maintain instream flows in a stretch of the Walla Walla River that had been seasonally dewatered by irrigation diversions. Previous to this agreement, thousands of fish, including numerous bull trout, were impacted annually and it was necessary to implement salvage operations to try and rescue those that became stranded in the dewatered reach. Since implementation of the agreement, fish strandings are no longer a problem in this area. In 2007, the Service completed a section 7 consultation with the Corps regarding the maintenance and operation of the Mill Creek Flood Control Project (USFWS 2008b, p. 51). This effort resulted in further measures to avoid or minimize incidental take of bull trout in the Walla Walla River and addressed river hydrology, bull trout strandings, connectivity of available habitats and fish passage, water quality, and protocols to address emergency operations. In order to help protect Chinook salmon in the South Fork Walla Walla, the Bureau of Land Management has implemented access restrictions to address potential impacts to Federal property due to summer fording of stream channels by vehicles. These measures also helped to protect a migratory corridor and potential prey species for bull trout. Finally, the Forest Service has implemented controlled burns to help avoid or reduce potential impacts from more catastrophic wild fires in the upper Walla Walla River watershed.

With regard to State and tribal efforts, WDFW has implemented game fish regulations within the Walla Walla River watershed that should help to control potential predator species of juvenile and sub-adult bull trout. In addition, the Confederated Tribes of the Umatilla Indian Reservation developed a reintroduction program for Chinook salmon, which has provided a potential prey base for bull trout and may generally improve nutrient cycling within the river system.

Other local conservation initiatives that have been undertaken within the Walla Walla River watershed include installing new or improved fish ladders at several passage barriers, implementing programs to improve irrigation efficiencies and in-stream flows, consolidating and screening various water diversion structures, and implementing measures to reduce the risk of wildfire. Numerous acres of riparian habitat and miles of stream channels within the Walla Walla River watershed have also been enrolled under the CREP. In addition, The Broughton Land Company HCP addresses improved management for bull trout on enrolled properties within the watershed. All of these efforts have helped to generally improve the habitat conditions for bull trout within the two Walla Walla River core areas.

Upper Clearwater River

The upper Clearwater River watershed encompasses 45 known local populations and 27 possible local populations distributed among seven core areas. These core areas are found in the South Fork Clearwater River, North Fork Clearwater River, Selway River, and Lochsa River. Local populations of bull trout in these core areas exhibit migratory (fluvial and adfluvial forms) and resident life history strategies. Except for the North Fork Clearwater River watershed, which is blocked by Dworshak Dam roughly 2 miles above its confluence with the Clearwater River, it is likely that the local populations of bull trout in the upper Clearwater River drainages can move freely between the core areas.

Relatively little is known about the status and trends of the local bull trout populations in the upper Clearwater River watershed and substantial areas of some river reaches remain unsurveyed. Bull trout use of the lower mainstem Clearwater River is seasonal, as summer water temperatures exceed those suitable for bull trout. Conversely, operations at Dworshak Dam may alter the natural temperature regime of river flows by reducing water temperatures below the North Fork Clearwater River confluence, which has the potential to disrupt natural cues for bull trout in the lower reaches to migrate to spawning locations (USFWS 2008b, pp. 32-33). However, it is currently unknown how these thermal changes may affect spawning migrations of bull trout from the upper Clearwater River core areas.

Land and water management activities that may depress local populations of bull trout and degrade habitat conditions in the upper Clearwater River watershed are similar to those in the other regional river systems. These activities may include operation and maintenance of dams and other diversion structures, forest management practices, livestock grazing, agricultural run-off, road construction and maintenance, mining, and the presence of non-native fish species. Dams and diversion structures with inadequate passage or screening facilities can contribute to isolating and fragmenting some local bull trout populations in the upper Clearwater River watershed. Various forestry and grazing practices can impact local bull trout populations by increasing water temperatures through reduced shading of streamside vegetation, decreasing the recruitment of large woody debris, eliminating pools, increasing streambank erosion and sedimentation rates, and generally degrading water quality and aquatic habitat complexity. Some agricultural practices can also impact local bull trout populations through added inputs of pesticides, herbicides, and sediments to aquatic habitats.

The following are brief descriptions of planning and management actions specific to the upper Clearwater River watershed that may generally improve conditions for bull trout in these core areas.

In cooperation with several Federal and other State agencies, the Idaho Department of Fish and Game (IDFG) developed a management plan for bull trout in 1993 (USFWS 2002e, pp. 84-85). As part of the plan, IDFG updated maps of all known bull trout occurrences, spawning and rearing areas, and potential habitats in the State. The plan also calls for IDFG to annually report on all recovery actions that have been undertaken for bull trout in the State. IDFG has undertaken nutrient enhancement actions in Dworshak Dam and implemented eradication programs for non-native fish species in the upper Clearwater River watershed, which could improve conditions for bull trout in these core areas (USFWS 2008b, p. 8). The Idaho Department of Lands has developed site specific implementation plans to alleviate identified water quality threats (e.g., from grazing, agricultural run-off) throughout the watershed (USFWS 2002e, pp. 85-86). In addition, Idaho Department of Lands has been actively graveling roads that closely parallel bull trout streams to help minimize sediment delivery, and has adopted more stringent stream shading standards to insure that timber harvest activities will not increase water temperatures.

The Service entered into an HCP with the Plum Creek Timber Company in 2000 (USFWS 2002e, p. 87). This HCP helped address existing concerns, improved ongoing management, and should help to reduce potential future impacts to bull trout from actions on the enrolled lands. The U.S. Forest Service and the Bureau of Land Management have undertaken various efforts to rehabilitate areas where roads are contributing excess sediment to bull trout habitat throughout the core areas (USFWS 2002e, p. 88). These activities have included upgrading culverts on existing roads and decommissioning other roads. The Forest Service has also developed various timber management prescriptions for the upper Clearwater River watershed to help avoid or reduce potential impacts from wild fires (USFWS 2008b, p. 7). In 1995, the Nez Perce Tribe developed a reintroduction program for coho salmon (*O. kisutch*), which has provided a potential prey base for bull trout and may generally improve nutrient cycling within the river system (USFWS 2002e, p. 90). Many other past and ongoing agency efforts primarily designed to improve conditions for anadromous salmonids have also benefitted bull trout by increasing potential prey abundance, improving aquatic habitats, and enhancing connectivity between core areas within the upper Clearwater River watershed (USFWS 2002e, p. 83).

Summary of Bull Trout Status in the Action Area

Connectivity is important between bull trout local populations, core areas, and forage, migration, and overwintering (FMO) habitats. The lower Snake and Clearwater Rivers provide FMO habitat for bull trout from core areas in the Touchet River, Tucannon River, Walla Walla River, Asotin Creek, and upper Clearwater River. FMO habitats are important to migratory bull trout, since migratory forms grow larger and are more fecund than residents, therefore contributing to population stability in core areas. Relative to other salmonids, such as steelhead or Chinook salmon, few bull trout occur within the lower Snake and Clearwater Rivers and little is known about their specific movements and habitat use patterns in the mainstems of these rivers especially during the winter. Most of the available distribution data in the mainstem Snake and Clearwater Rivers was obtained during salmon monitoring or capture efforts and does not provide information from December to February, when bull trout are expected to use the mainstems for foraging and over wintering. Adult and sub-adult bull trout display distinct diel (i.e., 24-hour cycle) habitat use behavioral patterns (Federick 1994, Jakober et al. 2000, Al-Chakhachy and Budy 2007, Muhlfeld et al. 2012). In general, bull trout tend to use relatively deep pools with abundant cover (e.g., large woody debris, river bottom depressions) and higher velocity flows during the day. In contrast, night time habitat use by bull trout is characterized by near-shore areas with shallower depths, less cover, and slower water velocities. The available information indicates that a relatively small number of adult or subadult bull trout may occur in the action area during the proposed activities and that these fish would represent migrants traveling among the major tributaries within the broader Snake, Clearwater, and Columbia River systems. Bull trout may occur in the action area year round, but are more likely to be present in the winter. When river temperatures are hospitable they are likely to use the shallow water areas, particularly at night.

ENVIRONMENTAL BASELINE: BULL TROUT CRITICAL HABITAT

Status of Critical Habitat for Bull Trout in the Action Area

Designated critical habitat for bull trout includes the free flowing reaches of the Snake and Clearwater Rivers and their reservoirs to the ordinary high water elevations and normal operating pool elevations, respectively. The action area encompasses the lower half of the Mainstem

Snake River Critical Habitat Unit (CHU) and a small portion of the most downstream extent of the Clearwater River CHU. These CHUs are essential to the recovery of bull trout because they contain PCEs that comprise suitable foraging, migration, and over-wintering habitats within the action area and they provide potential connectivity between multiple core areas in neighboring major tributaries throughout the broader region (USFWS 2010a, pp. 527 and 583). The current conditions of the PCEs that comprise bull trout critical habitat within the action area are described below.

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) that contribute to water quality and quantity and provide thermal refugia.

   The Service has no specific information on locations of springs or hyporheic flows within the reservoir environments of the lower Snake and Clearwater Rivers, although it is typical for rivers to have regions of hyporheic flows, therefore we assume that these regions occur within the Action Area and provide thermal refugia for bull trout.

2. Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, over-wintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

   The Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Dams have altered the lower Snake and Clearwater Rivers within the action area by converting this portion of the historic river system to a series of reservoir (i.e., adfluvial) environments. The operation of these dams disrupts bull trout migration by delaying or impeding upstream and downstream movements and creating conditions where bull trout may be injured or killed by various sources, including mechanical impingement in the dams and elevated dissolved gas levels in the dams' outflows.

3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

   The lower Snake and Clearwater Rivers currently support an abundant food base for adult and subadult migrating and over-wintering bull trout. This is primarily because the relatively stable water levels of the reservoirs help to maintain benthic habitat and the production of benthic invertebrates, which comprise an important food source for many prey species of adult bull trout. Potential forage fish for bull trout, such as juvenile salmon, steelhead, and whitefish (family Salmonidae), sculpins (family Cottidae), suckers (family Catostomidae), and minnows (family Cyprinidae), are present and numerous throughout the lower Snake River.

4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks, and unembedded substrates to provide a variety of depths, gradients, velocities, and structure.

   The reservoir environments and flow regimes that are currently present in the lower Snake and Clearwater Rivers within the action area are significantly altered from the historic riverine conditions that existed. Generally, the reservoirs have relatively stable channels and streambanks characterized by cliffs and talus substrate. In some areas, especially in the vicinity of the dams and urban areas, the shorelines have been extensively armored with riprap to protect adjacent structures. Relatively little riparian vegetation remains along the shorelines within the action area. In addition, floodplain encroachment by industrial, commercial, and private development over large portions of the action area have further degraded the historic habitat characteristics (e.g., riparian areas, off-channel habitats, water temperatures) of the original riverine environments. Consequently, the conditions and processes (e.g., seasonal flow patterns, channel complexity, large wood recruitment, litter fall) that supported historic riverine environments within the action area have been replaced with more simplified, adfluvial habitats since construction of the dams.

5. Water temperatures ranging from 36 °F to 59 °F, with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form, geography, elevation, diurnal and seasonal variation, shading (e.g., provided by riparian habitat), streamflow, and local groundwater influence.

   The timing, frequency, magnitude, and duration of water temperature and flow regimes in the lower Snake and Clearwater Rivers have been significantly altered by human activities, such as hydropower production and irrigated agriculture, since at least the mid-1900s. As a result, water temperatures in the lower Snake and Clearwater Rivers, including the action area, often exceed 68^{o} F during the summer (USFWS 2010b, p. 36). Summer water temperatures in major tributaries neighboring the action area (e.g., Tucannon River, Asotin Creek) are also significantly elevated, primarily as a result of warm return flows from adjacent farmland and developed areas, and contribute to the degraded water temperature conditions within the action area. Because of dam release flows of impounded water during the winter, water temperatures in the action area are also typically warmer during the winter compared to many tributary reaches and historic mainstem river conditions (USFWS 2010b, p. 36), although these somewhat warmer winter temperatures are not likely to preclude use by bull trout.

6. In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo over-winter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates is characteristic of these conditions. The size and amount of fine sediment suitable to bull trout will likely vary from system to system.

   The available historical data suggests that the areas inundated by the lower Snake River reservoirs following completion of the dams did not include any bull trout spawning or early rearing habitats, but that the areas were used as foraging, migration, and over-wintering habitats by adult and subadult bull trout. Therefore, the action area has likely never supported spawning or rearing habitats for bull trout and this PCE is not considered present within the action area.

7. A natural hydrograph, including peak, high, low, and base flows, within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.

   The operation of dams throughout the Snake and Clearwater River watersheds has significantly altered the natural river hydrograph within the action area, primarily by decreasing spring and summer flows and increasing fall and winter flows from historic river conditions. The flow conditions in the uppermost portion of the action area, including the confluence of the Snake and Clearwater Rivers, more closely resemble those of a riverine environment, however, the shoreline and in-stream habitats have been significantly altered from historic conditions.

8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

   The water quality of the lower Snake River is described as excellent (Class A) (Washington Administrative Code [WAC] Chapter 173-201A-030), whereas historic flow and temperature regimes within the action area have been significantly altered since construction of the dams.

   Water quantities are likely not limiting for bull trout in the action area.

9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout [*Salvelinus namaycush*], walleye [*Stizostideon vitreum*], northern pike [*Esox lucius*], smallmouth bass [*Micropterus dolomieu*]), interbreeding (e.g., brook trout [*Salvelinus fontinalis*]), or competing (e.g., brown trout [*Salmo trutta*]) species that, if present, are adequately temporally and spatially isolated from bull trout.

   Various non-native predatory fish species that are known to prey on juvenile and sub-adult salmonids and potentially larger fish like bull trout are present in the action area. Known predatory fish include (Seybold and Bennett 2010): northern pikeminnow, smallmouth and largemouth bass, walleye, yellow perch, white and black crappies, and channel catfish.

Consultations and Conservation Efforts in the Action Area for Bull Trout and Bull Trout Critical Habitat

The Service has undertaken numerous section 7 consultations pursuant to the ESA within the action area in coordination with various Federal agencies. To date, none of the Federal actions that have undergone consultation were determined to jeopardize the continued existence of bull trout in the Columbia River interim recovery unit or to adversely modify designated critical habitat for bull trout. Many of these federal actions included measures to help avoid or minimize potential impacts to bull trout and bull trout critical habitat. Most of these past consultation efforts also included conservation recommendations from the Service that the Federal action agencies could implement to benefit bull trout and other Federal species of concern in the action area. The following discussions address several of these consultation efforts with specific bearing on this current Opinion.

In 2000, the Service consulted with the Corps and other Federal agencies on the operations of the

FCRPS, which evaluated potential effects to bull trout from dam operations on the lower Snake and Columbia Rivers (USFWS 2000). Some of the general effects addressed by the FCRPS and other associated consultations in the broader region include the following: 1) fish passage barriers and entrainment; 2) modifications of stream flows and water temperature regimes; 3) dewatering of shallow water zones; 4) reduced productivity in the reservoirs; 5) gas supersaturation of waters in dam outflows; 6) management of native riparian habitats; 7) water level fluctuations associated with power peaking operations; and 8) control of non-native, invasive species. This consultation resulted in a “no jeopardy” determination for bull trout.

The Service has consulted with the EPA regarding their issuance of permits associated with the National Pollutant Discharge Elimination System (NPDES). The NPDES seeks to control water pollution levels by regulating point sources that discharge pollutants into waters of the U.S. In 2004, the Service issued a biological opinion to EPA regarding a permit issued to the Potlatch Corporation (now Clearwater Paper Corporation) within the action area. Of greatest concern during this consultation was the potential bioaccumulation of organic compounds in the bull trout and bald eagle resulting from the mill’s discharge of industrial return waters into the Clearwater River at Lewiston, Idaho (USFWS 2004c, p. 36). The EPA has also issued NPDES permits to various municipalities in the broader region of the action area, including one to the City of Lewiston for its wastewater facility discharges into the Clearwater River. The treatment facility provides secondary treatment and disinfection of domestic and industrial wastes prior to discharging them into the river. Issuance of many NPDES permits have not undergone consultation with the Service.

In 2003, the Service consulted with EPA regarding proposed limits for total maximum daily loads (TMDL) of dissolved gas and dioxins in the lower Snake River (USFWS 2004c, pp. 34-36). Corps actions taken during Phase I of efforts to manage these TMDLs were expected to have a positive effect on listed species under the Service’s jurisdiction during voluntary spill periods. The Service anticipates further ESA consultation with the Corps prior to implementation of actions undertaken in association with any future phase(s) to specifically manage these TMDLs.

Multiple aspects of bull trout and salmon recovery efforts are incorporated into (and funded through) the BPA’s Fish and Wildlife Program. This program included subbasin planning efforts for the Tucannon and Clearwater Rivers and Asotin Creek. Subbasin plans for these three watersheds were completed in 2004.

Washington State forest practices and associated regulations were significantly revised in connection with Washington State Department of Natural Resources Forest Practices HCP and State Trust Lands HCP. These revisions increased protections for riparian areas and unstable slopes, facilitated the recruitment of large woody debris to stream corridors, and improved road standards significantly over previous State provisions. Because of biological uncertainty associated with various forest prescriptions and the effectiveness of the regulations, a comprehensive adaptive management program was also adopted to ensure that the provisions would continue to meet the conservation needs of bull trout. The updated practices and regulations should significantly reduce future timber harvest impacts to bull trout streams on private and State lands, although most legacy impacts from past forest practices are likely to continue for some time.

Effects of Climate Change in the Action Area: Bull Trout and Critical Habitat

The potential effects of climate change were estimated by manipulating the elevational limits of fish distributions over a range bounding the predicted effects of warming over the next 50 plus years (Rieman et al. 2007, p. 1556). Results of these modeling efforts indicate that bull trout populations in some subbasins, particularly in the southern and central portions of the Columbia Basin interim recovery unit (including the major tributaries neighboring the action area) are already at high risk of extirpation under the base model conditions. The predicted effects of climate change would not only be expected to increase water temperatures, but could also intensify dewatering events in important habitats for bull trout due strictly to changed weather patterns or from effects of ongoing forestry and agricultural practices. While bull trout in portions of the upper-most watersheds may be somewhat insulated from climate change (due to minimal management activities in designated wilderness areas, and higher elevation colder water), the core area populations would likely become increasingly fragmented and their migratory life histories lost. Increased water temperatures and dewatering events would also further limit the ability of bull trout throughout the broader region to refound previously occupied habitat, seek refuge during catastrophic events, or reach seasonal use habitats for foraging, migrating, or over-wintering.

Bull trout are already exposed to unsuitable water temperatures during much of the summer within the action area and in many of the neighboring tributary reaches. These core populations would likely be further impacted by climate change if there are no cold water refuges remaining for them in the lower tributary reaches and mainstems of the river systems.

Conservation Role of the Action Area: Bull Trout and Critical Habitat

The conservation of the coterminous U.S. population of the bull trout is dependent upon the persistence of bull trout within each of five interim recovery units. Persistence of bull trout within each interim recovery unit is dependent upon maintaining viable core areas. Viable core areas are dependent on the persistence of local bull trout populations, which are in turn dependent upon reliable habitat connectivity for migratory bull trout that provides for genetic and demographic resiliency, especially in response to stochastic events. Therefore, interim recovery units should provide for the long-term persistence of self-sustaining, complex, interacting local populations of bull trout in core areas distributed throughout the species range. The relatively small number and potential isolation of local bull trout populations in the Tucannon River, Asotin Creek, and Walla Walla River core areas makes them vulnerable to extirpation from stochastic events, and increases the importance of maintaining connectivity between them.

The conservation role of the action area is to provide foraging, migration, and over-wintering habitats for bull trout in the lower Snake and Clearwater Rivers, as well as to indirectly support viable core area populations including those within the Tucannon River, Asotin Creek, Walla Walla River, and upper Clearwater River watersheds. Therefore, the lower Snake and Clearwater Rivers are essential to the long-term conservation of bull trout in the region (USFWS 2010a, pp. 427 and 527). Although currently fragmented by the presence of dams, the lower

Snake and Clearwater Rivers continue to play an important role in maintaining the migratory life history strategy of local bull trout populations and potential interactions between them in the neighboring tributaries, including genetic exchange and recolonizing opportunities. The lower Snake and Clearwater Rivers also provide an abundant food source for migrating and over-wintering bull trout during fall, winter, and spring (USFWS 2010a, p. 584). Forage fish such as juvenile and sub-adult salmonids, sculpins, suckers, and minnows are present throughout the action area. Mainstem habitats in the lower Snake and Clearwater Rivers will likely become increasingly important to bull trout as recovery plans are implemented in the neighboring tributaries and the status of their local populations improves (USFWS 2010a, p. 584).

EFFECTS OF THE ACTION: BULL TROUT

"Effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those caused by the proposed action and are later in time, but still are reasonably certain to occur.

The PSMP contains a suite of activities that cause many identical effects to bull trout. The proposed activities, their effects, and the conservation measures addressing those effects are shown in Table 7. As described previously, this is a programmatic consultation on the PSMP, and second-tier site specific consultations will be conducted in the future. For this reason, some effects listed below are "to be determined" (TBD) in the future.

Table 7. Effects of the Action

<table>
<tr><th>Activity</th><th>Effect Pathway</th><th>Project Design and other mitigating factors</th><th>Consequences</th></tr>
<tr><td rowspan="8">Navigation and Other Dredging

Dredge to improve Conveyance Capacity</td><td rowspan="3">Elevated suspended sediment and turbidity</td><td>Mechanical dredge only (no hydraulic)
Operational BMPs for dredging</td><td>Mechanical dredging using the proposed BMPs creates a plume of sediment that typically does not exceed background concentrations more than 5 nephelometric turbidity units (NTU); and the plume typically extends no more than 900 feet before returning to near-background levels, but has exceeded in the past.</td></tr>
<tr><td>WA Water quality standards</td><td>Plume of increased suspended sediment and turbidity</td></tr>
<tr><td>Width of River at dredge sites</td><td>Suspended sediment spans part of the channel, and extends downstream</td></tr>
<tr><td>Suspension of Water Contaminants</td><td>Sediment sampling
Contaminant thresholds (RSET Protocol)</td><td>Potentential contaminants in sediment will be re-suspended with potential to expose salmonids. Concentrations are limited by criteria established by WDOE, EPA or RSET; sediments will be sampled prior to dredging</td></tr>
<tr><td>Physical channel alterations</td><td>Excavation limited to 16' depth</td><td>The channel will be deepened up to 16 feet at dredge sites, and benthic invertebrates will be lost or displaced at the sites; temporary loss of foraging habitats</td></tr>
<tr><td>Noise/disturbance</td><td>To be developed through project-level planning (TBD)</td><td>Creates a temporary zone that is unsuitable for use by fish; may disturb fish away from foraging habitat</td></tr>
<tr><td>Indirect Effects</td><td>TBD</td><td>Barge wakes, overhead cover for predators</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="2">In-water Disposal of Sediment</td><td>Elevated suspended sediment and turbidity</td><td>TBD</td><td>Plume of increased suspended sediment and turbidity, limited by WA standards to 5 NTU above background, but has exceeded in the past. May expose salmonids to suspended sediment that may result in behavior or physiological effects</td></tr>
<tr><td>Physical channel alterations</td><td>Intentional creation of a shallow bench</td><td>An increase in the amount of shallow rearing habitat for Chinook salmon or other fish, long term beneficial effect for bull trout prey..</td></tr>
<tr><td rowspan="2">Upland Disposal of Sediment</td><td>Alteration of riparian veg</td><td rowspan="2">Disposal sites would not be located in riparian areas or sites where sediment could renter the river.</td><td rowspan="2">Generally insignificant or no effect on bull trout or bull trout habitat, depending on locations and site specific designs</td></tr>
<tr><td>Chronic sediment source</td></tr>
<tr><td rowspan="4">Bendway Weirs and Dikes/Dike Fields</td><td>Physical channel alterations</td><td rowspan="2">Intentional design elements</td><td>Scouring at end of weir; shift in thalweg; sediment deposition along streambank downstream from the weir.</td></tr>
<tr><td>hydraulic effects</td><td>Increased velocities near center of channel; decreased velocities along the shoreline.</td></tr>
<tr><td>Construction effects – suspended sediment</td><td>TBD</td><td>Brief plumes of turbidity/suspended sediment during installation; possible noise disturbance</td></tr>
<tr><td>Structural habitat complexity</td><td>TBD</td><td>Addition of rock structures; may provide habitat or cover for non-native predators</td></tr>
</table>

Activity	Effect Pathway	Project Design and other mitigating factors	Consequences
Agitation to Resuspend	Elevated suspended sediment and turbidity	TBD	Plume of increased suspended sediment and turbidity
Trapping Upstream Sediments (in reservoir)	Same as *Navigation and other dredging* (above)	The effect would be limited to a single site in the Snake River	
Reservoir Operations (raise/lower water)	Changes in water depth	TBD	Increase or decreases in water depth, should not impact bull trout movements
	Hydraulic effects	TBD	Changed flow patterns, should not impact bull trout movements
Reconfigure/Relocate Affected Facilities	Construction effects – suspended sediment	TBD	Plumes of turbidity/suspended sediment during installation, similar effects as navigation and other dredging
	Physical channel and riparian alterations	TBD	Habitat effects dependent on the site-specific circumstances
	Indirect effect on future dredging	TBD	Reduce or eliminate the need for future dredging, decreasing sediment effects over time to bull trout
Raise Lewiston Levee to Manage Flood Risk	Water depth	TBD	Increase in water depth
	Water surface elevation	TBD	Change in availability and characteristics of shoreline habitats, possible increase to predator habitat
	Hydraulic effects	TBD	Changed flow patterns, should not impair bull trout movements
Reservoir Drawdown to Flush Sediment	Water depth	TBD	Decrease in depth during the flush, increases and decreases in depth through scour and deposition
	Water surface elevation	TBD	10-15 foot decrease in surface elevation, change to flow patterns
	Hydraulic effects	TBD	Increased water velocity, and change in flow patterns
	Elevated suspended sediment and turbidity	Work window coincides with spring runoff and high sediment transport capacity	Plume of increased suspended sediment and turbidity, limited by WA standards to 5 NTU above background or and 10 percent over background when background exceeds 50 NTUs
	Water Contaminants	TBD	Temporary re-suspension of potential contaminants
Upland Sediment Reduction (Expanded)	Reduced sediment delivery to the Snake River	TBD	Potential reduced sediment in tributaries and in the Snake River, should decrease sediment impacts to bull trout

The effects discussion addressed the following primary stressors:

- Elevated turbidity and suspended sediments,
- Chemical contaminants,
- Potential for injury, entrainment, or burial during activities,
- Noise or disturbance effects,
- Effects to foraging habitats and prey,
- Other direct and indirect effects.

In the following narrative, we often include discussion of effects to salmonids, including Chinook salmon and steelhead, and then address how those effects relate to bull trout, specifically. This is because much of the research relevant to turbidity, chemicals, and other effects has been done on species other than bull trout , but is often relevant to bull trout since they are a similar salmonid. Also, juvenile salmon and steelhead, along with other small fish, are important prey for bull trout. Therefore, effects to juvenile salmonids are relevant to forage availability for bull trout.

Elevated Turbidity and Suspended Sediments

Dredging and disposal activities create increased suspended sediments and turbidity. Based on past quantities, the Corps predicts the following amount of dredging/disposal for the following activities:

- Navigation dredging: up to 500,000 cy for a maintenance action every 3 to 5 years
- Beneficial use of navigation sediment: up to 500,000 cy for a maintenance action every 3 to 5 years
- Flow conveyance dredging: 1 million cy/year for the first 10 years; 350,000 to 500,000 cy/year afterwards
- Recreation Dredging: 1,000 to 15,000 cy every 3 to 9 years
- Recreation disposal of sediment: 1,000 to 15,000 cy every 3 to 9 years
- Fish and Wildlife Dredging: 100 to 1000 cy every 7 to 15 years
- Wildlife Agitation to resuspend: less than 500 cy every7 to 15 years
- Recreation Agitation to resuspend sediments: 500 to 1500 cy every 3 to 9 years
- Sediment trap maintenance: 250,000 to 350,000 cy annually

To conduct a reasonable worst-case analysis, the Service evaluated the higher quantities of dredging at the most frequent duration listed above. Not all dredging or disposal activities would occur during the same year, and some activities under the PSMP may lessen the need for other activities to occur. For example, future installation of a sediment trap may decrease the need for some downstream flow conveyance or navigation dredging. For structural measures, there may be subsequent maintenance dredging associated with the structure.

The management measures associated with dredging include mechanical dredging (for navigation, recreation, and flow conveyance) and hydraulic dredging (for recreation and HMU irrigation facilities typically conducted at a time when water temperatures are high and bull trout are less likely to be exposed). Most dredging would occur in the winter in-water work window, although summer dredging may also be considered for other off-channel areas such as boat basins, swim beaches or irrigation intakes on a case-by-case basis when the shallow water temperatures are expected to be around 73 °F and bull trout are less likely to occur in the area. These projects are also smaller in magnitude and shorter in duration, lasting up to several days.

Construction or implementation of management measures under Structural Sediment Management (bendway weirs, dikes/dike fields, agitation to resuspend, reconfigure/relocate affected facilities, reservoir drawdown to flush sediment) could disturb and suspend sediments, although likely on a smaller scale than some of the dredging activities.

All of the dredging and/or disposal operations may result in increased turbidity and suspended sediments, with the larger actions having a higher likelihood of causing direct or indirect effects on bull trout or their habitats due, in part, to their much longer duration. As an example, flow conveyance dredging operations to address 1,000,000 cy annually would be expected to 1) take up to 77 active dredging days to complete, assuming a 24-hour per day work schedule, 2) require roughly 170 barge loads to transport the materials, and 3) affect over 370 acres of sandy, shallow water and mid-depth habitats from the shoreline to the thalweg and spanning up to 50 percent of the width of the river channel. Assuming there is in-water disposal, each loaded barge would travel to a disposal site to deposit its load before returning to the active dredge site. Activities at the disposal site would be periodic, occurring for up to 20 minutes roughly every 8 hours, as each barge is unloaded and nearly continuous for potentially more than a week as final contouring operations are conducted. Disposal operations would directly impact 35 to 60 acres of existing mid-depth (20-30 feet) habitats. All of these activities would disturb and suspend a significant volume of benthic sediment. In the immediate vicinity of each active work site and for some distance downstream and laterally within the river channel, turbidity would substantially exceed natural background levels. These turbidity plumes may adversely affect bull trout in the area.

Quantifying turbidity and suspended sediment levels and assessing their potential effects on salmonids is complicated by several factors. First, turbidity and suspended sediments from in-water activities will typically decrease as distance from the activities increases. How quickly turbidity and suspended sediment levels attenuate in space and time (i.e., their dilution factors) depends on the quantity of materials in suspension, the particle sizes of suspended sediments, the amount and velocity of river flow, and the physical and chemical properties of the sediments. Second, the potential impacts of turbidity and suspended sediment on fish are not only related to their levels (concentration and duration), but also to the particle sizes and constituents of the suspended sediments and the species and other characteristics (e.g., age, habitat use) of the fish potentially impacted. Third, it is difficult to determine how bull trout will react to increased sediment plumes. They may try to avoid the plume by migrating away from the increased sediment, or they may settle to the bottom of the river and wait out the plume.

Exposure to suspended sediment can be detrimental to salmonids through a variety of mechanisms: (1) injuring or killing fish from trauma or stress; (2) harming fish indirectly by reducing their growth rate or resistance to disease; (3) interfering with the development of eggs and larvae (not relevant to bull trout in the action area); (4) modifying fish behaviors such as feeding, migration, and movement patterns; and (5) reducing the abundance of food organisms available to the fish (Newcombe and MacDonald 1991; Bash et al 2001; Anderson et al. 1996; Newcombe and Jensen 1996).

Feeding behavior may be altered by reduced visibility if fish remain in turbid areas. In natural environments, salmonids typically avoid turbid waters when possible (Bisson and Bilby 1982; Sigler et al 1984; Berg and Northcote 1985), and most fish will avoid the turbidity plumes. However, some fish may remain in the turbidity plume and be exposed to suspended sediments. Since salmonids rely at least partly on vision to capture prey, turbidity can decrease their ability to locate and capture prey (Barrett et al. 1992; Vineyard and O’Brien 1976), although examples exist where feeding rates are not reduced by turbidity (Rowe et al. 2003; Gregory and Northcote 1993). Distance of prey capture and prey capture success both were found to decrease significantly when turbidity was increased (Berg and Northcote 1985; Zamor and Grossman 2007). Waters (1995) states that loss of visual capability leading to reduced feeding is one of the major sublethal effects of high suspended sediment. Increases in turbidity were reported to decrease reactive distance and the percentage of prey captured (Bash et al. 2001; Klein 2003). At 0 NTUs, 100 percent of the prey items were consumed; at 10 NTUs, fish frequently were unable to capture prey species; at 60 NTUs, only 35 percent of the prey items were captured. At 20 to 60 NTUs, significant delay in the response of fish to prey was observed (Bash et al. 2001). Loss of visual capability and reduced capture of prey leads to depressed growth and reproductive capability. There are also environments in the Pacific Northwest where salmonids thrive in naturally-turbid waters as an apparent result of reduced predation on juvenile salmonids (Gregory 1993). Given the various ways fish might respond to turbidity, the effects on individuals may be advantageous, neutral, or disadvantageous.

In salmonids, excessive turbidity and suspended sediments can elicit a number of physiological responses (i.e., gill flaring, coughing, increase in blood sugar levels), which indicate some level of stress (Bisson and Bilby 1982; Sigler et al. 1984; Berg and Northcote 1985; Servizi and Martens 1992; Gregory and Northcote 1993). The magnitude of these stress responses is generally higher as turbidity and suspended sediment levels increase and particle sizes decrease. The magnitude of the stress response also depends on the duration of increased turbidity and suspended sediments. A high increase in turbidity and suspended sediment for a short duration may cause the same stress response as a small increase in turbidity and suspended sediment for a long period.

Increases in turbidity and suspended sediments are also known to affect salmonid behavior in several ways. Fish may avoid high concentrations of suspended sediments altogether (Hicks et al. 1991), whereas lower concentrations may reduce feeding efficiency (Sigler et al. 1984). In addition, social behaviors (e.g., schooling) may be altered by suspended sediment (Berg and Northcote 1985). High concentrations of suspended sediment can also affect survival, growth, and behavior of stream biota on which salmonids feed (Harvey and Lisle 1998). Although increases in turbidity typically cause stress responses, moderate levels of turbidity (35 to 150

NTU) may also accelerate foraging rates among some juvenile salmonids, likely because of reduced vulnerability to predators due to camouflaging effects (Gregory and Northcote 1993). The potential adverse effects to fish from elevated turbidity and suspended sediment levels are summarized in Table 8.

Table 8. Summary of Expected Adverse Effects to Fish Resulting from Elevated Sediment Levels

Physiological	Behavioral	Habitat
Gill trauma; increased coughing; increased respiration rate[1]	Alarm reaction; Avoidance; Abandonment of cover[1]	Reduction in spawning habitat
Osmoregulation[1]	Territoriality[1]	Effect on hyporheic upwelling
Blood chemistry (increase in levels of stress hormones) [1]	Reduction in feeding rates and feeding success; increased exposure to predation[1]	Reduction in benthic invertebrate habitat
Reduced fitness; impaired growth and reproduction; increased susceptibility to disease; delayed hatching; reduced fish density; mortality[2]	Impaired homing and migration[1]	Damage to redds

(USFWS 2010c; Bash et al. 2001; Anderson et al. 1996; Newcombe and Jensen 1996)
[1] Behavioral and sublethal effects (USFWS 2010c)
[2] Lethal and paralethal effects (USFWS 2010c)

The Service typically uses an analytical framework (Biological Effects of Sediment on Bull Trout and Their Habitat - Guidance for Evaluating Effects (USFWS 2010c)) for analyzing the effects of sedimentation on bull trout. This framework is largely based on a report by Newcombe and Jensen (1996). However, since this Opinion addresses a sediment management plan, and not any individual action, we did not included a detailed analysis of site-specific scenarios. However, we used the effects thresholds in that document for the basis of our discussion of effects. We anticipate using that analytical framework, or similar methods based on the best available science, for future site-specific consultations.

Table 9 displays the severity of effect (SEV) levels that indicate adverse effects to bull trout (USFWS 2010c). Effect calls for habitat are also provided to assist with analyses of effects to individual bull trout. Bull trout in the action area are expected to be subadult and adult fish. For those life stages, for example, a severity level of 6 indicates moderate physical stress, a severity level of 8 indicates major physiological stress, and severity levels of 9 or higher indicate lethal and paralethal effects (USFWS 2010c).

Table 9. SEV levels that indicate adverse effects to bull trout

SEV		ESA Effect Call
Egg/alevin	1 to 4 5 to 14	Not applicable - alevins are still in gravel and are not feeding. LAA - any stress to egg/alevin reduces survival
Juvenile	1 to 4 5 to 14	NLAA LAA
Subadult and Adult	1 to 5 6 to 14	NLAA LAA
Habitat	1 to 6 7 to 14	NLAA LAA due to indirect effects to bull trout

The severity of suspended sediment effects depends on the duration of exposure and the concentration of suspended sediment. The potential adverse effects related to projected increased turbidity levels are summarized in Table 10 (after Newcombe and Jensen 1996 and USFWS 2010c). Although suspended sediment has the potential to injure or kill fish, the typical response of salmonids to increasing amounts of suspended sediment is to move in an attempt to avoid the sediment (Bash et al. 2001; ECORP 2009, Robertson et al. 2006; Servizi and Martens 1992). With this behavior pattern, fish that are capable of swimming against the current in a river can often escape plumes of suspended sediment if cleaner waters are available nearby. Bull trout, however, have unique behaviors; they tend to prefer deeper, cooler water during the day, and move up into shallow areas at night. It is difficult to predict how every bull trout will respond to turbidity. They may migrate away from the turbidity plume, or they may move toward the bottom for cover and therefore be exposed to the effects of the suspended sediments.

Table 10. The Severity of Ill Effects Associated with Continuous Exposure to Excess Suspended Sediment over a Certain Number of Hours on Juvenile and Adult Salmonids

Description of Effect	NTU Level (TSS)	Duration
Behavioral: Alarm Reaction, Avoidance Response, Abandonment of Cover	41 (99) 17 (40) 8 (20)	Up to 1 hour Up to 3 hours Up to 7 hours
Sublethal: Short- to Long-Term Reduction in Feeding Rates or Success, Moderate to Major Respiratory or Physiological Stress, Impaired Homing, Moderate Habitat Degradation, Poor Condition	369 (1097) 144 (403) 70 (148)	Up to 1 hour Up to 3 hours Up to 7 hours
Lethal: Reduced Growth Rates, Delayed Hatching, Reduced Fish Densities, Severe Habitat Degradation, Direct Mortality	3376 (8103) 1242 (2981) 457 (1097)	Up to 1 hour Up to 3 hours Up to 7 hours

(Adapted from USFWS 2010c and Newcombe and Jensen 1996)

Note: Salmonids can be adversely affected by total suspended sediments (TSS, often measured in mg/L), but monitoring often evaluates turbidity as measured in NTUs. Schroeder (2014, p.2) determined that the dredging plume data showed a ratio of 2.4 mg/L TSS to 1 NTU; or NTU levels roughly equivalent to 0.42

reported TSS levels (after Schroeder 2014).

During the dredging and disposal actions in 2005 and 2006, the Corps collected water quality data to monitor turbidity and other criteria in almost real-time (Dixon Marine Services 2006). The State of Idaho limits instantaneous turbidity levels to less than 50 NTUs above background, or 25 NTU above background for 10 consecutive days. The Washington standards limit turbidity levels to 5 NTU above background when the background level is less than 50 NTU, and 10 percent over background when background exceeds 50 NTUs. The monitoring points for the 2005/2006 dredging were at 300 feet and 600 feet downstream. The 2005/2006 monitoring indicated that background turbidity was lowest at the confluence of the Snake and Clearwater Rivers and increased farther downstream in the Snake River. During dredging at the Port of Clarkston, at 300 feet downstream and 3 feet above the substrate, turbidity levels exceeded standards (greater than 5 NTU above background, which is the point of compliance for Washington State water quality standards) by an average of 4.58 NTUs (totaling 9.58 NTUs above background), 11.6 percent of the time; and at 3 feet below the surface, an average exceedance of 2.62 NTU (totaling 7.63 NTUs above background) occurred 1.8 percent of the time. At 600 feet downstream, the shallow probe turbidity values exceeded compliance levels (more than 5 NTUs above background) 20 percent of the time, with an average of 3.87 NTU (8.87 NUTs above background). The deep probe exceeded compliance levels 35 percent of the time, with an average of 5.84 NTU (10.84 NTUs above background) (BA). During previous dredging and disposal efforts, turbidity levels occasionally ranged from 6 to 15 NTUs above background for several hours at a distance of 900 feet downstream. The majority of the time during dredging activities, turbidity remained within 5 NTU over background.

Sediment plumes generated by activities under the PSMP will not typically span the width of the river; therefore many bull trout may be able to move out of, or choose to not move into, the sediment plumes created by instream work activities. For those bull trout that move out of the plume, there will be relatively minor sublethal effects such as avoidance and disruption of normal behavior, including feeding. However, some bull trout may move to cover, or move lower in the water, instead of leaving the turbidity plume and therefore be exposed to the suspended sediments. Suspended sediment and turbidity levels where adverse effects from suspended sediments may occur to salmonids are listed in Table 10. The highest concentrations of suspended sediment (represented as NTUs) in previous dredging in 2005/2006 was 33 NTU (28 NTU over background) at a distance of 300 feet downstream from the sediment source. At some distance less than 300 feet from the sediment source, suspended sediment concentrations are likely to reach levels where sublethal effects might occur to fish that do not move out of the sediment plume.

The Service received the 2005/2006 monitoring data for turbidity levels that exceeded the 5 NTU threshold, and ran the Newcombe and Jensen (1996) analysis. At both the 300 feet and 600 feet monitoring stations, increased turbidity levels resulted in SEV of 3 to 6. These SEV levels indicate behavioral and sublethal effects ranging from abandonment of cover, avoidance response, short-term reduction in feeding rates and success, and moderate physiological stress with increased coughing and respiration rates. As described above, an SEVof 6 indicates adverse effects to adult bull trout, through causing moderate levels of physiological stress. The Service expects that future dredging and disposal actions under the PSMP will result in similar adverse effects to bull trout within 900 feet of all dredging and disposal activities. Adverse effects to bull trout are expected when turbidity levels exceed any of the following levels:

- When NTUs exceed 62 NTUs at any time, or
- When NTUs exceed 41 NTUs for up to 1 hour, or
- When NTUs exceed 17 NTUs for up to 3 hours, or
- When NTUs exceed 8 NTUs for up to 7 hours.

The majority of suspended sediment generated by activities under the PSMP would come from dredging and in-water disposal. Dredging activities under the proposed action are likely to cause a similar range of turbidity and suspended sediment as occurred in previous dredging in the same general area. Plumes of suspended sediment will be generated from excavating, dumping, and shaping deposited sediment. Suspended sediment will cause turbidity immediately when activities commence, and persist up to several hours after activities cease.

The PSMP prescribes a number of techniques to minimize turbidity effects resulting from project operations, including monitoring turbidity levels and modifying dredging operations to avoid prolonged negative effects. However, similar measures were also implemented for the 2005/2006 dredging and disposal actions, and turbidity levels exceeded State water quality standards (BA). Furthermore, as stated in the environmental baseline, the winter work window is the more likely time for bull trout to be present within the action area.

Project-level impacts associated with turbidity resulting from proposed in-water work would be temporary and would be expected to last for various lengths of time and affect various spatial footprints within the action area depending on the specific activity and its extent (see Table 6 summarizing the proposed action). The proposed dredging and disposal operations would be expected to create detectable turbidity plumes for considerable distances downstream from active work sites for the duration of the activities and for roughly one hour after activities stop, based on estimated travel times and dilution rates of the plumes. Schroeder (2014) used the monitoring data to model a worst case suspended sediment scenario for in-water placement of dredged materials (i.e., 1,950 feet for turbidity to attenuate to levels below 5 NTSs). For dredging, Schroeder 2014 anticipated that the turbidity plumes created would not exceed 5 NTUs beyond 3,000 feet downstream or 450 feet laterally (under the worst case scenario) within the river channel below any work zone at any one time. These dimensions would equate to roughly 30 acres of affected surface area that would extend to the riverbed; this area would move as the dredge moves. Based on the data collected during dredging in 2005/2006 and the estimated levels and duration that would cause behavioral, sublethal or lethal effects to bull trout, it is expected that turbidity levels within 900 feet of a dredge would increase at least to levels that will cause behavioral responses (alarm, avoidance, abandonment of cover) in adult and subadults that are within the turbidity plume, and potentially higher turbidity levels that cause sublethal effects and physiological stress (Table 10).

Based on the modeling provided by Schroeder (2014), and the 2005/2006 monitoring data, it is likely that any bull trout remaining in the turbidity plume during either dredging or disposal activities may be exposed to turbidity levels and suspended sediment that cause adverse effects up to 900 feet downstream of the dredging or disposal activities. At closer locations to the dredging site, it is likely that bull trout remaining in the plume would be exposed to higher levels of suspended sediment, resulting in sublethal adverse effects.

For in-water disposal of sediment (in deeper waters), the numbers of bull trout exposed will likely be higher, since adult bull trout prefer cooler, deeper waters.

Upland disposal would not be limited in timing, and the Corps would have to meet State water quality standards if there would be effluent; however, the effects to bull trout would depend on location, distance from the river, disposal site design, and other details that would vary from action to action. All site specific actions would be evaluated in a second-tier consultation.

Some activities conducted under the PSMP may be implemented in the summer in recreation and fish and wildlife mitigation sites when water temperatures are elevated, and bull trout are less likely to be present in shallow water during the daytime. The Corps anticipates removal of up to 15,000 cy, or agitation (resuspension) of up to 500 cy, in these areas. During the summer, in-water disposal of dredged sediments will not occur. In these instances, where the water is warm, and the quantities and duration of dredging are small, bull trout may be less likely to be exposed to the activities, however this will vary with the locations and design of future site-specific consultations.

Sediment plumes generated by actions implemented consistent with the PSMP would not be expected to span the entire width of the river; however, drawdowns would be an exception, with channel-wide turbidity likely. However, this drawdown would occur during runoff when background turbidity is already relatively high, and any additional adverse effects as a result of the drawdown would likely be small and difficult to discern.

In summary, the typical winter work windows in the Snake River were developed mainly for anadromous fish, and are not expected to minimize impacts to the bull trout that use the Snake River for foraging, migration, and overwintering. While densities of bull trout are likely to be low, their distribution in the winter is not well known. Typical salmon and steelhead monitoring and capture facilities, including ladders, are not operated or monitored through the winter. Bull trout migrate large distances, and may occur in likely dredging or disposal areas in the winter. The larger impact PSMP activities, including the predicted flow conveyance dredging (1,000,000 cy/year for the first 10 years for a duration of 77 days, then 500,000 cy/year thereafter), or the navigation dredging (500,000 cy for a duration of 77 days every 3 years) and the likely in-water disposal associated with these dredging activities, may expose low numbers of bull trout to the effects of suspended sediments. The Service expects adverse effects to bull trout to occur within 900 feet of dredging and disposal activities. Those levels of turbidity are likely to result in adverse sublethal effects to bull trout that, based on the process described USFWS (2010) is likely to result in a severity level of 6. Based on the above information and the results of monitoring that has occurred during past dredging and disposal operations, the Service does not expect that bull trout will be lethally affected from turbidity. However, various sublethal effects, including behavioral responses, and physiological stress, would be expected to occur to any bull trout that may is present and remain within the turbidity plumes. The long duration (up to 77 days) during the winter period when bull trout may be in the area, the annual repetition of the activities, and the large quantities of dredging or disposed material that may cause suspended sediments, makes the exposure of bull trout reasonably certain to occur despite the low densities of bull trout within the action area. The number of bull trout likely to be exposed is low. Bull trout are very mobile and we anticipate most migratory bull trout will move away from areas of turbidity and suspended sediments. Therefore, impacts to bull trout are not anticipated to measurably reduce numbers, reproduction, or distribution of the species in the action area.

Chemical Contaminants

Numerous chemical contaminants can be found in Snake River and Clearwater River sediments. The contaminants can become resuspended in the water column when sediments are excavated, disturbed, or deposited. The Corps identified PAHs, organophosphates, chlorinated herbicides, ammonia, oil, grease, glyphosate, AMPA, dioxin, heavy metals, and others as potential contaminants that have frequently been found in Snake River sediments. Contaminants found in sediment deposits can become re-suspended in the water column when sediments are excavated or deposited. Contaminants may be bound to sediment particles to varying degrees by sorption to the sediment particles, and particularly with organic materials in the sediment. Contaminants that remain attached to sediment particles will be in the water for only brief period lasting no more than several hours. Contaminants that separate from sediment particles will remain in the water column for widely varying amounts of time that vary with factors such as the particular chemical, temperature, discharge, and the amount of suspended organic material in the water column.

Dredging and disposal operations can mobilize chemical-laden particulates in the water column and result in substantial re-suspension and redistribution of a variety of chemicals. Containment of the sediments is not possible because of the extent of area, depth, and flow. The concentration of chemicals of concern in the water column could increase along with suspended sediments if the sediments in the action area contain elevated concentrations of chemicals of concern. This would increase the exposure of salmonids, and their prey species to these toxins. In addition, disturbance of the substrate could increase contaminant concentrations by resuspending particulates, thereby allowing more chemicals of concern to dissolve into the water column.

At a programmatic level, specific effects of toxic chemicals cannot be evaluated in detail since the occurrence of chemicals in sediments varies unpredictably from site-to-site and year-to-year, and the effects of the chemicals on listed fish depends on the specific chemicals and their concentrations. Thirty-seven chemicals of concern have been identified in sediments found in rivers in the Pacific Northwest (USACE et al. 2013). These chemicals may be toxic to aquatic organisms at certain concentrations. For each of these chemicals, maximum allowable sediment concentrations (screening limits) have been established at levels that approximate thresholds where fish are likely to experience adverse physiological effects. Screening levels are used to determine if sediment samples contain sufficient levels of contamination to warrant further investigation on their toxicity. Application of the screening criteria is likely to prevent outright lethal exposures, but various sublethal effects may occur below the screening thresholds. Fish that experience sublethal effects from contaminants may have an increased vulnerability to predators, or suffer from physical impairments that may reduce growth rates, reproductive success, or survival. Fish exposed might also recover from the effects of sublethal exposures with little consequence when they are no longer exposed to contaminants. In addition to being exposed to contaminants in the water columns, fish can be exposed to contaminants through the food they eat. Exposure to contaminants through the food chain can sometimes have serious implications for salmonid health and survival if they consume prey that is contaminated with chemicals that bioaccumulate or if a significant portion of the food base is lost when contaminants kill prey species.

Recent studies have shown that low concentrations of commonly available pesticides, herbicides, insecticides and fungicides, can induce significant sublethal effects on salmonids. Exposure to sublethal levels of chemicals of concern could result in effects on health and survival. NMFS (2008b; 2009; 2010; 2011b; 2012) reviewed scientific literature and conducted analysis on the effects of more than 25 pesticides, herbicides, insecticides and fungicides on salmonids and identified a wide range of sublethal effects, including: impaired swimming performance, increased predation on juveniles, altered temperature selection behavior, reduced schooling behavior, impaired migratory abilities, and impaired seawater adaptation. Bull trout in the action area are not anadromous, so impaired seawater adaptation is not anticipated. Bull trout are otherwise likely to react similarly to other salmonids.

Bioaccumulation and related effects are of concern, as pollutants can reach concentrations in higher trophic level organisms (e.g., salmonids) that far exceed ambient environmental levels (Meador et al. 2004; Meador et al. 2006; Meador et al. 1995). Bioaccumulation may therefore cause delayed stress, injury or death as chemicals of concern move from lower trophic levels (e.g., benthic invertebrates or other prey species) to predators long after the chemicals of concern have entered the environment or food chain. The result is that some organisms may experience adverse effects of some chemicals of concern even while the regulatory thresholds are met when measured in surface water or sediments, although these may be more accurately described as indirect effects.

Other non-pesticide compounds that are common constituents of urban pollution and agricultural runoff also adversely affect salmonids, and likely similarly affect bull trout. Exposure to metals, chlorinated hydrocarbons and aromatic hydrocarbons causes olfactory inhibition, immunosuppression and increased disease susceptibility (Arkoosh et al. 1998; Baldwin et al. 2003; Meador et al. 2006; Sandahl et al. 2007; Sprague 1968). Ammonia is present in the aquatic environment due to agricultural run-off and decomposition of biological waste and can be toxic to fish, especially when the pH is relatively high (above 7.5) as is the case in the Snake River (Dixon Marine Services 2006). However, the ammonia concentrations determined during the 2005-2006 dredging indicates that levels remained below the current Environmental Protection Agency (EPA) standards (2009), Additionally, ammonia does not have bioaccumulation potential common to fat soluble organic compounds.

It is uncertain how or whether the PSMP activities may actually redistribute potential contaminants within the action area. In-water disposal operations would involve dumping the dredged sediments directly from a barge into the river, which would redistribute any potential contaminants from the original dredging sites. Most of the potential contaminants of concern are bound to the finest particulates (i.e., silts), which are more likely to move over time with river flows. The proposed action includes procedures to sample sediments for presence of 37 chemicals of concern before dredging or excavation begins. The procedures are described in the

Dredged Material Evaluation and Disposal Procedures User Manual (Corps et al. 2013) and sediment evaluation framework (RSET 2009). Under these procedures, sediments are screened for the presence of “chemicals of concern,” which is a list of chemicals that are potentially toxic to aquatic organisms and which have either been found previously in sediments or have known sources in the Pacific Northwest. If contaminants exceed screening levels in the RSET (2009) framework (or subsequent updates), bioassays and water column samples would be required. These additional tests ensure that sediments used for in-water disposal would not contain chemicals of concern at levels that are known to be harmful to listed fish. Some risk of toxic effects still exists from chemicals that are not detected or which cause toxic effects that have not been recognized. If the sediment sampling and analysis results showed the sediments had unacceptable concentrations of chemicals of concern that would preclude using unconfined in-water disposal, the Corps would either not dredge the area or would pursue an alternate acceptable disposal method.

As an example, sediment samples were most recently taken in 2013. The Corps tested for the presence of over 200 compounds in the sediments proposed for the 2014/2015 dredging action near the confluence of the Snake and Clearwater rivers (BA). Typically, contaminant concentrations in past sediment samples have been below screening criteria, with the exception of phenol and 4-methylphenol in recent samples. The presence of these chemicals at concentrations above the screening limit in 2013 triggered additional sampling and several bioassays. The samples were tested for toxicity using a 10-day *Hyalella azteca* survival test and the 20-day *Chironomus dilutus* survival and growth tests. These additional efforts indicated the chemicals would be unlikely to harm listed fish. Similar steps would be taken for any chemicals found in the future.

In addition to potential resuspension of contaminants, there is a potential for chemical contamination from spills or leaks from vessels or machinery used during activities. Operation of equipment requires the use of fuel and lubricants, which, if spilled into the channel of a waterbody or into the adjacent riparian zone, can injure or kill aquatic organisms. Petroleum-based contaminants contain poly-cyclic aromatic hydrocarbons (PAHs), which can be acutely toxic to salmonids, including bull trout, at high levels of exposure and can cause lethal and sublethal chronic effects to other aquatic organisms (Neff 1985). Because of the nature of operating large equipment near water or on a barge, which is floating on the river, an accidental discharge could occur. Long-term effects could also result if a spill was not properly remediated. The Corps will include conservation measures including that all over-water construction vessels would be fueled at existing commercial fuel docks. Such facilities have existing spill prevention systems in place that would be adequate to avoid spills or immediately address any accidental spills that might occur. Equipment will be inspected and cleaned prior to any instream work. The only potential sources of contaminants at the construction sites would be the construction equipment itself (lubricating oils and fuel). Implementation of standard BMPs associated with this type of work reduces the likelihood of a spill to a level that is not reasonably certain to occur.

In summary, the bull trout is likely to have similar effects from chemicals or contaminants as other salmonids. Although past sediment sampling has not discovered high levels of contaminants, it is possible that future PSMP measures may expose or resuspend contaminated sediments. The Corps proposes to conduct sediment sampling before dredging, and if elevated levels are found will design the action to minimize the likelihood of resuspension. Specific locations of future PSMP actions are not known, and potential future sediment contaminant levels are not predictable. Therefore, the magnitude and likelihood of adverse effects to bull trout from resuspension of contaminants are difficult to predict at this time. The Corps will conduct second-tier consultations on site-specific actions to ensure that potential effects from contaminants are fully evaluated. Given implementation of the conservation measures such as sediment sampling, and the Corps' commitment to either not dredge the area or pursue an alternate acceptable disposal method when necessary, impacts to bull trout are not anticipated to measurably reduce numbers, reproduction or distribution of the species in the action area.

Risk of Injury, Entrainment, or Burial

Equipment used for dredging, excavation, placement of materials in the river, and sediment agitation can potentially injure or kill fish from trauma. Entrainment of fish by dredging equipment may occur if fish are trapped during the uptake of sediments and water by dredging machinery, which can cause injury or death. The use of hydraulic dredging could entrain fish, but this activity would be limited to small quantities in recreation or fish and wildlife mitigation sites and likely during the summer, when water temperatures would make the occurrence of listed fish less likely.

The Corps anticipates that nearly all dredging occurring during winter would be completed using a clamshell dredge. Due to the characteristics of this equipment, clamshell buckets are not likely to injure or entrain fish. Mechanical dredges do not have the capability to entrain fish since there is no tractive force to draw fish toward the dredge, but organisms with poor swimming ability can be scooped up by mechanical equipment. Specifically, under typical operating conditions, a clamshell bucket descends to the substrate in an open position and ascends to the surface in a closed position. During descent, the bucket cannot entrain a mobile organism because it is entirely open. The force generated by the descent of the bucket drives the jaws into the substrate. Upon retrieval, the jaws fully close to contain the sediment. Direct effects from the use of a clamshell dredge are possible, but not very likely.

The probability of entrainment or accidental capture of fish is largely dependent upon fish densities, the likelihood of fish occurring within the dredging prism, dredging depth, the entrainment zone, location of dredging within the river, equipment operations, time of year, and the species' life stage. A considerable amount of splashing, noise, and movement of equipment in and out of water occurs each time a scoop or bucket is dropped into the water and pulled back to the surface. The disturbance caused by operating a mechanical dredge is likely to elicit a startle response in salmonids that are in the vicinity of the dredge and also discourage more distant fish from moving toward the dredge site. Suspended sediment created by the dredging is also likely to discourage fish from approaching the dredge equipment since the initial response of a fish to increased levels of suspended sediment that is described by Newcombe and Jensen (1996) is to move away from the source. A plume of suspended sediment would surround the dredge equipment and act as a deterrent to fish. In addition, the limited dredging area compared to the total area of the river available for fish to move into when the disturbance starts at each site lowers the likelihood of fish entrainment.

In-water disposal of dredge spoils can bury aquatic organisms or expose them to extremely high concentrations of suspended sediment if materials descend too rapidly for the organisms to escape. Past dumping of dredged material showed the material tended to fall to the river bottom in a clump rather than disperse. Clumped material falls rapidly and entrains water during descent. Fish and other aquatic organisms can be entrained in the falling sediment and become buried if they do not quickly move away. Drabble (2012) investigated the potential for disposal of dredge materials to bury marine organisms, and found that organisms vulnerable to burial consisted primarily of those that live near the bottom and use sediment as a form of cover, such as flatfish and Pacific sandlance. The same principle was also described by Nightengale and Simenstad (2001) who noted that juvenile white sturgeon in the Columbia River were susceptible to burial by in-water sediment disposal due to their small size, limited swimming ability, and tendency to physically rest on the stream bottom.

Direct effects to bull trout from the use of dredging equipment are possible, but not reasonably certain to occur. The probability of entrainment is unlikely because of the low numbers, distribution, and mobility of bull trout. Bull trout in the vicinity will likely avoid the disturbance or in-water dredging/disposal activity, so the likelihood of one being trapped or killed is low. Adult or subadult bull trout that may be in the action area during these activities have relatively high swimming speeds that enable them to rapidly escape when they are alarmed, and they do not rest within the sediment or use sediment as a form of cover. It is possible, yet very unlikely, that bull trout near the riverbed could be injured or killed as the jaws of the bucket descend and contact the substrate. It is also unlikely that they would become entrained in the bucket as it closes prior to ascending. Likewise at the disposal site, it is possible that bull trout in the immediate area could be engulfed and injured or killed as barge loads are released and the materials descend through the water column, or they could be injured or killed by equipment during final contouring operations. These potential effects would be most likely to occur just as operations begin at a given work site, as any bull trout that may be present could be expected to avoid the immediate area of disturbance once operations are underway. Given their low densities in the Snake River and the expectation that they will move away from noise and equipment, bull trout are unlikely to be directly entrained, injured, or buried during dredging or disposal activities.

General Noise or Disturbance Effects

Vibrations and pressure variations from noise that are above background levels cause a startle response in fish (Eaton et al. 1977). The burst of movement when a fish startles has little direct effect other than the energetic cost from the movement (Barton and Schreck 1987), but there may also be indirect effects. When a fish is forced to move from a preferred location, it could become more vulnerable to predation or encounter conditions in the new environment that are less favorable for growth and survival (Railsback et al. 1999). Instream operation of machinery for dredging, filling, and installation of structures creates a zone where noise disturbance is likely to displace bull trout from the zone, and prevent them from returning until activities are completed. Disturbances caused by noise and use of equipment in the water are likely to be startle bull trout, and prompt them to move away to avoid the disturbance, and if the noise continues to either adjust to the noise or to stay away during the noise.

Dredging activities also generate underwater sound pressure levels (SPLs) that could elicit responses in some fish (Hastings and Popper 2005). The intensity of SPLs from dredging activities can be quite variable. The SPLs associated with actions occurring under the PSMP are likely to be in the range of 112 to 160 dB (BA). These sound intensities may influence organism behaviors or perceptions, but would be unlikely to cause physiological damage (Nightingale and Simenstad 2001, BA).

In a large river such as the lower Snake or Clearwater River, bull trout or their prey (such as juvenile salmon) displaced from dredging or filling sites can easily move laterally to avoid the disturbance instream work activities since the disturbance zone would not span most of the channel. The effects of moving to a different area are likely to be benign since habitat features within any given reach are similar throughout the action area, and fish would not need to swim far to find similar habitat. Carlson (2001) found that fish displaced by dredging in the Columbia River resumed normal positions and normal behavior within a short time after moving. A brief disruption in feeding and energy expenditures from moving from one spot to another is unlikely to have any lasting effect since fish are not stationary in the absence of a disturbance, and feeding rates and energetic demands are relatively low to begin with. The observations by Carlson (2001) indicate that fish are unlikely to incur significant energetic costs to avoid a dredge and find suitable habitat, and the physical characteristics of large rivers make it likely that fish can move to an area that does not meaningfully differ from their initial position.

Dredging, in-water sediment disposal, and installation of structures are proposed activities that are likely to create zones where noise or equipment operation may disturb fish, and for some PSMP activities may occur for all or most of the winter in-water work window (December 15 to March 1). Dredging operations generally produce sound energy that often lasts around the clock for extended periods of time (Nightingale and Simenstad 2001, USACE 2004). Dickerson et al. (2001) examined sound levels from bucket dredging in Cook Inlet, Alaska, and found the peak sound level to be 124 dB at a distance of 150 meters from a dredge. Sound levels attenuated to background levels at a distance of more than 1,000 meters. Around-the-clock dredging activities could have some behavioral effects to salmonids such as bull trout in the Clearwater River and Snake River in close proximity to dredging operations if activities exceed 150 dB. Chinook salmon start to show onset of physiological effects from pile driving sounds when the cummulative Sound Exposure Level (SEL_{cum}) exceeds about 183 dB (Halvorson et al 2012; WSDOT 2014), and bull trout are likely to react similarly. Therefore, the PSMP dredging activities are not expected to generate sound levels capable of harming bull trout. It is likely that individuals will move away from in-water activities while dredges are operating, and fish exposed to these sound levels might alter feeding while they seek suitable habitat. The significance of this avoidance behavior will vary based on duration, frequency, and specific location of these disturbance zones. Generally, however, actions are not anticipated to significantly disrupt normal behaviors because suitable foraging habitat is not limiting in the action area. In addition, activities conducted pursuant to the PSMP at the dredging sites within the Federal navigation channel would add to the existing amount of human-generated noise and activity at these sites, both in the main river channel and near the shoreline. In addition, project barges and dredging equipment could remain in one area for up to several days, as opposed to the transitory presence of most existing boat and barge traffic at the confluence of the Snake and

Clearwater Rivers. However, the existing boat and barge traffic in the dredging areas near the Ports of Clarkston and Lewiston currently generate considerable noise and human activity on a regular basis. Dredging activities would take place at these already impacted sites, would be confined to the immediate area where work is occurring for several days at a time, and would be expected to contribute only minor amounts of additional disturbance within the broader area of the confluence. For in-water disposal activities, each barge and its tug would typically only remain at the site for about 20 minutes, as the barge is unloaded, with up to four barges per day during the work window (Table 4, and Schroeder 2014) similar to existing transitory boat traffic in this area, whereas equipment and personnel could remain at the disposal site for over a week during final contouring operations.

Structural measures may also result in noise levels that lead to adverse effects, but the degree of adverse effects will vary based on design, location, and construction techniques and effects. Depending on duration, level of noise, and other site-specific factors, the consequence of that avoidance may include a significant disruption of normal behaviors. Boats, personnel, equipment used to perform redd surveys, and surface operations of barges associated with PSMP activities would be expected to create only minor amounts of disturbance in a specific area or while in transit. The action area is already subject to other shipping, boating, and shoreline activity. Operation of the dredging equipment would be expected to create a moderate amount of disturbance at each dredge site. Potential disturbance effects during the dredging operations would be of short duration and limited to the immediate area surrounding the barge to the river bottom, while the broader river channel with similar available substrates would remain undisturbed, and represent foraging habitats, migration areas, and refugia for the bull trout.

The magnitude of disturbance from noise due to structural measures (such as bendway weirs dikes/dike fields, or agitation to resuspend) is less predictable. The intensity and duration of such disruptions or construction methods are difficult to predict without site-specific information. However, it is expected that most activities would result in temporary disturbance, but adjacent habitat would remain nearby to provide foraging, migration, and refugia areas for bull trout. Therefore impacts to bull trout are not anticipated to measurably reduce numbers, reproduction or distribution of the species in the action area. Site-specific effects to bull trout will be fully evaluated in subsequent second tier consultations conducted under the PSMP.

Effects to foraging habitats and prey base

As described in the Status of the Species (Appendix A) bull trout are opportunistic feeders, with specific food habits primarily a function of their size and life-history strategy. Resident and juvenile migratory bull trout feed on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987, p. 58; Goetz 1989, pp. 33-34; Donald and Alger 1993, pp. 239-243). Subadult and adult migratory bull trout feed on various fish species (Leathe and Graham 1982, p. 95; Fraley and Shepard 1989, p. 135; Donald and Alger 1993, p. 242; Brown 1994, p. 21). Bull trout of all sizes, other than fry, have been known to eat fish as large as half of their own length (Beauchamp and VanTassell 2001). Much of the discussion below addresses salmonid juveniles because much of the literature regarding fish in the action area is based on anadromous fish, and because juvenile salmonids provide a prey base for the bull trout. However, bull trout are opportunistic predators, and will prey upon other fish species. In their surveys of Chinook salmon use of shallow water habitats in the Snake River outside of winter, Tiffan and Connor (2012) also documented numerous other fish species use the shallow water habitat during all seasons.

Activities conducted under the PSMP will involve dredging and sediment disposal activities, as well as structural activities, such as weirs and dikes that would involve disturbance of the river bottom. The temporal extent of disruptions to benthic forage availability during and following dredging, in-water disposal, or construction of structures could last from a few days to a few months in any one location.

Streambed disturbance from dredging, filling, and installation of structures will alter the invertebrates that live in and on the river bottom. Dredging and filling will cause temporary reductions in benthic invertebrates by crushing, covering, or dislodging them (Harvey 1986; Harvey and Lisle 1998). Where structures are installed, the structures would bury or displace benthic invertebrates living in the footprint of the structure. However, the structure itself would create a different type of habitat for invertebrates. Structures would generally be composed of much larger rocks that are present in the substrate and a 3-dimensional rock structure creates a more structurally-diverse environment than is found in places where sediment accumulates above Snake River reservoirs. The increased structural complexity and increase in particle size may allow a greater number of invertebrate species to use the area since aquatic invertebrates specialize in different types of substrate (Wallace and Webster 1996). Structures may also change local invertebrate production, but the precise effect would depend on the physical characteristics of the structure. Structures would be unlikely to have a significant effect on invertebrate production beyond the area occupied by the structure itself and adjacent areas where the structure may alter water velocity and flow direction.

The primary effect of PSMP activities on the substrate is dislodging benthic invertebrates, and moving sediment from dredge locations to the disposal sites. The dredging will not change the substrate size composition since the sediments that remain will likely be the same size as the sediments that were removed, and dredge sites are depositional areas that will likely continue to accumulate similarly-sized sediments in the future. Benthic and epibenthic organisms at a dredge site would likely suffer some level of mortality because of dredging. Recovery of the benthic invertebrates would occur within a few months. If dredged material is placed in-water for beneficial use some benthic organisms may survive the transfer and placement of dredged material to a new location.

Plankton and benthic organisms immediately downstream of a dredging site would likely be adversely affected due to increases in local turbidity and redeposition of suspended sediment. Increased suspended sediment can affect feeding of benthic and pelagic filter feeding organisms (Parr et al., 1998), and the settling of the suspended particles can cause local burial, affect egg attachment, and modify benthic substrate. Adverse effects to the benthic habitat would be minor and localized. Some minor changes in the species composition and relative abundance of the benthic fauna are likely, because of combined effects of changes in substrate conditions as well as water currents from increasing the depth in the dredged area.

Benthic species with planktonic larval stages or species that move into the water column from the substrate (e.g., Corophium species and chironomids) are expected to rapidly recolonize an in-water dredged material placement site within a few weeks. Less mobile species such as oligochaete worms would be expected to recolonize within a few months (Seybold and Bennett 2010; Bennett et al., 1990, 1993a, 1993b). The dredged material placement site at Knoxway Bench (RM 116) was quickly colonized by benthic macroinvertebrates, and the total density of invertebrates was consistently high during both fall and spring (Seybold and Bennett 2010) after placement. Thus, placement of dredged material for in-water habitat creation would have no lasting adverse effects on populations of benthic species. Other beneficial use of dredged material that involved in-water placement would be likely to have similar effects on plankton and benthic organisms, if it involved placement in similar locations and quantities. Beneficial use of dredged material that involves upland placement would be unlikely to have direct effects on plankton or benthic organisms.

Even though availability of benthic invertebrate species will be reduced in dredge and fill areas, the alteration may have little effect on salmonid feeding, including bull trout. Benthic invertebrates are not a significant part of the diet of salmon and steelhead smolts and Chinook salmon subyearlings, though other bull trout prey species may rely on those benthic invertebrates. In Columbia River reservoirs, Rondorf et al. (1990) found that subyearling Chinook salmon fed mostly on planktonic *Daphnia spp.* and terrestrial insects. In another study, Bratovich and Kelley (1998) found that 97 percent of the food items eaten by steelhead smolts in the estuarine portions of Lagunas Creek, California, were planktonic *Neomysis* shrimp. The availability of planktonic invertebrates will not be affected by disturbance of the substrate; therefore, the temporary reduction in benthic invertebrates at dredge and fill sites is likely to cause no more than minor changes in feeding and food consumption by Chinook salmon or steelhead, and therefore the salmon and steelhead subyearlings will continue to be available as bull trout prey.

During construction activities, benthic invertebrates within the structure construction zones would either be displaced or suffer mortality. Mobile organisms such as crayfish could escape construction activities, while immobile organisms living in the substrate would be killed. Their loss would be of a short-term nature because the area of impact would be repopulated rapidly by organisms such as larvae of mayflies, caddis flies, and midge larvae that drift with the stream current and readily recolonize disturbed areas.

The benthic invertebrate populations within the disturbed areas will be absent until the new surface layer is recolonized. The level of activity in the navigation channel and the berthing sites will influence the development of a healthy benthic community at the project sites, and the effects to benthic productivity and availability of prey items will last at least several months after in-water work is completed. The disturbance to the benthic community will not alter feeding opportunities for salmonids in the river as a whole. Even if the benthic invertebrate population in the disturbed area is being used by bull trout prey species, the disruption to this food source will cover a relatively small area, and will be limited to a few months after activities are completed (Barton and Dwyer 1997; Fowler 2004; Linton 1998).

Construction of bendway weirs or dikes for navigation would adversely affect benthic organisms that inhabited the site prior to the beginning of construction. After construction, as sediment accumulates between the weirs, recolonization is likely to occur. However, changes in the hydrology and sediment accretion could preclude the site from returning to its preconstruction benthic community. This could be beneficial in cases where the preconstruction conditions held poorly populated benthic communities. The accumulation of new sediment could allow the colonization of these areas and therefore benefit primary productivity and the food web. Construction of bendway weirs or dikes for navigation would have little discernible effect on plankton in the reservoirs. Localized effects could include temporary displacement from the construction sites and potential reduced feeding ability from increased suspended sediment during construction. The construction of the bendway weirs or dikes themselves would have less impact on the benthic community than the scouring of the river channel that would occur after the dikes are in place. These effects would include portions of the navigation channel scoured as a result of the dikes where benthic organisms reside. Changes in flow patterns for both bendway weirs and dikes could redistribute planktonic organisms to other areas, but little effect on abundance would occur. For non-mobile organisms such as benthic invertebrates and plants, the process would result in their dispersal with the agitated sediment, and deposition downstream. If the sediment contained organic materials in an anaerobic state, resuspension would increase the biological oxygen demand and depress dissolved oxygen (Johnson 1976).

For flow conveyance, the Corps would consider trapping upstream sediment, modifying flow regime to flush sediment, and raising the Lewiston levee to manage flood risk. Trapping upstream sediments would require excavation (dredging) of an in-stream sediment basin where sediments could be trapped and stored. A sediment trap would need to be periodically dredged to remove accumulated sediments. Initial excavation and periodic dredging (and associated dredged material management) would have similar effects on plankton and benthic organisms as described above. Trapping upstream sediment would cause loss of aquatic plants if they were present within the sediment trapping area, initially during excavation and later during periodic dredging of the trap. Excavation, dredging, and dredged material management associated with development and maintenance of the trap would cause turbidity increases during those activities, which could have adverse effects on aquatic plants in surrounding areas.

System management actions to maintain navigation would have differing effects on the aquatic environment. Plankton and benthic organisms would be affected most by drawing down the reservoir due to depth changes, and potential temporary drying out of shorelines. Relocation of facilities could also affect benthic species by removal or burial. During modified flow regimes to flush sediments, submerged aquatic vegetation could be adversely affected by transported sediments scoured from the navigation channel burying plants. During construction activities associated with reconfiguring or relocating facilities, localized areas may experience submerged aquatic vegetation losses, but would not affect overall population assemblages.

Implementation of the PSMP will increase shallow water habitat by using dredged material to create shallow, near-shore benches. Shallow water habitat is heavily used by juvenile Chinook during the spring and summer in the Snake River and by other fish species in all seasons (Tiffan and Connor 2012; Tiffan and Hatten 2012). With inundation by dams, much of the shallow, near-shore habitats that existed in the free-flowing river are gone. For example, currently, greater than 90 percent of the habitat in Lower Granite reservoir is considered either mid-depth (20 to 60 feet) or deep water (greater than 60 feet) (Tiffan and Hatten 2012). Creation of additional shallow water can benefit salmonids and other fishes increasing the availability of suitable resting, rearing, feeding, and predator avoidance habitat. A recent study by Tiffan and Connor (2012) of four shallow water habitat areas (including Knoxway Bench disposal site) found wild fry and parr present within all four sites from early spring through early summer, and parr were more abundant than fry. Mean spring and summer apparent density of wild subyearlings was over 15 times higher within the six feet or less depth interval than within the six to 20 foot depth interval. Surveys were not conducted in a manner that could detect changes in survival, growth, or productivity. In-water placement of dredged material for creation of beneficial shallow-water habitat can increase the abundance and availability of benthic macroinvertebrates. With the exception of oligochaete worms, density of benthic organisms decreases with depth (Pool and Ledgerwood 1997). Bull trout likely use these shallow water habitats for feeding during the night (Jakober et al. 2000, Al-Chakhachy and Budy 2007, Muhlfeld et al. 2012), and use the deeper habitats with cover during the day.

Bull trout use the Snake and Clearwater Rivers for foraging, and the prey base includes juvenile and sub-adult anadromous salmonids and other fish. In turn, many of the potential prey species of bull trout likewise depend on abundant benthic and planktonic organisms for food, which are supported by the sandy and silty substrates (Bennett and Shrier 1986, Curet 1994). Populations of these invertebrates, along with the fish that depend on them for food, are likely to be locally reduced or displaced during and immediately following dredging and disposal operations, potentially impairing the feeding behavior of bull trout. Implementation of PSMP measures include, but are not limited to the predicted flow conveyance dredging (1,000,000 cubic yards/year for the first 10 years for a duration of 77 days, then 500,000 cubic yards/year thereafter), or the navigation dredging (500,000 cy for a duration of 77 days every 3 years) and the likely in-water disposal associated with these dredging activities. The effects to the benthic prey and food web would be from both the dredging of sediments and the in-water disposal of sediments. However, as these benthic communities typically occupy habitat types that are prone to disturbance under natural conditions, they would be expected to recolonize the dredged areas and disposal site within several months following the operations through dispersal from adjacent undisturbed areas (USACE 2012). Implementation of the PSMP may have short-term adverse impacts to the benthic habitat, and therefore to bull trout prey or the food their prey depends upon, and may temporarily displace bull trout from these feeding areas. Other nearby feeding areas would likely be available for their continued use, and bull trout may benefit from additional foraging habitats created in the shallow-water benches. Therefore the effects to bull trout are expected to be temporary, there are other foraging habitats available, and effects to bull trout are not anticipated to measurably reduce numbers, reproduction or distribution of the species in the action area. Site-specific effects to bull trout will be fully evaluated in subsequent second tier consultations conducted under the PSMP.

Altered Channel Morphology or Flows from PSMP Activities

The proposed action includes activities that would alter the physical characteristics of the channel by increasing or decreasing the depth and adding physical structures such as dikes or weirs. An increase in shallow, near-shore areas from in-water sediment disposal increases the amount of rearing habitat for subyearling salmonids and habitat for other fish, which provide forage for the bull trout. Areas with increased depth increase the amount of deeper pools that are used by smolt or other fish for cover and resting, and by bull trout for cover during the day. Deeper habitats are not limiting in the action area.

Structures such as weirs and dikes add physical complexity to the channel, which generally increases the local diversity or aquatic organisms and may also be used by one or more species of fish for cover. Changes of this nature may be beneficial or detrimental to bull trout and their prey, depending on the location, structural design, and size of the structure. In general, it is expected that these structures would provide both shallow and deep water habitats that may be used by bull trout. These details would be considered in future second tier consultations, and cannot be evaluated in detail at the programmatic level.

The beneficial use of sediment management could include several possibilities. For previous dredging material disposal actions, the Corps has beneficially used material to fill uneven ground at the Port of Lewiston and to create shallow water habitat for Snake River salmonids and other fishes. Shallow water habitat creation has been used several times by the Corps. Shallow water habitat is considered the most productive habitat in aquatic ecosystems (Wetzel 2001) and it is heavily used by juvenile Chinook salmon during the spring and summer in the Snake River (Tiffan 2013; Tiffan and Connor 2012; Tiffan and Hatten 2012), and by other fish in all seasons that may be preyed on by bull trout. There are numerous potential biological benefits of in-water sediment disposal for salmonids and other fishes. They include providing suitable resting, rearing, feeding, and predator avoidance habitat. Studies indicate that all of these benefits apparently exist at some level as predator abundances and predation rates are similar to natural, unaltered habitats, and juvenile salmonid fish usage is increased compared to other areas.

The various species of fish that occur in the action area may be attracted to or repelled from dredged areas in response to changes in water depth, substrate topography, or sediment coarseness. However, in a river system as large as the Lower Snake River, the physical changes at several dozen dredge sites are unlikely to significantly change the suitability of the habitat for any of the species in the action area, including bull trout. The dredge sites are relatively deep habitats with fine-textured substrate both before and after the dredging; consequently the character of the habitat is little changed. In-water sediment disposal results in a substantial increase in shallow rearing habitat for bull trout prey base, and may be used by bull trout for night time foraging.

PSMP measures including dredging for navigation or flow conveyance, or potential future sediment traps, will change depths in certain locations and potentially change flows, but flow and morphology also changes in natural rivers and bull trout should be able to adjust their movements accordingly. Because the rivers in the action area are very wide adjacent habitats are expected to be available adjacent during construction and dredging activities, and bull trout upstream or downstream movement should not be impaired.

In-water structures, reservoir drawdowns, or NORO would alter the flow characteristics of the river channel, which may affect the bull trout that uses the lower Snake River as a migratory corridor. Addition of structures within the river channel would alter localized flow patterns, depths, sediment, and disrupt or move local benthic communities. These changes would be within the vicinity of the constructed structures and may alter some of the specific routes within the river for migrating bull trout but would not impede their migrations, because flow velocities are expected to be similar to those that already occur in the river. The main effects of flow modification measures to the aquatic environment would be from changes in flow conditions, water levels, and sediment dispersion patterns. It is not expected that flow or channel morphology changes associated with PSMP measures would cause any migration or movement barriers to the bull trout. Bull trout are very mobile fish, and it is likely that structural changes will not affect their ability to move; therefore impacts to bull trout are not anticipated to measurably reduce numbers, reproduction or distribution of the species in the action area.

Other Effects

The reconfigure or relocate measures (such as relocating water intake structures or recreational boating facilities) associated with the PSMP may affect shorelines, uplands, or riparian habitats. It is likely that the impact will affect only a small portion of available riparian habitat or shoreline, based on the assumption that the facilities will impact a similar small portion of the shoreline as they do today. The effects would depend on the site-specific designs and locations and will be evaluated in second-tier consultations as appropriate.

Indirect effects from PSMP activities may occur if fish later respond to habitat changes from dredging and in-water sediment disposal by shifting their locations, their use of a habitat, or if the habit value is affected and through the effects of barge traffic that is enabled by the proposed action.

Maintenance of a navigation channel indirectly affects fish by enabling barges to continue certain uses of the river in the vicinity of the dredge sites. Without dredging, barge traffic would still exist, but the volume and pattern of barge traffic would differ. Navigation dredging enables some incremental portion of the barge usage to continue. Barge traffic can cause several physical effects that influence the characteristics of riverine habitats used by anadromous fish. Potential effects of barges include contaminants spills or leaks (such as fuels, oils, greases), generation of wakes and turbidity by moving vessels, and through creation of overhead shade when shipping vessels are moored. Small fish that are incapable of swimming against the wave energy caused by wakes can become stranded on the shore or injured by trauma, but bull trout in the action area would be large enough to be strong swimmers and would likely avoid this effect. Ships that are capable of generating wakes that strand fish require a draft deeper than the 14-foot depth of the Snake River navigation channel.

Where wakes hit the shore, they are likely to cause brief episodes of turbidity along the shoreline each time a vessel passes, as described by Whitfield and Becker (2014). Shallow, near-shore areas are likely to be important to juvenile salmonids for feeding (Naughton et al. 2010), and are likely important for bull trout at night. Turbidity from barge wakes reduces visibility and at certain thresholds it can cause a short-reduction in feeding rates of juvenile salmonids that bull trout may prey on. The duration of turbid conditions following the passage of a barge is likely to be relatively brief, since the flowing waters in the river rapidly dissipate suspended sediments. Episodes of turbidity caused by barge wakes are likely to persist for well-under an hour due to the river current, and turbidity levels from wakes are unlikely to exceed the threshold where reductions in feeding rates have been observed at 1-hour exposures. No data could be found regarding turbidity caused by barge wakes in the Snake River; however, dredging and disposal of dredged materials are likely to create far more turbidity than a barge wake. Brief disruptions in behavior caused by barge wakes are unlikely to have a significant effect since the bull trout are capable of swimming against the waves and turbidity is likely to below levels that affect fish behavior, and turbidity is likely to last only for short durations.

Some fish species could be directly affected by the barges themselves. In a review of recreational boating effects, Whitfield and Becker (2014) found that some species of fish are affected by moving vessels by becoming startled by noise or motion, colliding with a vessel, or being struck with a propeller. These effects vary according to the species and size of the fish, and the speed of the boat. Anecdotal evidence of salmon and steelhead behavior in the action area indicates that passing vessels are unlikely to have a significant effect. Salmon and steelhead are often caught from fisherman a short distance from boats propelled by idling gas engines or trolling motors, suggesting that the fish are not disturbed by boats beyond a certain distance. Boat strikes also appear to be unlikely. Xie et al. (2008) observed avoidance reactions of migrating adult sockeye salmon when the motor boat and fish were separated by a distance less than 7 m, but saw no reaction beyond this distance. Since moving vessels trigger an avoidance reaction in salmon and steelhead before the vessel reaches the fish, they are unlikely to be injured or killed from vessel strikes. We assume that bull trout, being similar to salmon and steelhead, respond similarly and are not significantly affected by passing boats or barges. Most salmonids, including bull trout, in the Snake River are capable of avoiding vessel strikes since they have high burst speeds and they have a tendency to avoid residing near the surface of the deeper water that barges use to navigate the channel.

When vessels are moored, they create the effect of a floating island that blocks sunlight underneath and alters currents near the surface. Subyearling chinook salmon and other species swimming near the shore may encounter predatory fish that hide in the shadow of moored vessels. A variety of studies have found that predatory fish gain an advantage over their prey by hiding near overhead cover that creates low light conditions. As light levels decrease, predation on juvenile salmonids by piscivorous fishes increases due to a diminished ability for the juvenile salmonids to detect predators (Rondorf et al 2010). The most significant piscivores in the action area that prey on salmon and steelhead are northern pikeminow and smallmouth bass, and to a lesser extent, walleye (Beamesderfer and Rieman 1991). Northern pikeminow and smallmouth bass may sometimes use shade to avoid detection by their prey (Chapman 2007). Smallmouth bass in particular have a strong affinity to in-water structures and they are common predators of subyearling salmonids in the Columbia River drainage (Carrasquero 2001), however bull trout in the action area are not as vulnerable as juvenile salmonids due to their larger size. Although predatory fish may use overhead cover from barges to prey on fish, moored barges associated with PSMP activities are unlikely to offer much advantage to predators for several reasons: the sporadic mooring of vessels would not provide a consistent or predictable environment that would enable predatory fish to congregate at the ports; bull trout favor deeper water except at night, when the cover from barges would be less of an advantage to predatory fish.

Barge traffic from PSMP activities in likely to be similar to levels already occurring in the rivers, and the additional effects to bull trout are not anticipated to measurably reduce numbers, reproduction or distribution of the species in the action area.

Summary of Effects to Bull Trout

Bull trout adults and subadults are likely to occur in the action area year round, and are likely to be exposed to activities associated with the PSMP. The likelihood of bull trout injury or entrainment from the use of dredging equipment is low. The probability of entrainment is unlikely in any given year because of the low numbers and distribution of bull trout during in-water activities, and the avoidance behavior anticipated by bull trout due to noise during these activities. In-water disposal of dredge spoils in deeper waters could entrain or bury fish including bull trout in the immediate area of the disposal, but bull trout are very mobile and likely to leave the area when disposal begins. While many bull trout are likely to move away from activities causing suspended sediments or turbidity, some small numbers of bull trout may remain in or enter in to the turbidity plumes. The largest activities causing increased turbidity, especially dredging and disposal activites, may occur 24 hours a day, for up to 77 days of the work window during the times when bull trout are likely to be in the action area. Increased turbidity and suspended sediment impacts associated with dredging and disposal is reasonably certain to cause adverse effects to the bull trout, and may result in behavioral changes and sublethal effects for bull trout that remain within, or enter the turbidity plumes.

Underwater sound pressure levels for dredging operations are generally in the range of 112 to 160 dB. The proposed action is not expected to generate SPLs capable of injuring or killing bull trout(183 dB peak and greater). However, around-the-clock dredging activities could have some behavioral effects in close proximity to dredging operations if activities exceed 150 dB. It is likely that individuals will move away from in-water activities, thereby resulting in impacts to foraging area. However, foraging areas are not a limited habitat in the action area for bull trout. While PSMP activities may impact normal behaviors or injure very small numbers of bull trout that remain in, or enter in to the turbidity plumes associated with the proposed activities, the impacts to bull trout are not anticipated to measurably reduce numbers, reproduction or distribution of the species in the action area because for most activities, bull trout will be able to move away from the affected areas, and movement and migration within the action area should not be impaired.

EFFECTS OF THE ACTION: BULL TROUT CRITICAL HABITAT

The mainstem Snake and Clearwater rivers are designated as foraging, migration, and overwintering critical for bull trout. The PSMP activities will have the following effects on bull trout critical habitat PCEs: no effect on PCE 6 (spawning and rearing areas); a slight beneficial effect on PCE 4 (complexity); slight negative effects on PCE 1 (springs and groundwater), PCE 5 (water temperatures), and PCE 7 (a natural hydrograph); and adverse effects on PCE 2 (migration habitats), PCE 3 (food resources), PCE 8 (water quality), and PCE 9 (low levels of predators). These effects are discussed below.

PCE 1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) that contribute to water quality and quantity and provide thermal refugia.

Because we don't know where all springs or hyporheic flows occur in the action area, the effects of the proposed action are difficult to predict. Most of the dredging activities are likely to occur in areas that have been dredged before. If springs or hyporheic flows occurred in those areas, the effects from dredging would likely be short-term, and the springs and flows would likely continue at or near their original locations and continue to provide thermal refugia for bull trout.

PCE 2. Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, over-wintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

PSMP activities may affect migration habitats through increased turbidity and suspended sediment impacts in the water column. As discussed above, the proposed activities would result in an increase in the level of disturbance and turbidity within the immediate area of the dredging operations. The proposed project actions are expected to directly impact foraging areas and the migration corridor for bull trout in the action area downstream of in-water work activities. The annual navigation dredging may occur over a maximum of 370 acres of shallow to mid-depth habitats annually. Suspended sediment may affect water quality within 450 feet laterally and 3,000 feet downstream of in-water work. Turbidity effects may last from several days up to 77 days; however, these potential impacts would not be expected to create any significant or long-lasting physical, biological, or other barrier that would impede bull trout migration patterns at project sites because ample areas within the river channel adjacent to the affected sites would remain undisturbed.

Addition of structures within the river channel would alter localized flow patterns, depths, sediment, and disrupt or move local benthic communities.

These changes would be within the vicinity of the constructed structures and may alter some of the specific routes within the river for migrating adults, but they are not expected to increase flows to the point that existing migration opportunities are impeded.

PCE 3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

The proposed PSMP activities may affect bull trout prey in the action area temporarily and indirectly as a result of removing sediment or in-water deposit of sediment. Potential impacts would be due to physical disturbance of existing riverbed substrates and subsequent impacts to benthic organisms. Potential bull trout prey species (e.g., anadromous salmonids or other fish) feed on benthic and planktonic organisms. Impacted areas will likely be recolonized by invertebrates within a few months, and the majority of instream habitat and bull trout prey availability should remain unaffected in other nearby foraging areas. The Service concludes that potential effects to this PCE are expected to be short-term, and other foraging habitats would continue to be available, indicating that the

PCE should remain functional to provide for the conservation of bull trout in the action area.

PCE 4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks, and unembedded substrates to provide a variety of depths, gradients, velocities, and structure.

The proposed action includes activities that will alter the physical characteristics of the channel by increasing or decreasing the depth, adding or removing sediment, and adding physical structures such as dikes or weirs. Dredging activities may simplify certain areas within the river, but other areas would remain in the current condition.

The proposed beneficial in-water disposal activities would be expected to slightly improve the complexity of the aquatic environment by increasing the availability of shallow water rearing habitats for anadromous salmonids. These potential effects would be expected to result in a very slight improvement in the potential prey base for bull trout that may occur within the action area, since the river is quite large and this type of habitat is not limited.

Structures such as weirs and dikes add physical complexity to the channel, which generally increases the local diversity of aquatic organisms and may also be used by one or more species of fish for cover. In-water structures may provide areas that act like pools or side channels with variable gradients and velocities; while they will not be a natural channel, depending on location or design they may be used by bull trout.

PCE 5. Water temperatures ranging from 36 °F to 59 °F, with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form, geography, elevation, diurnal and seasonal variation, shading (e.g., provided by riparian habitat), streamflow, and local groundwater influence.

The proposed beneficial in-water disposal activities would be expected to result in very slight increases in water temperatures in the immediate vicinity of the newly created benches due to shallower water, but deeper water in the dredged areas may stay cooler. Structural changes may create additional shallow backwaters or low-flow areas resulting in slight temperature changes in small portions of the river. However, these potential effects would not be expected to result in any measureable effects to water quality and temperatures, because the area of potential change temperature is small in relation to the whole action area and, therefore, would be considered insignificant. Nonetheless, over the indefinite period of the PSMP, climate change may continue to result in higher water temperatures in the mainstem rivers of the Columbia River Basin, including within the action area.

PCE 6. In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo over-winter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates is characteristic of these conditions. The size and amount of fine sediment suitable to bull trout will likely vary from system to system.

The proposed PSMP measures would not impact any spawning or rearing habitats for bull trout, since there are none in the action area.

PCE 7. A natural hydrograph, including peak, high, low, and base flows, within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.

The hydrograph in the action area is already highly modified due to flood control and hydroelectric dams. Stream flows may be slightly altered over the long-term at the confluence of the Snake and Clearwater rivers if certain aspects of the proposed action are implemented, but the impacts to bull trout migration and behavior are not expected to be measurable. In-water structures would slightly alter the flow characteristics of the river channel. Installation of dikes or weirs would increase water velocity and redirect flows to scour areas near the structures. Scouring would clear accumulated sediment near the structures and keep the area from accumulating any additional sediment. The effect of higher water velocity and scouring on critical habitat is an increase in the complexity and diversity of the physical environment. Near the structures, there would be a wider range of water velocities, particle sizes, and water depths. These changes would be within the vicinity of the constructed structures and may alter some of the specific routes within the river for migrating adult bull trout, but would not impede their migrations. NORO and Flow Conveyance measures may also result in flow changes, but the changes will not be significant or will be moderately short in duration, and the bull trout should still be able to move in the system.

PCE 8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

Water quantity is not expected to change as a result of PSMP activities.

Effects to bull trout from resuspended contaminants are described above in the bull trout effects section and are similar to the anticipated effects to this PCE. Numerous chemical contaminants can be found in Snake River and Clearwater River sediments. The contaminants can become resuspended in the water column when sediments are excavated, deposited, or reshaped. Contaminants found in sediment deposits can become re-suspended in the water column when sediments are excavated, deposited, or reshaped. The presence of contaminants in sediments is not predictable; therefore, when implementing sediment-disturbing activities the Corps would follow procedures to sample sediments for presence of 37 chemicals of concern before dredging or excavation begins. These procedures are described in the Dredged Material Evaluation and Disposal Procedures User Manual (Corps et al. 3013) and sediment evaluation framework (USACE et al. 2009, Michelsen 2011). Under these procedures, sediments are screened for the presence of "chemicals of concern," which are potentially toxic to aquatic organisms and which have either been found previously in sediments or have known sources in the Pacific Northwest. If contaminants exceed screening levels in the USACE et al. (2009) framework as updated by Michelsen (2011) (or subsequent updates), bioassays and water column samples are required. These additional tests ensure that sediments used for in-water disposal would not contain chemicals of concern at levels that are known to be harmful to listed fish. Some risk of toxic effects still exists from chemicals that might be undetected, chemicals which cause toxic effects that have not been recognized, or if a situation arises where contaminated sediment cannot be removed because sediments cannot be dredged in a manner that can keep contaminants at concentrations that are safe for fish. If contaminants are found in amounts that are toxic to fish, they would not be disposed of in-water, and other decisions that might be made for safely handling those sediments would be made on a case-by-case basis through the NEPA process and ESA consultation. None of the contaminants tested for in the past have exceeded established criteria that would be considered harmful to the environment, and conservation measures and project design should minimize that risk in the future. All of the contaminants in the sediment samples analyzed in 2013 were either undetectable, found in concentrations below the WDOE criteria, or determined by additional studies to be below levels where the chemicals would cause deleterious effects to growth or survival of listed fish. In summary, future proposed dredging and disposal activities may still suspend or resuspend contaminants and would be expected to impact water quality within the action area. The Corps' conservation measures help to minimize effects from contaminants, but adverse effects to water quality from resuspension of contaminants may still occur. However, past samples have not shown chemicals that exceed criteria, and design changes to the actions (such as not disposing of sediments in water if they exceed criteria) will lessen the likelihood of adverse effects in later site-specific actions.

Turbidity and suspended sediment effects were described in detail in the bull trout effects section above, and are briefly summarized here given the similar effects to this PCE. The majority of suspended sediment that could be generated by potential actions described in the PSMP is likely to come from dredging and in-water disposal in association with navigation channel maintenance, dredging for flow conveyance, or maintaining a sediment trap. The turbidity impacts may be long in duration (up to 77 days, for 24-hours a day), and may impact an area from 450 feet wide to 3,000 feet long as dredging actions continue. When actions include in-water disposal, each barge would travel from dredge sites to a disposal site to deposit its load before returning to the active dredge site. Activities at the disposal site would be periodic, typically occurring for up to 20 minutes roughly every 8 hours, as each barge is unloaded. All of these activities could create a large volume of suspended sediment. In the immediate vicinity of each active work site and for some distance downstream and laterally within the river channel, turbidity would exceed natural background levels.

Dredging may enable a small increase, or changes, in barge traffic that can cause brief episodes of increased turbidity near the shore from wakes generated by moving vessels. Turbidity caused by wakes would be limited to near-shore areas that have deposits of fine sediment. The duration and frequency of turbidity increases from barge wakes is unlikely to rise to a level that would diminish the value of the habitat as cover from predators or as a foraging area.

> The activities conducted under the PSMP, in particular dredging and disposal activities, will result in adverse effects to PCE 8 for durations of up to 77 days, however, adjacent habitat may still be available to the bull trout.

PCE 9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout [*Salvelinus namaycush*], walleye [*Stizostideon vitreum*], northern pike [*Esox lucius*], smallmouth bass [*Micropterus dolomieu*]), interbreeding (e.g., brook trout [*Salvelinus fontinalis*]), or competing (e.g., brown trout [*Salmo trutta*]) species that, if present, are adequately temporally and spatially isolated from bull trout.

> Implementation of PSMP measures may not have significant effects on predatory species, but some effects may occur. Structures may provide habitat for predatory fish. When vessels are moored, they create the effect of a floating island that blocks sunlight underneath and alters currents near the surface. Smaller adult and subadult bull trout in the action area may be vulnerable to non-native predators. A variety of studies have found that predatory fish gain an advantage over their prey by hiding near overhead cover that creates low light conditions. The most significant piscivores in the action area that prey on salmon and steelhead are northern pikeminow and smallmouth bass, and to a lesser extent, walleye (Beamesderfer and Rieman1991). Northern pikeminow and smallmouth bass may sometimes use shade to avoid detection by their prey (Chapman 2007). Smallmouth bass in particular have a strong affinity to in-water structures and they are common predators of subyearling salmonids in the Columbia River drainage (Carrasquero 2001), however bull trout tend to be larger and less vulnerable. The sporadic mooring of vessels would not provide a consistent or predictable environment that would enable predatory fish to congregate at the ports, and the PSMP will result in little change to moored barges, therefore the vulnerability of bull trout to the predators is likely to be unchanged from the environmental baseline.

Summary of Effects to Critical Habitat

The Service concludes that despite adverse effects, critical habitat for bull trout in the action area would remain functional (or sites within the action area that are currently unsuitable, but capable, would retain their current ability for the PCEs to be functionally established) and continue to serve its intended recovery role of providing sufficient forage, migration, and over-wintering habitats for the bull trout. While there may be short-term effects to water quality and foraging habitat, and non-native predators will continue in the action area, bull trout would still be able to move upstream, downstream, and migrate within the action area. Connectivity is the main expectation for critical habitat within the action area, and connectivity will continue.

CUMULATIVE EFFECTS: BULL TROUT AND BULL TROUT CRITICAL HABITAT

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

In a large river such as the lower Snake River, habitat conditions in the action area are influenced by countless activities that have the potential to affect stream flows or water quality in the action area, but occur upstream, outside the action area. Effects of future urban growth, forestry activities, sediment caused by agricultural practices, and flow reductions from water withdrawals are among the most significant activities that are likely to affect fish and critical habitat in the action area. These activities will continue to adversely affect bull trout and bull trout critical habitat.

Within the action area, there is a significant demand within the State of Washington to begin appropriating water directly from the Snake River and from local aquifers that may be hydraulically connected to the Snake River. Furthermore, the State reopened the mainstem Columbia and Snake Rivers for further appropriation in 2002, after withdrawing the water from further appropriation in 1995. It is difficult to predict long-term trends in water quantity and quality, but reduced flows from water withdrawals are reasonably certain to continue, and may have adverse effects on bull trout and bull trout critical habitat.

Washington, Oregon and Idaho have all developed total maximum daily load restrictions (TMDL) for various water quality components, turbidity, temperature, pesticides, heavy metals and others in the Snake River and some of its tributaries (WDOE 2009 and 2010; IDEQ and ODEQ 2003). As these plans are carried out water quality may improve. In Washington State, the EPA has delegated NPDES permitting authority to the State, which issues NPDES permits. Section 7 consultation with EPA on the effects of these State-issued permits is not always conducted. These State-permitted discharges would be expected to contribute to cumulative effects within the action area.

Potential impacts to the aquatic environments within the broader region that may contribute specifically to cumulative effects, especially within the neighboring major tributaries, include water flow fluctuations, degraded water quality, migration barriers, habitat degradation, resource competition, and introduction of non-native invasive species. Because the action area primarily encompasses aquatic environments, water quality and availability are avenues for adverse effects to listed resources. Elevated levels of contaminants in the waterways can be reasonably certain to adversely affect aquatic species through direct lethal or sublethal toxicity, through indirect effects on food supply, or through interactions with other compounds present in the water. Agricultural practices associated with irrigation are also reasonably certain to adversely affect aquatic environments. Water withdrawals and runoff of irrigation water containing residual constituents of pesticides and fertilizers are expected to contribute excessive nutrients, elevated levels of chemicals, and substantial amounts of sediment to natural waterways further degrading the water quality and quantity within the river systems throughout the broader region. Likewise, urban and rural land uses for residential, commercial, industrial, and recreational activities, such as boating and golf courses, often require water withdrawals and can further contribute pollutants and sediments to surface waters, thereby degrading aquatic habitats.

The Snake River basin is one of many areas in the State of Washington that is experiencing ongoing wind power developments and expansion of transportation infrastructure. Recent national economic developments have slowed population growth in the last few years but non-agriculture employment has increased and that trend is likely to continue. Population changes and economic diversification are likely to result in greater overall and localized demands for electricity, water, and buildable land in the action area. They may affect water quality directly and indirectly and increase the need for transportation, communication, and other infrastructure. These economic and population demands will probably affect habitat features such as water quality and quantity, which are important to the survival and recovery of the bull trout.

There are a number of other non-federal actions that are expected to address potential impacts to bull trout from urban development within the broader region encompassing the action area. These approaches include initiatives under Critical Areas Ordinances and measures associated with the State's Shoreline Management Act (SMA). Many cities and counties in Washington are required to adopt Critical Areas Ordinances under the State's Growth Management Act. Among other concerns, the ordinances address important fish and wildlife habitats, including wetlands, rivers, streams, lakes, and marine shorelines. The SMA seeks to prevent harm to identified resources due to haphazard development of State shorelines. The responsibilities of local governments under the SMA, with support and oversight provided by the Washington Department of Ecology, include: 1) administering a shoreline permit system for proposed substantial development; 2) conducting and compiling a shoreline inventory; and 3) developing a Shoreline Master Program for regulating the State's shorelines. Salmon recovery efforts in the action area have assisted with numerous projects to improve habitat for listed salmon and steelhead, and often have beneficial effects to bull trout. Ongoing studies and habitat enhancement projects conducted by the Snake River Salmon Recovery Board and Washington State Department of Fish and Wildlife Department to implement watershed plans and recovery plans are expected to continue. Various other entities have developed plans and conservation initiatives that may benefit listed species within the broader region encompassing the action area; however, comprehensive results from most of these ongoing or planned actions must be documented before they can be considered reasonably foreseeable for purposes of cumulative effects analyses.

Considering the available information, cumulative effects within the action area that are reasonably certain to impact bull trout and bull trout critical habitat are likely to increase in the future. Unless planning includes measures to avoid, minimize, and effectively mitigate the potential effects to listed species, the effect of continued growth and economic diversification will likely be negative. Sediment-producing actions such as on-going agriculture and forestry activities described in the baseline are likely to continue. Actions to reduce erosion from roads and agricultural lands are likely to occur at the same time actions that increase erosion are undertaken. No distinct trend in future sediment-producing activities can be predicted. An analysis of sediment sources in the Northern Rocky Mountains by Goode et al. (2012) shows that any effect of non-Federal actions that increase or decrease sediment production will be vastly overwhelmed by natural sediment.

CONCLUSION

After reviewing the current status of bull trout and its critical habitat, the environmental baseline for the action area, the effects of the proposed PSMP and the cumulative effects, it is the

Service's biological opinion that the PSMP, as proposed, is not likely to jeopardize the continued existence of the bull trout; and is not likely to destroy or adversely modify designated bull trout critical habitat.

The Service's conclusions are based on the following considerations. No spawning and rearing habitat occurs in the action area, and the action area is expected to continue to serve its conservation role for the species by providing adequate foraging, migration, and over-wintering habitats for individual bull trout present in the lower Snake and Clearwater Rivers. Threats within these migratory corridors include crop production, irrigation withdrawals, livestock grazing, logging, hydropower production, management of non-native fish species, recreation, urbanization, and transportation networks ((USFWS 2008b, p. 12; USFWS 2002a; USFWS 2002b; USFWS 2014; 63 FR 31647; 64 FR 58910). The PSMP does not directly contribute to those threats, and the action area is expected to continue to provide connectivity of local populations of bull trout between multiple core areas in neighboring major tributaries throughout the broader region, including those within the Tucannon River, Asotin Creek, Walla Walla River, and upper Clearwater River watersheds. Effects to bull trout from implementation of the PSMP are expected to be limited in scope and duration and are not expected to impact the ability of the action area to serve its conservation role for the species. While PSMP activities may have adverse effects and in some instances impact normal behaviors or injure very small numbers of bull trout that remain in, or enter the turbidity plumes associated with the proposed activities, the impacts to bull trout are not anticipated to measurably reduce numbers, reproduction or distribution of the species in the action area because for most activities, bull trout will be able to move away from the affected areas, and movement and migration within the action area should not be impaired. Therefore, the Service concludes that the Project would not significantly impact bull trout within the Columbia Basin interim recovery unit or within the coterminous range of the species.

Considering the above information, the proposed Project is not expected to significantly alter any critical habitat indicators for bull trout at the scale of the associated CHUs. Specifically, the PSMP activities will likely have no effect on PCE 6 (spawning and rearing areas); may have slight beneficial effects on PCE 4 (complexity); slight negative effects on PCE 1 (springs and groundwater), PCE 5(water temperatures) and PCE 7 (a natural hydrograph); and adverse effects on PCE 2 (migration habitats), PCE 3 (food resources), PCE 8 (water quality), and PCE 9 (low levels of predators). The potential adverse effects of the PSMP measures on critical habitat for bull trout would not be expected to create any long-lasting physical, biological, or other barrier that would significantly impede bull trout migration patterns (PCE 2); result in any significant, long-lasting effects to bull trout food resources (PCE 3), water quality parameters (PCE 8), or levels of predators (PCE9) within the action area. The ability of the action area to support sufficient foraging, migration, and over-wintering habitats for bull trout and to provide connectivity between neighboring core areas would be maintained in the Mainstem Snake River and Clearwater River CHUs. Therefore, the Service concludes that critical habitat for bull trout in the action area would remain functional (or sites within the action area that are currently unsuitable, but capable, would retain their current ability for the PCEs to be functionally established) and continue to serve its intended recovery role for the bull trout.

The Service has reviewed the current status of the bull trout and critical habitat for the bull trout, the environmental baseline for the action area, the effects of the proposed PSMP, and cumulative effects within the action area. Based on this review, it is the Service's biological opinion that the PSMP, as proposed, is not likely to jeopardize the continued existence of bull trout within the Columbia River interim recovery unit and is not likely to destroy or adversely modify designated critical habitat for the bull trout within the mainstem Snake River or Clearwater River CHUs.

Bull trout may be affected from future activities conducted under the PSMP through physiological stress caused by turbidity. Depending on future site-specific actions, other effects may occur but there is not sufficient detail to quantify that take at this time. Future second tier consultations will confirm the extent of take from dredging, disposal, and turbidity and evaluate other site-specific effects that could not be fully evaluated at this programmatic level.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. *Harm* is defined by the Service as an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). *Harass* is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps 1) fails to assume and implement the terms and conditions or 2) fails to require the any applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

The PSMP provides a process and guidance for sediment management in the lower Snake River but it does not authorize individual actions to occur. This Opinion evaluates likely activities that may be undertaken pursuant to the PSMP that adversely affect bull trout. At the broad scale of this consultation, and based on the nature of the PSMP, there is no currently authorized action that will result in take of listed species. The Corps' PSMP informs future decisions that are reasonably expected to result in take.

Information regarding the amount and frequency of dredging and disposal activities is provided in sufficient detail to allow an analysis and initial quantification of incidental take resulting from such activities, as described below. Because the PSMP does not authorize specific project-level actions, and because the Corps must conduct a subsequent section 7 consultation that will analyze the site-specific effects of each proposed action, this initial quantification of take at the Plan scale will be refined during subsequent consultations. Such future consultations will consider the site-specific information related to duration, timing, location, and other information available at that time, to assess whether and to what extent, incidental take is reasonably certain to occur. At that time, if take is anticipated, additional or different reasonable and prudent measures and implementing terms and conditions may be developed to minimize the impact of the incidental take on the species.

There is sufficient specificity regarding the impacts from dredging and disposal activities to allow the Service to anticipate take associated with these activities at the plan level. Although this take cannot be quantified in terms of numbers of individual fish, we developed environmental surrogates to create a clear trigger for determining when the anticipated amount of take would be exceeded and, if discretionary involvement or control is retained or authorized by law, when reinitiation of consultation would be warranted. We anticipate this take in the form of harm from physiological effects of suspended sediment and turbidity.

The Service anticipates that the incidental take of bull trout will be difficult to detect in the aquatic environment for the following reasons: 1) it is very unlikely that sublethal effects to individual bull trout associated with temporary exposure to unsuitable water quality conditions would be noticeable to an observer; and 2) finding an injured bull trout within the aquatic environment is highly unlikely. Therefore, even though the Service expects that incidental take of bull trout is reasonably certain to occur during the implementation of actions under the Plan, available data are insufficient to estimate an exact number of individuals that may be harmed. When the expected number of individuals that may be taken is not quantifiable, the Service uses an environmental surrogate for monitoring and reporting.

The Corps has provided general locations of likely sediment management actions, and general estimates of amounts of dredging and disposal activities. The Corps provided a range of estimates of cubic yards dredged and a range of dredging frequencies by year. The maximum extent of take that is reasonably certain to occur is based on the higher quantity of cubic yards dredged and the most frequent dredging estimates, as follows:

- 500,000 cy of navigation dredging every 3 years
- 500,000 cy of in-water disposal of sediment every 3 years
- 1,000,000 cy of flow conveyance dredging every 10 years, and then 500,000 cy of flow conveyance dredging every year

- 15,000 cy of recreation dredging every 3 years
- 1,000 cy of wildlife dredging every 7 years
- Less than 500 cy of sediment that is resuspended at wildlife mitigation areas every 7 years
- 250,000-350,000 cy of dredging to maintain a sediment trap

Based on this information, the Service has developed the following environmental surrogates for take that is reasonably certain to occur from suspended sediment and turbidity levels associated with dredging and disposal activities. The associated frequencies and quantities described above are expected to exceed 20 mg/L (8 NTU) for a duration of 7 hours or more (the lowest turbidity level in Table 10 indicating behavioral effects) or exceed higher turbidity and duration thresholds, indicating physiological effects to bull trout that comport to the regulatory definition of harm. Conditions resulting in an SEV of 6 are reasonably certain to harm bull trout; these conditions are expected to occur downstream of the source at a distance of no more than 900 feet, and for a lateral distance of no more than 450 feet. These conditions may occur for a period of up to 77 days between December 15 and March 1, and may occur as often as annually.

The incidental take anticipated above will be more specifically quantified and authorized when a site-specific consultation is completed. This incidental take statement does not authorize any incidental take resulting from site-specific actions.

EFFECT OF THE TAKE

In the accompanying Opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measure(s) are necessary and appropriate to minimize impacts of incidental take of bull trout:

1. Prior to authorizing any action taken in accordance with the PSMP that “may affect” listed species, request consultation with the Service, and obtain an incidental take statement.

2. Prior to dredging, determine and implement appropriate sampling methodologies for screening sediments for contaminant, and use that information to develop disposal plans that minimize effects from the resuspension of contaminants.

3. Monitor turbidity during dredging and disposal activities.

4. Report cubic yard quantities of dredged materials and in-water disposal, and results of all

monitoring.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the ESA, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. To implement reasonable and prudent measure number 1, the Corps shall initiate consultation with Service under Section 7(a)(2) for any proposed future action taken in accordance with the PSMP, at the earliest possible time, on actions that “may affect” listed species or their designated critical habitat.

2. To implement reasonable and prudent measure number 2 (contaminant sampling), the Corps shall follow the most recent version of the Sediment Evaluation Framework for the Pacific Northwest prior to any dredging for navigation, conveyance, and sediment trapping. The sampling plan shall be provided to the Service prior to sampling; and results of sampling shall be submitted to the Service for review prior to any dredging occurring. Information gained through this sediment sampling process shall be used to develop actions and disposal methods that minimize exposure of listed fish to harmful chemicals.

3. To implement reasonable and prudent measure number 3 (turbidity monitoring), the Corps shall monitor water quality (i.e., turbidity) conditions at background, early warning, and compliance monitoring stations in a zone encompassing each active work site. The Corps shall implement the identified management measures developed during site specific consultations control turbidity levels.

4. To implement reasonable and prudent measure number 4 (monitoring and reporting), the Corps shall do the following:

    a. Develop an annual report for activities completed pursuant to the PSMP and submit it to the Service by March 31 of the following year. The report shall include the number and location of activities conducted, the cubic yards of sediment dredged and/or disposed of in-water, and results of turbidity and water quality monitoring. All reports shall be sent to the Supervisor, Eastern Washington Field Office, 11103 E. Montgomery Drive, Spokane Valley, WA, 99206.

    b. Cease dredging activities and report to Service immediately if the following dredge quantities are exceeded:

        - 500,000 cy yards of navigation dredging every 3 years
        - 500,000 cy of in-water disposal of sediment every 3 years

- 1,000,000 cy/per year for 10 years, then 500,00 cy/yr afterwards for flow conveyance dredging
- 15,000 cy of recreation dredging every 3 years
- 1000 cy of wildlife dredging every 7 years
- Less than 500 cy of sediment resuspended through agitation at wildlife mitigation areas every 7 years
- 250,000-350,000 cy of dredging to maintain a sediment trap

c. For each dredging activity or in-water dredge material disposal activity, turbidity shall not exceed applicable State's Section 401 Water Quality Certification or site-specific measures developed at the project-level.

d. Do not dispose of sediments in water, and report to Service immediately, if contaminant levels in sediments to be disposed of exceed criteria in the 2009 Sediment Evaluation Framework for the Pacific Northwest, the 2013 Dredged Material Evaluation and Disposal Procedures User Manual, or any subsequent revisions or successors to these documents; or if any chemicals not listed in these documents are found in amounts that may harm or kill bull trout.

The Service believes that bull trout will be incidentally taken as a result of the PSMP measures associated with dredging and in-water disposal. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

The Service is to be notified within three working days upon locating a dead, injured or sick endangered or threatened species specimen. Initial notification must be made to the nearest U.S. Fish and Wildlife Service Law Enforcement Office. Notification must include the date, time, precise location of the injured animal or carcass, and any other pertinent information. Care should be taken in handling sick or injured specimens to preserve biological materials in the best possible state for later analysis of cause of death, if that occurs. In conjunction with the care of sick or injured endangered or threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed. Contact the U.S. Fish and Wildlife Service Law Enforcement Office at (425) 883-8122, or the Service's Washington Fish and Wildlife Office at (360) 753-9440.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The Corps should seek opportunities to partner with other land management agencies to reduce the input of sediments to the Snake or Clearwater Rivers or their tributaries such that the frequency of dredging may be reduced.

2. Where appropriate and feasible, conduct second tier consultations in batches, for groups of activities, to increase consultation efficiency. For example, conduct a single second-tier consultation on all dredging associated with the HMU irrigation screens, including any interrelated and interdependent actions.

3. Information on bull trout distribution in the mainstem of the Snake and Columbia Rivers is lacking, particularly between December and February. Modify existing anadromous fish monitoring activities to gather additional information on bull trout, or contribute to studies or research to gain that information.

4. Any additional information that may become available regarding the potential toxicity of contaminants should be carefully considered in any future sediment control actions conducted by the Corps in the lower Snake and Clearwater Rivers.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request for consultation. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; 3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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APPENDIX A - STATUS OF THE SPECIES: BULL TROUT and STATUS OF THE BULL TROUT CRITICAL HABITAT

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Appendix A - Status of the Species: Bull Trout and Status of the Bull Trout Critical Habitat

Status of the Species: Bull Trout

Listing Status

The coterminous United States population of the bull trout (*Salvelinus confluentus*) was listed as threatened on November 1, 1999 (64 FR 58910). The threatened bull trout generally occurs in the Klamath River Basin of south-central Oregon; the Jarbidge River in Nevada; the Willamette River Basin in Oregon; Pacific Coast drainages of Washington, including Puget Sound; major rivers in Idaho, Oregon, Washington, and Montana, within the Columbia River Basin; and the St. Mary-Belly River, east of the Continental Divide in northwestern Montana (Bond 1992, p. 2; Brewin and Brewin 1997, p. 215; Cavender 1978, pp. 165-166; Leary and Allendorf 1997, pp. 716-719).

Throughout its range, bull trout are threatened by the combined effects of habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality, entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels, and introduced non-native species (64 FR 58910). Although all salmonids are likely to be affected by climate change, bull trout are especially vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the requirement for cold water temperatures (Battin et al. 2007, pp. 6672-6673; Rieman et al. 2007, p. 1552). Poaching and incidental mortality of bull trout during other targeted fisheries are additional threats.

The bull trout was initially listed as three separate Distinct Population Segments (DPSs) (63 FR 31647; 64 FR 17110). The preamble to the final listing rule for the United States coterminous population of the bull trout discusses the consolidation of these DPSs with the Columbia and Klamath population segments into one listed taxon and the application of the jeopardy standard under section 7 of the Endangered Species Act (Act) relative to this species (64 FR 58910):

> Although this rule consolidates the five bull trout DPSs into one listed taxon, based on conformance with the DPS policy for purposes of consultation under section 7 of the Act, we intend to retain recognition of each DPS in light of available scientific information relating to their uniqueness and significance. Under this approach, these DPSs will be treated as interim recovery units with respect to application of the jeopardy standard until an approved recovery plan is developed. Formal establishment of bull trout recovery units will occur during the recovery planning process.

On September 4, 2014, the Service announced the availability of a revised draft recovery plan for the coterminous U.S. population of bull trout (79 FR:52741). This revised recovery plan focuses on the identification and management of known threat factors in core areas in six proposed recovery units. The revised draft recovery plan updated the recovery criteria; however, the recovery unit implementation plans have not yet been drafted and will be announced in 2015 with an additional public comment period.

Current Status and Conservation Needs

In recognition of available scientific information relating to their uniqueness and significance, five segments of the coterminous United States population of bull trout are considered essential to the survival and recovery of this species and are identified as interim recovery units: 1) Jarbidge River, 2) Klamath River, 3) Columbia River, 4) Coastal-Puget Sound, and 5) St. Mary-Belly River (USFWS 2002a, pp. iv, 2, 7, 98; 2004a, Vol. 1 & 2, p. 1; 2004b, p. 1). Each of these interim recovery units is necessary to maintain the bull trout's distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions.

A summary of the current status and conservation needs of the bull trout within the interim recovery units is provided below and a comprehensive discussion is found in the U.S. Fish and Wildlife Service's (Service) draft recovery plans for the bull trout (USFWS 2002a, pp. vi-viii; 2004a, Vol. 2 p. iii-x; 2004b, pp. iii-xii).

The conservation needs of bull trout are often generally expressed as the four "Cs": cold, clean, complex, and connected habitat. Cold stream temperatures, clean water quality that is relatively free of sediment and contaminants, complex channel characteristics (including abundant large wood and undercut banks), and large patches of such habitat that are well connected by unobstructed migratory pathways are all needed to promote conservation of bull trout at multiple scales ranging from the coterminous to local populations (a local population is a group of bull trout that spawn within a particular stream or portion of a stream system). The recovery planning process for bull trout (USFWS 2002a, pp. 49-50; 2004a, Vol 1 & 2 pp. 12-18; 2004b, pp. 60-86) has also identified the following conservation needs: 1) maintenance and restoration of multiple, interconnected populations in diverse habitats across the range of each interim recovery unit, 2) preservation of the diversity of life-history strategies, 3) maintenance of genetic and phenotypic diversity across the range of each interim recovery unit, and 4) establishment of a positive population trend. Recently, it has also been recognized that bull trout populations need to be protected from catastrophic fires across the range of each interim recovery unit (Rieman et al. 2003).

Central to the survival and recovery of bull trout is the maintenance of viable core areas (USFWS 2002a, pp. 53-54; 2004a, Vol. 1 pp. 210-218, Vol 2. pp. 61-62; 2004b, pp. 15-30, 64-67). A core area is defined as a geographic area occupied by one or more local bull trout populations that overlap in their use of rearing, foraging, migratory, and overwintering habitat. Each of the interim recovery units listed above consists of one or more core areas. There are 121 core areas recognized across the coterminous range of the bull trout (USFWS 2002a, pp. 6, 48, 98; 2004a, Vol. 1 p. vi, Vol. 2 pp. 14, 134; 2004b, pp. iv, 2; 2005, p. ii).

Jarbidge River Interim Recovery Unit

This interim recovery unit currently contains a single core area with six local populations. Less than 500 resident and migratory adult bull trout, representing about 50 to 125 spawning adults, are estimated to occur in the core area. The current condition of the bull trout in this interim recovery unit is attributed to the effects of livestock grazing, roads, incidental mortalities of released bull trout from recreational angling, historic angler harvest, timber harvest, and the introduction of non-native fishes (USFWS 2004b). The draft bull trout recovery plan (USFWS 2004b) identifies the following conservation needs for this interim recovery unit: 1) maintain the current distribution of the bull trout within the core area, 2) maintain stable or increasing trends in abundance of both resident and migratory bull trout in the core area, 3) restore and maintain suitable habitat conditions for all life history stages and forms, and 4) conserve genetic diversity and increase natural opportunities for genetic exchange between resident and migratory forms of the bull trout. An estimated 270 to 1,000 spawning bull trout per year are needed to provide for the persistence and viability of the core area and to support both resident and migratory adult bull trout (USFWS 2004b).

Klamath River Interim Recovery Unit

This interim recovery unit currently contains three core areas and seven local populations. The current abundance, distribution, and range of the bull trout in the Klamath River Basin are greatly reduced from historical levels due to habitat loss and degradation caused by reduced water quality, timber harvest, livestock grazing, water diversions, roads, and the introduction of non-native fishes (USFWS 2002a). Bull trout populations in this interim recovery unit face a high risk of extirpation (USFWS 2002a). The draft Klamath River bull trout recovery plan (USFWS 2002a) identifies the following conservation needs for this interim recovery unit: 1) maintain the current distribution of bull trout and restore distribution in previously occupied areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all life history stages and strategies, 4) conserve genetic diversity and provide the opportunity for genetic exchange among appropriate core area populations. Eight to 15 new local populations and an increase in population size from about 2,400 adults currently to 8,250 adults are needed to provide for the persistence and viability of the three core areas (USFWS 2002a).

Columbia River Interim Recovery Unit

The Columbia River interim recovery unit includes bull trout residing in portions of Oregon, Washington, Idaho, and Montana. Bull trout are estimated to have occupied about 60 percent of the Columbia River Basin, and presently occur in 45 percent of the estimated historical range (Quigley and Arbelbide 1997, p. 1177). This interim recovery unit currently contains 97 core areas and 527 local populations. About 65 percent of these core areas and local populations occur in central Idaho and northwestern Montana. The Columbia River interim recovery unit has declined in overall range and numbers of fish (63 FR 31647). Although some strongholds still exist with migratory fish present, bull trout generally occur as isolated local populations in headwater lakes or tributaries where the migratory life history form has been lost. Though still widespread, there have been numerous local extirpations reported throughout the Columbia

River basin. In Idaho, for example, bull trout have been extirpated from 119 reaches in 28 streams (IDFG in litt. 1995). The draft Columbia River bull trout recovery plan (USFWS 2002c) identifies the following conservation needs for this interim recovery unit: 1) maintain or expand the current distribution of the bull trout within core areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all bull trout life history stages and strategies, and 4) conserve genetic diversity and provide opportunities for genetic exchange.

This interim recovery unit currently contains 97 core areas and 527 local populations. About 65 percent of these core areas and local populations occur in Idaho and northwestern Montana. The condition of the bull trout within these core areas varies from poor to good. All core areas have been subject to the combined effects of habitat degradation and fragmentation caused by the following activities: dewatering; road construction and maintenance; mining; grazing; the blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species. The Service completed a core area conservation assessment for the 5-year status review and determined that, of the 97 core areas in this interim recovery unit, 38 are at high risk of extirpation, 35 are at risk, 20 are at potential risk, 2 are at low risk, and 2 are at unknown risk (USFWS 2005, pp. 2, Map A, pp. 73-83).

Coastal-Puget Sound Interim Recovery Unit

Bull trout in the Coastal-Puget Sound interim recovery unit exhibit anadromous[1], adfluvial, fluvial, and resident life history patterns. The anadromous life history form is unique to this interim recovery unit. This interim recovery unit currently contains 14 core areas and 67 local populations (USFWS 2004a). Bull trout are distributed throughout most of the large rivers and associated tributary systems within this interim recovery unit. Bull trout continue to be present in nearly all major watersheds where they likely occurred historically, although local extirpations have occurred throughout this interim recovery unit. Many remaining populations are isolated or fragmented and abundance has declined, especially in the southeastern portion of the interim recovery unit. The current condition of the bull trout in this interim recovery unit is attributed to the adverse effects of dams, forest management practices (e.g., timber harvest and associated road building activities), agricultural practices (e.g., diking, water control structures, draining of wetlands, channelization, and the removal of riparian vegetation), livestock grazing, roads, mining, urbanization, poaching, incidental mortality from other targeted fisheries, and the introduction of non-native species. The draft Coastal-Puget Sound bull trout recovery plan (USFWS 2004a) identifies the following conservation needs for this interim recovery unit: 1) maintain or expand the current distribution of bull trout within existing core areas, 2) increase bull trout abundance to about 16,500 adults across all core areas, and 3) maintain or increase connectivity between local populations within each core area.

[1] Bull trout migrate from saltwater to freshwater to reproduce are commonly referred to as anadromous. However, bull trout and some other species that enter the marine environment are more properly termed amphidromous. Unlike strictly anadromous species, such as Pacific salmon, amphidromous species often return seasonally to fresh water as subadults, sometimes for several years, before returning to spawn (Brenkman and Corbett 2005, p. 1075; Wilson 1997, p. 5). Due to its more common usage, we will refer to bull trout has exhibiting anadromous rather than amphidromous life history patterns in this document.

St. Mary-Belly River Interim Recovery Unit

This interim recovery unit currently contains six core areas and nine local populations (USFWS 2002b). Currently, bull trout are widely distributed in the St. Mary-Belly River drainage and occur in nearly all of the waters that it inhabited historically. Bull trout are found only in a 1.2-mile reach of the North Fork Belly River within the United States. Redd count surveys of the North Fork Belly River documented an increase from 27 redds in 1995 to 119 redds in 1999. This increase was attributed primarily to protection from angler harvest (USFWS 2002b). The current condition of the bull trout in this interim recovery unit is primarily attributed to the effects of dams, water diversions, roads, mining, and the introduction of non-native fishes (USFWS 2002b). The draft St. Mary-Belly River bull trout recovery plan (USFWS 2002b) identifies the following conservation needs for this interim recovery unit: 1) maintain the current distribution of the bull trout and restore distribution in previously occupied areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all life history stages and forms, 4) conserve genetic diversity and provide the opportunity for genetic exchange, and 5) establish good working relations with Canadian interests because local bull trout populations in this interim recovery unit are comprised mostly of migratory fish, whose habitat is mostly in Canada.

Life History

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993, pp. 1-18). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. The resident form tends to be smaller than the migratory form at maturity and also produces fewer eggs (Fraley and Shepard 1989, p. 1; Goetz 1989, pp. 15-16). Migratory bull trout spawn in tributary streams where juvenile fish rear 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989, pp. 135-137; Goetz 1989, pp. 22-25), or saltwater (anadromous form) to rear as subadults and to live as adults (Cavender 1978, pp. 139, 165-68; McPhail and Baxter 1996, p. 14; WDFW et al. 1997, pp. 17-18, 22-26). Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. They are iteroparous (they spawn more than once in a lifetime). Repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Fraley and Shepard 1989, pp. 135-137; Leathe and Graham 1982, p. 95; Pratt 1992, p. 6; Rieman and McIntyre 1996, p. 133).

The iteroparous reproductive strategy of bull trout has important repercussions for the management of this species. Bull trout require passage both upstream and downstream, not only for repeat spawning but also for foraging. Most fish ladders, however, were designed specifically for anadromous semelparous salmonids (fishes that spawn once and then die, and require only one-way passage upstream). Therefore, even dams or other barriers with fish passage facilities may be a factor in isolating bull trout populations if they do not provide a downstream passage route. Additionally, in some core areas, bull trout that migrate to marine waters must pass both upstream and downstream through areas with net fisheries at river mouths. This can increase the likelihood of mortality to bull trout during these spawning and foraging migrations.

Growth varies depending upon life-history strategy. Resident adults range from 6 to 12 inches total length, and migratory adults commonly reach 24 inches or more (Goetz 1989, pp. 29-32; Pratt 1984, p. 13) The largest verified bull trout is a 32-pound specimen caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982).

Habitat Characteristics

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993, p. 7). Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors (Fraley and Shepard 1989, pp. 137, 141; Goetz 1989, pp. 19-26; Bond in Hoelscher and Bjornn 1989, p. 57; Howell and Buchanan 1992, p. 1; Pratt 1992, p. 6; Rich 1996, pp. 35-38; Rieman and McIntyre 1993, pp. 4-7; Rieman and McIntyre 1995, pp. 293-294; Sedell and Everest 1991, p. 1; Watson and Hillman 1997, pp. 246-250). Watson and Hillman (1997, pp. 247-249) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993, p. 7), bull trout should not be expected to simultaneously occupy all available habitats (Rieman et al. 1997, p. 1560).

Migratory corridors link seasonal habitats for all bull trout life histories. The ability to migrate is important to the persistence of bull trout (Gilpin, in litt. 1997, pp. 4-5; Rieman and McIntyre 1993, p. 7; Rieman et al. 1997, p. 1114). Migrations facilitate gene flow among local populations when individuals from different local populations interbreed or stray to nonnatal streams. Local populations that are extirpated by catastrophic events may also become reestablished by bull trout migrants. However, it is important to note that the genetic structuring of bull trout indicates there is limited gene flow among bull trout populations, which may encourage local adaptation within individual populations, and that reestablishment of extirpated populations may take a long time (Rieman and McIntyre 1993, p. 7; Spruell et al. 1999, pp. 118-120). Migration also allows bull trout to access more abundant or larger prey, which facilitates growth and reproduction. Additional benefits of migration and its relationship to foraging are discussed below under “Diet.”

Cold water temperatures play an important role in determining bull trout habitat quality, as these fish are primarily found in colder streams (below 15 °C or 59 °F), and spawning habitats are generally characterized by temperatures that drop below 9 °C (48 °F) in the fall (Fraley and Shepard 1989, p. 133; Pratt 1992, p. 6; Rieman and McIntyre 1993, p. 7).

Thermal requirements for bull trout appear to differ at different life stages. Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Baxter et al. 1997, pp. 426-427; Pratt 1992, p. 6; Rieman and McIntyre 1993,

p. 7; Rieman et al. 1997, p. 1117). Optimum incubation temperatures for bull trout eggs range from 2 °C to 6 °C (35 °F to 39 °F) whereas optimum water temperatures for rearing range from about 6 °C to 10 °C (46 °F to 50 °F) (Buchanan and Gregory 1997, pp. 121-122; Goetz 1989, pp. 22-24; McPhail and Murray 1979, pp. 41, 50, 53, 55). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 8 °C to 9 °C (46 °F to 48 °F), within a temperature gradient of 8 °C to 15 °C (4 °F to 60 °F). In a landscape study relating bull trout distribution to maximum water temperatures, Dunham et al. (2003) found that the probability of juvenile bull trout occurrence does not become high (i.e., greater than 0.75) until maximum temperatures decline to 11 °C to 12 °C (52 °F to 54 °F).

Although bull trout are found primarily in cold streams, occasionally these fish are found in larger, warmer river systems throughout the Columbia River basin (Buchanan and Gregory 1997, pp. 121-122; Fraley and Shepard 1989, pp. 135-137; Rieman and McIntyre 1993, p. 2; Rieman and McIntyre 1995, p. 288; Rieman et al. 1997, p. 1114). Availability and proximity of cold water patches and food productivity can influence bull trout ability to survive in warmer rivers (Myrick et al. 2002). For example, in a study in the Little Lost River of Idaho where bull trout were found at temperatures ranging from 8 °C to 20 °C (46 °F to 68 °F), most sites that had high densities of bull trout were in areas where primary productivity in streams had increased following a fire (Gamett, pers. comm. 2002).

All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989, pp. 135-137; Goetz 1989, pp. 22-25; Hoelscher and Bjornn 1989, p. 54; Pratt 1992, p. 6; Rich 1996, pp. 35-38; Sedell and Everest 1991, p. 1; Sexauer and James 1997, pp. 367-369; Thomas 1992, pp. 4-5; Watson and Hillman 1997, pp. 247-249). Maintaining bull trout habitat requires stability of stream channels and maintenance of natural flow patterns (Rieman and McIntyre 1993, p. 7). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997, pp. 367-369). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring (Fraley and Shepard 1989, pp. 135-137; Pratt 1992, p. 6; Pratt and Huston 1993, pp. 70-72). Pratt (1992, p. 6) indicated that increases in fine sediment reduce egg survival and emergence.

Bull trout typically spawn from August through November during periods of increasing flows and decreasing water temperatures. Preferred spawning habitat consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989, p. 135). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989, p. 15; Pratt 1992, p. 8; Rieman and McIntyre 1996, p. 133). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992, p. 8). After hatching, fry remain in the substrate, and time from egg deposition to emergence may surpass 200 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Ratliff and Howell 1992 in Howell and Buchanan 1992, pp. 10, 15; Pratt 1992, pp. 5-6).

Early life stages of fish, specifically the developing embryo, require the highest inter-gravel dissolved oxygen (IGDO) levels, and are the most sensitive life stage to reduced oxygen levels. The oxygen demand of embryos depends on temperature and on stage of development, with the greatest IGDO required just prior to hatching.

A literature review conducted by the Washington Department of Ecology (WDOE 2002) indicates that adverse effects of lower oxygen concentrations on embryo survival are magnified as temperatures increase above optimal (for incubation). In a laboratory study conducted in Canada, researchers found that low oxygen levels retarded embryonic development in bull trout (Giles and Van der Zweep 1996, pp. 54-55). Normal oxygen levels seen in rivers used by bull trout during spawning ranged from 8 to 12 mg/L (in the gravel), with corresponding instream levels of 10 to 11.5 mg/L (Stewart et al. 2007). In addition, IGDO concentrations, water velocities in the water column, and especially the intergravel flow rate, are interrelated variables that affect the survival of incubating embryos (ODEQ 1995). Due to a long incubation period of 220+ days, bull trout are particularly sensitive to adequate IGDO levels. An IGDO level below 8 mg/L is likely to result in mortality of eggs, embryos, and fry.

Migratory forms of bull trout may develop when habitat conditions allow movement between spawning and rearing streams and larger rivers, lakes or nearshore marine habitat where foraging opportunities may be enhanced (Brenkman and Corbett 2005, pp. 1073, 1079-1080; Frissell 1993, p. 350; Goetz et al. 2004, pp. 45, 55, 60, 68, 77, 113-114, 123, 125-126). For example, multiple life history forms (e.g., resident and fluvial) and multiple migration patterns have been noted in the Grande Ronde River (Baxter 2002). Parts of this river system have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem Snake River. Such multiple life history strategies help to maintain the stability and persistence of bull trout populations to environmental changes. Benefits to migratory bull trout include greater growth in the more productive waters of larger streams, lakes, and marine waters; greater fecundity resulting in increased reproductive potential; and dispersing the population across space and time so that spawning streams may be recolonized should local populations suffer a catastrophic loss (Frissell 1999, pp. 15-16; MBTSG 1998, pp. iv, 48-50; Rieman and McIntyre 1993, pp. 18-19; USFWS 2004a, Vol. 2, p. 63). In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbances make local habitats temporarily unsuitable. Therefore, the range of the species is diminished, and the potential for a greater reproductive contribution from larger fish with higher fecundity is lost (Rieman and McIntyre 1993, pp. 1-18).

Diet

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. A single optimal foraging strategy is not necessarily a consistent feature in the life of a fish, because this strategy can change as the fish progresses from one life stage to another (i.e., juvenile to subadult). Fish growth depends on the quantity and quality of food that is eaten (Gerking 1994), and as fish grow, their foraging strategy changes as their food changes, in quantity, size, or other characteristics. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987, p. 58; Donald and Alger 1993, pp. 239-243; Goetz 1989, pp. 33-34). Subadult and adult migratory bull trout feed on various fish species (Brown 1994, p. 21; Donald and Alger 1993, p. 242; Fraley and Shepard

1989, p. 135; Leathe and Graham 1982, p. 95). Bull trout of all sizes other than fry have been found to eat fish up to half their length (Beauchamp and VanTassell 2001). In nearshore marine areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) (Goetz et al. 2004, p. 114; WDFW et al. 1997, p. 23).

Bull trout migration and life history strategies are closely related to their feeding and foraging strategies. Migration allows bull trout to access optimal foraging areas and exploit a wider variety of prey resources. Optimal foraging theory can be used to describe strategies fish use to choose between alternative sources of food by weighing the benefits and costs of capturing one source of food over another. For example, prey often occur in concentrated patches of abundance ("patch model") (Gerking 1994). As the predator feeds in one patch, the prey population is reduced, and it becomes more profitable for the predator to seek a new patch rather than continue feeding on the original one. This can be explained in terms of balancing energy acquired versus energy expended. For example, in the Skagit River system, anadromous bull trout make migrations as long as 121 miles between marine foraging areas in Puget Sound and headwater spawning grounds, foraging on salmon eggs and juvenile salmon along their migration route (WDFW et al. 1997). Anadromous bull trout also use marine waters as migration corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter (Brenkman and Corbett 2005, p. 1079; Goetz et al. 2004, pp. 36, 60).

<u>Changes in Status of the Coastal-Puget Sound Interim Recovery Unit</u>

Although the status of bull trout in Coastal-Puget Sound interim recovery unit has been improved by certain actions, it continues to be degraded by other actions, and it is likely that the overall status of the bull trout in this population segment has not improved since its listing on November 1, 1999. Improvement has occurred largely through changes in fishing regulations and habitat-restoration projects. Fishing regulations enacted in 1994 either eliminated harvest of bull trout or restricted the amount of harvest allowed, and this likely has had a positive influence on the abundance of bull trout. Improvement in habitat has occurred following restoration projects intended to benefit either bull trout or salmon, although monitoring the effectiveness of these projects seldom occurs. On the other hand, the status of this population segment has been adversely affected by a number of Federal and non-Federal actions, some of which were addressed under section 7 of the Act. Most of these actions degraded the environmental baseline; all of those addressed through formal consultation under section 7 of the Act permitted the incidental take of bull trout.

Section 10(a)(1)(B) permits have been issued for Habitat Conservation Plans (HCP) completed in the Coastal-Puget Sound population segment. These include: 1) the City of Seattle's Cedar River Watershed HCP, 2) Simpson Timber HCP (now Green Diamond Resources), 3) Tacoma Public Utilities Green River HCP, 4) Plum Creek Cascades HCP, 5) Washington State Department of Natural Resources (WSDNR) State Trust Lands HCP, 6) West Fork Timber HCP, and 7) WSDNR Forest Practices HCP. These HCPs provide landscape-scale conservation for fish, including bull trout. Many of the covered activities associated with these HCPs will contribute to conserving bull trout over the long-term; however, some covered activities will result in short-term degradation of the baseline. All HCPs permit the incidental take of bull trout.

Changes in Status of the Columbia River Interim Recovery Unit

The overall status of the Columbia River interim recovery unit has not changed appreciably since its listing on June 10, 1998. Populations of bull trout and their habitat in this area have been affected by a number of actions addressed under section 7 of the Act. Most of these actions resulted in degradation of the environmental baseline of bull trout habitat, and all permitted or analyzed the potential for incidental take of bull trout. The Plum Creek Cascades HCP, Plum Creek Native Fish HCP, Storedahl Daybreak Mine HCP, and WSDNR Forest Practices HCP addressed portions of the Columbia River population segment of bull trout.

Changes in Status of the Klamath River Interim Recovery Unit

Improvements in the Threemile, Sun, and Long Creek local populations have occurred through efforts to remove or reduce competition and hybridization with non-native salmonids, changes in fishing regulations, and habitat-restoration projects. Population status in the remaining local populations (Boulder-Dixon, Deming, Brownsworth, and Leonard Creeks) remains relatively unchanged. Grazing within bull trout watersheds throughout the recovery unit has been curtailed. Efforts at removal of non-native species of salmonids appear to have stabilized the Threemile and positively influenced the Sun Creek local populations. The results of similar efforts in Long Creek are inconclusive. Mark and recapture studies of bull trout in Long Creek indicate a larger migratory component than previously expected.

Although the status of specific local populations has been slightly improved by recovery actions, the overall status of Klamath River bull trout continues to be depressed. Factors considered threats to bull trout in the Klamath Basin at the time of listing – habitat loss and degradation caused by reduced water quality, past and present land use management practices, water diversions, roads, and non-native fishes – continue to be threats today.

Changes in Status of the Saint Mary-Belly River Interim Recovery Unit

The overall status of bull trout in the Saint Mary-Belly River interim recovery unit has not changed appreciably since its listing on November 1, 1999. Extensive research efforts have been conducted since listing, to better quantify populations of bull trout and their movement patterns. Limited efforts in the way of active recovery actions have occurred. Habitat occurs mostly on Federal and Tribal lands (Glacier National Park and the Blackfeet Nation). Known problems due to instream flow depletion, entrainment, and fish passage barriers resulting from operations of the U.S. Bureau of Reclamation's Milk River Irrigation Project (which transfers Saint Mary-Belly River water to the Missouri River Basin) and similar projects downstream in Canada constitute the primary threats to bull trout and to date they have not been adequately addressed under section 7 of the Act. Plans to upgrade the aging irrigation delivery system are being pursued, which has potential to mitigate some of these concerns but also the potential to intensify dewatering. A major fire in August 2006 severely burned the forested habitat in Red Eagle and Divide Creeks, potentially affecting three of nine local populations and degrading the baseline.

Effects of Climate Change on Bull Trout

The Service's analyses include consideration of ongoing and projected changes in climate. The terms "climate" and "climate change" are defined by the Intergovernmental Panel on Climate Change (IPCC). "Climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

Climate change is likely to play an increasingly important role in determining the abundance of ESA-listed species and the conservation value of designated critical habitats in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. Areas with elevations high enough to maintain temperatures well below freezing for most of the winter and early spring will be less affected. Low-elevation areas are likely to be more affected. During the last century, average regional air temperatures increased by 1.5°F, with increases as much as 4°F in isolated areas (USGCRP 2009). Average regional temperatures are likely to increase an additional 3°F to 10°F over the next century (USGCRP 2009). Overall, about one-third of the current cold-water fish habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (USGCRP 2009).

Precipitation trends during the next century are less certain than for temperature, but more precipitation is likely to occur during October through March, less may occur during summer months, and more winter precipitation is likely to fall as rain rather than snow (ISAB 2007, USGCRP 2009). Significant reductions in both total snow pack and low-elevation snow pack in the Pacific Northwest is predicted over the next 50 years (Mote and Salathé 2010) – changes that will shrink the extent of the snowmelt-dominated habitat available to salmonids. Where snow occurs, a warmer climate will cause earlier runoff, which will increase flows in early spring but will likely reduce flows and increase water temperature in late spring, summer, and fall (ISAB 2007, USGCRP 2009).

As the snow pack diminishes and seasonal hydrology shifts to more frequent and severe early large storms, stream flow timing and increased peak river flows may limit salmonid survival (Mantua et al. 2010). Lower stream flows and warmer water temperatures during summer will degrade summer rearing conditions, in part by increasing the prevalence and virulence of fish diseases and parasites (USGCRP 2009). To avoid waters above summer maximum temperatures, juvenile rearing may be increasingly found only in the confluence of colder tributaries or other areas of cold water refugia (Mantua et al. 2010). Other adverse effects are likely to include altered migration patterns, accelerated embryo development, premature emergence of fry, variation in quality and quantity of tributary rearing habitat, and increased competition and predation risk from warm-water, non-native species (ISAB 2007).

The earth's oceans are also warming, with considerable interannual and inter-decadal variability superimposed on the longer-term trend (Bindoff et al. 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmonids, while cooler ocean periods have coincided with relatively high abundances (Scheuerell and Williams 2005; Zabel et al. 2006; USGCRP 2009). Ocean conditions adverse to salmonids may be more likely under a warming climate (Zabel et al. 2006).

Ocean acidification resulting from the uptake of carbon dioxide by ocean waters threatens corals, shellfish, and other living things that form their shells and skeletons from calcium carbonate (Orr et al. 2005; Feely et al. 2012). Such ocean acidification is essentially irreversible over a time scale of centuries (Royal Society 2005). Increasing carbon dioxide concentrations are reducing ocean pH and dissolved carbonate ion concentrations, and thus levels of calcium carbonate saturation. Over the past several centuries, ocean pH has decreased by about 0.1 (an approximately 30 percent increase in acidity) and is projected to decline by another 0.3 to 0.4 pH units (approximately 100 to 150 percent increase in acidity) by the end of this century (Orr et al. 2005; Feely et al. 2012). As aqueous carbon dioxide concentrations increase, carbonate ion concentrations decrease, making it more difficult for marine calcifying organisms to form biogenic calcium carbonate needed for shell and skeleton formation. The reduction in pH also affects photosynthesis, growth, and reproduction of marine organisms. The upwelling of deeper ocean water deficient in carbonate, and thus potentially detrimental to the food chains supporting juvenile salmonids, has recently been observed along the U.S. west coast (Feely et al. 2008).

Climate change is expected to make recovery targets for ESA-listed species more difficult to achieve. Actions improving freshwater and estuarine habitats can offset some of the adverse impacts of climate change. Examples include restoring connections to historical floodplains and estuarine habitats, protecting and restoring riparian vegetation, purchasing or applying easements to lands that provide important cold water or refuge habitat, and leasing or buying water rights to improve summer flows (Battin et al. 2007; ISAB 2007).

Status of the Bull Trout Critical Habitat

Legal Status

Current Designation

The U.S. Fish and Wildlife Service (Service) published a final critical habitat designation for the coterminous United States population of the bull trout on October 18, 2010 (70 FR 63898); the rule became effective on November 17, 2010. A justification document was also developed to support the rule and is available on our website (http://www.fws.gov/pacific/bulltrout). The scope of the designation involved the species' coterminous range, including six draft recovery units [Mid-Columbia, Saint Mary, Columbia Headwaters, Coastal, Klamath, and Upper Snake (75 FR 63927)]. The Service's 1999 coterminous listing rule identified five interim recovery units (50 CFR Part 17, pg. 58910), which includes the Jarbidge River, Klamath River, Columbia River, Coastal-Puget Sound, and Saint Mary-Belly River population segments (also considered as interim recovery units). Our five year review recommended re-evaluation of these units based on new information (USFWS 2008, p. 9). However, until the bull trout draft recovery plan is finalized, the current five interim recovery units will be used for purposes of section 7 jeopardy analyses and recovery planning. The adverse modification analysis in this biological opinion does not rely on recovery units, relying instead on the listed critical habitat units and subunits.

Rangewide, the Service designated reservoirs/lakes and stream/shoreline miles as bull trout critical habitat (Table 1). Designated bull trout critical habitat is of two primary use types: 1) spawning and rearing, and 2) foraging, migration, and overwintering (FMO).

Table 1. Stream/shoreline distance and reservoir/lake area designated as bull trout critical habitat by state.

State	Stream/Shoreline Miles	Stream/Shoreline Kilometers	Reservoir /Lake Acres	Reservoir /Lake Hectares
Idaho	8,771.6	14,116.5	170,217.5	68,884.9
Montana	3,056.5	4,918.9	221,470.7	89,626.4
Nevada	71.8	115.6	-	-
Oregon	2,835.9	4,563.9	30,255.5	12,244.0
Oregon/Idaho	107.7	173.3	-	-
Washington	3,793.3	6,104.8	66,308.1	26,834.0
Washington (marine)	753.8	1,213.2	-	-
Washington/Idaho	37.2	59.9	-	-
Washington/Oregon	301.3	484.8	-	-
Total	19,729.0	31,750.8	488,251.7	197,589.2

The 2010 revision increases the amount of designated bull trout critical habitat by approximately 76 percent for miles of stream/shoreline and by approximately 71 percent for acres of lakes and reservoirs compared to the 2005 designation.

This rule also identifies and designates as critical habitat approximately 1,323.7 km (822.5 miles) of streams/shorelines and 6,758.8 ha (16,701.3 acres) of lakes/reservoirs of unoccupied habitat to address bull trout conservation needs in specific geographic areas in several areas not occupied at the time of listing. No unoccupied habitat was included in the 2005 designation. These unoccupied areas were determined by the Service to be essential for restoring functioning migratory bull trout populations based on currently available scientific information. These unoccupied areas often include lower main stem river environments that can provide seasonally important migration habitat for bull trout. This type of habitat is essential in areas where bull trout habitat and population loss over time necessitates reestablishing bull trout in currently unoccupied habitat areas to achieve recovery.

The final rule continues to exclude some critical habitat segments based on a careful balancing of the benefits of inclusion versus the benefits of exclusion. Critical habitat does not include: 1) waters adjacent to non-Federal lands covered by legally operative incidental take permits for habitat conservation plans (HCPs) issued under section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (Act), in which bull trout is a covered species on or before the publication of this final rule; 2) waters within or adjacent to Tribal lands subject to certain commitments to conserve bull trout or a conservation program that provides aquatic resource protection and restoration through collaborative efforts, and where the Tribes indicated that inclusion would impair their relationship with the Service; or 3) waters where impacts to national security have been identified (75 FR 63898). Excluded areas are approximately 10 percent of the stream/shoreline miles and 4 percent of the lakes and reservoir acreage of designated critical habitat. Each excluded area is identified in the relevant Critical Habitat Unit (CHU) text, as identified in paragraphs (e)(8) through (e)(41) of the final rule. See Tables 2 and 3 for the list of excluded areas. It is important to note that the exclusion of waterbodies from designated critical habitat does not negate or diminish their importance for bull trout conservation. Because exclusions reflect the often complex pattern of land ownership, designated critical habitat is often fragmented and interspersed with excluded stream segments.

Table 2. Stream/shoreline distance excluded from bull trout critical habitat based on Tribal ownership or other plan.

Ownership and/or Plan	Kilometers	Miles
Lewis River Hydro Conservation Easements	7.0	4.3
DOD – Dabob Bay Naval	23.9	14.8
HCP – Cedar River (City of Seattle)	25.8	16.0
HCP – Washington Forest Practices Lands	1,608.30	999.4
HCP – Green Diamond (Simpson)	104.2	64.7
HCP – Plum Creek Central Cascades (WA)	15.8	9.8
HCP – Plum Creek Native Fish (MT)	181.6	112.8
HCP–Stimson	7.7	4.8
HCP – WDNR Lands	230.9	149.5
Tribal – Blackfeet	82.1	51.0
Tribal – Hoh	4.0	2.5
Tribal – Jamestown S'Klallam	2.0	1.2
Tribal – Lower Elwha	4.6	2.8

Ownership and/or Plan	Kilometers	Miles
Tribal – Lummi	56.7	35.3
Tribal – Muckleshoot	9.3	5.8
Tribal – Nooksack	8.3	5.1
Tribal – Puyallup	33.0	20.5
Tribal – Quileute	4.0	2.5
Tribal – Quinault	153.7	95.5
Tribal – Skokomish	26.2	16.3
Tribal – Stillaguamish	1.8	1.1
Tribal – Swinomish	45.2	28.1
Tribal – Tulalip	27.8	17.3
Tribal – Umatilla	62.6	38.9
Tribal – Warm Springs	260.5	161.9
Tribal – Yakama	107.9	67.1
Total	3,094.9	1,923.1

Table 3. Lake/Reservoir area excluded from bull trout critical habitat based on Tribal ownership or other plan.

Ownership and/or Plan	Hectares	Acres
HCP – Cedar River (City of Seattle)	796.5	1,968.2
HCP – Washington Forest Practices Lands	5,689.1	14,058.1
HCP – Plum Creek Native Fish	32.2	79.7
Tribal – Blackfeet	886.1	2,189.5
Tribal – Warm Springs	445.3	1,100.4
Total	7,849.3	19,395.8

Conservation Role and Description of Critical Habitat

The conservation role of bull trout critical habitat is to support viable core area populations (75 FR 63898:63943 [October 18, 2010]). The core areas reflect the metapopulation structure of bull trout and are the closest approximation of a biologically functioning unit for the purposes of recovery planning and risk analyses. CHUs generally encompass one or more core areas and may include FMO areas, outside of core areas, that are important to the survival and recovery of bull trout.

Thirty-two CHUs within the geographical area occupied by the species at the time of listing are designated under the final rule. Twenty-nine of the CHUs contain all of the physical or biological features identified in this final rule and support multiple life-history requirements. Three of the mainstem river units in the Columbia and Snake River basins contain most of the physical or biological features necessary to support the bull trout's particular use of that habitat, other than those physical biological features associated with Primary Constituent Elements (PCEs) 5 and 6, which relate to breeding habitat.

The primary function of individual CHUs is to maintain and support core areas, which 1) contain bull trout populations with the demographic characteristics needed to ensure their persistence and contain the habitat needed to sustain those characteristics (Rieman and McIntyre 1993, p. 19); 2) provide for persistence of strong local populations, in part, by providing habitat conditions that encourage movement of migratory fish (Rieman and McIntyre 1993, pp. 22-23; MBTSG 1998, pp. 48-49); 3) are large enough to incorporate genetic and phenotypic diversity, but small enough to ensure connectivity between populations (Hard 1995, pp. 314-315; Healey and Prince 1995, p. 182; Rieman and McIntyre 1993, pp. 22-23; MBTSG 1998, pp. 48-49); and 4) are distributed throughout the historic range of the species to preserve both genetic and phenotypic adaptations (Hard 1995, pp. 321-322; Rieman and McIntyre 1993, p. 23; Rieman and Allendorf 2001, p. 763; MBTSG 1998, pp. 13-16).

The Olympic Peninsula and Puget Sound CHUs are essential to the conservation of anadromous[2] bull trout, which are unique to the Coastal-Puget Sound population segment. These CHUs contain marine nearshore and freshwater habitats, outside of core areas, that are used by bull trout from one or more core areas. These habitats, outside of core areas, contain PCEs that are critical to adult and subadult foraging, overwintering, and migration.

Primary Constituent Elements for Bull Trout

Within the designated critical habitat areas, the PCEs for bull trout are those habitat components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering. Based on our current knowledge of the life history, biology, and ecology of this species and the characteristics of the habitat necessary to sustain its essential life-history functions, we have determined that the following PCEs are essential for the conservation of bull trout.

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.

2. Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

[2] Bull trout migrate from saltwater to freshwater to reproduce are commonly referred to as anadromous. However, bull trout and some other species that enter the marine environment are more properly termed amphidromous. Unlike strictly anadromous species, such as Pacific salmon, amphidromous species often return seasonally to fresh water as subadults, sometimes for several years, before returning to spawn (Brenkman and Corbett 2005, p. 1075; Wilson 1997, p. 5). Due to its more common usage, we will refer to bull trout has exhibiting anadromous rather than amphidromous life history patterns in this document.

4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.

5. Water temperatures ranging from 2 °C to 15 °C (36 °F to 59 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.

6. In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system.

7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.

8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

The revised PCE's are similar to those previously in effect under the 2005 designation. The most significant modification is the addition of a ninth PCE to address the presence of nonnative predatory or competitive fish species. Although this PCE applies to both the freshwater and marine environments, currently no non-native fish species are of concern in the marine environment, though this could change in the future.

Note that only PCEs 2, 3, 4, 5, and 8 apply to marine nearshore waters identified as critical habitat. Also, lakes and reservoirs within the CHUs also contain most of the physical or biological features necessary to support bull trout, with the exception of those associated with PCEs 1 and 6. Additionally, all except PCE 6 apply to FMO habitat designated as critical habitat.

Critical habitat includes the stream channels within the designated stream reaches and has a lateral extent as defined by the bankfull elevation on one bank to the bankfull elevation on the opposite bank. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge that generally has a recurrence interval of

1 to 2 years on the annual flood series. If bankfull elevation is not evident on either bank, the ordinary high-water line must be used to determine the lateral extent of critical habitat. The lateral extent of designated lakes is defined by the perimeter of the waterbody as mapped on standard 1:24,000 scale topographic maps. The Service assumes in many cases this is the full-pool level of the waterbody. In areas where only one side of the waterbody is designated (where only one side is excluded), the mid-line of the waterbody represents the lateral extent of critical habitat.

In marine nearshore areas, the inshore extent of critical habitat is the mean higher high-water (MHHW) line, including the uppermost reach of the saltwater wedge within tidally influenced freshwater heads of estuaries. The MHHW line refers to the average of all the higher high-water heights of the two daily tidal levels. Marine critical habitat extends offshore to the depth of 10 meters (m) (33 ft) relative to the mean lower low-water (MLLW) line (zero tidal level or average of all the lower low-water heights of the two daily tidal levels). This area between the MHHW line and minus 10 m MLLW line (the average extent of the photic zone) is considered the habitat most consistently used by bull trout in marine waters based on known use, forage fish availability, and ongoing migration studies and captures geological and ecological processes important to maintaining these habitats. This area contains essential foraging habitat and migration corridors such as estuaries, bays, inlets, shallow subtidal areas, and intertidal flats.

Adjacent shoreline riparian areas, bluffs, and uplands are not designated as critical habitat. However, it should be recognized that the quality of marine and freshwater habitat along streams, lakes, and shorelines is intrinsically related to the character of these adjacent features, and that human activities that occur outside of the designated critical habitat can have major effects on physical and biological features of the aquatic environment.

Activities that cause adverse effects to critical habitat are evaluated to determine if they are likely to “destroy or adversely modify” critical habitat by no longer serving the intended conservation role for the species or retaining those PCEs that relate to the ability of the area to at least periodically support the species. Activities that may destroy or adversely modify critical habitat are those that alter the PCEs to such an extent that the conservation value of critical habitat is appreciably reduced (75 FR 63898:63943; USFWS 2004, Vol. 1. pp. 140-193, Vol. 2, pp. 69-114). The Service’s evaluation must be conducted at the scale of the entire critical habitat area designated, unless otherwise stated in the final critical habitat rule (USFWS and NMFS 1998, pp. 4-39). Thus, adverse modification of bull trout critical habitat is evaluated at the scale of the final designation, which includes the critical habitat designated for the Klamath River, Jarbidge River, Columbia River, Coastal-Puget Sound, and Saint Mary-Belly River population segments. However, we consider all 32 CHUs to contain features or areas essential to the conservation of the bull trout (75 FR 63898:63901, 63944). Therefore, if a proposed action would alter the physical or biological features of critical habitat to an extent that appreciably reduces the conservation function of one or more critical habitat units for bull trout, a finding of adverse modification of the entire designated critical habitat area may be warranted (75 FR 63898:63943).

Current Critical Habitat Condition Rangewide

The condition of bull trout critical habitat varies across its range from poor to good. Although still relatively widely distributed across its historic range, the bull trout occurs in low numbers in many areas, and populations are considered depressed or declining across much of its range (67 FR 71240). This condition reflects the condition of bull trout habitat. The decline of bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, impoundments, dams, water diversions, and the introduction of nonnative species (63 FR 31647, June 10 1998; 64 FR 17112, April 8, 1999).

There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout and their habitat, and continue to do so. Among the many factors that contribute to degraded PCEs, those which appear to be particularly significant and have resulted in a legacy of degraded habitat conditions are as follows: 1) fragmentation and isolation of local populations due to the proliferation of dams and water diversions that have eliminated habitat, altered water flow and temperature regimes, and impeded migratory movements (Dunham and Rieman 1999, p. 652; Rieman and McIntyre 1993, p. 7); 2) degradation of spawning and rearing habitat and upper watershed areas, particularly alterations in sedimentation rates and water temperature, resulting from forest and rangeland practices and intensive development of roads (Fraley and Shepard 1989, p. 141; MBTSG 1998, pp. ii - v, 20-45); 3) the introduction and spread of nonnative fish species, particularly brook trout and lake trout, as a result of fish stocking and degraded habitat conditions, which compete with bull trout for limited resources and, in the case of brook trout, hybridize with bull trout (Leary et al. 1993, p. 857; Rieman et al. 2006, pp. 73-76); 4) in the Coastal-Puget Sound region where amphidromous bull trout occur, degradation of mainstem river FMO habitat, and the degradation and loss of marine nearshore foraging and migration habitat due to urban and residential development; and 5) degradation of FMO habitat resulting from reduced prey base, roads, agriculture, development, and dams.

Effects of Climate Change on Bull Trout Critical Habitat

One objective of the final rule was to identify and protect those habitats that provide resiliency for bull trout use in the face of climate change. Over a period of decades, climate change may directly threaten the integrity of the essential physical or biological features described in PCEs 1, 2, 3, 5, 7, 8, and 9. Protecting bull trout strongholds and cold water refugia from disturbance and ensuring connectivity among populations were important considerations in addressing this potential impact. Additionally, climate change may exacerbate habitat degradation impacts both physically (e.g., decreased base flows, increased water temperatures) and biologically (e.g., increased competition with non-native fishes).

Consulted on Effects for Critical Habitat

The Service has formally consulted on the effects to bull trout critical habitat throughout its range. Section 7 consultations include actions that continue to degrade the environmental baseline in many cases. However, long-term restoration efforts have also been implemented that provide some improvement in the existing functions within some of the critical habitat units.

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Supporting Documents
Biological Opinions for
Programmatic Sediment Management Plan

National Marine Fisheries Service
Biological Opinion

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, Washington 98115

NMFS Tracking Number: WCR-2014-1704

November 14, 2014

Lieutenant Colonel Timothy R. Vail
Department of the Army
Walla Walla District, Corps of Engineers
201 North Third Avenue
Walla Walla, Washington 99362-1876

Re: Endangered Species Act section 7 Formal Consultation and Magnuson-Stevens Act Essential Fish Habitat Consultation for the Programmatic Sediment Management Plan in the Lower Snake River and Lower Clearwater River (5th Field HUCs: 1706011004, 1706011001, 1706010708, 1706010702, 1706010303, 1706030613); Walla Walla, Columbia, Garfield, and Asotin Counties, Washington; Nez Perce County, Idaho

Dear Lt. Col. Vail:

The enclosed document contains a biological opinion (Opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) on the effects the U.S. Army Corps of Engineers' (COE) Programmatic Sediment Management Plan (PSMP) for the lower Snake River. In this Opinion, NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of ESA-listed Snake River spring/summer-run Chinook salmon (*Oncorhynchus tshawytscha*), Snake River fall-run Chinook salmon (*O. tshawytscha*), Snake River sockeye salmon (*O. nerka*), or Snake River Basin steelhead (*O. mykiss*), or any of their designated critical habitat.

As required by section 7 of the ESA, NMFS provided an incidental take statement with the Opinion. The incidental take statement describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements, that the Federal agency and any person who performs the action must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA take prohibition.

This document also includes the results of our analysis of the action's likely effects on essential fish habitat (EFH) pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes one Conservation Recommendation to avoid, minimize, or otherwise offset potential adverse effects to EFH. These Conservation Recommendations are a non-identical set of the ESA terms and conditions. Section 305(b)(4)(B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH Conservation Recommendations, the Walla Walla District of the COE must explain why, including the justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many Conservation Recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, in your statutory reply to the EFH portion of this consultation, we ask that you clearly identify the number of Conservation Recommendations accepted.

If you have any questions, please contact Bob Ries at (208) 882-6148 or electronic mail at bob.ries@noaa.gov.

Sincerely,

for William W. Stelle, Jr.
Regional Administrator

Enclosure

cc M. Eames – FWS
R. Hennekey – IDFG
B.Tice – COE
M. Lopez – NPT

:

Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation

Lower Snake Programmatic Sediment Management Plan

Fourth Field Hydrologic Unit Codes: 1706011004, 1706011001, 1706010708, 1706010702, 1706010303, 1706030613; Walla Walla, Columbia, Garfield, and Asotin Counties, Washington; Nez Perce County, Idaho

NMFS Consultation Number: WCR-2014-1704

Action Agency: U.S. Army Corps of Engineers, Walla Walla District

Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?	Is Action Likely to Jeopardize the Species?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
Snake River spring/summer-run Chinook salmon (*Oncorhynchus tshawytscha*)	Threatened	Yes	No	No
Snake River fall-run Chinook salmon (*O. tshawytscha*)	Threatened	Yes	No	No
Snake River sockeye salmon (*O. nerka*)	Endangered	Yes	No	No
Snake River Basin Steelhead (*O. mykiss*)	Threatened	Yes	No	No
Middle Columbia River Steelhead (*O. mykiss*)	Threatened	No	No	No
Upper Columbia River Steelhead (*O. mykiss*)	Threatened	No	No	No
Upper Columbia River spring Chinook salmon (*O. tshawytscha*)	Threatened	No	No	No

Fishery Management Plan that Describes EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued by:

for William W. Stelle, Jr.
Regional Administrator

Date: November 14, 2014

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ACRONYM GLOSSARY

BA	Biological Assessment
BMP	Best Management Practices
CFR	Code of Federal Regulations
cfs	cubic feet per second
COE	U.S. Army Corps of Engineers
Comp Plan	Lower Snake River Fish and Wildlife Compensation Plan
CRITFC	Columbia River Inter-Tribal Fish Commission
CWA	Clean Water Act
cy	cubic yards
dB	decibel
DPS	Distinct Population Segment
DQA	Data Quality Act
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FR	Federal Register
HMU	Habitat Management Unit
HUC	Hydrologic Unit Code
ICTRT	Interior Columbia Basin Technical Recovery Team
ISAB	Independent Scientific Advisory Board
ITS	Incidental Take Statement
LSMG	Local Sediment Management Group
LSRP	Lower Snake River Project
MCR	Mid-Columbia River
MPG	Major Population Group
MOP	Minimum Operating Pool
msl	mean sea level
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act of 1969, as amended
NMFS	National Marine Fisheries Service
NTU	Nephelometric Turbidity Unit
Opinion	Biological Opinion
PCE	Primary Constituent Element
PFMC	Pacific Fishery Management Council

PL	Public Law
PSMP	Programmatic Sediment Management Plan
RM	River Mile
SEV	Severity of Ill Effects Score
SR	Snake River
SRB	Snake River Basin (steelhead)
SRF	Snake River fall-run (Chinook)
SRSS	Snake River spring/summer-run (Chinook)
UCR	Upper Columbia River
USFWS	U.S. Fish and Wildlife Service
U.S.C.	United States Code
VSP	Viable Salmonid Population

1 INTRODUCTION

This introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

The biological opinion (Opinion) and incidental take statement portions of this document were prepared by the National Marine Fisheries Service (NMFS) in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531, *et seq*.), and implementing regulations at 50 CFR 402.

NMFS also completed an essential fish habitat (EFH) consultation. It was prepared in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 *et seq*.) and implementing regulations at 50 CFR 600.

The Opinion and EFH Conservation Recommendations are both in compliance with section 515 of the Treasury and General Government Appropriations Act of 2001 (Data Quality Act[DQA]) (44 U.S.C. 3504(d)(1) *et seq*.), and underwent pre-dissemination review.

The proposed action is contemplated under various acts. Congress authorized the reservoir system and the navigation channel that runs through the reservoirs with the River and Harbor Act of 1945 (Public Law [PL] 79-14), section 2. This act included authorization to construct Ice Harbor, Lower Monumental, Little Goose, and Lower Granite lock and dams for the purposes of inland navigation, power generation, and incidental irrigation water supply.

The Flood Control Act of 1962 (PL 87-874) mandated the establishment of the navigation channel within the Lower Snake River Project (LSRP) at 14 feet deep by 250 feet wide at the minimum operating pool (MOP) level, and provides the U.S. Army Corps of Engineers (COE) with authority to maintain the channel at those dimensions.

Based on the authorizing legislation and associated Congressional documents, Congress required the COE to maintain the lower Snake River navigation channel at the dimensions specifically designated by Congress (i.e., 14 feet deep and 250 feet wide) and for slack water navigation to be possible on the lower Snake River on a year-round basis. The COE lacks discretion to designate alternative channel dimensions.

The proposed action is a programmatic sediment management plan (PSMP) developed by the COE. The purpose of the PSMP is to provide a comprehensive framework for COE maintenance actions to manage and prevent, if possible, the accumulation of sediment that interferes with existing authorized purposes of the LSRP (i.e., commercial navigation, recreation, fish and wildlife conservation, and flow conveyance at Lewiston, Idaho). The PSMP is a long-term plan that forms the basis of the COE's decision-making process for future sediment management activities needed to maintain and meet existing authorized project purposes of the LSRP. The PSMP is intended to be a proactive adaptive management plan, addressing both the immediate near-term problems and anticipated future problems before they are critical and solutions become limited. The PSMP will guide only those actions taken by the COE within the project boundaries of the LSRP that are within the COE's authority.

The PSMP does not authorize or implement any site specific action or activity, but rather provides the decision making framework to make future site specific decisions at a later date. Thus, there is no direct and immediate effect to listed species from the PSMP. The effects to listed species will accrue when future site-specific actions are authorized under this framework, and the COE will engage its own site specific consultation when these projects or activities are proposed. Even though there is no direct immediate effect from the PSMP, NMFS has nevertheless analyzed the possible effects of this plan on listed species to ensure the COE's compliance with section 7(a)(2) of the ESA.

1.2 Consultation History

Prior to development of the PSMP, NMFS participated in the local sediment management group (LSMG) for the lower Snake River, which has met periodically since 2000. This group provided a forum to address regional sediment issues common to groups that include tribes, state and Federal agencies, public ports, environmental groups, and transportation interests. All of the sediment management measures in the PSMP were discussed informally at various times within the LSMG. While NMFS was involved in discussions with the LSMG related to sediment management activities in the lower Snake River, NMFS had no direct involvement in developing the PSMP.

On May 23, 2014, NMFS received a request from the COE seeking concurrence with the COE's determination that the PSMP had no effect on listed species or critical habitat since all actions under the PSMP would require subsequent project-level decisions and project-level ESA consultations. After discussions among the COE, NMFS, and U.S. Fish and Wildlife Service (USFWS) regarding consultations on programmatic actions, on July 10, 2014, the COE decided to withdraw the request for concurrence and instead request consultation. Formal consultation was initiated on August 5, 2014, when NMFS received a biological assessment (BA) from the COE on the PSMP. Additional information was provided from the COE through several letters, emails, and phone conversations. The information included updated conservation measures that were received by NMFS on September 22, 2014.

1.3 Proposed Action

The COE proposes to adopt and implement a PSMP to guide the management of sediment within the lower Snake River system to meet the authorized project purposes of the LSRP (i.e., commercial navigation, recreation, fish and wildlife conservation, and flow conveyance at Lewiston, Idaho). The PSMP describes potential sediment management actions to address locations in the Snake River where sediment accumulation interferes with navigation, recreation, fish and wildlife conservation, or flow conveyance. Under the PSMP the COE will follow a process of monitoring and problem identification to plan and implement site-specific actions, and carry out those actions after project-level National Environmental Policy Act (NEPA) and ESA section 7 analyses are completed.

The following discussion describes: (1) The management measures described in the PSMP for addressing sediment issues; (2) areas where sediment issues have previously occurred and are likely to recur; (3) the framework set out in the PSMP for identifying actions to respond to specific sediment issues; (4) conservation measures to be implemented when sediment management actions are taken; and (5) the potential frequency, duration, and magnitude of specific actions described in the PSMP.

1.3.1 The PSMP Management Measures

Through a collaborative process that included a series of workshops involving technical experts from the COE and other agencies and input from scoping and stakeholders, the COE developed a broad range of management measures that could address sediment accumulation problems. The management measures fall within four general categories: dredging and dredged material management, structural management, system management, and upland sediment reduction (Table 1). These categories are summarized in the following subparagraphs, which also provide generally a worst-case description of quantities and frequency associated with each measure to facilitate ESA consultation. The actual/anticipated quantities/frequencies associated with such measures may be much less.

Table 1. Management Measures

Measure	Description
Dredging and Dredged Material Management	
Navigation and Other Dredging	Dredging typically consists of excavation, transport, and placement of dredged sediments. The excavation process for the lower Snake River generally involves the removal by mechanical means (e.g., a barge-mounted “clamshell” dredge scooping sediments from the reservoir bottom) to restore the intended dimension or use of the area where sediment has accumulated. Removal of material by hydraulic means (e.g., suction or water induced vacuum) may also be considered for recreation and habitat management Unit (HMU) irrigation facilities when potential adverse effects to ESA listed fish is unlikely. This measure would also have ancillary benefit for flow conveyance through the Lewiston levee system.
Dredge to improve conveyance capacity	This measure differs from the “Navigation and Other Dredging” measure in that it involves removal of substantially greater quantities of sediments from areas outside the navigation channel, access channel and port berthing areas, and/or recreation facilities. The excavation process involves sediment removal by mechanical means at the Snake and Clearwater Rivers confluence to improve flow conveyance.

Measure	Description
Beneficial use of sediment	Beneficial use of dredged material includes a wide variety of options that utilize the dredged material for some productive purpose such as habitat restoration/enhancement, construction and industrial use, etc and can apply to upland or in-water disposal options. The COE views dredged material as a valuable and manageable resource and seeks opportunities to use it beneficially whenever possible. The COE has beneficially used dredged material in the past to create fish habitat. Other potential beneficial uses include: habitat restoration/enhancement, beach nourishment, aquaculture, parks and recreation, agriculture, forestry, horticulture, strip mine reclamation, landfill cover for solid waste management, shoreline stabilization, erosion control, construction, and industrial use. Beneficial use of dredged material generally requires a cost-share sponsor (See ER 1105-2-100), unless it is the least cost, environmentally acceptable alternative.
In-water disposal of sediment	In-water disposal of dredged sediment is the discharge of dredged material back into the waterway. Typically, dredged material is transported to a previously identified in-water location selected to minimize impacts and released into the water.
Upland disposal of sediment	In upland placement, dredged material is placed on land, above high water, and out of wetland areas. The dredged material is typically placed in a cell behind levees/dikes that contain and isolate it from the surrounding environment. The dredged material is dewatered through evaporation and/or settling with the effluent discharged as clean water.
Structural Sediment Management	
Bendway weirs	Bendway weirs are rock sills located on the outside of a stream or river bend that are angled upstream into the direction of flow. With the weirs angled upstream, flow is directed away from the outer bank of the bend and toward the point bar or inner part of the bend. This redirection of flow occurs at all stages higher than the weir crest. Where there is sufficient velocity and volume, the redirection of flow generally results in a widening of the channel through scour of the point bar. Bendway weirs are typically used to maintain navigation channels.
Dikes/dike fields	Dikes are longitudinal structures used to maintain navigation channels through effects on channel depth and alignment. Dikes constrict low and intermediate flows, causing the channel velocity to increase within the reach, thereby scouring a deeper channel. Dikes are typically built of rock, but can also be constructed using other materials.
Agitation to resuspend	This technique involves the deliberate agitation and resuspension of deposited sediment; the sediment is then carried downriver as part of the suspended load of the river. This technique requires both some form of agitation mechanism, and sufficient river flow (velocity and volume) to carry the additional sediment load away from the targeted area. There are numerous potential means to mechanically agitate and resuspend sediment, including high pressure air and water pumps and using propellers to move sediment.
Trapping Upstream Sediments (In-Reservoir)	This measure would involve excavating a pit, or sediment trap, in a depositional part of the upstream reach of a river or reservoir to trap incoming sediment, thus reducing the sediment available to deposit in other areas where it may interfere with existing authorized project purposes. Sediment would have to be periodically removed from the trap and managed by one of the measures described above (i.e., beneficial use, in-water or upland placement).
System Management	

Measure	Description
Navigation Objective Reservoir Operation	This measure involves operating reservoirs of the LSRP at water surface elevations that would provide a 14-foot deep channel within the Federal navigation channel. The COE would manage pool levels within the preset operating range for each reservoir to maintain 14 feet of water depth over areas where sediment deposition has occurred in the channel. Currently the COE operates the LSRP at MOP, or as close to MOP as possible, during the juvenile salmonid outmigration season (typically from April through August, but as late as October in Lower Granite reservoir), and at varying levels within each reservoir's 3 or 5-foot operating range through the rest of the year. This measure would provide the COE the option of operating above MOP and even at the upper end of the operating range year-round as needed to maintain the 14-foot deep navigation channel.
Reconfigure affected facilities	This measure applies only to COE facilities affected by sediment and could include a range of facility modifications. Examples include water intake structures, mooring facilities, docks, boat ramps, and loading/unloading facilities that could potentially be extended to reach out beyond nearshore areas where sediment deposition is occurring. In addition to reconfiguring water intake structures, alternative water sources for irrigation could be explored. Reconfiguration of recreation facilities may also include consideration of repurposing; temporarily, partial or full closing; and/or reducing the scope of the facility.
Relocate affected facilities	Moving or relocating affected facilities affected by sediment deposition is potentially suitable for navigation facilities, recreational boating facilities, and water intake structures. In addition to relocating water intake structures, alternative water sources for irrigation could be explored. The COE' ability to consider/study the feasibility of reconfiguring or relocating port facilities is limited and generally requires a cost-share sponsor and specific authority. The COE could consider/study reconfiguration or relocation of port facilities, if requested by the Ports, subject to availability of authority and funding.
Raise Lewiston Levee to Manage Flood Risk	Current analysis indicates that flood risk is within acceptable limits, however if future sediment accumulation changes the flood risk to Lewiston by raising the water level in the reservoir, raising the levee would be an option for reducing flood risk. Location and height of change would be determined through detailed site- and time-specific studies.
Reservoir Drawdown to Flush Sediment)	In this measure, flow would be temporarily modified to increase the capacity of the river system to scour and carry sediment, thereby flushing deposited sediments downstream. The ability of a river system to carry sediment is determined by the river's velocity and volume. Flow modification would be created by a drawdown of a reservoir to increase velocity. Drawing down the pool elevation by 10 to 15 feet during a 30- to 45-day period in an effort to flush sediments from the navigation channel. Flow modification would be created by a drawdown of the Lower Granite reservoir. Lower Granite reservoir is the only LSRP reservoir in which this measure would be effective. Flow modifications would be temporary and would be timed to take advantage of naturally-occurring periods of high flows.
Upland Sediment Reduction (Expanded)	
Local Sediment Management Group (LSMG) Coordination Meetings	The LSMG is an information exchange forum comprised of the COE and Federal and state regulatory agencies, tribal governments, local governments, and non-governmental organizations (e.g., barge operators, Ports, Pacific Northwest Waterways Association). The primary purposes of the meetings would be to share data and compare trends observed by each agency, identify potential opportunities to improve each agency's independent sediment reduction practices, and analyze trends on a watershed basis. Information gained from LSMG meetings may be used by the COE to adapt PSMP measures.

Dredging and Dredged Materials Management

Dredging involves physical removal of sediments from one location, and placement of the dredged material in another location. The dredging process typically consists of excavation, transport, and placement of dredged sediments. Excavation would generally be by mechanical means (i.e., physically scooping sediments with a clamshell or backhoe). Removal of material by hydraulic means (e.g., suction or water induced vacuum) may also be considered for recreation and HMU irrigation facilities when potential adverse effects to ESA listed fish are unlikely. Once dredged, sediments are transported to a disposal or placement area. Dredged material may be disposed of in-water or upland and may be beneficially used for purposes other than disposal only, such as habitat creation. The disposal method is ultimately identified through evaluation of disposal alternatives under the substantive provisions of Section 404(b)(1) of the Clean Water Act, guidelines established by the Environmental Protection Agency (EPA) (40 CFR 230) and COE regulations.

<u>Dredging</u>

Dredging is a measure that is applicable to almost any sediment accumulation issue. Dredging technologies can be scaled to address small or large quantities of sediment and can be applied in almost any environment. A corresponding measure to manage dredged sediments must be available (see “Dredged Material Management” below).

Dredging consists of removal, transport, and placement of dredged sediments. For the purposes of this analysis, the term “dredging” will refer to the excavation process, as placement and disposal options are discussed separately. The excavation process involves the removal of deposited sediment as part of maintenance activities. After excavation, the sediment is transported from the dredging site to a site where it will be used or permanently placed. This transport operation is typically accomplished by the dredge itself or by using additional equipment such as barges. Use and/or placement can occur in-water or in an upland area.

Backhoe and bucket (such as clamshell, or dragline) are types of mechanical dredges. Clamshell buckets are the most commonly used dredges in the lower Snake River. Mechanical dredging has been used primarily due to concerns about potential entrainment of fish associated with hydraulic, or suction, dredging. Sediments excavated with a mechanical dredge are generally placed onto a barge or truck (for near-shore excavations) for transportation to the use or disposal site.

Dredging has historically been the most common method used to remove sediment and maintain navigation channels, recreation areas, berthing areas, and flow conveyance capacity. Additionally, due to concerns over potential effects to listed endangered anadromous species and other aquatic resources, dredging in the lower Snake River is typically limited to a winter in-water work window of December 15 to March 1. Summer dredging may also be considered for other off-channel areas such as boat basins, swim beaches, or irrigation intakes on a case-by-case basis. These shallow-water areas may have elevated water temperatures at certain times during the summer and thus may not have salmonid fish present. The material dredged from these sites would probably be disposed of at an upland location since the in-water disposal areas (e.g. Knoxway Bench) may have salmonid fish present during the disposal activity.

On a case-by-case basis, hydraulic dredging may be considered for off-channel areas such as boat basins, swim beaches, or irrigation intakes, when potential adverse effects to ES- listed fish are unlikely. This would probably be done in the summer when water temperatures are elevated in these off channel areas and salmonid fish are less likely to be present. The dredged material would exit the dredge as a slurry that is likely to be 65% to 80% water and would not be suitable for in-water disposal as described above. Instead, this slurry could be incorporated into the wildlife habitat planting areas or used to restore eroded streambanks near the intakes.

Navigation and Other Dredging. Dredging typically consists of excavation, transport, and placement or disposal of dredged sediments. The excavation process for the lower Snake River generally involves the removal by mechanical means (e.g., a barge-mounted “clamshell” dredge scooping sediments from the reservoir bottom) to restore the congressionally authorized navigation channel dimensions or use of non-navigation areas where sediment has accumulated.

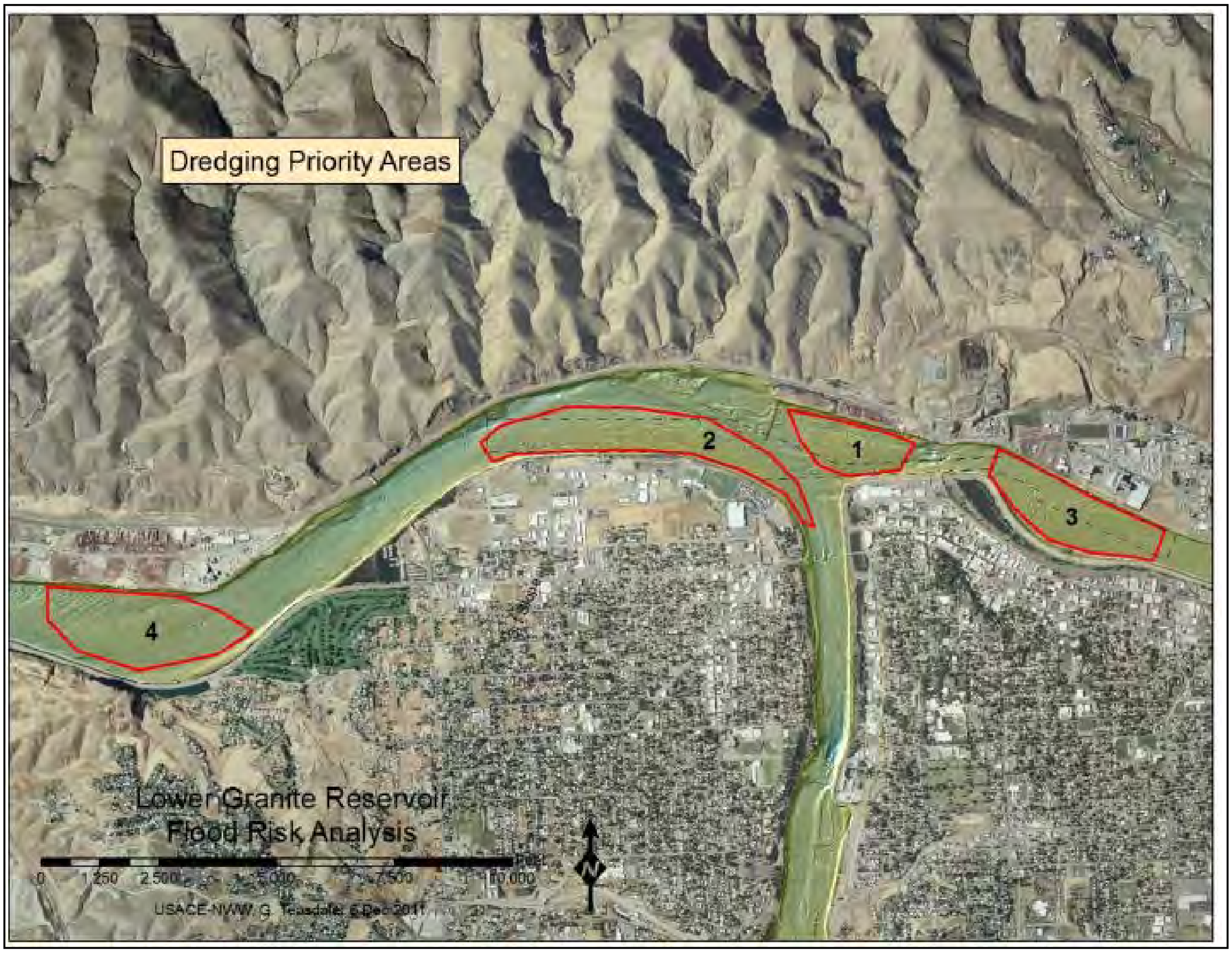
Removal of material by hydraulic means (e.g., suction or water induced vacuum) may also be considered for recreation and habitat management unit (HMU) irrigation facilities when potential adverse effects to ESA-listed fish are unlikely. This measure would also have ancillary benefit for flow conveyance through the Lewiston levee system.

The COE anticipates that dredging 200,000 to 500,000 cubic yards (cy) of material, primarily from the Snake-Clearwater rivers confluence area, will be needed every 3 to 5 years, unless longer-term solutions are identified. The COE anticipates dredging 500 to 15,000 cy of material from other areas (recreation or fish and wildlife sites) every 3 to 9 years. For additional information on potential actions that may be taken in response to sediment accumulation, see Section 3.4.3 below.

Dredging to Improve Flow Conveyance. This measure differs from the “Navigation and Other Dredging” measure in that it involves removal of substantially greater quantities of sediments from areas outside the Federal navigation channel, access channel and port berthing areas, and/or recreation facilities. The excavation process involves sediment removal by mechanical means at the Snake and Clearwater Rivers confluence at the upstream end of Lower Granite reservoir to improve flow conveyance.

Flow conveyance dredging in the Lower Granite reservoir would extend from the Port of Wilma near Snake RM 134 to the U.S. Highway 12 bridge located upstream of the confluence of the Snake and Clearwater Rivers, near Snake river mile (RM) 139.5. The Clearwater River dredging would extend from the Snake River confluence upstream to RM 2.0. The priority areas for dredging within the template are depicted in Figure 1.

Figure 1. Dredging Priority Areas for Flow Conveyance



The Snake and Clearwater Rivers confluence area dredging template varies in width from 300 feet, near the Port of Wilma, to 1,700 feet in the Clearwater River confluence area. The average dredging width on the Snake River within this area would be 750 feet. Material would be removed to approximately elevation 708, which is 25 feet below MOP. Material would not be removed from the original riverbed or shoreline.

The COE anticipates dredging in the confluence area would require annual removal of between 750,000 to 1,000,000 cy of material to maintain the current conveyance capacity. See also Section 3.4.3 below.

Dredged Material Management

Disposal options available to the COE for dredged materials are identified in accordance of COE regulations (33 CFR 335-338). The "Federal Standard" for disposal of dredged material is defined as "[T]he least costly alternatives consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process. . . ." (33 CFR 335.7). The COE considers both upland and in-water disposal alternatives when dredging is proposed. For proposed in-water disposal, the disposal method is ultimately identified after evaluation of disposal alternatives under the substantive provisions of Section 404(b)(1) of the Clean Water Act (CWA), associated EPA guidelines (40 CFR 230) and COE regulations. When in-water disposal is proposed, the COE is required to identify and utilize the lowest cost, least environmentally damaging, practicable alternative as its disposal method. The alternatives analysis in the Section 404(b)(1) evaluation is incorporated into the NEPA process and ultimately identifies the COE proposed/preferred disposal alternative. Additionally, it is the COE's policy to always consider beneficial use of dredged material when evaluating disposal options (Engineer Manual 1110-2-5026).

Beneficial Use of Sediment. Beneficial use of dredged material includes a wide variety of options that utilize the dredged material for some productive purpose and can apply to upland or in-water disposal options. Broad categories of beneficial uses based on the functional use of the dredged material include:

- Habitat restoration/enhancement (wetland, upland, island, and aquatic sites including use by ESA-listed fish);
- Beach nourishment;
- Aquaculture;
- Parks and recreation (commercial and noncommercial);
- Agriculture, forestry, and horticulture;
- Landfill cover for solid waste management;
- Shoreline stabilization and erosion control (fills, artificial reefs, submerged berms, etc.);
- Construction and industrial use (including port development, airports, urban, and residential);
- Fill for other uses (dikes, levees, parking lots, and roads).

It is the COE's practice to secure the maximum practicable benefits of dredged material within authority and funding limitations. The COE views dredged material as a valuable and manageable resource and seeks opportunities to use it beneficially whenever possible. The COE has beneficially used dredged material in the past to create fish habitat in the lower Snake River. Specific applications are dependent on opportunities available at the time the dredging is occurring. Opportunities for beneficial use would be identified and evaluated as part of the planning for any dredging activity.

Beneficial use of dredged material is applicable to a wide variety of settings and uses when it is determined to be the preferred disposal method consistent with environmental reviews and the Federal Standard. Often, a local sponsor must be identified as part of the beneficial use.
If the COE were to implement beneficial use of dredged materials to create shallow water habitat, the COE would likely select sites based on proximity to dredging site, potential to provide suitable resting and rearing habitat for juvenile salmonids if the river bottom were to be raised, the site could not interfere with navigation, and could not impact cultural and historic properties, and is of sufficient size to accommodate the anticipated dredged sediment disposal volume.

In-water Disposal of Sediment. In-water disposal of dredged material is simply the discharge of dredged material into the waterway for purposes of disposal (as opposed to placing it in-water for a beneficial purpose). Typically, dredged material is transported to a suitable location in a bottom dump barge, and released into the water at the upstream end of a deep-water area. All dredged material is a candidate for in-water disposal if it meets the requirements of the Federal Standard. For future actions, the COE would perform all required sediment sampling and analysis and determine suitability for in-water disposal. If the sediment sampling and analysis results showed the sediments had unacceptable concentrations of chemicals of concern that would preclude using unconfined in-water disposal, the COE would either not dredge the area or would pursue an alternate acceptable disposal method.

In-water disposal of sediment is applicable to most dredged material management needs in the LSRP. The COE has identified multiple locations with sufficient capacity to accept the volumes of dredged material that could be generated by potential dredging activities in LSRP. In-water sediment disposal is contingent on examination of sediment samples and finding that toxic chemicals are below state water quality standards or thresholds established by the Regional Sediment Analysis Team (USACE *et al* 2009; Michelson 2011).

Upland Disposal of Sediment. Upland disposal of sediment is the placement of dredged material on land, above high water and out of wetland areas, but not for a beneficial purpose. The dredged material is typically placed in a cell behind berms that contain and isolate it from the surrounding environment and is dewatered through evaporation and/or settling and discharge of clean water. There may be other uses of the land during and after the site is used for dredged material placement.

Upland disposal can be used for any dredged material, coarse or fine-grained. The material would be transported to and placed on the upland site using methods such as scooping it out with a clamshell bucket, using an auger or a conveyor belt, or hydraulic pumping.

Upland disposal is an option for disposal when it is determined to be the preferred disposal method consistent with environmental reviews and the Federal Standard. Depending on dredged material quantities, upland disposal could require a fairly large area with proximity and good access to the waterbody being dredged. Site development, including a containment berm and dewatering channels, is typically required.

Structural Sediment Management

Structural sediment management measures seek to control the location and rate at which sediment is deposited at a specific location, in order to reduce or eliminate the magnitude of the sediment interference with existing authorized purposes of the LSRP. Examples of structural management measures include weirs and sediment traps, which prevent sediment from accumulating in certain areas or intercept and collect sediment that may otherwise interfere with existing authorized project purposes. Such measures would require site-specific NEPA analysis and ESA consultation, and may require additional congressional authority and funding to implement. The upper end of Lower Granite reservoir is the only location where structural measures would be effective. The purpose of the structure would be to restrict/reduce the reservoir flow area to maintain sediment transport velocities. The structure length could be up to half the existing reservoir cross-section distance at the confluence.

Bendway Weirs. Bendway weirs would be placed at strategic locations along the banks of the lower Snake River to redirect water flow in a manner that would prevent problem sediment accumulation and maintain navigation channel dimensions. Bendway weirs are rock structures located on the outside of a stream or river bend, angled upstream into the direction of flow. Water flowing over the bendway weirs is redirected at an angle perpendicular to the middle of the weir. With the weirs angled upstream, flow is directed away from the outer bank of the bend and toward the point bar or inner part of the bend. This redirection of flow occurs at all stages higher than the weir crest. Where there is sufficient velocity and volume, the redirection of flow generally results in a widening of the channel through scour of the point bar (Figure 2). Other possible effects include:

- Deposition at the toe of the ***revetment*** (river bank stabilization armoring) on the outside of the bend, thus increasing bank stability.

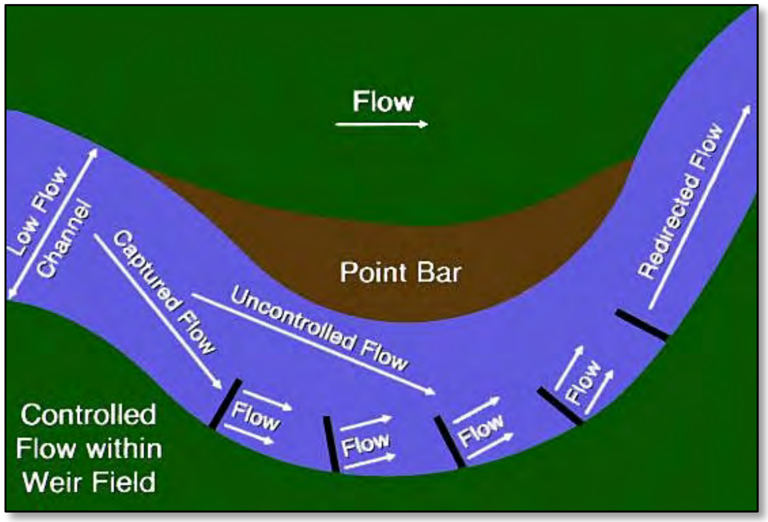
- Scouring on the point bar creating a flow path on the inside of the bend.

- Surface water velocities are more uniform across any cross-section.

- Flow patterns in the bends are generally parallel with the banks (not concentrated on the outer bank of the bend).

- The ***thalweg*** (deepest, continuous line in river) of the channel is moved from the toe of the outer bank revetment to the stream ends of the weirs.

Figure 2. Schematic of Bendway Weirs



Weirs are generally built in sets (four to 14 weirs per bend) and are designed to act as a system to control velocities and current directions through the bend and well into the downstream crossing.

Typically, bendway weirs are applied to unimproved or revetted bends where growth of the point bar is restricting the navigation channel width, or an improved navigation channel alignment is desired. Bendway weirs are commonly used on both navigable rivers and smaller streams.

Bendway weirs are applicable in locations where there is sufficient flow and velocity to sustain sediment transport (and possibly mobilize accumulated sediments) through the area of influence of the structures. For the LSRP, bendway weirs could be applicable in locations like the main river channel through Snake-Clearwater confluence where flow velocities are relatively high. Bendway weirs would generally not be effective in off-channel or backwater locations, like some recreation sites or at locations further downstream within the reservoirs where flow depths are larger and flow velocities smaller. Bendway weirs would require sufficient lead time to plan, design, and implement.

Dikes/Dike Fields. Dikes would work in a similar manner as bendway weirs to redirect river flows and velocities and prevent problem sediment accumulation and maintain navigation channel dimensions. Dikes are linear structures used to maintain navigation channels through effects on channel depth and alignment. Dikes constrict channels at low and intermediate flows, causing the channel velocity to increase within the reach and thereby scour a deeper channel. Dikes are typically built of rock but may be constructed with other suitable materials (Figure 3).

Dikes are generally used to contract river channels at low and intermediate flows, forcing all flow through a narrower width. The resulting increased velocity erodes or scours the bed to a lower elevation. Scour is commonly needed only to provide navigable depths during periods of low flow; therefore, low dikes are more desirable than high dikes, which can cause excessive scour at high flows. Scour can also be greater for dikes angled upstream rather than perpendicular to flow or angled downstream.

Maintenance of open water areas in dike fields can be encouraged through variations in the design, such as notches or rootless (e.g., not attached to the riverbank) dikes. Dikes have traditionally been designed to induce sediment deposition within the dike fields although stone dikes do not necessarily have to fill with sediment to be effective.

Figure 3. Dike on the Mississippi River

Agitation to Resuspend. Agitation to resuspend sediments involves the deliberate agitation and resuspension of deposited sediment. Following agitation, the sediment is carried downriver as part of the suspended load of the river. This technique requires both some form of agitation mechanism, and sufficient river flow (velocity and volume) to carry the additional sediment load away from the targeted area. There are numerous potential means to mechanically agitate and resuspend sediment, including hydraulic dredges, high pressure air and water pumps, and using propellers to move sediment. In this technique, jets of air and/or water are applied to the deposited sediments at sufficient pressure to dislodge them from the bottom causing the sediments to become resuspended in the water column and carried downriver by the current.

The effectiveness of this measure is dependent on the ability of the agitation mechanism to resuspend the deposited sediment and the ability of the river to carry the resuspended sediment a sufficient distance downriver to avoid problems with resettling. The COE has used this method before in the lower Snake River. It is suited to addressing smaller, localized sediment issues with fine sediments. Assuming conditions are met for the measure to work, agitation and resuspension could be used as a short-term sediment management measure. The measure would not prevent sediment from depositing in the same location in the future, nor does it control where resuspended sediment is transported and potentially resettles.

Agitation to resuspend sediments is applicable only in those areas where there is sufficient flow, both in terms of volume and velocity, to transport resuspended sediments away from areas where they interfere with authorized project purposes of the LSRP, such as locations within the main channel of a reservoir. In addition, hydraulic conditions downstream should be such that the resuspended (and transported) sediment does not interfere with an authorized project purpose in another location.

Trapping Upstream Sediments (In-Reservoir). Trapping upstream sediment involves creating a location within a depositional reach at the upstream end of a reservoir where sediments settle and are captured, thus preventing them from reaching other locations where they may interfere with authorized project purposes of the LSRP. A pit in the river bottom would be excavated to create the trap. Sediment caught in the trap would need to be periodically removed through dredging or other means. The removed sediment would be managed using one of the dredged material management measures described above. This technique has been successfully applied on small river systems. Trapping upstream sediments (in-reservoir) would require sufficient lead time to plan, design, and implement.

This measure is applicable in areas where there is sufficient space and hydraulic conditions allow for the capture of sediment upstream of where sediment interferes with authorized project purposes of the LSRP.

The COE performed a sediment load analysis that showed the volume of sand delivered to Lower Granite reservoir from the Snake River is about 600,000 cy per year. A large part of this load is bedload which is evident from the sand waves that form upstream from the Lewiston Levee System on the Snake River as seen in the 2009 and 2011 bathymetries. Potentially, substantial volumes of sand bedload can be trapped and harvested in the channel, thereby reducing the amount of sediment that accumulates below the confluence. A possible location for a sediment trap is immediately upstream from the right bank levee on the Snake River at RM 140.7 (Figure 4). This location is advantageous because narrowing of the channel produces a local backwater effect that reduces the amount of sand carried in suspension.

The COE evaluated the efficiency of a sand trap at this location. A trap about 1,900 feet long would hold about 770,000 cy of sediment. The COE estimates about 300,000 cy of material would be trapped over a 2-year period. An equal amount of sediment would need to be removed from the trap every 2 years to maintain its usefulness. Further analysis and detailed hydraulic modeling of alternative sediment trap configurations would be needed before an actual sediment trap could be designed and constructed.

System Management

System management measures modify reservoir operations (such as pool depth) or facilities so that sediment deposition does not adversely affect existing authorized purposes. Examples of system management measures include reconfiguring or relocating navigation facilities, managing reservoir water levels for navigation, and modifying flows to flush sediments from problem areas. It should be noted that measures for reconfiguring or relocating recreation and irrigation intake facilities apply only to facilities operated and maintained by the COE.

Figure 4. Location of a Potential Sediment Trap on the Snake River
Lewiston is on the right and Clarkston is on the left.

Navigation Objective Reservoir Operation. This measure involves operating reservoirs of the LSRP at water surface elevations that would provide a 14-foot-deep channel within the Federal navigation channel. When sediment accumulation is affecting navigation, as an immediate need, the COE would first implement operational changes, (i.e., raising the reservoir elevation, adjusting spill patterns, or releasing water at one or more of the dams) as in interim action, as needed, to provide a 14-foot navigation channel. These actions could remain in effect until the

COE could implement a dredging action to remove the accumulated sediment. The COE would manage pool levels within the preset operating range for each reservoir to maintain 14 feet of water depth over areas where sediment deposition has occurred in the channel. This measure would provide the COE the option of operating above MOP and even at the upper end of the operating range as needed to maintain the 14-foot deep navigation channel. Raising the operating pool as part of this measure provides a temporary means to provide desired water depths; however, there are physical limits as to how much the pool levels can be raised based on design specification for the dams. For example, the operating range of Lower Granite reservoir is 733 to 738 feet above mean sea level (msl) and the COE does not have the authority to raise the pool above 738 msl. Once the pool has been raised to the maximum level, it cannot be raised further and the measure ceases to be effective. Additionally, raising the operating pool in a reservoir has a greater effect near the dam than upriver due to the normal change in elevation moving upstream.

The McNary reservoir and lower Snake River reservoirs are typically operated within a 3- to 5-foot range with the lowest end of the range designated as the MOP. Currently the COE operates the lower Snake River reservoirs at MOP or near MOP during the juvenile salmonid outmigration season, typically from April through August, and as late as October at Lower Granite, to ensure compliance with NMFS' Federal Columbia River Power System (FCRPS) Opinion. Under this measure, the COE would operate the projects as needed at a pool level above MOP to provide temporary relief from sediment accumulated in the navigation channel. The COE would coordinate with NMFS when proposing to operate above MOP during the juvenile salmonid outmigration season.

The COE could also adjust operation of the dams to influence water depth at the downstream entrance to the navigation locks. An example would be adjusting operation of the dam to temporarily increase water releases from the dam to provide sufficient depth for a barge tow to enter or exit the navigation lock.

This measure is applicable within the operating range of the reservoirs, and subject to ESA requirements in NMFS' FCRPS Opinion.

Reconfigure/Relocate Affected Facilities. Facilities affected by unwanted sediment deposition may be relocated or otherwise modified to avoid those areas where sediment deposition tends to accumulate and interfere with facility uses. This measure could include a range of facility modifications, such as extending a dock or mooring facility, changing the entrance to a boat basin, or adding an inlet to provide water circulation within a boast basin. It could also include temporarily or permanently closing COE-managed recreation facilities. Moving or relocating affected facilities is potentially suitable for commercial navigation facilities, recreational boating facilities, and water intake structures. It is not practicable to move the existing navigation channels, locks, or lock approach channels.

Water intake structures and some docks could potentially be extended to reach out beyond near-shore areas where unwanted sediment deposition is occurring. This technique has been successfully used on several water intake structures in the program area. In lieu of reconfiguring or relocating water intake structures, alternative water sources for irrigation that would alleviate the need for the intake, such as a well, could be explored. Other facilities, such as boat ramps, would likely need to be completely relocated. The effectiveness and applicability of this measure is highly site-and facility-specific and would have to be determined on a case-by-case basis.

This measure would be applicable where the use of the affected facility can be replaced, relocated, or potentially closed, and it would be more economical than managing sediment that affects its use. The COE's ability to consider the feasibility of reconfiguring or relocating port facilities is limited and generally requires a cost-share sponsor and specific authority. This measure is primarily applicable to COE-managed facilities.

Reconfiguring or relocating affected facilities would require sufficient lead-time to plan, design, and implement modifications to infrastructure.

Raise Lewiston Levee to Manage Flood Risk. This measure involves raising critical portions of the Lewiston levee system to limit the risk of being overtopped during a high flow event. The Lewiston levee system is an upstream extension of Lower Granite dam and was designed to protect parts of Lewiston, Idaho from being flooded by the creation of the reservoir and from inundation during the standard flood project. The COE's criteria for managing flood risk at facilities like the Lewiston levee has changed over time. Currently, the COE uses risk analysis to determine the appropriate approach to managing flood risk. Current analysis indicates that flood risk is within acceptable limits, however if future sediment accumulation changes the flood risk to Lewiston, raising portions of the levee system would be a viable option for reducing flood risk, subject to authority. Location and height of change would be determined through detailed site- and time-specific studies. Based on past analysis of levee modification, any future levee raise would likely involve raising the earthen embankments or building low walls on portions of the existing levees, and modifying surrounding roads and other infrastructure affected by the levee raise.

Raising levees would be applicable if other means of managing flood risk per the Risk Analysis for Flood Damage Reduction Studies (January 2006) were determined infeasible or otherwise unacceptable. This measure would only be applicable in the existing area of the Lewiston levee system. Lewiston levee raise would require sufficient lead-time to plan, design, and implement modifications to infrastructure.

Reservoir Drawdown to Flush Sediment. The reservoir drawdown to flush sediment would draw the Lower Granite reservoir down 10 to 15 feet below MOP (measured at the confluence of the Snake and Clearwater Rivers) and would occur on a one-time basis for up to 6 weeks sometime during the period of late April through late June. This period takes advantage of naturally high spring freshet flows and corresponds with the juvenile salmonid outmigration season. Drawing down Lower Granite reservoir would create a high flow and velocity condition that would scour and transport accumulated sediment from the confluence of the Snake and Clearwater Rivers. Most of the sediment scour would occur within the main channel of both rivers and the scoured sediment would be transported downstream and redeposited. Much of the sediment would likely redeposit within Lower Granite reservoir or in the upper reaches of Little Goose reservoir. Sediments could potentially deposit in areas where they would interfere with authorized project purposes of the LSRP. There must be adequate high flow prediction and modeling allowing the COE to conduct drawdown operations in a timely manner for this measure to function effectively.

Drawdown would be most effective during high flow conditions, such as those resulting from spring snowmelt and runoff, when scouring and transport of sediments would be greater. Drawdown affects an entire reservoir and mobilizes sediments from area(s) where they interfere with authorized project purposes of the LSRP, as well as, other locations in the reservoir. Drawdown would be applicable only to Lower Granite reservoir where it could address accumulation of sediment in the Snake-Clearwater confluence area. Reservoir drawdown would require sufficient lead-time to plan, design, and implement modifications to infrastructure.

Upland Sediment Reduction (Expanded)

Local Sediment Management Group (LSMG) Coordination Meetings. The only upland sediment reduction measure that is incorporated into the PSMP is continued LSMG meeting coordination. The COE would continue to coordinate meetings with all applicable land use management agencies and groups through the annual LSMG meeting. The LSMG meeting would serve as an information exchange forum between the COE and Federal and state regulatory agencies, tribes, local governments, and other stakeholders. The primary purposes of the meeting would be to share data and compare trends observed by each agency, identify potential opportunities to improve each agency's independent sediment reduction practices, and analyze trends on a watershed basis. Information gained from LSMG meetings may be used by the COE to adapt PSMP measures. The COE may also participate in other regional coordination meetings hosted or facilitated by other agencies (e.g., EPA) or stakeholders concerning sediment management in the lower Snake River basin.

1.3.2 Sediment Accumulation Areas

The COE evaluated locations where sediment accumulation could interfere with the LSRP authorized purposes. The COE identified 48 locations in the LSRP where sediment accumulation historically has affected authorized purposes or sediment accumulation may potentially be a problem in the future (Table 2). Table 2 is not intended to be an exhaustive list. This list is not static and may be modified as new sites are identified or problems are resolved. Flow conveyance (as it relates to flood risk management through the Lewiston levee system) and navigation are affected project purposes at the Snake and Clearwater confluence. Within the first 4,000 feet of the Snake River (from the mouth up to the railroad bridge), navigation is affected by the elevation of the underlying bedrock, rather than accumulated sediment. The potential action which may occur in this area includes removal of possible high points within the navigation channel which were missed in prior rock removal efforts, should they be discovered. The work would consist of breaking off the high points with a barge-mounted excavator. This work would likely be completed within 1 day.

Table 2. Potential Sedimentation Problem Areas

Reservoir	River	Approx. River Mile[1]	Site Name	Purpose
McNary	Snake	0	Sacajawea State Park	Recreation
		1.5	Hood Park Boat Ramp	Recreation
		9.2	Ice Harbor Lock Approach/Nav Coffer Cells	Navigation
		0.0–1.5	Snake River Entrance (rock removal)	Navigation
		2.0–10.0	Nav Channel Below Ice Harbor	Navigation
Ice Harbor	Snake	10	North Shore Boat Ramp	Recreation
		11.5	Charbonneau Park	Recreation
		13.5	Levey Park	Recreation
		15	Big Flat Habitat Management Unit (HMU)	Fish and wildlife
		18	Fishhook Park	Recreation
		23	Lost Island HMU	Fish and wildlife
		24.5	Hollebeke HMU	Fish and wildlife
		29.0–33.3	Walker’s Elevator	Navigation
		39	Windust Boat Ramp	Recreation
		41	Lower Monumental Lock Approach	Navigation
Lower Monumental	Snake	48	Skookum HMU	Fish and wildlife
		51	Ayer	Recreation
		55	55-Mile HMU	Fish and wildlife
		56.5	Joso HMU	Navigation
		59.5	Lyons Ferry Park	Recreation
		66	Texas Rapids Boat Basin	Recreation
		68	John Henley HMU	Fish and wildlife
		70	Little Goose Lock Approach	Navigation
Little Goose	Snake	76	Ridpath HMU	Fish and wildlife
		81	New York Bar HMU	Fish and wildlife
		82.5	Central Ferry Park	Recreation
		83	Port of Garfield Access	Navigation
		83.5	Port of Central Ferry	Navigation
		88	Willow Landing HMU	Fish and wildlife
		93	Rice Bar HMU	Fish and wildlife
		95	Swift Bar HMU	Fish and wildlife
		100.0-102.0	Navigation Channel at Schultz Bar	Navigation
		103.5	Port of Almota	Navigation
		103.5	Illia Landing	Recreation
		105.5	Boyer Park and Marina	Recreation
		107	Lower Granite Lock Approach	Navigation

Reservoir	River	Approx. River Mile[1]	Site Name	Purpose
Lower Granite	Clearwater	1.0-2.0	Port of Lewiston	Navigation
		3	Clearwater Boat Ramp	Recreation
	Snake/ Clearwater	131.5-139.5/ 0.0-2.0	Snake River at Mouth of Clearwater River	Navigation, conveyance
	Snake	128-130	Silcott Island	Navigation
		132	Chief Timothy HMU	Fish and wildlife
		137	Hells Canyon Resort *	Recreation
		139	Port of Clarkston	Navigation
		139.5	Greenbelt Boat Basin	Recreation
		140.5	Southway Boat Ramp	Recreation
		141.5	Swallows Park Boat Basin and Swim Beach	Recreation
		142.5	Hells Gate State Park	Recreation
		146	Chief Looking Glass Park	Recreation

1.3.3 Triggers for Action

Problem identification may "trigger" the need for action(s) to address problem sediment at the sites shown in Table 3. There are two trigger levels (immediate need and future forecast need), which are described below.

Immediate Need. An immediate need action is warranted when sediment accumulation is currently impairing an existing authorized project purpose of the LSRP.

Future Forecast Need. A future forecast need warranting initiation of an analysis of long-term solutions to reoccurring sediment deposition problems occurs when sediment accumulation that impairs an existing authorized project purpose has occurred at a particular location(s) more frequently than once in the past 5 years or is anticipated to reoccur more than once in the next 5 years. The PSMP does not restrict the COE ability to initiate other future forecast need studies when warranted.

The PSMP includes triggers (Table 3) for sediment impacting irrigation intakes at COE-managed HMUs, however, neither this consultation nor the PSMP includes the diversion and use of water through those intakes. The COE will continue to withdraw the same amount of water at each of the irrigated HMUs (from approximately April 1 to September 30) each year to irrigate wildlife habitat in the existing HMUs to mitigate impacts to fish and wildlife resulting from the lower Snake River dams under the Lower Snake River Fish and Wildlife Compensation Plan (Comp Plan). The COE is not consulting under this BA on the use of the water for the Comp Plan purposes, but more specifically on managing sediment that interferes with irrigation intake structures.

Table 3. Triggers and Actions in Response.

Management Purpose	Triggers	Actions in Response to triggers
Navigation	• Navigable depth in the Federal navigation channel is less than 14 feet deep at MOP and is impairing the safe movement of tug and multi-barge tows and other commercial vessels through the navigation system. • Navigable depth is less than 14 feet deep at MOP within the Federal navigation channel and is impairing access to any of the four navigation locks on the lower Snake River.	**Immediate Need** 1. Use navigation objective reservoir operation (NORO) as interim measure. . 2. Dredge area(s) of problem sediment deposition **Future Forecast** • dredging. • dredge to improve conveyance capacity. • beneficial use of sediment.(in-water or upland) • bendway weirs. • dikes/dike fields. • trapping upstream sediments (in reservoir). • navigation objectives reservoir operations. • reconfigure/relocate affected facilities. •reservoir drawdown to flush sediment.
Recreation	• Boat basin depths at MOP are less than the original design criteria and boats are having difficulty maneuvering within the basin. • Sediment has built up at the entrance to boat basins, blocking access.	**Immediate Need** 1. Use agitation to resuspend problem sediment; or. 2. Dredge area(s) of problem sediment deposition. **Future Forecast** • dredging. • beneficial use of sediment.(in-water or upland) • agitation to resuspend.sediment • navigation objectives reservoir operations. • reconfigure/relocate affected facilities.
Fish and Wildlife	• Sediment has buried an irrigation intake at a COE-managed HMU • Sediment is clogging an irrigation intake at a COE managed HMU	**Immediate Need** 1. Clear problem sediment by lifting/raising the intake out of the sediment, moving/shifting intake, or limited excavation (e.g., by hand). 2. Install temporary irrigation intake line or use other available water source (Interim). 3. Dredging **Future Forecast** • dredging. • beneficial use of sediment.(in-water or upland) • agitation to resuspend sediment. • reconfigure/relocate affected facilities.
Flow Conveyance	• Consecutive surveys show an accelerated rate of sediment accumulation in the channel near Lewiston *and* • Hydraulic modeling indicates a heightened risk of overtopping the Lewiston levees during extreme floods within 5 years if the rate of accumulation continues and • The risk of flooding cannot be reduced to acceptable levels with normal reservoir operations prescribed in the authorized water control manual.	**Immediate Need** 1. Use reservoir operations during high flow event to lower reservoir water surface and increase capacity, in accordance with the Lower Granite Project Water Control Manual (Interim). 2. Conduct bathymetric surveys and develop new hydraulic models for the confluence area. 3. Dredging. **Future Forecast** • dredging • beneficial use of sediment.(in-water or upland) • trapping upstream sediments (in reservoir). • raise Lewiston levee to manage flood risk. • reservoir drawdown to flush sediment.

1.3.4 Proposed Effects Minimization Measures

The COE proposes the following effects minimization measures as part of the proposed action in order to minimize potential adverse effects related to implementation of the proposed action. These measures are not meant to be mitigation for the proposed action, but instead are integral to the reduction of impacts (potential adverse effects) that may be incidental to the proposed action, and must be considered when analyzing the potential effects of the proposed action. These measures were included in the BA, and clarifications were provided in an email from Ben Tice (COE) on September 22, 2014.

General

- The COE will observe appropriate in-water work windows. In-water work would be conducted during either the winter window of December 15 to March 1, or a summer window in backwater areas when the water temperature is above 73 degrees F.
- The COE will comply with applicable state water quality standards.
- The COE will comply with applicable site/action-specific conservation measures when implementing subsequent actions.
- Worksite isolation would be used as a minimization practice if practicable. Worksite isolation could consist of several measures meant to decrease fish exposure to the effects of construction activities.
- No in-water disposal in summer for actions.
- The Raise Lewiston Levee to Manage Flood Risk measure would not involve in-water placement of materials.

Conservation measures associated with minimization of identified effects of the action include:

Dredging

- Sediment sampling – The COE will perform sediment sampling and analysis prior to dredging as required by applicable regional agreements such as the 2009 *Sediment Evaluation Framework for the Pacific Northwest*, the *2013 Dredged Material Evaluation and Disposal Procedures User Manual*, or any subsequent revisions or successors to these documents..
- Work Windows:
    - Winter in-water work window Dec 15 to Mar 1.

  - Summer window (when water temps are above 73°F) in backwater areas.

- Mechanical dredging will be used for mainstem actions and either mechanical or hydraulic dredging will be used in backwater areas.

- Employ an experienced equipment operator.

- All dredged material from summer dredging will be placed upland.

- A qualified biologist trained in identification of Washington ground squirrel burrows would survey potential upland disposal areas within the range of Washington ground squirrel prior to disposal.

- The COE will avoid any Washington ground squirrel burrows found by a qualified biologist.

Turbidity

- The COE would implement a number of techniques to minimize turbidity effects resulting from project operations.

- The COE would monitor turbidity levels and modify dredging operations to avoid prolonged negative effects.

- If water standards for turbidity are exceeded the COE will employ one or more of the following bucket control best management practices (BMPs):

  - No reopening to fill a partially filled bucket.

  - Do not overfill the bucket.

  - Close the bucket as slowly as possible on the bottom.

  - Pause before hoisting the bucket off of the bottom to allow any overage to settle near the bottom.

  - Hoist load very slowly.

  - Pause bucket at water surface to minimize distance of discharge.

  - "Slam" open the bucket after material is dumped to dislodge any additional material that is potentially clinging to the bucket.

  - Ensure that all material has been dumped from the bucket before returning for another bite.

- Do not dump partial or full buckets of material back into the waterway.

- Vary the volume, speed, or both of digging passes to minimize siltation to the maximum extent practicable.

Snake River Fall-Run (SRF) Chinook Redds

- To prevent disturbance or harm to potential SRF Chinook redds when dredging in an area that might have redds, the COE will conduct underwater surveys of the proposed dredging site and within 900 feet downstream of the navigation locks when dredging below the dams, once in November and once during the first 2 weeks of December prior to commencing dredging. Techniques similar to those used by Battelle from 1993 to 2008 will be employed (Dauble *et al*. 1996; Dauble *et al*. 1994; Dauble and Watson 1997; Mueller and Coleman 2007; Mueller and Coleman 2008). This technique has used a combination of a boat mounted underwater video camera tracking system to look at the bottom of the river to identify redds. The COE will compile the results prior to December 15, at which time the COE can communicate results to NMFS for appropriate action.

- If no redds are located, then the COE will proceed with proposed dredging within the boundaries of the surveyed template.

- If one or more redds are located within the proposed dredging template and such redds are verified with video, then the COE will coordinate with NMFS to determine if dredging can proceed without harming or disturbing the redd(s) or needs to be delayed until fry are able to move out of the area.

Spills

- All over-water construction vessels would be fueled at existing commercial fuel docks. Such facilities have existing spill prevention systems in place that would be adequate to avoid spills or immediately address any accidental spills that might occur.

- Equipment will be inspected and cleaned prior to any instream work.

Suspension of Chemicals of Concern

- Conduct dredging and disposal when listed salmonids are least likely to be in the work area.

- The COE would not use in-water disposal/placement for any material that is not determined to be suitable for in-water placement in accordance with the *2009 Sediment Evaluation Framework for the Pacific Northwest* (USACE *et al*. 2009), the *2013 Dredged Material Evaluation and Disposal Procedures User Manual* (USACE *et al*. 2013), or any subsequent revisions or successors to these documents.

- Use BMPs to prevent spills of fuel, or hydraulic leaks during the dredging and disposal operation.

- The COE would use BMPs at disposal locations to prevent remobilization of sediments, and subsequent turbidity, through dewatering activities or storage.

Entrainment

- Dredging activities at locations and times of the year when ESA-listed fish would likely be present (e.g. the mainstem of the Snake and Clearwater Rivers) would be accomplished using mechanical means which are slow enough to frighten fish and give them time to move away.

1.3.5 Summary of the Proposed Action

Table 4 displays a summary of actions that may be implemented under the PSMP, with expected quantities, frequencies, and other details if known. The table was generated from Appendix A in the BA.

Table 4. Summary of Actions Considered under the PSMP. (table below generated from Appendix A in BA)

Activity	Sediment Quantity/	Location	Timing	Duration	Frequency
Navigation dredging	6000-7200 cy/day total quantities up to 500,000 cy	Snake River RM 0-139; Clearwater River RM 0-2	Dec 15-Mar 1	75days	3-5 years
Beneficial use of navigation sediment (upland or in-water disposal)	6000-7200 cy/day	Sites may vary	Dec 15-Mar 1	75days	3-5 years
Flow conveyance dredging	1 million cy/yr for first 10 yrs, 350,000-500,000 cy/yr afterwards	Confluence of the Snake and Clearwater rivers from Snake River RM 131.5-139.5 and Clearwater River RM 0-2	Dec 15- Mar 1	75 days	annually
Recreation Dredging	1,000–15,000 cy	Snake River RM 0-146 and Clearwater River RM 0-3	Dec 15 - Mar 1 or during summer window if appropriate	Several days	3-9 years
Recreation disposal of sediment (Upland or in-water; no in-water disposal in summer)	1,000–15,000 cy		Dec 15 - Mar 1 or during summer window if appropriate	Several days	3-9 years
Fish and Wildlife Dredging	100-1000 cy	12 COE HMUs, between Snake River RM 15-132	Summer irrigation season	Several days	7-15 years
Wildlife Agitation to resuspend	<500 cy		Summer irrigation season	Several days	7-15 years
Wildlife; Reconfigure or Relocate Affected Facilities; immediate need (ie: short-term fix)	NA		Summer irrigation season	Several hours	Annually
Bendway weirs	Unknown	near or upstream of the confluence with the Snake and Clearwater rivers	Dec 15-Mar 1	1 year per site	1 time per site
Dike/ Dike Fields	Unknown		Dec 15-Mar 1	1 year per site	1 time per site

Activity	Sediment Quantity/	Location	Timing	Duration	Frequency
trapping upstream sediments in reservoir	250,000-350,000 cy	upstream of the confluence of the Snake and Clearwater rivers	Dec 15- Mar 1	75 days	annually
Reconfigure/relocate affected facilities	Unknown	To be determined	In-water work : Dec 15 - Mar 1 Upland work: appropriate construction season	1-3 years	1 time per site
Recreation facility closure	Unknown	Same as existing	Anytime	Indefinite; or 1 year	1 time per site
Raise Lewiston Levee up to 3 feet to manage flood risk	NA	Same as existing levee	Outside of summer recreation season, if possible	1 year	1 time
Reservoir drawdown to flush sediment	Unknown	NA	late April through late June	6 weeks	1 time
Recreation; Agitation to resuspend sediments	500-1500 cy	Snake River RM 0-146 and Clearwater River RM 0-3	Dec 15 - Mar 1 or during summer window if appropriate (In-water work window)	75 days	3-9 years
Navigation Objectives Reservoir Operations	NA	System-wide	During juvenile salmonid outmigration season (typically from April through August, but as late as October)	Several months	Annually
Wildlife; Reconfigure/Relocate Affected Facilities; future need (ie: long-term fix)	Unknown	To be determined	Outside of summer irrigation season	Several days-several months	1 time per site

1.4 Action Area

"Action area" means all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). In delineating the action area, we evaluated the farthest reaching physical, chemical, and biotic effects of the action on the environment.

The downstream end of the action area begins at the confluence of the Snake River (river mile (RM) 0) and the Columbia River. The action area extends upstream within the Snake River to the confluence with the Clearwater River (approximately RM 146 of the Snake River). Within the Clearwater River, the action area extends from the mouth (RM 0) to approximately RM 3. The action area also includes all COE lands adjoining the rivers within the action area where upland disposal or action implementation staging may occur. These boundaries represent the uppermost locations where proposed activities may occur and the entire lower Snake River navigation channel due to the effects of navigation by large vessels (consisting almost exclusively of barge traffic) that is facilitated by dredging. The effects of the proposed action in regards to increased barge traffic will not be detectable downstream of the confluence of the Snake and Columbia Rivers. Navigation in the Columbia River is not dependent on transport in the Snake River. The direct effects of dredging and filling are also not expected to reach beyond the mouth of the Snake River (the most downstream location of potential PSMP activities is 4000 feet above the mouth).

The species of listed anadromous fish in the action area are Snake Rivwer spring/summer run (SRSS) Chinook salmon, SRF Chinook salmon, Snake River (SR) sockeye salmon, and Snake River Basin (SRB) steelhead, Mid-Columbia River (MCR) steelhead, Upper Columbia River (UCR) spring Chinook, UCR steelhead (Table 5). Both adult and juvenile life stages of these species use the action area as a migration corridor. In addition, SRF Chinook salmon spawn in some areas of the mainstem Snake River and Clearwater Rivers, primarily upstream of the action area but occasionally in the tailrace areas of the mainstem dams. The mainstem Snake and Clearwater Rivers in the action area also provide adult holding habitat and rearing habitat for SRF Chinook salmon, SRSS Chinook salmon and SRB steelhead. The action area is also designated as EFH for Chinook salmon and coho salmon (PFMC1999).

Table 5. Federal Register notices for final rules that list threatened and endangered species, designate critical habitats, or apply protective regulations to listed species considered in this consultation. Listing status: "T" means listed as threatened, "E" means listed as endangered under the ESA.

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon (*Oncorhynchus tshawytscha*)			
Snake River spring/summer-run	T 6/28/05; 70 FR 37160 Originally 4/22/92; 57FR14653	12/28/93; 58 FR 68543 revised 10/25/99; 64 FR 57399	6/28/05; 70 FR 37160
Snake River fall-run	T 6/28/05; 70 FR 37160 Originally 4/22/92 57FR14653	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Upper Columbia Spring run	E 6/28/05; 70 FR 37160	9/02/05; 70 FR 52360	ESA section 9 applies
Sockeye salmon (*O. nerka*)			
Snake River sockeye	E 6/28/05; 70 FR 37160 Orig. 11/20/91 56 FR 58619	12/28/93; 58 FR 68543	ESA section 9 applies
Steelhead (*O. mykiss*)			
Snake River Basin	T 1/05/06 71 FR 834; 8/18/97 62 FR 4397	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Middle Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River	T 8/24/09; 74 FR 42605	9/02/05; 70 FR 52630	2/01/06; 71 FR 5178

2 ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, Federal agencies must ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an Opinion stating how the agency's actions would affect listed species and their critical habitat. If incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement (ITS) that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures and terms and conditions to minimize such impacts.

The COE has determined the proposed action is likely to adversely affect Snake River spring/summer (SRSS) Chinook salmon (*Oncorhynchus tshawytscha*), Snake River fall (SRF) Chinook salmon (*O. tshawytscha*), Snake River (SR) sockeye salmon (*O. nerka*), and Snake River Basin (SRB) steelhead (*O. mykiss*), and their designated critical habitat.

The proposed action is not likely to adversely affect Middle Columbia River steelhead (*O. mykiss*), Upper Columbia River steelhead (*O. mykiss*), Upper Columbia spring run Chinook, and their critical habitat. The action area does not include critical habitat for these species, and it is used only occasionally by adult fish that stray into the Snake River while migrating toward spawning areas in the Columbia River basin. The analysis for these species and their critical habitat is found in the "Not Likely to Adversely Affect" Determinations Section (2.11).

2.1 Analytical Approach of the Biological Opinion

This Opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of “to jeopardize the continued existence of a listed species,” which is “to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species” (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

The adverse modification analysis considers the impacts of the Federal action on the conservation value of designated critical habitat. This Opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.[1]

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an “exposure-response-risk” approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.

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1 Memorandum from William T. Hogarth to Regional Administrators, Office of Protected Resources, NMFS (Application of the “Destruction or Adverse Modification” Standard Under Section 7(a)(2) of the Endangered Species Act) (November 7, 2005).

- Reach jeopardy and adverse modification conclusions.
- If necessary, define a reasonable and prudent alternative to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

This Opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The Opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential physical and biological features that help to form that conservation value.

Climate change is likely to play an increasingly important role in determining the abundance of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. Areas with elevations high enough to maintain temperatures well below freezing for most of the winter and early spring will be less affected. Low-elevation areas are likely to be more affected. During the last century, average regional air temperatures increased by 1.5°F, with increases as much as 4°F in isolated areas (USGCRP 2009). Average regional temperatures are likely to increase an additional 3°F to 10°F over the next century (USGCRP 2009). Overall, about one-third of the current cold-water fish habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (USGCRP 2009).

Precipitation trends during the next century are less certain than for temperature, but more precipitation is likely to occur during October through March, less may occur during summer months, and more winter precipitation is likely to fall as rain rather than snow (ISAB 2007, USGCRP 2009). Significant reductions in both total snow pack and low-elevation snow pack in the Pacific Northwest is predicted over the next 50 years (Mote and Salathé 2010) – changes that will shrink the extent of the snowmelt-dominated habitat available to salmonids. Where snow occurs, a warmer climate will cause earlier runoff, which will increase flows in early spring but will likely reduce flows and increase water temperature in late spring, summer, and fall (ISAB 2007, USGCRP 2009).

As the snow pack diminishes and seasonal hydrology shifts to more frequent and severe early large storms, stream flow timing and increased peak river flows may limit salmonid survival (Mantua *et al.* 2010). Lower stream flows and warmer water temperatures during summer will degrade summer rearing conditions, in part by increasing the prevalence and virulence of fish diseases and parasites (USGCRP 2009). To avoid waters above summer maximum temperatures, juvenile rearing may be increasingly found only in the confluence of colder tributaries or other areas of cold water refugia (Mantua *et al.* 2010). Other adverse effects are likely to include altered migration patterns, accelerated embryo development, premature emergence of fry, variation in quality and quantity of tributary rearing habitat, and increased competition and predation risk from warm-water, non-native species (ISAB 2007).

The earth's oceans are also warming, with considerable interannual and inter-decadal variability superimposed on the longer-term trend (Bindoff *et al.* 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances (Scheuerell and Williams 2005; Zabel *et al.* 2006; USGCRP 2009). Ocean conditions adverse to salmon and steelhead may be more likely under a warming climate (Zabel *et al.* 2006).

Ocean acidification resulting from the uptake of carbon dioxide by ocean waters threatens corals, shellfish, and other living things that form their shells and skeletons from calcium carbonate (Orr *et al.* 2005; Feely *et al.* 2012). Such ocean acidification is essentially irreversible over a time scale of centuries (Royal Society 2005). Increasing carbon dioxide concentrations are reducing ocean pH and dissolved carbonate ion concentrations, and thus levels of calcium carbonate saturation. Over the past several centuries, ocean pH has decreased by about 0.1 (an approximately 30 percent increase in acidity), and is projected to decline by another 0.3 to 0.4 pH units (approximately 100 to 150 percent increase in acidity) by the end of this century (Orr *et al.* 2005; Feely *et al.* 2012). As aqueous carbon dioxide concentrations increase, carbonate ion concentrations decrease, making it more difficult for marine calcifying organisms to form biogenic calcium carbonate needed for shell and skeleton formation. The reduction in pH also affects photosynthesis, growth, and reproduction. The upwelling of deeper ocean water, deficient in carbonate, and thus potentially detrimental to the food chains supporting juvenile salmon has recently been observed along the U.S. west coast (Feely *et al.* 2008).

Climate change is expected to make recovery targets for ESA-listed populations more difficult to achieve. Actions improving freshwater and estuarine habitats can offset some of the adverse impacts of climate change. Examples include restoring connections to historical floodplains and estuarine habitats, protecting and restoring riparian vegetation, purchasing or applying easements to lands that provide important cold water or refuge habitat, and leasing or buying water rights to improve summer flows (Battin *et al.* 2007; ISAB 2007).

2.2.1 Status of the Species

This section describes the present condition of the SRSS Chinook salmon, SRF Chinook salmon, and SR sockeye salmon evolutionarily significant units (ESUs), and the SSRB steelhead distinct population segment (DPS). The status of a salmonid ESU or DPS is expressed in terms of likelihood of persistence over 100 years, or in terms of risk of extinction within 100 years. NMFS uses McElhaney *et al*.'s (2000) description of a viable salmonid population (VSP) that defines "viable" as less than a 5% risk of extinction within 100 years and "highly viable" as less than a 1% risk of extinction within 100 years. A third category, "maintained," represents a less than 25% risk within 100 years (moderate risk of extinction). To be considered viable (with a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100-year time frame), an ESU or DPS should have multiple populations so that a single catastrophic event is less likely to cause the ESU/DPS to become extinct, and so that the ESU/DPS may function as a metapopulation as necessary to sustain population-level extinction and recolonization processes (ICTRT 2005). The risk level of the ESU/DPS is built up from the aggregate risk levels of the individual populations and major population groups (MPGs, defined below) that make up the ESU/DPS.

Attributes associated with a VSP are the levels of abundance (number of adult spawners in natural production areas), productivity (adult progeny per parent), and the spatial structure and diversity necessary to: (1) Safeguard the genetic diversity of the listed ESU or DPS; (2) Enhance its capacity to adapt to various environmental conditions; and (3) Allow it to become self-sustaining in the natural environment. In 2007, the Interior Columbia Basin Technical Recovery Team (ICTRT) further defined population-level viability criteria to address, in combination, all four of the key parameters: (1) Abundance; (2) productivity; (3) spatial structure; and (4) diversity (ICTRT 2007). These viability attributes are influenced by survival, behavior, and experiences throughout the entire life cycle, characteristics that are influenced in turn by habitat and other environmental and anthropogenic conditions. The present risk faced by the ESU/DPS informs NMFS' determination of whether additional risk will appreciably reduce the likelihood that the ESU/DPS will survive or recover in the wild.

The four species discussed in this Opinion that use the lower Snake River include SRSS Chinook salmon, SRF Chinook salmon, SR sockeye salmon, and SRB steelhead. In 2003, and updated in 2005, the ICTRT identified independent populations of each species based on genetic information, geography, life-history traits, morphological traits, and population dynamics (Table 6). Within each ESU or DPS, the ICTRT further aggregated populations into major population groups (MPGs), which are a group of populations that share similar environments, life-history characteristics, and geographic proximity within an ESU (McElhany *et al*. 2000). All 52 populations identified (all species combined) use all or significant portions of the mainstem of the lower Snake River for migration, spawning, or rearing.

On August 15, 2011, NMFS announced the results of an ESA 5-year review for salmon and steelhead in the Interior Columbia Recovery Domain (76 FR 50448). After reviewing new information on the viability of these species, ESA section 4 listing factors, and efforts being made to protect the species, NMFS concluded that all salmon and steelhead in the Snake River sub-domains should retain their 2005 (salmon) or 2006 (steelhead) ESA listing classifications.

Table 6. ESA-listed salmon and steelhead populations that use the Lower Snake River subbasin (ICTRT 2003; 2005; 2007; and Ford 2011).

Species	Populations
Snake River spring/summer-run Chinook salmon	28 extant ; four extirpated (Includes 15 hatchery programs)
Snake River fall-run Chinook salmon	one extant (includes 4 hatchery programs); two extirpated
Snake River sockeye salmon	one (all Snake River Basin fish and Redfish Lake captive propagation)
Snake River Basin steelhead	23 extant; one blocked and one extinct

For the status of critical habitat, NMFS reviews the condition of the essential physical or biological features throughout the designated area, and the conservation values of the various watersheds in the designated area to determine whether the proposed action will destroy or adversely modify those specific conservation values. The regulatory definition of “destruction or adverse modification” at 50 CFR 402.02 is not used in this Opinion. Instead, this analysis relies on statutory provisions of the ESA, including those in section 3 that define “critical habitat” and “conservation,” in section 4 that describe the designation process, and in section 7 that sets forth the substantive protections and procedural aspects of consultation, and on agency guidance for application of the “destruction or adverse modification” standard (Hogarth 2005).

Snake River Spring/Summer-run Chinook Salmon

The Snake River spring/summer Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653). This ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Several factors led to NMFS’ conclusion that Snake River spring/summer Chinook were threatened: (1) Abundance of naturally produced Snake River spring and summer Chinook runs had dropped to a small fraction of historical levels; (2) short-term projections were for a continued downward trend in abundance; (3) hydroelectric development on the Snake and Columbia Rivers continued to disrupt Chinook runs through altered flow regimes and impacts on estuarine habitats; and (4) habitat degradation existed throughout the region, along with risks associated with the use of outside hatchery stocks in particular areas (Good *et al.* 2005). On August 15, 2011, in the agency’s most recent 5-year review for the Snake River ESU, NMFS concluded that the species should remain listed as threatened (76 FR 50448).

Current runs returning to the Clearwater River drainages were not included in the SRSS Chinook salmon ESU. Lewiston Dam in the lower mainstem of the Clearwater River was constructed in 1927 and functioned as an anadromous block until the early 1940s (Matthews and Waples 1991). In the 1940s spring and summer Chinook salmon runs were reintroduced into the Clearwater system via hatchery outplants. As a result, when determining the status of Snake River spring/summer Chinook for ESA listing, NMFS concluded that even if a few native salmon survived the hydropower dams, "the massive outplantings of nonindigenous stocks presumably substantially altered, if not eliminated, the original gene pool" (Matthews and Waples 1991).

Life History. The SRSS Chinook salmon are characterized by their return times. Runs classified as spring Chinook salmon are counted at Bonneville Dam beginning in early March and ending the first week of June; summer runs are those Chinook adults that pass Bonneville Dam from June through August. Returning adults will hold in deep mainstem and tributary pools until late summer, when they move up into tributary areas and spawn. In general, spring-run type Chinook salmon tend to spawn in higher-elevation reaches of major Snake River tributaries in mid- through late August, and summer-run type Chinook salmon spawn approximately 1 month later than spring-run fish. Summer-run Chinook salmon tend to spawn lower in the Snake River drainages, although their spawning areas often overlap with spring-run spawners.

Spring/summer Chinook spawn follow a "stream-type" life history characterized by rearing for a full year in the spawning habitat and migrating in early to mid-spring as age-1 smolts (Healey 1991). Eggs are deposited in late summer and early fall, incubate over the following winter, and hatch in late winter and early spring of the following year. Juveniles rear through the summer, and most overwinter and migrate to sea in the spring of their second year of life. Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer-rearing or overwintering areas. The SRSS Chinook salmon return from the ocean to spawn primarily as 4- and 5-year-old fish, after 2 to 3 years in the ocean. A small fraction of the fish return as 3-year old "jacks," heavily predominated by males (Good *et al*. 2005).

Spatial Structure and Diversity. The Snake River ESU includes all naturally spawning populations of spring/summer Chinook in the mainstem Snake River (below Hells Canyon Dam) and in the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins (57 FR 23458), as well as the progeny of 15 artificial propagation programs (70 FR 37160). The hatchery programs include the South Fork Salmon River (McCall Hatchery), Johnson Creek, Lemhi River, Pahsimeroi River, East Fork Salmon River, West Fork Yankee Fork Salmon River, and Upper Salmon River (Sawtooth Hatchery) programs in Idaho; and the Tucannon River (conventional and captive broodstock programs), Lostine River, Catherine Creek, Lookingglass Creek, Upper Grande Ronde River, Imnaha River, and Big Sheep Creek programs in Oregon. The historical SRSS Chinook ESU likely also included populations in the Clearwater River drainage and extended above the Hells Canyon Dam complex.

Within the Snake River ESU, the ICTRT identified 28 extant and four extirpated or functionally extirpated populations of spring/summer-run Chinook salmon, listed in Table 7 (ICTRT 2003; McClure *et al.* 2005). The ICTRT aggregated these populations into five MPGs: Lower Snake River, Grande Ronde/Imnaha Rivers, South Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River. For each population, Table 7 shows the current risk ratings that the ICTRT assigned to the four parameters of a viable salmonid population (spatial structure, diversity, abundance, and productivity).

In general, current spatial structure risk is low in this ESU and is not preventing the recovery of the species. Spring/summer Chinook salmon spawners are distributed throughout the ESU albeit at very low numbers. Diversity risk, on the other hand, is somewhat higher, driving the moderate and high combined spatial structure/diversity risks shown in Table 7 for some populations. In the upper Salmon, for example, high diversity risks are caused by chronically high proportions of hatchery spawners in natural areas, and by loss of access to tributary spawning and rearing habitats and the associated reduction in life history diversity (Ford 2011). Diversity risk will need to be lowered in multiple populations in order for the ESU to recover (ICTRT 2007, ICTRT 2010a).

Abundance and Productivity. Historically, the Snake River drainage is thought to have produced more than 1.5 million adult spring/summer Chinook salmon in some years (Matthews and Waples 1991), yet by the mid-1990s counts of natural-origin fish passing Lower Granite Dam dropped to less than 10,000 (IDFG 2007). Natural-origin returns have since increased somewhat but remain highly variable and a fraction of historic estimates (Ford 2011). Between 2002 and 2012, the number of wild adult fish passing Lower Granite Dam annually ranged from 8,808 to 31,619 (IDFG 2014). For individual populations, abundance remains below viability thresholds for all populations, reflected in the ICTRT’s high risk rating for abundance/productivity for each population listed in Table 7 (Ford 2011). For some populations, mean abundance from 2000 to 2009 was extremely low, such as for the Yankee Fork and Camas Creek populations, which had recent mean abundances of just 21 and 30 natural spawners, respectively, compared to minimum viability targets of at least 500 spawners (Ford 2011). Relatively low natural production rates and spawning levels remain a major concern across the ESU, and each extant population in the ESU currently faces a high risk of extinction over the next 100 years (Table 7).

Table 7. Summary of viable salmonid population (VSP) parameter risks and overall current status for each population in the Snake River spring/summer Chinook salmon ESU (Ford 2011).

MPG	Population	VSP Parameter Risk		Overall Viability Rating
		Abundance/ Productivity	Spatial Structure/ Diversity	
South Fork Salmon River (Idaho)	Little Salmon River	High	High	High Risk
	South Fork Salmon River mainstem	High	Moderate	High Risk
	Secesh River	High	Low	High Risk
	East Fork South Fork Salmon River	High	Low	High Risk
Middle Fork Salmon River (Idaho)	Chamberlain Creek	High	Low	High Risk
	Middle Fk. Salmon River below Indian	High	Moderate	High Risk
	Big Creek	High	Moderate	High Risk
	Camas Creek	High	Moderate	High Risk
	Loon Creek	High	Moderate	High Risk
	Middle Fk. Salmon River above Indian Ck.	High	Moderate	High Risk
	Sulphur Creek	High	Moderate	High Risk
	Bear Valley Creek	High	Low	High Risk
	Marsh Creek	High	Low	High Risk
Upper Salmon River (Idaho)	North Fork Salmon River	High	Low	High Risk
	Lemhi River	High	High	High Risk
	Salmon River Lower Mainstem	High	Low	High Risk
	Pahsimeroi River	High	High	High Risk
	East Fork Salmon River	High	High	High Risk
	Yankee Fork Salmon River	High	High	High Risk
	Valley Creek	High	Moderate	High Risk
	Salmon River Upper Mainstem	High	Moderate	High Risk
	Panther Creek			Extirpated
Lower Snake (Washington)	Tucannon River	High	Moderate	High Risk
	Asotin River			Extirpated
Grande Ronde and Imnaha Rivers (Oregon/ Washington)	Wenaha River	High	Moderate	High Risk
	Lostine/Wallowa River	High	Moderate	High Risk
	Minam River	High	Moderate	High Risk
	Catherine Creek	High	Moderate	High Risk
	Upper Grande Ronde R.	High	High	High Risk
	Imnaha River	High	Moderate	High Risk
	Big Sheep Creek			Extirpated
	Lookingglass Creek			Extirpated

Snake River fall-run Chinook Salmon

The Snake River fall Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653). This ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Snake River fall Chinook salmon have substantially declined in abundance from historic levels, primarily due to the loss of primary spawning and rearing areas upstream of the Hells Canyon Dam complex (57 FR 14653). Additional concerns for the species have been the high percentage of hatchery fish returning to natural spawning grounds and the relatively high aggregate harvest impacts by ocean and in-river fisheries (Good *et al.* 2005). On August 15, 2011, NMFS completed a 5-year review for the Snake River fall Chinook salmon ESU and concluded that the species should remain listed as threatened (76 FR 50448).

Life History. The SRF Chinook salmon enter the Columbia River in July and August, and migrate past the lower Snake River mainstem dams from August through November. Fish spawning takes place from October through early December in the lower mainstem of the Snake River and the lower reaches of several of the associated major tributaries including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers (Connor and Burge 2003; Ford 2011). Spawning has occasionally been observed in the tailrace areas of the four mainstem dams (Dauble *et al*. 1999; Dauble *et al*. 1995; Dauble *et al*. 1994; Mueller 2009). Juveniles emerge from the gravels in March and April of the following year. The reach of the Snake River upstream of the action area is the warmest spawning area, and it offers a relatively high level of opportunity for growth. In comparison, the lower reach of the Clearwater River is the coolest spawning area and it offers a relatively low level of opportunity for growth.

Until recently, SRF Chinook have been assumed to follow an “ocean-type” life history (Dauble and Geist 2000; Good *et al*. 2005; Healey 1991) where they migrate to the Pacific Ocean during their first year of life, normally within 3 months of emergence from spawning substrate as age-0 smolts, to spend their first winter in the ocean. Ocean-type Chinook salmon juveniles tend to display a “rear as they go” rearing strategy in which they continually move downstream through shallow shoreline habitats their first summer and fall until they disperse off shore and become more pelagic and migratory in the winter and following spring (Connor and Burge 2003; Coutant and Whitney 2006). However, in recent years several studies have shown that another life history pattern exists where a significant number of smaller SRF Chinook juveniles overwinter in Snake River reservoirs prior to outmigration. These fish begin migration later than most, arrest their seaward migration and overwinter in reservoirs on the Snake and Columbia Rivers, then resume migration and enter the ocean in early spring as age-1 smolts (Connor and Burge 2003; Connor *et al*. 2002; Connor *et al*. 2005; Hegg *et al*. 2013). Connor *et al*. (2005) termed this life history strategy “reservoir-type.” Scale samples from natural-origin adult fall Chinook salmon taken at Lower Granite Dam continue to indicate that approximately half of the returns overwintered in freshwater (Ford 2011). Tiffan and Connor (2012) showed that subyearling fish favor water less than 6 feet deep.

Spatial Structure and Diversity. The SRF Chinook salmon ESU includes one extant population of fish spawning in the lower mainstem of the Snake River and the lower reaches of several of the associated major tributaries including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers. The ESU also includes four artificial propagation programs: the Lyons Ferry Hatchery and the Fall Chinook Acclimation Ponds Program in Washington; the Nez Perce Tribal Hatchery in Idaho; and the Oxbow Hatchery in Oregon and Idaho (70 FR 37160). Historically, this ESU included two large additional populations spawning in the mainstem of the Snake River upstream of the Hells Canyon Dam complex, an impassable migration barrier. The spawning and rearing habitat associated with the current extant population represents approximately 20% of the total historical habitat available to the ESU (Dauble and Geist 2000). A high proportion of current spawning is concentrated in the Snake River upstream from Asotin Creek, but recent spawner surveys document spawning across many major tributaries within the population boundaries (e.g., Arnsberg *et al*. 2013; 2014). Spatial structure risk for the existing ESU is therefore low (Ford 2011) and is not precluding recovery of the species.

There are several diversity concerns for SRF Chinook salmon, leading the ICTRT to give the Lower Snake River fall Chinook population a moderate diversity risk rating. One concern is the high proportion of hatchery fish spawning naturally. For the 5-year period ending in 2008, 78% of the estimated total spawners were of hatchery origin (Ford 2011). The moderate diversity risk is also driven by changes in major life history patterns; shifts in phenotypic traits; high levels of genetic homogeneity in samples from natural-origin returns; selective pressure imposed by current hydropower operations; and cumulative harvest impacts (Ford 2011). The moderate diversity risk for the population leads to a moderate cumulative spatial structure/diversity risk. Diversity risk will need to be reduced to low in order for this population to be considered highly viable, a requirement for recovery of the species (ICTRT 2007).

Abundance and Productivity. Historical abundance of Snake River fall Chinook salmon is estimated to have been 416,000 to 650,000 fish (NMFS 2006), but numbers declined drastically over the 20th century, with only 78 natural-origin fish passing Lower Granite Dam in 1990 (Joint Columbia River Management Staff 2014b). The first hatchery-reared Snake River fall Chinook salmon returned to the Snake River in 1981, and since then the number of hatchery returns has increased steadily, such that hatchery fish dominate the Snake River fall Chinook run. Natural returns have also increased. The recent 10-year (1998 to 2008) mean abundance of natural-origin fall Chinook passing Lower Granite Dam was 2,200 adults, and the recent short-term trend in natural-origin spawners was strongly positive, with the population increasing at an average rate of 16% per year. This 10-year mean abundance is below the ICTRT's recovery goal of a minimum mean of 3,000 natural-origin spawners for the species' single extant population (Ford 2011). Combining the 10-year mean natural spawning escapement estimate of 2,200 with productivity estimates of 1.07 to 1.28 results in an abundance/productivity rating of moderate risk for this population (Ford 2011). The cumulative moderate risks for both abundance/productivity and spatial structure/diversity put this population at moderate risk of extinction over the next 100 years, or "maintained" status (Ford 2011). Natural-origin adult returns over the last 5 years may lessen abundance risk because counts have continued to increase. Natural-origin SRF Chinook salmon returning to Lower Granite Dam totaled 4,977 in 2009; 7,995 in 2010; 8,778 in 2011; 12,797 in 2012, and 21,124 in 2013 (Joint Columbia River Management Staff 2014b).

Snake River Sockeye Salmon

This ESU includes all anadromous and residual sockeye salmon from the Snake River basin, Idaho, as well as artificially propagated sockeye salmon from the Redfish Lake captive propagation program. The ESU was first listed as endangered under the ESA in 1991, the listing was reaffirmed in 2005 (70 FR 37160 and 37204). Reasons for the decline of this species include high levels of historic harvest, dam construction including hydropower development on the Snake and Columbia Rivers, water diversions and water storage, predation on juvenile salmon in the mainstem river migration corridor, and active eradication of sockeye from some lakes in the 1950s and 1960s (56 FR 58619; ICTRT 2003). On August 15, 2011, NMFS completed a 5-year review for the Snake River sockeye salmon ESU and concluded that the species should remain listed as endangered (76 FR 50448).

Life History. Snake River sockeye salmon adults enter the Columbia River primarily during June and July, and arrive in the Sawtooth Valley peaking in August. The Sawtooth Valley supports the only remaining run of Snake River sockeye salmon. The adults spawn in lakeshore gravels, primarily in October (Bjornn *et al.* 1968). Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in the gravel for 3 to 5 weeks, emerge from April through May, and move immediately into the lake. Once there, juveniles feed on plankton for 1 to 3 years before they migrate to the ocean, leaving their natal lake in the spring from late April through May (Bjornn *et al.* 1968). Snake River sockeye salmon usually spend 2 to 3 years in the Pacific Ocean and return to Idaho in their 4th or 5th year of life.

Spatial Structure and Diversity. Within the Snake River ESU, the ICTRT identified historical sockeye salmon production in five Sawtooth Valley lakes, in addition to Warm Lake and the Payette Lakes in Idaho and Wallowa Lake in Oregon (ICTRT 2003). The sockeye runs to Warm, Payette, and Wallowa Lakes are now extinct, and the ICTRT identified the Sawtooth Valley lakes as a single MPG for this ESU. The MPG consists of the Redfish, Alturas, Stanley, Yellowbelly, and Pettit Lake populations (ICTRT 2007). The only extant population is Redfish Lake, supported by a captive broodstock program. Hatchery fish from the Redfish Lake captive propagation program have also been outplanted in Alturas and Pettit Lakes since the mid-1990s in an attempt to reestablish those populations (Ford 2011). With such a small number of populations in this MPG, increasing the number of populations would substantially reduce the risk faced by the ESU (ICTRT 2007).

Currently, the Snake River sockeye salmon run is highly dependent on a captive broodstock program operated at the Sawtooth Hatchery and Eagle Hatchery. Although the captive brood program rescued the ESU from the brink of extinction, diversity risk remains high without sustainable natural production (Ford 2011).

Abundance and Productivity. Prior to the turn of the 20th century (ca. 1880), around 150,000 sockeye salmon ascended the Snake River to the Wallowa, Payette, and Salmon River basins to spawn in natural lakes (Evermann 1896, as cited in Chapman *et al.* 1990). The Wallowa River sockeye run was considered extinct by 1905, the Payette River run was blocked by Black Canyon Dam on the Payette River in 1924, and anadromous Warm Lake sockeye in the South Fork Salmon River basin may have been trapped in Warm Lake by a land upheaval in the early 20th century (ICTRT 2003). In the Sawtooth Valley, the IDFG eradicated sockeye from Yellowbelly, Pettit, and Stanley Lakes in favor of other species in the 1950s and 1960s, and irrigation diversions led to the extirpation of sockeye in Alturas Lake in the early 1900s (ICTRT 2003), leaving only the Redfish Lake sockeye. From 1991 to 1998, a total of just 16 natural-origin adult anadromous sockeye salmon returned to Redfish Lake. These 16 natural-origin fish were incorporated into a captive broodstock program that began in 1992 and has since expanded so that the program currently releases hundreds of thousands of juvenile fish each year in the Sawtooth Valley (Ford 2011). With the increase in hatchery production, adult returns to Sawtooth Valley have increased in past few years to 833 in 2009, 1,355 in 2010, 1,117 in 2011, 257 in 2012, and 272 in 2013 (IDFG 2011; NMFS 2014). The increased abundance of hatchery reared Snake River sockeye reduces the risk of immediate loss, yet levels of naturally produced sockeye returns remain extremely low (Ford 2011). The ICTRT's viability target is at least 1,000 naturally produced spawners per year in each of Redfish and Alturas Lakes and at least 500 in Pettit Lake (ICTRT 2007).

The species remains at high risk across all four risk parameters (spatial structure, diversity, abundance, and productivity). Although the captive brood program has been highly successful in producing hatchery *O. nerka*, substantial increases in survival rates across all life history stages must occur in order to reestablish sustainable natural production (Ford 2011). Low survival rates outside of the Sawtooth Valley are limiting the recovery of the species (NOAA Fisheries 2011).

Snake River Basin Steelhead

The Snake River steelhead was listed as a threatened ESU on August 18, 1997 (62 FR 43937), with a revised listing as a DPS on January 5, 2006 (71 FR 834). This DPS occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Reasons for the decline of this species include substantial modification of the seaward migration corridor by hydroelectric power development on the Snake and mainstem Columbia Rivers, and widespread habitat degradation and reduced streamflows throughout the Snake River basin (Good *et al.* 2005). Another major concern for the species is the threat to genetic integrity from past and present hatchery practices, and the high proportion of hatchery fish in aggregate run of SRB steelhead over Lower Granite Dam (Good *et al.* 2005; Ford 2011). On August 15, 2011, in the agency's most recent 5-year review for the Snake River DPS, NMFS concluded that the species should remain listed as threatened (76 FR 50448).

Life History. Adult SRB steelhead enter the Columbia River from late June to October to begin their migration inland. After holding over the winter in larger rivers in the Snake River basin, steelhead disperse into smaller tributaries to spawn from March through May. Earlier dispersal occurs at lower elevations and later dispersal occurs at higher elevations. Juveniles emerge from the gravels in 4 to 8 weeks, and move into shallow, low-velocity areas in side channels and along channel margins to escape high velocities and predators (Everest and Chapman 1972). Juvenile steelhead then progressively move toward deeper water as they grow in size (Bjornn and Rieser

1991). Juveniles typically reside in fresh water for 1 to 3 years, although this species displays a wide diversity of life histories. Smolts migrate downstream during spring runoff, which occurs from March to mid-June depending on elevation, and typically spend 1 to 2 years in the ocean.

Steelhead can spawn more than once and adults may return to the ocean after spawning. Repeat spawning rates for steelhead are highly variable (e.g., range from under 1% to over 50% in the Pacific Northwest) and are regulated by several biological, ecological, and anthropogenic factors. Under natural conditions these fish would swim back downstream to the Pacific Ocean to feed and restore depleted energy reserves before attempting to spawn again. In 1999 the Yakama Nation and the Columbia River Inter-Tribal Fish Commission (CRITFC) partnered on a project to capture these fish in the spring as they start back downstream and "recondition" them in hatchery facilities home basins e.g., Clearwater River, Yakima River, Methow River. The Nez Perce Tribe captures kelts at Lower Granite Dam from March through June for reconditioning at the Dworshak National Fish Hatchery before release back into the Snake River basin in the late fall so they can spawn again the following spring.

Spatial Structure and Diversity. This species includes all naturally-spawning steelhead populations below natural and manmade impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho, as well as the progeny of six artificial propagation programs (71FR834). The hatchery programs include Dworshak National Fish Hatchery, Lolo Creek, North Fork Clearwater River, East Fork Salmon River, Tucannon River, and the Little Sheep Creek/Imnaha River steelhead hatchery programs. The SRB steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

The ICTRT identified 24 extant populations within this DPS, organized into five MPGs (ICTRT 2003). The ICTRT also identified a number of potential historical populations associated with watersheds above the Hells Canyon Dam complex on the mainstem Snake River, a barrier to anadromous migration. The five MPGs with extant populations are the Clearwater River, Salmon River, Grande Ronde River, Imnaha River, and Lower Snake River. In the Clearwater River, the historic North Fork population was blocked from accessing spawning and rearing habitat by Dworshak Dam. Current steelhead distribution extends throughout the DPS, such that spatial structure risk is generally low. For each population in the DPS, Table 8 shows the current risk ratings that the ICTRT assigned to the four parameters of a viable salmonid population (spatial structure, diversity, abundance, and productivity).

The Snake River Basin DPS steelhead exhibit a diversity of life-history strategies, including variations in fresh water and ocean residence times. Traditionally, fisheries managers have classified SRB steelhead into two groups, A-run and B-run, based on ocean age at return, adult size at return, and migration timing. A-run steelhead predominantly spend 1 year at sea and are assumed to be associated with low to mid-elevation streams in the Snake River Basin. B-run steelhead are larger with most individuals returning after 2 years in the ocean. The ICTRT has identified each population in the DPS as either A-run or B-run. Initial results from new research, however, indicate that some populations in the Snake River Basin assumed to be either A-run or B-run may support a mixture of the two run types (Ford 2011). Maintaining life history diversity is important for the recovery of the species.

Diversity risk for the DPS is low to moderate, and drives the moderate combined spatial structure/diversity risks shown in Table 8 for some populations. Moderate diversity risks for some populations are caused by the high proportion of hatchery fish on natural spawning grounds. Reductions in hatchery-related diversity risks would increase the likelihood of these populations reaching viable status.

Abundance and Productivity. Historical estimates of steelhead production for the entire Snake River basin are not available, but the basin may have supported more than half the total steelhead production from the Columbia River basin (Mallet 1974, as cited in Good *et al.* 2005). Historical estimates do exist for portions of the basin. Estimates of steelhead passing Lewiston Dam (removed in 1973) on the lower Clearwater River were 40,000 to 60,000 adults (Ecovista *et al.* 2003). Based on relative drainage areas, the Salmon River basin likely supported substantial production as well (Good *et al.* 2005). In contrast, at the time of listing, the 5-year (1991 to 1996) mean abundance for natural-origin steelhead passing Lower Granite Dam was 11,462 adults (Ford 2011). Steelhead passing Lower Granite Dam include those returning to: (1) The Grande Ronde and Imnaha Rivers in Oregon; (2) Asotin Creek in Washington; and (3) the Clearwater and Salmon Rivers in Idaho. A more recent 5-year (2003 to 2008) mean abundance passing Lower Granite Dam was larger at 18,847 natural-origin fish (Ford 2011). These natural-origin fish represent just 10% of the total steelhead run over Lower Granite Dam of 162,323 adults for the same time period. However, a large proportion of these fish return to the hatcheries or are removed by selective harvest prior to reaching spawning areas, such that the relatively high hatchery proportions in the aggregate run over Lower Granite Dam are not representative of the proportions in spawning escapements into most population-level tributaries (Ford 2011). Natural-origin steelhead returns to the Snake River (counted July 1 through June 30 of the following year) have further increased in recent years with Lower Granite Dam counts of 44,239 returning natural-origin adults in 2009 to 2010; 44,839 in 2010 to 2011; 40,151 in 2011 to 2012; and 26,173 in 2012 to 2013 (Joint Columbia River Management Staff 2014a).

Despite recent increases in steelhead abundance, population-level natural-origin abundance and productivity inferred from aggregate data indicate that many populations in the DPS are likely below the viability targets necessary for species recovery (Ford 2011). Population-specific abundance estimates are not available for most Snake River steelhead populations. Instead, the ICTRT estimated average population abundance and productivity using annual counts of natural-origin steelhead passing Lower Granite Dam, generating separate estimates for a surrogate A-run and B-run population. Most population abundance/productivity risks shown in Table 8 are based on a comparison of the surrogate population current abundance and productivity estimates to a population viability threshold of 1,000 natural-origin spawners and a productivity of 1.14 recruits per spawner. The surrogate A-run population has a mean abundance of 556 spawners and productivity of 1.86, indicating a moderate abundance/productivity risk. The surrogate B-run population has a mean abundance of 345 spawners and productivity of 1.09, indicating a high abundance/productivity risk (ICTRT 2010b, Appendix B-1). Based on these tentative risk ratings, all populations except for one are currently at either high or moderate risk of extinction over the next 100 years. Joseph Creek in Oregon, for which population-specific abundance information is available, is the only population in the DPS currently rated as viable (Ford 2011).

Table 8. Summary of viable salmonid population (VSP) parameter risks and overall current status for each population in the Snake River Basin steelhead DPS (Ford 2011).

MPG	Population	VSP Parameter Risk		Overall Viability Rating
		Abundance/ Productivity	Spatial Structure/ Diversity	
Lower Snake River	Tucannon River	High	Moderate	High Risk?[1]
	Asotin Creek	Moderate	Moderate	High/Moderate Risk?
Grande Ronde River	Lower Grande Ronde		Moderate	Moderate Risk?
	Joseph Creek	Very Low	Low	Highly Viable
	Wallowa River	High	Low	High Risk?
	Upper Grande Ronde	Moderate	Moderate	Moderate Risk
Imnaha River	Imnaha River	Moderate	Moderate	Moderate Risk
Clearwater River (Idaho)	Lower Mainstem Clearwater River	Moderate	Low	Moderate Risk?
	South Fork Clearwater River	High	Moderate	High Risk?
	Lolo Creek	High	Moderate	High Risk?
	Selway River	High	Low	High Risk?
	Lochsa River	High	Low	High Risk?
	North Fork Clearwater River			Extirpated
Salmon River (Idaho)	Little Salmon River	Moderate	Moderate	Moderate Risk?
	South Fork Salmon River	High	Low	High Risk?
	Secesh River	High	Low	High Risk?
	Chamberlain Creek	Moderate	Low	Moderate Risk?
	Lower Middle Fork Salmon River	High	Low	High Risk?
	Upper Middle Fork Salmon River	High	Low	High Risk?
	Panther Creek	Moderate	High	Moderate Risk?
	North Fork Salmon River	Moderate	Moderate	Moderate Risk?
	Lemhi River	Moderate	Moderate	Moderate Risk?
	Pahsimeroi River	Moderate	Moderate	Moderate Risk?
	East Fork Salmon River	Moderate	Moderate	Moderate Risk?
	Upper Mainstem Salmon River	Moderate	Moderate	Moderate Risk?
Hells Canyon	Hells Canyon Tributaries			Extirpated

[1] The question mark indicates that information on the population size is incomplete.

2.2.2 Status of Critical Habitat

Critical habitat for SRSS Chinook salmon, SRF Chinook salmon, and SR sockeye salmon was designated on December 28, 1993. In 1999, NMFS revised the SRSS Chinook salmon habitat to remove an area above a natural waterfall barrier on Napias Creek. The 1993 (and 1999) designations for SRSS Chinook salmon, SRF Chinook salmon and SR sockeye salmon included "the bottom and water of the waterways and the adjacent riparian zone. The riparian zone includes those areas within 300 feet" of the normal high water line (64 FR 57399).

Critical habitat for SRB steelhead was designated in 2005 and includes the stream channels within designated stream reaches, and a lateral extent as defined by the ordinary high-water line (33 CFR 319.11). In designating critical habitat, NMFS looked for two categories or types: (1) Specific areas within the geographical area occupied by the species at the time of listing, if they contain essential physical and biological features (Chinook and sockeye salmon) or primary constituent elements (PCEs) (steelhead) of designated critical habitat (hereinafter collectively referred to as PCEs); and (2) specific areas outside the geographical area currently occupied by the species if the area itself is essential for conservation of the species. NMFS identified PCEs in both freshwater and saltwater for all anadromous fish species; however, since the action area occurs entirely in freshwater, only freshwater PCEs (Table 9) are considered in this Opinion.

The four species addressed in this Opinion occupy much of the same geographic area albeit for different life history phases. Although some life history characteristics differ, such as adult upstream migration timing and age at which juveniles migrate downstream, within the subbasin where the action area is located, all species require many of the same habitat functions provided by the designated critical habitat. The PCEs designated for steelhead and the essential physical and biological features designated for salmon are jointly referred to as PCEs in this consultation. The specific critical habitat PCE's that are relevant to this consultation are those associated with freshwater migration, spawning, and rearing. The lower Snake and lower Clearwater Rivers function as a migration corridor for adults and juveniles of all species, and also provides SRF Chinook salmon spawning habitat in some areas (dam tailraces) and serves as rearing habitat, particularly by "reservoir" type SRF Chinook salmon juveniles from the Clearwater River (Connor *et al*. 2005; Hegg *et al*. 2013; Tiffan and Connor 2012).

Many factors over the past century, both human-caused and natural, have contributed to the decline of both quantity (significantly large areas blocked by dams) and quality of critical habitat for all of the Snake River species considered in this Opinion. Power generation, urban development, logging, grazing, and agriculture have reduced or eliminated access and reduced the functional capacity of remaining critical habitat and resulted in the loss of important spawning and rearing habitat and the loss or degradation of migration corridors. The Dworshak Dam at RM 1.9 on the North Fork of the Clearwater River and the Hells Canyon Complex at RM 247 of the Snake River are not fish passable and prevent access to hundreds of miles of formerly accessible habitat.

Table 9. Types of sites and essential physical and biological features designated as PCEs, and the species life stage each PCE supports.

Site	Essential Physical and Biological Features/PCEs	ESA-listed Species Life Stage
Snake River Basin Steelhead[a]		
Freshwater rearing	Water quantity & floodplain connectivity to form and maintain physical habitat conditions	Juvenile growth and mobility
	Water quality and forage[b]	Juvenile development
	Natural cover[c]	Juvenile mobility and survival
Freshwater migration	Free of artificial obstructions, water quality and quantity, and natural cover[c]	Juvenile and adult mobility and survival
Snake River Fall and Spring/summer Chinook Salmon		
Spawning and Juvenile Rearing	Spawning gravel, water quality and quantity, cover/shelter, food, riparian vegetation, and space	Juvenile and adult
Migration	Substrate, water quality and quantity, water temperature, water velocity, cover/shelter, food[d], riparian vegetation, space, safe passage	Juvenile and adult
Snake River Sockeye Salmon		
Migration	Substrate, water quality and quantity, water temperature, water velocity, cover/shelter, food[d], riparian vegetation, space, safe passage	Juvenile and adult

a. Additional PCEs pertaining to estuarine, nearshore, and offshore marine areas have also been described for Snake River Basin steelhead. These PCEs will not be affected by the proposed action and have therefore not been described in this letter of concurrence.
b. Forage includes aquatic invertebrate and fish species that support growth and maturation.
c. Natural cover includes shade, large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
d. Food applies to juvenile migration only.

Development and operation of hydroelectric dams on the Snake and Clearwater Rivers have dramatically altered, reduced or completely eliminated freshwater migration, spawning and rearing PCEs in large segments of both rivers and the lower reaches of tributaries (e.g. available SRF Chinook salmon habitat is reduced by 80% from historical levels). There are currently four hydroelectric dams in the mainstem Columbia River migration corridor downstream of the action area, another four in the mainstem Snake and one in the North Fork Clearwater Rivers within the existing range of all four species. Although major efforts have been made to improve migration by reducing juvenile mortality and improving adult passage, the safe passage element of the migration PCE is impaired as smolts are killed or injured by every hydroelectric dam they must pass along this critical migration corridor. These Columbia River and lower Snake River dams also pose migration challenges to returning adults.

Where habitat is accessible, freshwater rearing and spawning PCEs have also been impaired, as impounded water behind hydroelectric dams has reduced formerly complex mainstem habitats to mostly single channels with little complexity (e.g. little or no shallow water habitat or off channel habitat). Hydroelectric development has also impaired the water volume by altering the natural flow regime of the Snake River (decreasing spring and summer flow while increasing fall and winter flow). Both rearing and migration behaviors are impacted as fluctuations in river elevation and flow velocity due to power operations slow juvenile migration through reservoirs, disturb riparian areas, and strand fish in shallow areas as levels recede. Similarly, hydro development has also degraded the water temperature characteristics through altered natural thermal patterns, again affecting rearing (SRF Chinook), and migration habitats.

The water quality element of the freshwater spawning, rearing, and migration PCEs are also impaired by agricultural and urban development throughout the range of critical habitat. Urban and agricultural runoff, irrigation return flows, as well as municipal and industrial wastewater outflows have increased water temperatures and introduced high levels of sediment and other pollutants into this migration corridor. Before mainstem dams were constructed, habitat was lost or severely damaged in tributary streams by construction and operation of irrigation dams, channelization of streams, removal of riparian vegetation, and other activities generally associated with farming, grazing, logging, and development.

Although designated critical habitat for all Snake River species is degraded in places, and in some cases highly degraded, the dramatic reduction in accessible area because of the dams increases the conservation value of the remaining watersheds. In addition, the Snake River from the downstream end of the action area (Ice Harbor Dam) is the essential link to all upstream natal streams. The lower Snake River in the action area connects every watershed and population for SRSS Chinook salmon, SRF Chinook salmon, SR sockeye salmon ESUs, and the SRB steelhead DPS with the ocean, and is used by rearing and migrating juveniles, and spawning and migrating adults.

Climate change is expected to alter critical habitat as described above in Section 2.2 by generally increasing temperature and peak flows and decreasing base flows. Although changes will not be spatially homogenous, effects of climate change are expected to decrease the capacity of critical habitat to support successful spawning, rearing, and migration.

2.3 Environmental Baseline

The “environmental baseline” includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

NMFS describes the environmental baseline in terms of the biological requirements for habitat features and processes necessary to support all life stages of each of the four ESA-listed species within the action area. The species considered in this Opinion reside in or migrate through the action area. Thus, for this action area, the biological requirements for SRSS Chinook salmon, SRF Chinook salmon, SR sockeye salmon and SRB steelhead are the habitat characteristics that support successful completion of spawning, rearing, and migration. An environmental baseline that does not meet the biological requirements of a listed species may increase the likelihood that adverse effects of the proposed action will result in jeopardy to a listed species or in destruction or adverse modification of a designated critical habitat.

Federal Hydropower System

The Lower Snake River is confined and controlled by four hydroelectric, concrete, run-of-the-river dams, all part of the FCRPS. The three lower dams, Ice Harbor, Lower Monumental and Little Goose each create a reservoir that extends upstream to the next dam. The fourth dam, Lower Granite creates a reservoir that extends 46 miles upstream to Asotin, Washington. At RM 139.2, the Clearwater River enters the reservoir at Lewiston Idaho.

Ice Harbor Dam and Reservoir*:* Located at RM 9.5, construction began in 1955, completed in 1961. The reservoir is known as Lake Sacajawea and stretches upstream to the base of Lower Monumental Dam, 32 miles upstream. The Wallula Channel, formed from the backup of Snake River entering the Columbia River, runs 10 miles (16 km) downstream from the base of the dam.

Lower Monumental Dam and Reservoir*:* Lake Herbert G. West, which extends 28 miles (45 km) upstream (east) to the base of Little Goose Dam, is formed behind the dam. Construction began in 1961 with the dam and three generators completed in 1969.

Little Goose Dam and Reservoir: Construction began in 1963. The main structure and three generators were completed in 1970. The reservoir, Lake Bryan, runs upstream 37 miles to Lower Granite Dam.

Lower Granite Reservoir: Located at RM 107.5, construction on Lower Granite Dam began in 1965 with the main structure and three generators completed in 1972. This is the most upstream dam in the Snake River system that has a fish ladder to allow anadromous fish to migrate upstream for spawning. Lower Granite Lake extends upstream from the dam 39 miles to Lewiston, Idaho, into the lower Clearwater River. The reservoir influence on the Snake River extends to Asotin, Washington and the next dam, Hell's Canyon is at RM 247. From Asotin, Washington upstream approximately 95 miles to the Hell's Canyon Complex, the Snake River is relatively free flowing.

Current conditions within much of the mainstem Snake and Clearwater Rivers are degraded relative to historic conditions. Dams and their associated reservoirs have modified much of the mainstem habitat downstream of the Clearwater River confluence previously used by SRF Chinook salmon for spawning and altered the functional capacity of the habitat for all rearing and migrating salmon and steelhead. Formerly complex habitat in the mainstem and lower tributaries of the Snake River have been reduced, for the most part, to single channels with reduced or disconnected floodplains, side channels or off-channel habitats (Sedell and Froggatt 1984; Ward and Stanford 1995). A study of the available rearing habitat in Lower Granite reservoir by Tiffan and Hatten (2012) estimated that 44% of the shoreline of the reservoir is lined with riprap. Most riprapped shorelines were located along the road and railway along the north side of the reservoir and along the roadway on the south side of the reservoir from Silcott Island to Clarkston. The entire shoreline of the Clearwater River within the action area (RM 0 to 1.9) is lined with riprap. In addition, estimates of shallow water rearing habitat, areas less than 6 feet deep found only 217 acres or 2.2% of the reservoir area is suitable juvenile shallow water rearing habitat.

Hydroelectric dams have eliminated or reduced mainstem spawning and rearing habitat and have altered the normal flow regime of the Snake and Clearwater Rivers, decreasing spring and summer flows, increasing fall and winter flow and altering natural thermal patterns (Coutant 1999). Power operations cause fluctuating flow levels and river elevations, affecting fish movement through the reservoirs, disturbing shoreline or shallow water areas and possibly stranding fish in shallow areas when flows recede quickly. A substantial fraction of the mortality experienced by juvenile outmigrants through the portion of the migratory corridor affected by the FCRPS occurs in the reservoirs. This includes about half of the mortality of all in-river migrating juvenile salmon and steelhead (NMFS 2008). The altered habitats in many reservoirs reduce smolt migration rates and create more favorable habitat conditions for fish predators, including native northern pikeminnow, nonnative walleye and smallmouth bass (ISG 1998; NRC 1996).

In the Lower Snake River and the lower reach of the Clearwater River, dams have changed food web interaction both directly and indirectly. Impoundments have directly increased predation risk for anadromous salmon and steelhead smolts by delaying downstream migration, thereby prolonging their exposure to piscivorous birds and fishes. Impoundments have also changed trophic interaction indirectly by creating extensive new habitat (e.g., riprap banks) that favors some native piscivorous fishes like northern pikeminnow and providing new opportunities for non-native piscivores like walleye and smallmouth bass (Beamesderfer and Rieman 1988; Kareiva *et al*. 2000; Petersen and Poe 1993). The new and poorly understood food webs that have developed in run-of-the-river reservoirs in recent decades may not support the energetic needs of over winter juvenile rearing, spring-migrating salmon and steelhead or other native organisms. Future changes in run-of-the-river food webs can be expected as new non-native species become established, and these additions also may have unanticipated effects on the nutritional condition and fitness of migrating juvenile salmon (Kareiva *et al*. 2000).

In addition, numerous anthropogenic features or activities in the action area (e.g., dams, ports, docks, roads, railroads, bank stabilization, irrigation withdrawals, and landscaping) have become permanent fixtures on the landscape, and have displaced and altered native riparian habitat. Consequently, the potential for normal riparian processes (e.g., litter fall, channel complexity, and large wood recruitment) to occur is diminished and aquatic habitat has become simplified. Shoreline development has reduced the quantity and quality of nearshore salmon and steelhead habitat by eliminating native riparian vegetation, displacing shallow water habitat with fill materials, and by disconnecting the Snake River from historic floodplain or side channel areas. Further, riparian species that evolved under the environmental gradients of riverine ecosystems are not well suited to the present hydraulic setting of the action area (i.e., static, slackwater pools), and are thus often replaced by invasive, non-native species. The riparian system is fragmented, poorly connected, and provides inadequate protection of habitats and refugia for sensitive aquatic species.

Lower Granite reservoir is located on the lower Snake River in southeastern Washington, and is the first of eight mainstem impoundments that juvenile salmonids encounter as they migrate seaward and the last of eight mainstem dams that adults must pass to reach spawning areas. Lower Granite Dam is located at RM 107.5 as measured from the confluence of the Snake and Columbia Rivers. The reservoir extends 46 miles upstream to Asotin, Washington. At RM 139.2, the Clearwater River enters the reservoir at Lewiston, Idaho. Lower Granite reservoir is a run-of-the-river reservoir and is operated primarily for hydropower and flood control. Flows range can range above 150,000 cubic feet per second (cfs) in the spring to lows around 16,000 cfs in the winter. The reservoir has an average channel width of 2,080 ft. Water depth averages 56 feet and ranges from less than 3 feet in shallow shoreline areas to a maximum of 137 feet (Tiffan and Hatten 2012). Under current operations, the normal pool elevation typically has a maximum potential fluctuation of about 5 feet. To protect roads and railways, much of the shoreline is lined with riprap (Tiffan and Hatten 2012). In the lower one-half of the reservoir, natural shorelines are generally steep, often characterized by cliffs and talus substrate with little riparian vegetation.

Snake River Navigation Channel

The COE maintains a navigation system in the Snake River that enables barges, and other large vessels that require a minimum depth of 14 feet, to travel upstream in the Snake River, from Ice Harbor Dam to Lewiston, Idaho. The Snake River navigation channel extends approximately 140 miles, from the confluence of the Columbia and Snake Rivers at Pasco, Washington, to the confluence of the Clearwater and Snake rivers, and a short distance upstream in the Clearwater River to the Port of Lewiston, at Lewiston, Idaho. Approximately 10 million tons of commercial cargo is transported on the lower Snake River each year with an annual value of between $1.5 and $2 billion (USACE 2012a). Movement of grain from upstream ports toward the Columbia River accounts for most of this cargo, the largest share of which is wheat. Approximately half of all the wheat exported from export terminals on the lower Columbia River arrives by barge. Commercial barge traffic on the lower Snake River fluctuates from year to year, depending on crop production, the state of the U.S. economy, and trends in world trade. Over the last 20 years the total tonnages of cargo moved through the lower Snake River, and includes McNary reservoir (cargo statistics do not differentiate between the Snake and Columbia River portions of McNary reservoir) has ranged from a high of 8,670 million tons in 1995 to a low of 5,301 million tons in 2008.

The Federal navigation channel through the lower Snake River affects all four listed anadromous fish species through effects of barges and dredging that is needed to maintain a shipping channel. The effects of barge operations on critical habitat include spillage or leakage of contaminants (such as fuels, oils, greases), generation of wakes and turbidity by moving vessels, and through creation of overhead shade when shipping vessels are moored. Barge traffic has likely caused minor effects to fish through direct impacts of moving vessels, and the habitat effects described above. Effects of shipping vessels are limited in severity due to physical characteristics of the Snake River and the size of the vessels that can navigate the river. The river is relatively wide, which allows fish ample room to avoid moving barges and dredging effects. The 14-foot depth of the navigation channel also limits commercial traffic to barges which have a shallow draft that is not capable of producing high-amplitude wakes that might strand fish or cause trauma from the wave energy. While barges are moored, the vessels may serve as overhead cover that might be used by fish that prey on juvenile salmonids; although this is unlikely to be significant source of predation since the smolts of sockeye and Chinook salmon and steelhead generally avoid shady areas.

Barge traffic can cause several physical effects that influence the characteristics of riverine habitats used by listed anadromous fish. Potential effects of barges include spillage or leakage of contaminants (such as fuels, oils, greases), generation of wakes and turbidity by moving vessels, and through creation of overhead shade when shipping vessels are moored. Small fish that are incapable of swimming against the wave energy caused by wakes can become stranded on the shore or injured by trauma. Trauma to juvenile salmon and steelhead from wakes is unlikely since they are capable of swimming in strong currents soon after emergence, and by the time they emerge from redds, they are already a sufficient size to where they would not be vulnerable to trauma from boat wakes. In studies of traumatic injuries from wakes Holland (1986) and another study by Odum *et al.* (1992) found no evidence that larval or age-0 fish were injured by barge wakes. Stranding is also unlikely in the Snake River. Wakes from large, deep-draft ships are known to strand juvenile Chinook along the shoreline, but smaller vessels such as barges that operate in water less than 14 feet (such as the Snake River navigation channel) do not create wakes large enough to strand fish (Pearson and Skalski 2011). Ships that are capable of generating wakes that strand fish require a draft deeper than the 14-foot depth of the Snake River navigation channel.

Where wakes hit the shore, they are likely to cause brief episodes of turbidity along the shoreline each time a vessel passes, as described by Whitfield and Becker (2014). Shallow, near-shore areas are likely to be important to juvenile salmonids for feeding (Naughton *et al.* 2010). Turbidity from barge wakes reduces visibility and, at certain thresholds, can cause a short-reduction in feeding rates. The duration of turbid conditions following the passage of a barge is likely to be relatively brief, since the flowing waters in the river rapidly dissipate suspended sediments. Episodes of turbidity caused by barge wakes are likely to persist for well -under an hour due to the river current, and turbidity levels from wakes are unlikely to exceed the threshold where reductions in feeding rates have been observed at 1-hour exposures. No data could be found regarding turbidity caused by barge wakes in the Snake River; however, dredging and disposal of dredged materials are likely to create far more turbidity than a barge wake, and the turbidity observed previously at Snake River dredging sites is well below the threshold where feeding stops (a 1-hour exposure to 1097 NTUs). In the 2006 dredging, 99% of turbidity results at 300 feet were less than 30 NTUs above background (Schroeder 2014). Brief disruptions in behavior caused by barge wakes are unlikely to have a significant effect since the fish are capable of swimming against the waves and turbidity is likely to below levels that affect fish behavior.

Fish that occupy deep water or locations away from the shore would not be affected by wakes or turbidity, but some fish species could be directly affected by the barges themselves. In a review of recreational boating effects, Whitfield and Becker (2014) found that some species of fish are affected by moving vessels by becoming startled by noise or motion, colliding with a vessel, or being struck with a propeller. These effects vary according to the species and size of the fish, and the speed of the boat. Anecdotal evidence of salmon and steelhead behavior in the action area indicates that passing vessels are unlikely to have a significant effect. Salmon and steelhead are often caught from fisherman a short distance from boats propelled by idling gas engines or trolling motors, suggesting that the fish are not disturbed by boats beyond a certain distance. Boat strikes also appear to be unlikely. Xie *et al.* (2008) observed avoidance reactions of migrating adult sockeye salmon when the motor boat and fish were separated by a distance less than 7 m, but saw no reaction beyond this distance. Since moving vessels trigger an avoidance reaction in salmon and steelhead before the vessel reaches the fish, they are unlikely to be injured or killed from vessel strikes. All lifestages of listed anadromous fish in the Snake River are capable of avoiding vessel strikes since they have high burst speeds and they have a tendency to avoid residing near the surface of the deeper water that barges use to navigate the channel.

When barges are moored at ports, they create the effect of a floating island that blocks sunlight underneath and alters currents near the surface. Subyearling Chinook salmon and other species swimming near the shore may encounter predatory fish that hide in the shadow of moored vessels. A variety of studies have found that predatory fish gain an advantage over their prey by hiding near overhead cover that creates low light conditions. As light levels decrease, predation on juvenile salmonids by piscivorous fishes increases due to a diminished ability for the juvenile salmonids to detect predators (Rondorf *et al.* 2010). The most significant piscivores in the action area that prey on salmon and steelhead are northern pikeminow and smallmouth bass, and to a lesser extent, walleye (Rieman *et al*. 1991). Northern pikeminow and smallmouth bass may sometimes use shade to avoid detection by their prey (Chapman 2007). Smallmouth bass in particular have a strong affinity to in-water structures and they are common predators of subyearling salmonids in the Columbia River drainage (Carrasquero 2001). However, barges lack the physical habitat complexity that provides hiding places found among the pilings that often support in-water structures. Although moored barges provide shadows, the effects of barges might not be comparable to fixed structures supported by piles.

Although predatory fish may use overhead cover from barges to prey on listed fish, moored barges in the action area are unlikely to offer much advantage to predators for several reasons: the sporadic mooring of vessels would not provide a consistent or predictable environment that would enable predatory fish to congregate at the ports; salmon smolts tend to avoid shaded areas and shorelines (Kemp *et al* 2005); and by the time subyearling Chinook salmon and all other smolts reach Lower Granite reservoir, the fish favor deep, mid-channel areas (Rondorf *et al*. 2010; Chapman 2007). Given the above circumstances, moored barges are unlikely to provide habitat features that meaningfully increases losses of anadromous fish to predators.

Dredging needed to maintain the navigation channel increases water depth at dredge sites for an indeterminate duration, that may vary from a year to several decades, depending on the rate of sediment accumulation. There are 48 locations where sediment accumulation has required dredging in the past or where sediment accumulation presents a potential problem in the future. Dredged material has been used to create shallow benches along the shore. The changes in depth have no effect on habitat value beyond the immediate areas where dredging or disposal occur. The overall habitat value has been little changed by the dredging since the amount of area that has been dredged is an insignificant portion of the river, and the increased depth at the dredge sites is of little consequence to listed fish or their predators. The shallow bench area created by in-water sediment disposal is beneficial to subyearling fall Chinook salmon, but the benefits have minor significance since the shallow bench habitat created by sediment disposal is a relatively small area.

Sediment Accumulation in the Action Area

The existence and operation of the lower Snake River dams and reservoirs prevent the normal transport and deposition of sediment throughout the system. Under a normative flow, without the dams, fine-grained material tends to be deposited on the river floodplain, high on the channel margins and in low velocity side channels and off-channel areas. Under a normative flow, the riverbed would be a complex mosaic of substrate materials with a variety of pools, runs and shallow areas built and rebuilt. The alluvial riffle areas that previously collected suitable spawning gravel for SRF Chinook salmon are now found in the tailraces of the dams and upstream of the action area. Currently there are very few natural, shallow water, sandy shoals downstream of the Snake and Clearwater confluence area. As a result, juveniles that use shallow water areas to rest and feed during seaward migrations (and SRF Chinook juveniles that reside in the reservoirs for a year) must travel significant distances between foraging areas.

Most sediment entering Lower Granite reservoir deposits near the confluence of the Snake and Clearwater Rivers. The combination of the transition from a free-flowing river to a reservoir and the confluence of the two rivers cause both rivers to lose energy. The result is an ongoing deposition of sediment within the confluence area. The material deposited in this area is primarily sand. The Snake River downstream of the confluence annually transports approximately 3 to 4 million cy of new sediments. The COE estimates that 100 to 150 million cy of sediment have been deposited upstream of the four lower Snake River dams (mostly in Lower Granite reservoir) since Ice Harbor dam became operational in 1961.

Historically, the COE has periodically removed some of this material by dredging to provide access to ports and to maintain the navigation channel. In the past, the COE has used dredge material to create shallow water benches, primarily for subyearling SRF Chinook salmon habitat. This approach was used in 1989 to construct a 0.91 acre island in Lower Granite reservoir (Centennial Island RM 119; (Chipps *et al*. 1997)) and in 2006 to create shallow water habitat at Knoxway Bench (RM 116.6). The shallow-water habitats surrounding Centennial Island are heavily used by subyearlings and Knoxway Bench is also used (Tiffan and Connor 2012). The COE's current definition of shallow-water habitat is water <20 feet deep, however with recent information on the higher use of habitat less than 6 feet deep, this criterion continues to be evaluated as part of research efforts ((Tiffan and Connor 2012; USACE 2012b).

Sediment samples collected in 2011 in the main navigation channel in the confluence area indicate that sand is the dominant material in the navigation channel combined with small amounts of silt near the mooring (shoreline) areas. At the Ice Harbor navigation lock the dredged material is mostly gravel and cobble, from 2 to 6 inches and larger, similar to the riverbed materials in adjacent areas outside the navigation channel and below the dam. The COE believes the source of this material to be a redistribution of local riverbed material caused by flow passing through the spillways during high flows and sloughing from the steep slopes of the channel through hydraulic action of barge guidance in the lock and passage through the lock.

Presence of species and critical habitat

The entire action area is designated critical habitat for all four listed species of anadromous fish. Fish presence in the action area consists of different size groups and age classes of salmon and steelhead during migration, adult SRF Chinook spawning (possibly in dam tailraces) starting in late October, incubating eggs through the winter, alevins and fry in the spring and juveniles (primarily SRF Chinook with smaller numbers of SRSS Chinook and steelhead) rearing in the reservoirs year round. The majority of adult upstream migration begins at Ice Harbor and Lower Granite Dams in early April and continues until the end of November with the occasional adult Chinook or steelhead still moving upstream in December (Table 10). Adult steelhead that move upstream between April and November will often hold in deep water in the mainstem until winter or spring flows increase in the tributaries enough for them to complete migration into headwater streams.

Table 10. Ten-year (2001 to 2010) historical run timing (first observation – last observation) for adults of each species at Ice Harbor and Lower Granite Dams. The 95% date in parentheses represents the latest date in the 10-year period when 95% of the run has passed that dam. Data is from the Columbia River from 2001 through 2010 (University of Washington School of Aquatic and Fishery Sciences -DART 2013).

Species (Adults)	**Ice Harbor Dam (95% date)**	**Lower Granite Dam (95% date)**
SRSS Chinook adult	04/01 – 08/11 (7/9)	03/20 – 8/17 (7/17)
SRF Chinook adult	08/12 – 10/30 (10/13)	08/17 – 12/15 (10/26)
SR sockeye	05/21 – 10/02 (8/28)	06/11 – 11/27 (11/27)
SRB steelhead	04/01 – 10/31 (10/23)	03/01 – 12 /30 (11/20)

Data for the 10-year (2003 to 2012) historical run timing of smolts indicates movement downstream begins as early as March 7 at the Lewiston trap on the Snake River and 2 weeks later at the Lower Granite Dam. The same years of data for smolts at Lower Monumental Dam (the downstream extent of smolt counts on the Snake River) indicates that 95% of all outmigrating smolts of all species have passed the dam before the first week in August. Small numbers of Chinook and sockeye smolts have been observed as late as November 1 at Lower Granite Dam and October 1 at Lower Monumental. Because smolt monitoring on the Snake

River only occurs between March 26 (Lower Granite, others are April 1) and October 31, there are no dam counts of ‘reservoir-type’ SRF Chinook subyearlings moving downstream during the winter. However, when Tiffan and Connor (2012) conducted a study to describe juvenile fall Chinook salmon use of a selected group of shallow water habitat complexes in the lower Snake River reservoirs from spring 2010 through winter 2011, they found the lowest numbers of juvenile Chinook in Lower Granite reservoir and the highest numbers in Ice Harbor reservoir. Tiffan and Connor (2012) also found that the number of Chinook juveniles in Lower Granite reservoir declined over the winter while the numbers downstream in Little Goose reservoir increased, suggesting that juveniles move downstream in the reservoir system during the winter and that there are relatively few juveniles to move into Lower Granite reservoir from areas upstream during the winter.

2.4 Effects of the Action on the Species and their Designated Critical Habitat

“Effects of the action” means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those caused by the proposed action and are later in time, but still are reasonably certain to occur.

As discussed previously, the PSMP will guide the COE’s sediment management activities but does not directly authorize any specific actions. Therefore, adoption of the PSMP has no direct effects on listed fish or critical habitat. All effects discussed below are indirect effects of the implementation of the PSMP.

2.4.1 Effects on Critical Habitat

Implementation of the potential actions described in the PSMP could affect freshwater rearing and freshwater migration sites for all subject species, and could affect a small amount of SRF Chinook salmon spawning areas. The PSMP includes a suite of potential actions that if implemented would cause a variety of effects to critical habitat. These potential actions, their effects, and mitigation addressing those effects are shown in Table 11. The effects analysis below is organized by the *habitat effect pathways* shown in Table 11.

Table 11. Habitat Effects

Activity	Habitat Effect Pathway	Project Design and other mitigating factors	Habitat consequences
Navigation and Other Dredging Dredge to improve Conveyance Capacity	Elevated suspended sediment and turbidity	Mechanical dredge only (no hydraulic) Operational BMPs for dredging	Mechanical dredging using the proposed BMPs creates a plume of sediment that typically does not exceed background concentrations more than 5 NTUs at 600 feet downstream of the dredging; and the plume typically extends no more than 900 feet before returning to near-background levels.
		WA Water quality standards	Plume of increased suspended sediment and turbidity, limited by WA standards to 5 NTUs above background or and 10% over background when background exceeds 50 NTUs, for a distance of up to 900 feet.
		Width of River at dredge sites	Suspended sediment spans part of the channel, and extends downstream
	Water Contaminants	Sediment sampling Contaminant thresholds (RSET Protocol)	Contaminants in sediment will be resuspended. Concentrations are limited by criteria established by Washington State Department of Ecology, DOE, EPA or RSET (USACE *et al* 2009)
	Physical channel alterations	Excavation limited to 16' depth	The channel will be deepened up to 16 feet at dredge sites, and benthic invertebrates will be lost or displaced at the sites
	Noise/disturbance	To be developed through project-level planning (TBD)	Creates a temporary zone that is unsuitable for use by fish
	Indirect Effects	TBD	Barge wakes, overhead cover
In-water Disposal of Sediment	Elevated suspended sediment and turbidity	TBD	Plume of increased suspended sediment and turbidity, limited by WA standards to 5 NTUs above background or and 10% over background when background exceeds 50 NTUs, for a distance of up to 900 feet.
	Physical channel alterations	Intentional creation of a shallow bench	An increase in the amount of shallow rearing habitat.
Upland Disposal of Sediment	Alteration of riparian veg	Disposal sites would not be located in riparian areas or sites where sediment could renter the river.	Generally insignificant or no effect on fish habitat, depending on locations and site specific designs
	Chronic sediment source		
Bendway Weirs and Dikes/Dike Fields	Physical channel alterations	Intentional design elements	Scouring at end of weir, shift in thalweg, sediment deposition along streambank downstream from the weir.
	hydraulic effects		Increased velocities near center of channel; decreased velocities along the shoreline.
	Construction effects – suspended sediment	TBD	Brief plumes of turbidity/suspended sediment during installation

Activity	Habitat Effect Pathway	Project Design and other mitigating factors	Habitat consequences
	Structural habitat complexity	TBD	Addition of rock structures
Agitation to Resuspend	Elevated suspended sediment and turbidity	TBD	Plume of increased suspended sediment and turbidity, limited by WA standards to 5 NTUs above background or and 10% over background when background exceeds 50 NTUs
Trapping Upstream Sediments (in reservoir)	Same as *Navigation and other dredging* (above)	The effect would be limited to a single site in the Snake River	
Reservoir Operations (raise/lower water)	Changes in water depth	TBD	Increase or decreases in water depth
	Hydraulic effects	TBD	Changed flow patterns
Reconfigure/Relocate Affected Facilities	Construction effects – suspended sediment	TBD	Plumes of turbidity/suspended sediment during installation
	Physical channel and riparian alterations	TBD	Habitat effects dependent on the site-specific circumstances
	Indirect effect on future dredging	TBD	Reduce or eliminate the need for future dredging
Raise Lewiston Levee to Manage Flood Risk	Water depth	TBD	Increase in water depth
	Water surface elevation	TBD	Change in availability and characteristics of shoreline habitats
	Hydraulic effects	TBD	Changed flow patterns
Reservoir Drawdown to Flush Sediment	Water depth	TBD	Decrease in depth during the flush, increases and decreases in depth through scour and deposition
	Water surface elevation	TBD	10-15 foot decrease in surface elevation
	Hydraulic effects	TBD	Increased water velocity, and change in flow patterns
	Elevated suspended sediment and turbidity	Work window coincides with spring runoff and high sediment transport capacity	Plume of increased suspended sediment and turbidity, limited by WA standards to 5 NTUs above background or and 10% over background when background exceeds 50 NTUs
	Water Contaminants	TBD	Temporary re-suspension of contaminants
Upland Sediment Reduction (Expanded)	Reduced sediment delivery to the Snake River	TBD	Reduced sediment in tributaries and in the Snake River

Elevated Suspended Sediment and Turbidity

Critical habitat would be temporarily affected by turbidity from all of the proposed in-water activities that require dredging, excavation, or placement of materials. The severity and duration of effects would be generally commensurate with the amount of channel disturbed by the activity. During the winter work window, dredging operations may occur for up to 77 consecutive days, 24 hours per day, and could possibly occur at multiple sites. When actions include in-water disposal, each barge would travel from dredge sites to a disposal site to deposit its load before returning to the active dredge site. Activities at the disposal site would be periodic, typically occurring for up to 20 minutes roughly every 8 hours, as each barge is unloaded. All of these activities could create a large volume of suspended sediment. In the immediate vicinity of each active work site and for some distance downstream and laterally within the river channel, turbidity would exceed natural background levels.

The majority of suspended sediment that could be generated by potential actions described in the PSMP is likely to come from dredging and in-water disposal in association with navigation channel maintenance, dredging for flow conveyance, or maintaining a sediment trap. Dredging activities that could occur under the PSMP are likely to cause a similar range of turbidity and suspended sediment as occurred in previous dredging in the same general area. Plumes of suspended sediment would be generated from excavating, dumping, and shaping deposited sediment. Suspended sediment will cause turbidity immediately when activities commence, and persist up to several hours after activities cease. During previous dredging and disposal efforts, turbidity levels occasionally ranged from 6 to 15 nephelometric turbidity units (NTUs) above background for several hours at a distance of 900 feet downstream. The majority of the time during dredging activities, turbidity remained within 5 NTUs over background at a distance of 600 feet downstream. The dredging that could occur under the PSMP is likely to cause suspended sediment effects that are similar to those observed in the 2005/2006 dredging. The average background turbidity levels in the Snake and Clearwater Rivers during the winter dredging period in 2005 and 2006 were less than 5 NTU. Data collected in 2005 and 2006 indicates that background turbidity was lowest at the confluence of the Snake and Clearwater Rivers and increased farther downstream in the Snake River. During dredging at the Port of Clarkston, at 300 feet downstream and 3 feet above the substrate, turbidity levels exceeded guidelines (greater than 5 NTUs above background) by an average of 4.58 NTUs, 11.6% of the time; and at 3 feet below the surface, an average exceedance of 2.62 NTUs occurred 1.8% of the time. At 600 feet downstream, the shallow probe turbidity values exceeded compliance 20% of the time by an average of 3.87 NTUs and the deep probe exceeded compliance 35% of the time by an average of 5.84 NTU.

Navigation dredging may also enable a small increment in barge traffic that can cause brief episodes of increased turbidity near the shore from wakes generated by moving vessels. Turbidity caused by wakes would be limited to near-shore areas that have deposits of fine sediment. The duration and frequency of turbidity increases from barge wakes is unlikely to rise to a level that would diminish the value of the habitat as cover from predators or as a foraging area used by juvenile salmon and steelhead.

Chemical Contaminants

Numerous chemical contaminants can be found in Snake River and Clearwater Rivers sediments. The contaminants can become resuspended in the water column when sediments are excavated, deposited, or reshaped. All of the in-water activities described in the PSMP involve one or more of these activities that have the potential to suspend contaminants. The COE identified polycyclic aromatic hydrocarbons, organophosphates, chlorinated herbicides, ammonia, oil, grease, glyphosate, AMPA, dioxin, heavy metals, and others as potential contaminants that have frequently been found in Snake River sediments. Contaminants found in sediment deposits can become resuspended in the water column when sediments are excavated, deposited, or reshaped. Contaminants may be bound to sediment particles to varying degrees by sorption to the sediment particles, and particularly with organic materials in the sediment. Contaminants that remain attached to sediment particles will be in the water for only brief period lasting no more than several hours. Contaminants that separate from sediment particles will remain in the water column for widely varying amounts of time that vary with factors such as the particular chemical, temperature, discharge, and the amount of suspended organic material in the water column.

The presence of contaminants in sediments is not predictable; therefore, when implementing sediment-disturbing activities the COE would follow procedures to sample sediments for presence of 37 chemicals of concern before dredging or excavation begins. These procedures are described in the Dredged Material Evaluation and Disposal Procedures User Manual (USACE *et al*. 2013) and sediment evaluation framework (USACE *et al*. 2009, Michelsen 2011). Under these procedures, sediments are screened for the presence of “chemicals of concern,” which is a list of chemicals that are potentially toxic to aquatic organisms and which have either been found previously in sediments or have known sources in the Pacific Northwest. If contaminants exceed screening levels in the USACE *et al*. (2009) framework as updated by Michelsen (2011) (or subsequent updates), bioassays and water column samples are required. These additional tests ensure that sediments used for in-water disposal would not contain chemicals of concern at levels that are known to be harmful to listed fish. Some risk of toxic effects still exists from chemicals that might be undetected, chemicals which cause toxic effects that have not been recognized, or if a situation arises where contaminated sediment cannot be removed because sediments cannot be dredged in a manner that can keep contaminants at concentrations that are safe for fish. If contaminants are found in amounts that are toxic to fish, they would not be disposed of in-water, and other decisions that might be made for safely handling those sediments would be made on a case-by-case basis through the NEPA process and ESA consultation.

Physical Channel Alterations

The proposed action includes activities that will alter the physical characteristics of the channel by increasing or decreasing the depth, adding or removing sediment, and adding physical structures such as dikes or weirs. An increase in shallow, near-shore areas from in-water sediment disposal increases the amount of rearing habitat for subyearling fall Chinook salmon.

Areas with increased depth increase the amount of deeper pools that are used by smolts for cover and resting, and by adults for cover and holding before final migration to spawning areas.

Structures such as weirs and dikes add physical complexity to the channel, which generally increases the local diversity of aquatic organisms and may also be used by one or more species of fish for cover. Changes of this nature may be beneficial or detrimental to listed fish, depending on the location, structural design, and size of the structure. These details would be considered in future site-specific consultations, and cannot be evaluated at the programmatic level. Without more specificity, the extent of our analysis is limited to just acknowledgement of future beneficial or adverse effects.

Any actions implemented consistent with the PSMP that disturb the river bottom have the potential to alter substrate characteristics. Dredging would not change the substrate size composition since the sediments that remain at dredge sites will generally be the same size as the sediments that were removed, and all of the likely dredge sites and in-water disposal sites are depositional areas that would continue to accumulate similarly-sized sediments in the future. None of the dredging or fill activities would occur in areas where the dredging would affect substrates that are suitable for spawning, with the possible exception of the Ice Harbor Dam lock site. Dredging at the Ice Harbor site has the potential to entail removal of materials of a suitable size range for spawning; however, no spawning has been observed at the site in 6 years of surveys, and surveys for redds prior to dredging would ensure that substrates used for spawning would not be disturbed.

Noise and Disturbance

Dredging, in-water sediment disposal, and installation of structures are potential activities described in the PMSP that are likely to create zones where noise or equipment operation may disturb fish. Dredging operations generally produce sound energy that often lasts around the clock for extended periods of time (Nightingale and Simenstad 2001). Dickerson *et al*. (2001) examined sound levels from bucket dredging in Cook Inlet, Alaska, and found the peak sound level to be 124 decibel (dB) at a distance of 150 meters from a dredge. Sound levels attenuated to background levels at a distance of more than 1,000 meters. Implementation of any activities described in the PMSP is not expected to generate sound levels capable of harming ESA-listed fish (206 dB peak and greater). However, around-the-clock dredging activities could preclude fish from occupying areas near dredge operations for an extended period while the dredges are operating. The effects of the disturbance zones on critical habitat are temporary, and the zones are not extensive enough to interfere with fish passage or any other PCEs.

Hydraulic Effects

Installation of dikes or weirs are proposed activities that are intended to increase water velocity and redirect flows to scour areas near the structures. Scouring would clear accumulated sediment near the structures and keep the area from accumulating any additional sediment. The effect of higher water velocity and scouting on critical habitat is an increase in the complexity and diversity of the physical environment. Near the structures, there would be a wider range of water velocities, particle sizes, and water depths. River substrate PCEs would be maintained or possibly enhanced by the hydraulic changes.

Food and Forage

Streambed disturbance from dredging, filling, and installation of structures would alter the number and possibly type of invertebrates that live in and on the surface of the stream bottom. Dredging and filling would cause temporary reductions in benthic invertebrates by crushing, covering, or dislodging them (Harvey 1986; Harvey and Lisle 1988). The density of drifting invertebrates may temporarily increase from invertebrates that become dislodged during excavation or disposal, and then after, invertebrate drift densities may be reduced for a short time in the vicinity of dredged areas and in-water disposal sites. The changes in benthic and drifting invertebrates are likely to be short-lived as disturbed areas are likely to be recolonized within several months after project completion (Fowler 2004; Griffith and Andrews 1981; Harvey 1986; Harvey and Lisle 1988). In the long term, the addition of a rock structure as described in the PSMP would be likely to have little effect on invertebrate abundance or species composition, but the types of invertebrates that occupy the rock structure may shift. Culp *et al*. (1983) found that an increase in substrate size favors trophic groups such as filter feeders, but Hawkins *et al*. (1982) found that substrate size did not strongly influence the number of taxa or abundance.

Safe Passage

The Snake River serves as a migration corridor to and from the ocean for all species of anadromous fish in the Snake River, including all ESA-listed species of Snake River salmon and steelhead. Passage through the Snake River system is altered by the dams, which slow fish movements and increase exposure of migrating fish to predators. The types of activities proposed under the PSMP could potentially affect fish passage by altering water velocities, changing the location of the thalweg (deepest part of the channel), or creating barriers or impediments to movement from suspended sediment or resuspension of contaminants that may accumulate in the sediment. The PSMP includes general measures that minimize or avoid some of these potential effects, but additional project-specific protective measures would also be necessary in some instances. For instream work activities, the PSMP largely avoids passage effects by timing the activities to occur when fish are not migrating. The general work window for instream activities is December 15 to March 1. This window is intended to coincide with times when migration of anadromous fish is at its lowest. The window begins a few months after 95% of all outmigrating juveniles have passed downstream into the Columbia River, and it ends around the time that adults and juveniles begin their spring migration. Instream work activities may briefly delay fish passage by forcing migrating fish to swim around work zones; however, salmon and steelhead would be capable of moving through the action area at all times since, based on previous project monitoring, the areas affected by noise, turbidity, and excavation or filling would not span more than half the channel width. With no more than half the channel width affected by instream work activities at a given time, and timing the activities to occur almost entirely outside the migration period, effects of instream work activities described in the PSMP on fish passage are likely to be relatively minor.

Some of the activities described in the PSMP such as changes in reservoir operations, drawdowns, and instream structures may cause effects that occur outside the winter work window, at times with fish are migrating. Drawdowns would likely expose juveniles of all Snake River salmon and steelhead species to increased amounts of suspended sediment during the migration period. Fish would be unable to avoid suspended sediment caused by drawdowns since the sediment would span the entire width of the river. While the water quality aspect of fish passage may be adversely affected, the substantially increased current velocity during a drawdown might improve migration conditions for juvenile fish. The timing, duration, and magnitude of drawdowns would influence the overall effect. These details would be developed at the project-level.

Chances in-water elevation, and dike or weir options described in the PSMP can cause longer-term alterations in fish passage conditions in the Lower Granite reservoir. Bendway weirs, for instance, have the potential to speed fish movement through an increased velocity thalweg in the section of the Snake River below the Clearwater River confluence. However, these same structures and in-river dikes linked to shore could be substantially detrimental by entraining migrating juvenile salmonids upstream of the weir or dike and also collecting fish species that prey on juvenile fish. Raising levees to increase water depth would likely slow velocity and could potentially make the environment more favorable for fish species that prey on juvenile anadromous fish.

Relevance of Effects on Primary Constituent Elements to Conservation Value

As described above, instream work activities will cause some temporary negative effects on a variety of habitat elements in the vicinity of instream work sites, and some long-term beneficial effects may occur as well from increasing structural diversity and shallow rearing areas. None of the habitat effects from dredging, excavation, filling, sediment agitation, or structure installation during the winter work window are severe enough to alter the conservation value of critical habitat since fish would be capable of performing normal activities such as feeding, sheltering, and migrating with minor disruptions near work sites. Given the transient nature of adverse water quality effects, and the timing of the instream work to avoid key periods when the action area is used by anadromous fish for migration, effects of those activities on water quality, physical channel alterations, forage, and safe passage will not meaningfully decrease the function of the PCEs in the action area.

Other options described in the PSMP, such as weirs, dikes, drawdowns, and levees could have more lasting more substantial effects on PCEs in the action area. These actions would tend to increase thalweg current velocities under certain flows and in that respect improve safe passage conditions. However, weirs and dikes might negate those positive effects by entraining, slowing, and increasing exposure to predators for some portion of the large numbers of juvenile fish that migrate through the Lower Granite reservoir. Particularly for permanent in-water structures such as weirs and dikes, the balance of positive and negative effects would have to be carefully evaluated in development of any specific proposal and through site-specific ESA consultation.

2.4.2 Effects on Species

In-water work activities such as those described in the PSMP as potential sediment management actions have potential to affect listed species through: (1) Temporary increases in suspended sediment; (2) re-suspension of contaminants; (3) injuries from operating equipment in a stream; (4) displacement from work sites; (5) alteration of physical habitat characteristics; and (6) alteration in the abundance and diversity of invertebrate prey species.

Effects of Suspended Sediment

As described above, increased amounts of suspended sediment would likely be generated by the implementation of some of the actions described in the PSMP. Instream work activities such as dredging, in-water disposal sediment disposal, and installation of weirs or dikes tends to produce plumes of sediment that typically do not span the entire channel. Agitation to suspend sediment could generate plumes of sediment that range in width from a few yards to the entire channel depending on the techniques and equipment used. Drawing down reservoirs to flush sediment could increase suspended sediment throughout the entire action area. All these techniques with the exception of the reservoir draw-down would produce plumes of suspended sediment that would span roughly half of the channel at the most, with falling sediment concentrations as the plumes dissipate downstream varying distances. The amount of suspended sediment produced from the various activities would vary in sediment concentration, duration, and amount of area affected, but the worst-case for all types of the above activities is 75-77 days of continuous suspended sediment throughout the winter work window. With the exception of reservoir draw-down, plumes caused by in-water sediment disposal would likely span the longest longitudinal distance, based on past monitoring. Modeling by Schroeder (2014) indicates that sediment plumes from in-water sediment disposal may travel 1,200 or more feet before reaching near-background levels and minor amounts of suspended sediment slightly above background might travel much farther that 1,200 ft.

Exposure to suspended sediment can be detrimental to salmon and steelhead through a variety of mechanisms summarized in reviews by Newcombe and MacDonald (1991), Bash *et al.* (2001), Anderson *et al.* (1996), Newcombe and Jensen (1996), and Muck (2010). Those mechanisms include: injuring or killing fish from trauma or stress; harming fish indirectly by reducing their growth rate or resistance to disease; interfering with the development of eggs and larvae; modifying fish behaviors such as feeding, migration, and movement patterns; and reducing the abundance of food organisms available to the fish. Fish can sometimes avoid these detrimental effects if there is an opportunity to readily move to cleaner water.

Assessing the effects of suspended sediment on salmonids is complicated by several factors. First, turbidity and suspended sediments from in-water activities will typically decrease as distance from the activities increases. How quickly turbidity and suspended sediment levels attenuate in space and time (i.e., their dilution factors) depends on the quantity of materials in suspension, the particle sizes of suspended sediments, the amount and velocity of river flow, and the physical and chemical properties of the sediments. Second, the potential impacts of turbidity and suspended sediment on fish are not only related to their levels (concentration and duration), but also to the particle sizes and constituents of the suspended sediments and the species and other characteristics (e.g., age, habitat use) of the fish potentially impacted. Third, it is difficult to determine how individual fish will react to increased amounts of suspended sediment since results of experiments on the response of fish response to suspended sediment vary. Most commonly, increasing levels of suspended sediment cause juvenile salmonids to seek cleaner water (Servizi and Martens 1992; Sigler *et al.* 1984; Lloyd 1987). Consequently, when an activity produces a sediment plume, the effects of the sediment on a fish depends largely on if or when the fish moves out of the plume, and whether or not clean water is readily accessible.

If fish remain in sediment plumes, there behavior may be altered by reduced visibility. Juvenile steelhead and coho salmon have shown decreased growth rates when reared under chronically-turbid water in artificial streams as a result of decreased food consumption (Newcombe and MacDonald 1991; Sigler 1984). In natural environments, salmonids typically avoid turbid waters when possible (Bisson and Bilby 1982; Sigler *et al.* 1984; Berg and Northcote 1985). Since most fish are likely to avoid turbidity by moving out of the plume, effects of turbidity on feeding behavior are likely to be avoided by the majority of fish that encounter turbidity. However, some fish may remain in the turbidity plume. Since salmonids rely at least partly on vision to capture prey, turbidity can decrease their ability to locate and capture prey (Barrett *et al*. 1992; Vineyard and O'Brien 1976), although examples exist where feeding rates are not reduced by turbidity (e.g. Rowe *et al*. 2003; Gregory and Northcote 1993). Turbidity that is used as cover may provide an advantage to planktivorous fish such as subyearling Chinook salmon when avian or piscivorous predators are present. In some situations, turbidity may be high enough to reduce predation risk without causing substantial decrease in their ability to capture zooplankton (De Robertis *et al*. 2003). Given the various ways fish might respond to turbidity, the effects on individuals may be advantageous, neutral, or disadvantageous, but the majority of fish are likely to avoid turbidity and thus be largely unaffected by turbidity.

In reviews of studies on the effects of suspended sediment studies on fish by Newcombe and MacDonald (1991) and Anderson *et al*. (1996), and USFWS (2010), minor behavioral changes (feeding rate, avoidance, gill flaring, coughing, interactions) in laboratory experiments were reported with exposures to turbidity around 7-30 NTU. The lowest apparent turbidity level where exposure to suspended sediment caused more than minor behavioral effects in salmon or steelhead occurred at 25 NTU, where Sigler *et al*. (1984) observed reduced growth of juvenile steelhead and coho with constant exposure for 14 days. Several studies cited in Anderson *et al*. (1996) noted reduced feeding rates in salmonids at turbidities as low as 7-10 NTU. Servizi and Martens (1992) noted a threshold for the onset of avoidance at 37 NTU, while Berg and Northcote (1985) found that juvenile coho salmon did not avoid moderate turbidity increases when background levels were low, but exhibited significant avoidance when turbidity exceeded a threshold that was relatively high (>70 NTU). Gregory and Northcote (1993) found that coho exhibited higher feeding rates at 35-150 NTU than occurred in clearer water, and Bisson and Bilby (1982) found that juvenile coho salmon did not exhibit significant avoidance behavior in turbid waters until fish were exposed to 70 NTU. Bisson and Bilby (1982) also observed that fish appeared to acclimate to suspended sediment with repeated exposures. Some of the largest salmon-producing streams have high natural background turbidities (Gregory 1993), that are higher than thresholds where adverse effects of suspended sediment are a reported in a variety of studies. The variation ion response at low levels of suspended sediment indicates that the tolerance to suspended sediment may vary in different settings, but in general, any increase in turbidity is likely to have at least a small negative effect even if fish are able to cope with higher amounts of turbidity or suspended sediment.

Newcombe and Jensen (1996) developed an index that is used in this opinion to predict the severity of ill effects experienced by fish when exposed to suspended sediment (Box 1). The "severity of ill effects score" (SEV) is based on the concept of a dose-response relationship, where the severity of effect increases in relation to the dosage. Under Newcombe and Jensen's (1996) model, the "dosage" is dependent on the sediment concentration and the duration of exposure, and the SEV score represents the fish's response. The USFWS (Muck 2010) developed guidance for using the SEV score to represent thresholds for incidental take, such as "harm," or "harass." The precise thresholds for take vary with different species, lifestages, and the physical characteristics of the sediment particles (such as hardness, size and angularity).

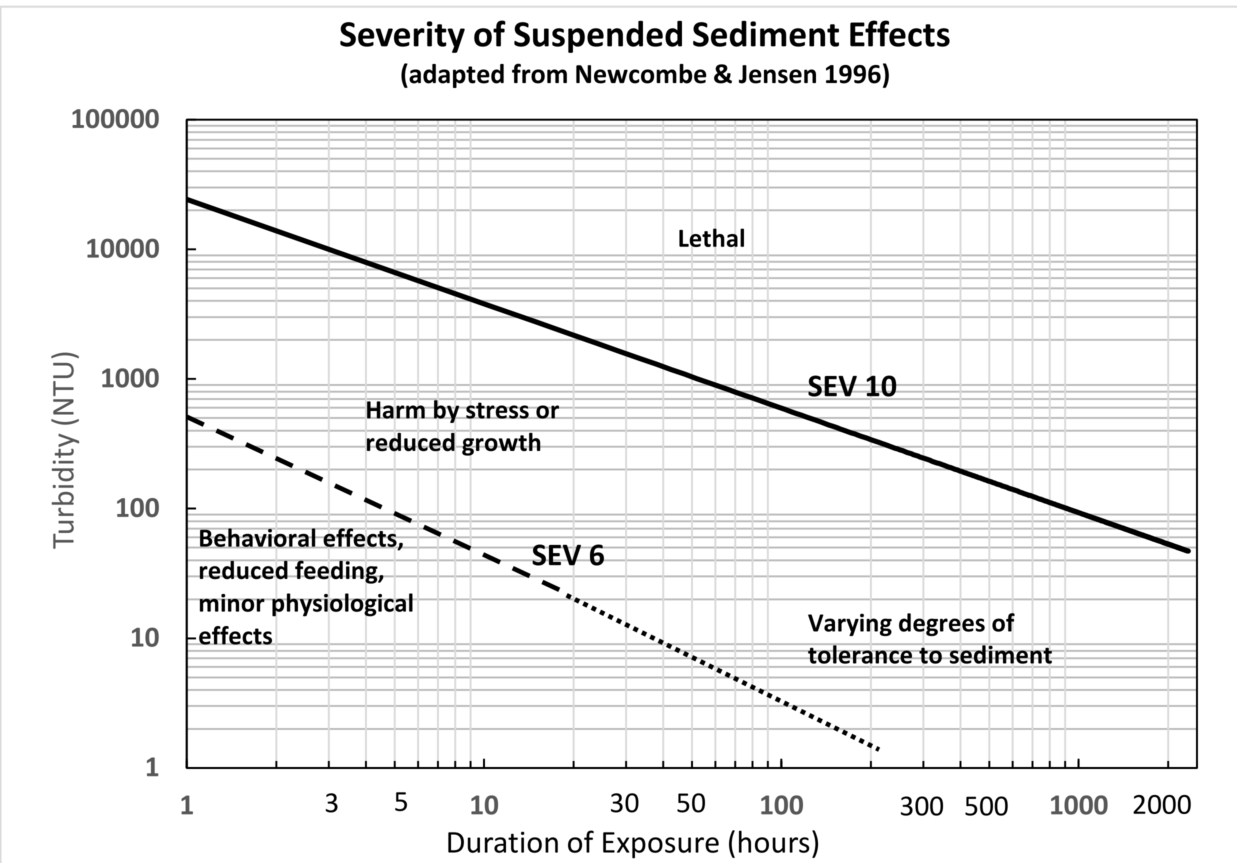
Box 1. Severity of ill effects scores.

SEV	Description of Effect
	Nill Effect
0	No behavioral effects
	Behavioral effects
1	Alarm reaction
2	Abandonment of cover
3	Avoidance response
	Sublethal effects
4	Short-term reduction in feeding rates and feeding success;
5	Minor physiological stress: Increased rate of coughing; increased respiration rate
6	Moderate physiological stress
7	Moderate habitat degradation; impaired homing
8	Indications of major physiological stress: long-term reduction in feeding rate; long-term reduction in feeding success; poor condition
	Lethal and Paralethal Effects
9	Reduced growth rate; delayed hatching; reduced fish density
≥10	Increasing rates of mortality

Newcombe and Jensen (1996) based their SEV scores on suspended sediment concentrations expressed as the unit weight of sediment per unit volume of water, while in the proposed action, water quality criteria for suspended sediment are expressed as turbidity measured in NTUs. Turbidity is a measure of how much a beam of light is scattered by particles suspended in water, and for any given particle type, there is a relationship between particle concentration and the amount of light scattering; therefore turbidity measurements can be used to estimate suspended sediment concentrations or vice versa. For Snake River sediments, Schroeder (2014) determined the ratio of suspended sediment concentrations (mg/l) to turbidity (NTU) to be 2.4 mg/l per NTU. To develop SEV scores based on turbidity, numbers from Newcombe and Jensen (1996) are converted to turbidity units so the units of measure in this analysis are consistent with the units the COE uses for monitoring suspended sediment.

In this opinion, SEV 6 is used to represent an approximate threshold where suspended sediment might harm juvenile or adult salmon and steelhead by causing moderate physiological stress, and SEV 10 represents an approximate threshold where fish might be killed (Box 1). In Figure 5, the severity scores of SEV 6 (broken line) and SEV 10 (solid line) are plotted to characterize the effects of suspended sediment on salmon and steelhead over a wide range of turbidity levels and exposure durations. The lower, dotted portion of the broken line represents circumstances where salmonids can often tolerate low levels of turbidity and the responses of fish vary in this range.

Figure 5. Relationship of turbidity, duration of exposure, and severity of effects. Adapted from Figure 1 in Newcombe and Jensen (1996); based on Schroeder's (2014) ratio of 2.4 mg/l suspended sediment to 1 NTU. The lines represent Newcombe and Jensen's severity scores: broken line: SEV= 6; solid line: SEV=10. See above text for explanation.



There are no monitoring results of sediment produced by installation of bendway weirs or dikes, or sediment agitation that could provide reliable estimates of the amount of sediment that might be generated if these actions were used in the Snake River, but modeled worst-case sediment from sediment disposal and constraints of state water quality criteria provide an indication of the upper limits. During previous dredging and disposal efforts, turbidity was measured at distances of 300, 600, and 900 feet downstream from the work areas. The highest turbidity measurements usually occurred at the 300-foot monitoring station. Less than one percent of hourly turbidity measurements taken 300 ft downstream exceeded 29 NTU (Schroeder 2014), and the highest average turbidity at a single monitoring station over the duration of activities at a single site was 15 NTU (PSMP BA). The majority of the time during dredging activities, turbidity remained within 5 NTU over background. The "worst-case" turbidity modeled by Schroeder (2014) was 293 NTUs 300 feet downstream from the source, which might occur from in-water sediment disposal at high water velocities (0.4 ft/sec) and with a large-capacity barge (4,000 cubic yards). Figure 5 shows that exposures of this magnitude would likely cause harm by stress or reduced growth at durations lasting from less than 1 hour to roughly 200 hours. However, state of Washington water quality standards could net be met under the worst-case scenario, and therefore, operators would not be permitted to produce this amount of sediment for suspended for a 200-hour duration. With the state of Washington water quality standards as an operating constraint and past monitoring results showing only brief incidents where sediment exceeds the standards, none of the instream work activities described in the PSMP would likely produce sediment exceeding 25 NTUs beyond a distance of 900 feet downstream for more than a few hours at a time. Monitoring results from past dredging (Dixon Marine Services 2006) indicates that such occurrences would likely be uncommon. Actual sediment exposures likely to occur under state of Washington water quality standards are likely to remain below the threshold where more than minor behavioral effects are likely to occur under most circumstances, with only brief periods where sediment might exceed the threshold for harm shown in Figure 5. At varying distance less than 300 meters from the sediment source, suspended sediment concentrations are likely to reach levels where physiological stress, or even lethal effects might occur if fish did not move out of the sediment plume.

Monitoring results of past activities indicate that sediment plumes that could be generated by instream structures and sediment removal implemented in a manner consistent with the PSMP would not be likely span more than half of the width of the river; therefore, adults and older juvenile salmon and steelhead would likely avoid harmful effects by moving out of the sediment plumes created by instream work activities. A drawdown would be an exception, with channel-wide turbidity likely; however, this measure would be implemented during runoff when background turbidity is already relatively high and would have the counterbalancing effect of reducing time of exposure by increasing current velocity and reducing juvenile fish travel time through the action area. At suspended sediment concentrations and durations likely to occur as a result of actions implemented under the PSMP, and with roughly half the river unaffected by suspended sediment from PSMP activities, the effects of the sediment on listed fish are likely to be relatively minor sublethal effects such as avoidance and disruption of normal behavior in most cases. As mentioned previously, fish responses vary and some fish may remain in sediment plumes for durations that cause more than minor adverse effects.

With the December 15 to March 1 window for instream work, the number of fish in the action area is near its lowest, and the window would largely avoid times when juvenile SR Sockeye salmon, SRSS Chinook salmon, and SR steelhead are present; therefore, any such action consistent with the PSMP would be unlikely to affect these life stages, with the exception of a small number of fish that might behave differently from the norm. Approximately 95% of all outmigrating juveniles migrate outside the work window (Table 12), and the work window ends around the time that steelhead spawning begins in some lower Clearwater River tributaries. Subyearling SRF Chinook salmon are the only species where juveniles typically overwinter in the pools created by dams in the Snake River, and it is only the "reservoir-type" that exhibits this behavior. The vast majority of listed fish present in the action are likely to move when they initially encounter a sediment plume and the most severe effect of the sediment would be the energetic cost of moving away from the sediment, and any consequences of moving to a different location. Moving to a different location could also increase the exposure of smolts and sub-yearling fish to predators or conditions for growth that are more favorable or less favorable than their original position, but this effect is likely to be minor since the species that prey on these fish do not occupy the deep waters where salmon and steelhead typically reside during winter, and juvenile fish have typically reached a size where they are too large for predators to readily capture.

Table 12. Ten-year (2001 to 2010) historical run timing (first observation – last observation) for adults of each species at Ice Harbor and Lower Granite Dams. The 95% date in parentheses represents the latest date in the 10-year period when 95% of the run has passed that dam. Data is from the Columbia River from 2001 through 2010 (DART and UWSAFS - CBR 2013).

Species (Adults)	Ice Harbor Dam (95% date)	Lower Granite Dam (95% date)
SRSS Chinook adult	04/01 – 08/11 (7/9)	03/20 – 8/17 (7/17)
SRF Chinook adult	08/12 – 10/30 (10/13)	08/17 – 12/15 (10/26)
SR sockeye	05/21 – 10/02 (8/28)	06/11 – 11/27 (11/27)
SRB steelhead	04/01 – 10/31 (10/23)	03/01 – 12 /30 (11/20)

Effects of Contaminants

As stated above, numerous chemical contaminants can be found in Snake River and Clearwater River sediments. The contaminant concentrations and locations where contaminants are found vary from year to year. The contaminants can become resuspended in the water column when sediments are excavated, deposited, or reshaped. Listed fish can potentially be exposed to chemicals that become resuspended in the water, or exposed indirectly through the consumption of contaminated prey that become dislodged from disturbed sediments.

Many of the contaminants found in Snake River sediments may be acutely or chronically harmful to salmonids at certain concentrations. Contaminants found in past sediment samples have generally been below screening limits (with the exception of phenol or 4-methylphenol in 2013), and at concentrations that are not known to cause lethal effects. Sublethal effects could possibly occur with exposure to some chemicals found in sediments due to unknown adverse effects that might occur at concentrations below the screening limits. Sublethal exposures to metals, chlorinated hydrocarbons and aromatic hydrocarbons can cause olfactory inhibition, immunosuppression and increased disease susceptibility (Arkoosh *et al*. 1998; Baldwin *et al*. 2003; Meador *et al*. 2006; Sandahl *et al*. 2007; Sprague 1968). Fish that experience sublethal effects of contaminants may have increased vulnerability to predators or suffer from physical impairments that may reduce the fish's growth rate, reproductive success, or survival rate if the effects are persistent. Fish might also recover with little consequence when they are no longer exposed to contaminants.

At a programmatic level, specific effects of toxic chemicals cannot be evaluated in detail since the occurrence of chemicals in sediments varies unpredictably from site-to-site and year-to-year, and each chemical affects fish differently. Thirty-seven chemicals of concern have been identified in sediments found in rivers in the Pacific Northwest (USACE *et al*. 2013). These chemicals may be toxic to aquatic organisms at certain concentrations. For each of these chemicals, maximum allowable sediment concentrations (screening limits) have been established at levels that approximate thresholds where fish might experience adverse physiological effects. Screening levels are used to determine if sediment samples contain sufficient levels of contamination to warrant further investigation on their toxicity.

Application of the screening criteria is likely to prevent outright lethal exposures by precluding use of in-water disposal when chemicals are found to be present at levels that would harm listed fish, but various sublethal effects may occur below the screening thresholds. If screening limits are exceeded, it triggers additional analysis of the sediments and their toxicity to determine if the sediments are suitable for in-water disposal. Appropriate measures for handling contaminated sediments would be identified at the project-level. Contaminated sediments suitable for in-water disposal could potentially cause sublethal effects such as increased vulnerability to predators or physical impairments that may reduce the fish's growth rate, reproductive success, or survival. If contaminants are present in sediments in more than trace amounts exposure to contaminants through the food chain can sometimes have serious implications for salmonid health and survival if fish consume prey that is contaminated with chemicals that bioaccumulate or if a significant portion of the food base is lost when contaminants kill prey species. Although contaminants have the potential to cause a variety of adverse effects to fish and their prey, in sediment samples from Snake River dredge sites taken in the past decade, contaminants have not been found in concentrations capable of causing more than benign effects

Potential in-water work activities described in the PSMP could also expose fish to contaminants from chemical leakage or spills. These risks are minimized by requiring the contractor to implement practices to prevent spills of fuel and hydraulic leaks during in-water operations. The proposed action minimizes the likelihood of leakage and spills by requiring inspection of equipment for leaks and requiring all barge refueling to be done at established terminals, which have proper equipment for preventing and containing spills.

Injuries from Machinery Operated in the Water

Equipment used for dredging, excavation, placement of materials in the river, and sediment agitation can potentially injure or kill fish from trauma. Dredges and excavating equipment can potentially scoop fish from the stream, and any equipment used instream and material placement can kill or injure fish by striking or crushing them. The likelihood that fish will be killed or injured by machinery depends on the type of equipment used, the swimming abilities of the fish (which vary by life stage), and the likelihood that fish would be present at the work site. Work windows are established to avoid the migration period and performing instream work when early life-stages are present. Only mechanical dredges are contemplated for use at navigation and flow conveyance sites, which eliminates entrainment that can occur with hydraulic dredging equipment. Specifications for other type of equipment and instream work procedures would be made at the project level as needed to minimize adverse effects to fish and critical habitat.

Noise and suspended sediment created by instream work activities are likely to discourage fish from approaching or remaining near mechanical equipment since the initial response of a fish to noise and increased levels of suspended sediment is to move away from the source. The plume of suspended sediment that would surround instream work sites is an effective deterrent to fish. At the Ice Harbor dredge site and possibly other sites where dredging or other instream work might be done in the future, there is a possibility that redds might occur in the work area. The proposed action requires the COE to survey any areas where SRF Chinook redds might occur in locations that might be used for spawning prior to dredging, and then develop appropriate measures at the project-level to avoid adverse effects to redds. The survey method described in Dauble *et al*. (1999) uses precise underwater video transects that are likely to detect fall Chinook redds in the survey areas, if present, but there is a remote possibility that redds may go unnoticed if a redd is located outside the survey area. If a redd is not detected at a work site, it could be damaged or destroyed, but the survey procedures in the PSMP make it unlikely a redd would be destroyed by dredging.

A drawdown under the PSMP could affect redds present in the tailraces of any of the four dams in the action area by increasing flow velocity and potential for scour when SRF Chinook eggs or alevins are still in the river substrate. The action area, however, contains an extremely small component of the SRF spawning habitat, the vast majority of which is upstream in the Snake and Clearwater Rivers and in the lower reaches of major tributaries. The PSMP does not provide specific information on measures that would be applied to reduce the adverse effects of a drawdown. If there were a drawdown proposal, site specific consultation would help ensure identification and application of minimization measures such as surveying tailraces for redds and timing the drawdown or managing flows to reduce effects on redds.

In view of the above factors, listed salmon or steelhead are unlikely to be injured or killed by operation of mechanical equipment in the water. There are numerous factors that discourage juvenile or adult fish from getting close enough to machinery to be at risk of injury, and redds are unlikely to be encountered due to the fact they have not been observed previously at the dredging sites. Specific efforts to identify any redds before dredging make it even less likely they will be disturbed. Drawdown effects or redds may be more difficult to avoid completely, but may be effectively minimized through site specific consultation and measures such as timing and dam operation with respect to the drawdown and redd location.

Death or Injury from In-water Sediment Disposal

In-water sediment disposal would be limited to a winter work window when none of the species and lifestages in the action area are likely to occupy disposal areas in significant numbers. No more than a few juvenile steelhead or Chinook salmon are likely to be present at the disposal sites when barges release material. Smolts are generally absent during the winter, and adults typically occupy deeper waters that tend to occur on the opposite side of the channel from depositional areas that would be used for in-water sediment disposal.

In-water disposal of dredge spoils can bury aquatic organisms or expose them to extremely high concentrations of suspended sediment if materials descend too rapidly for the organisms to escape the descending material. Past dumping of dredged material showed the material tended to fall to the river bottom in a clump rather than disperse. Clumped material falls rapidly and entrains water during descent. Fish and other aquatic organisms can be entrained in the falling sediment and become buried if they do not quickly move away. Drabble (2012) investigated the potential for disposal of dredge materials to bury marine organisms, and found that organisms vulnerable to burial consisted primarily of those that live near the bottom and use sediment as a form of cover, such as flatfish and Pacific sandlance. The same principle was also described by Nightengale and Simenstad (2001) who noted that juvenile white sturgeon in the Columbia River were susceptible to burial by in-water sediment disposal due to their small size, limited swimming ability, and tendency to physically rest on the stream bottom.

None of the life stages of salmon and steelhead that would be present during the winter work window have any of the characteristics that make fish susceptible to burial. All of the listed fish present during winter have well-developed swimming skills, a rapid startle response, and they do not rest on the stream bottom. In response to threat such as predator, salmonids exhibit a startle response that consists of rapid burst of swimming away from the threat, usually toward deeper water (Eaton *et al*. 1976, Gregory 1993). Listed fish would likely respond similarly to sediment released from a barge.

Subyearling Chinook are the only listed fish likely to encounter descending sediment released from barges. If an individual subyearling Chinook salmon is located in a relatively open area when sediment is released, the startle response would likely cause fish to avoid injury or burial. If an individual subyearling Chinook salmon is located in a position where the topography of the stream bottom contains dunes or depressions that restrict movement, these physical features could act as barriers that prevent rapid escape and cause fish to be buried. Although burial may be possible, it would be a rare occurrence, if it happens at all. Very few SRF Chinook salmon subyearlings use near-shore areas in the winter, and even fewer occupy water less than 20 feet deep by late fall or early winter (Tiffan *et al.* 2014; Tiffan and Connor 2012). With the low fish densities and the ability of fish to evade the sediment when movement is not restricted, there are only limited circumstances where fish might be buried.

Effects of Disruption and Displacement

Instream operation of machinery for dredging, filling, and installation of structures creates a zone where noise disturbance and suspended sediment is likely to displace fish from the zone, and prevent them from returning until activities are completed. Disturbances caused by noise, turbidity, and use of equipment in the water are likely to be brief encounters that prompt fish to move away to avoid the disturbance. Vibrations and pressure variations from noise that are above background levels cause a startle response in fish (Eaton *et al*. 1977). The burst of movement when a fish startles has little direct effect other than a brief minor energetic cost from the movement (Barton and Schreck 1987), but there may also be indirect effects. Since the dredges will operate nearly 24 hours per day and occupy the same general area for days or weeks at a time, individual fish are unlikely to be startled more than once. Once a fish flees an area to avoid noise or other disturbances, it is unlikely to return to the area until the noise or disturbance has abated. Longer-lasting effects may occur from displacement after a fish flees. When a juvenile fish is forced to move from a preferred location, it could be exposed to increased vulnerability to predation or encountering conditions in the new environment that could be more favorable or less favorable for growth and survival (Railsback *et al.* 1999).

In a large river such as the lower Snake and Clearwater Rivers, juvenile salmon displaced from dredging or filling sites can easily move laterally to avoid the disturbance instream work activities since the disturbance zone would not span most of the channel. The effects of moving to a different area are likely to be benign since habitat features within any given reach are similar throughout the action area, and fish would not need to swim far to find similar habitat. Carlson *et al.* (2001) found that fish displaced by dredging in the Columbia River resumed normal positions and normal behavior within a short time after moving. A brief disruption in feeding and energy expenditures form from moving from one spot to another is unlikely to have any lasting effect since fish are not stationary in the absence of a disturbance, and feeding rates and energetic demands are relatively low to begin with. The observations by Carlson *et al.* (2001) indicate that fish are unlikely to incur significant energetic costs to avoid a dredge and find suitable habitat, and the physical characteristics of large rivers make it likely that fish can move to an area that does not meaningfully differ from their initial position.

Predation risks from displacement would not increase at all for adults. Predation risks for juvenile fish might increase, but the risk would be small. In winter, the majority of juvenile fish in the action area would be SRF Chinook salmon, which prefer deep water areas (Tiffan and Connor 2012) where predatory fish cannot approach without being detected. The smallest fish in the action area during the winter work window are SRF chinook, and by winter most individuals would generally be too large (c.f. Tiffin and Connor 2012) to fall prey to piscivorous fish that feed by cruising in the river. The number of incidents where a juvenile fish falls prey to a predator as a result of displacement is likely to be too low to cause meaningful changes in the numbers of listed fish because the predation risks to individual fish would not be substantially different from background levels.

Effects of Creating of Shallow Water Habitat

The proposed action will increase shallow water habitat by using dredged material to create a shallow, near-shore bench. Shallow water habitat is heavily used by juvenile Chinook during the spring and summer in the Snake River (Tiffan 2013; Tiffan and Connor 2012; Tiffan and Hatten 2012). With inundation by dams, much of the shallow, near-shore habitats that existed in the free-flowing river are gone. Creation of additional shallow water can benefit salmonids and other fishes increasing the availability of suitable resting, rearing, feeding, and predator avoidance habitat. A recent study by Tiffan and Connor (2012) of four shallow water habitat areas (including Knoxway Bench disposal site) found natural-origin fry and parr present within all four sites from early spring through early summer, and parr were more abundant than fry. Mean spring and summer apparent density of natural-origin subyearlings was over 15 times higher within the 6 feet or less depth interval than within the 6- to 20-foot depth interval. Surveys were not conducted in a manner that could detect changes in survival, growth, or productivity.

Habitat changes can sometimes alter the dynamics of predators and their prey by providing an advantage or disadvantage to one or the other. The possibility that the shallow areas might benefit fish that prey on listed salmonids was examined by monitoring fish at the Knoxway Bench disposal site. Several years of monitoring dredge disposal sites in Lower Granite reservoir indicate that numbers of fish that prey on juvenile salmon and steelhead have not increased at the disposal sites (Seybold and Bennett 2010).

Changes in the Prey Base

Streambed disturbance from dredging, filling, and installation of structures will alter the invertebrate populations that live in and on the surface of the stream bottom. Dredging and filling will cause temporary reductions in benthic invertebrates by crushing, covering, or dislodging them (Harvey 1986; Harvey and Lisle 1998). The reductions are likely to be short-lived as disturbed areas are likely to be recolonized within several months after project completion (Fowler 2004; Griffith and Andrews 1981; Harvey 1986; Harvey and Lisle 1998).

Even though availability of benthic invertebrate species will be reduced in dredge and fill areas, the alteration may have little effect on feeding. Benthic invertebrates are not a significant part of the diet of salmon and steelhead smolts and Chinook subyearlings. In Columbia River reservoirs, Rondorf *et al*. (1990) found that subyearling Chinook salmon fed mostly on planktonic *Daphnia spp.* and terrestrial insects. In another study, Bratovich and Kelley (1998) found that 97% of the food items eaten by steelhead smolts in the estuarine portions of Lagunas Creek, California, were planktonic *Neomysis* shrimp. The availability of planktonic invertebrates will not be affected by disturbance of the substrate; therefore, the temporary reduction in benthic invertebrates at dredge and fill sites is likely to cause no more than minor changes in feeding and food consumption by listed fish.

If structures such as dikes or weirs are installed, the structures would bury or displace benthic invertebrates living in the footprint of the structure. However, the structure itself would create a different type of habitat for invertebrates. Structures would generally be composed of much larger rocks that are present in the substrate and a 3-dimensional rock structure creates a more structurally-diverse environment than is found in a places where sediment accumulates above Snake River reservoirs. The increased structural complexity and increase in particle size may allow a greater number of invertebrate species to use the area since aquatic invertebrates specialize in different types of substrate (Wallace and Webster 1996). Structures may also change local invertebrate production, but the precise effect would depend on the physical characteristics of the structure. Structures would be unlikely to have a significant effect on invertebrate production beyond the area occupied by the structure itself and adjacent areas where the structure may alter water velocity and flow direction.

Effects of Changes in Flow, Water Elevation, and In-River structures

Several potential actions described in the PSMP, specifically reservoir drawdown to flush sediment, changes in reservoir operations, raising levees, and installations of weirs and dikes all have the potential to cause widespread effects on listed fish in the action area or cause substantial site-level effects that are in the path of large numbers of fish migrating through the action area. However, without details and site-specific information regarding implementation of such actions, we do not have sufficient information to evaluate their effects at this time. Fish would not be able to avoid changes in flow or water elevation since these effects would span the entire river width and change habitat conditions for many miles, and probably adversely affect the entire action area. Lowering water elevations and flushing sediments could have beneficial or adverse effects, or a combination of both. Raising water elevations with levees or changing dam operations would likely cause adverse effects that would be roughly proportionate to the amount of increase. Increased water impoundment adversely affects fish by delaying migration, creating habitats that favor fish that prey on salmonids, and increasing water temperature in summer. The effects of changes in flow or water elevations cannot be evaluated at the programmatic level since the effects depend on the timing, duration, frequency, and magnitude of the elevation change. Dikes and bendway weirs could speed flow in some portion of the river and thus benefit migrating juvenile salmon and steelhead moving through those river sections. However, such structures may also potentially entrain and delay juvenile fish above the structures and increase their exposure to predators, and may delay adult fish migrating upstream around these structures. The PSMP offers little specificity about these options that have not been implemented in the area, and greater specificity on physical effects and minimization measures associated with the techniques that have been the mainstay of the program to date (dredging and disposal). There remains substantial dependence on future site-specific consultations to ensure the effects of any of these less familiar techniques are well described, evaluated, and avoided or minimized as appropriate. NMFS would carefully evaluate any specific proposals, especially with regards to measures described in other consultations including those that are being applied for the FCRPS dams in the action area.

2.4.3 Long-term Effects

Structural changes from activities such as creation of shallow benches, bendway weirs, and dikes, and raising levees all have the potential to cause long-lasting habitat changed and persist effects on fish. The various species of fish that occur in the action area may be attracted to or repelled from habitats altered by activities described in the PSMP. Shallow benches are likely to attract early life stages of Chinook salmon and steelhead, while the long-term effects of the other types of habitat alterations depend on their design features and location. In a river system as large as the Lower Snake River, long-term physical changes from structure installation are unlikely to meaningfully change the suitability of the habitat for any of the species in the action area since the amount of area involved is not meaningful in the context of the action area as a whole.

The effects of dredging are mostly short-term effects, but prospects for long-term additive effects from annual dredging must be considered. Since the primary effects of most sediment reduction measures in described in the PSMP area related to suspended sediment, long-term effects are unlikely. Suspended sediment from dredging, filling, and structure installation typically returns to background levels within a few hours after activities cease, and any sediments that settle out of suspension would not remain in place for more than a month or two since the spring run-off period begins shortly after the winter work window closes.

Actions described in the PSMP would maintain the navigation channel and allow barges to continue their use of the navigation channel and ports. The effects of barging that are described above in the Environmental Baseline would continue should PSMP actions maintain the navigation channel as planned. Barging has minor effects on water quality by creating wakes that generate suspended sediment when the waves break on the shore, and through leakage or spillage of fuels, lubricants, or materials hauled by barges. Barges moored at ports also create shaded areas that listed fish tend to avoid due to an increased risk of falling prey to larger fish that might hide in the shade

2.4.4 Summary of Effects on Listed Species**.**

Relevance of Effects on Individual Fish to Salmonid Population Viability

NMFS assesses the importance of habitat effects in the action area (on individual fish) to their ESUs or DPSs by examining the relevance of those effects to the characteristics of VSPs. The characteristics of VSPs are abundance, population growth rate (productivity), spatial structure, and diversity. While these characteristics are described as unique components of population dynamics, each characteristic exerts significant influence on the others. For example, declining abundance can reduce spatial structure of a population; and when habitats are less varied, then diversity among the population declines.

Abundance. An action adversely affects abundance of a population when it causes losses of individuals through injuries or death, or through emigration to areas outside the population area when individuals are forced to move to avoid direct effects of an action. The PSMP actions may cause spatial patterns in fish abundance to shift as fish move away from instream work activities or respond to changes in depth or habitat complexity that result from dredging, disposal, and installation of structures. Significant changes in abundance due to mortality are unlikely since effects of these PSMP activities are likely to be largely non-lethal. The large size of the rivers provides ample opportunity for listed fish to avoid instream work areas and downstream areas affected by turbidity or chemical contaminants while remaining in the same general vicinity of the river. Since these PSMP activities are unlikely to kill fish and would not cause fish to emigrate, abundance of listed fish would not appreciably change. The PSMP activities such as drawdowns, dikes, and weirs have the potential to improve salmon and steelhead survival through this reach by concentrating flow, increasing current speed, and decreasing travel time of juvenile fish through the action area (substantial albeit short duration improvement with drawdown and little improvement with weirs). Dikes, weirs, and levees, however, also have the potential to have counterbalancing negative effects on survival by slowing migration through entrainment or increase in reservoir volume/decrease in current. Development of site-specific proposals and consultations on those activities will help evaluate the balances of positive and negative effects on salmon and steelhead survival and abundance, and thus will help direct the avoidance, modification, or approval of those activities.

Productivity. Productivity is an indicator of population growth over the entire life cycle. Productivity of anadromous fish is adversely affected by any action that reduces the reproductive rate or increases the mortality rate. Changes in productivity may occur when fish or habitat are affected in a manner that reduces the success of spawning or incubation, reduces the growth or survival of juvenile fish; or results in losses of adults. With few exceptions, PSMP activities occur at times and locations where they are unlikely to affect fish while they are spawning, incubating, or migrating, or when fish are highly vulnerable after newly emerging from redds. In addition, the effects of PSMP activities are largely non-lethal. The proposed action is unlikely to cause a discernable change in productivity since instream work activities would avoid critical periods; few if any fish would be killed; and sublethal effects such as displacement or temporary changes in forage do not appear to be severe enough to affect individual growth or reproductive success at a later time.

Spatial Structure. Spatial structure refers to the arrangement of the locations where fish are found throughout their range. An action adversely affects spatial structure through effects such as: causing a watershed or stream to become unusable or inaccessible; extirpating a fish population associated with a particular area; or by interfering with adult migration in a manner that reduces the likelihood that adults will return to their natal streams. The only mechanism by which the proposed action would be capable of affecting spatial structure is by interfering with migration. The action does not affect tributary watersheds, it does not interfere with migration, and it does not harm or kill fish in sufficient numbers to affect the size of any population. Instream work activities in general could have potential to interfere with migration if migrating fish significantly change their behavior in response to the disruptions caused by noise, mechanical equipment, or plumes of sediment. Since migrating fish will be capable of swimming around the work sites at all times, migration would not be impaired in a manner that affects spatial structure.

Diversity. Diversity refers to the array of physical and behavioral traits found in a population, which enable various individuals to flourish under a wide range of environmental conditions. An action can adversely affect diversity from effects such as: causing an appreciable and persistent environmental alteration of an area with unique habitat characteristics; or systematically reducing the abundance, survival, or reproduction of a unique genotype or phenotype. The PSMP actions have little potential to affect diversity since effects of the action are largely non-lethal and diversity cannot be altered unless an action affects abundance, survival, or reproduction. The action area is used as a migration corridor by all species, and migration is unlikely to be affected by any of the PSMP activities except for raising or lowering the reservoir. Either type of reservoir change could be done in a variety of ways that could avoid adverse effects to migration.

In-water sediment disposal may have a slight effect on fall Chinook salmon diversity since the population is relatively small. SRF Chinook salmon is apparently developing a “reservoir-type” life history that relies on shallow rearing habitat in the first few months after fish emerge from redds. In-water sediment disposal would increase the amount of shallow water habitat by a small amount. The proposed action is unlikely to affect diversity in any other way since the action would not harm or kill enough individuals to affect the expression of various phenotypes or genotypes.

2.5 Cumulative Effects

“Cumulative effects” are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Cumulative effects, when combined with baseline effects and effects of the action, may increase the likelihood that the proposed action will result in jeopardy to a listed species, or in destruction or adverse modification of designated critical habitat.

In a large river such as the lower Snake River, habitat conditions in the action area are influenced by countless activities that have the potential to affect streamflows or water quality in the action area, but occur upstream, outside the action area. Effects of future urban growth, forestry activities, sediment caused by agricultural practices, and flow reductions from water withdrawals are among the most significant activities that are likely to affect fish and critical habitat in the action area. These activities will continue to affect listed fish and critical habitat in the action area in a similar manner as described previously in the environmental baseline.

Within the action area, there is a significant demand within the State of Washington to begin appropriating water directly from the Snake River and from local aquifers that may be hydraulically connected to the Snake. Furthermore, the State reopened the mainstem Columbia and Snake Rivers for further appropriation in 2002, after withdrawing the water from further appropriation in 1995. It is difficult to predict long-term trends in water quantity and quality, but reduced flowsfrom water withdrawals are reasonably certain to continue.

Salmon recovery efforts in the action area have assisted with numerous projects to improve habitat for listed species. Ongoing studies and habitat enhancement projects conducted by the Snake River Salmon Recovery Board and Washington State Department of Fish and Wildlife Department to implement watershed plans and recovery plans are expected to continue.

Washington, Oregon and Idaho have all developed total maximum daily load restrictions (TMDL) for various water quality components, turbidity, temperature, pesticides, heavy metals and others in the Snake River and some of its tributaries. As these plans are carried out water quality may improve.

The Snake River basin is one of many areas in the state of Washington that is experiencing ongoing wind power developments and expansion of transportation infrastructure. Recent national economic developments have slowed population growth in the last few years but non-agriculture employment has increased and that trend is likely to continue. Population changes and economic diversification are likely to result in greater overall and localized demands for electricity, water, and buildable land in the action area. They may affect water quality directly and indirectly and increase the need for transportation, communication, and other infrastructure. These economic and population demands will probably affect habitat features such as water quality and quantity, which are important to the survival and recovery of the listed species. Unless planning includes measures to avoid, minimize, and effectively mitigate the potential effects to listed species, the effect of continued growth and economic diversification will likely be negative. Sediment-producing actions such as on-going agriculture and forestry activities described in the baseline, are likely to continue. Actions to reduce erosion from roads and agricultural lands are likely to occur at the same time actions that increase erosion are undertaken. No distinct trend in future sediment-producing activities can be predicted. An analysis of sediment sources in the Northern Rocky Mountains by Goode *et al*. (2012) shows that any effect of non-Federal actions that increase or decrease sediment production will be vastly overwhelmed by natural sediment.

2.6 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (section 2.4) to the environmental baseline (section 2.3) and the cumulative effects (section 2.5), taking into account the status of the species and critical habitat (section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species.

The action area is used as a migratory corridor by all listed Snake River salmon and steelhead species, and it is also used to a limited extent for rearing by subyearling fall Chinook salmon and steelhead. Low abundance and productivity are a recurring factor that keep most populations of SRSS Chinook salmon, SR sockeye salmon, SR steelhead and SRF Chinook salmon from attaining their desired status as described in the draft recovery plans. The ICTRT (2005) and the most recent 5-year status review (Ford 2011) noted a high viability risk for all SRSS Chinook and SR sockeye populations, and a moderate viability risk for SRF Chinook salmon. Little is known about the individual Snake River Basin steelhead populations, but with the exception of the Joseph Creek population (rated highly viable) remaining steelhead populations are thought to be have a moderate or high viability risk.

Almost all of the populations of SRSS Chinook, SRF Chinook, SR sockeye and SRB steelhead considered in this opinion must pass over eight mainstem dams to reach spawning areas or migrate downstream. Exceptions are the populations of SRSS Chinook and SRB steelhead that use the Tucannon River, where they only have to pass over six mainstem dams. There are 28 populations of SRSS Chinook, five populations of SR sockeye (four have been extirpated), one extant population of SRF Chinook, and 24 populations of SRB steelhead that pass through or use the action area as adults and/or as juvenile outmigrants. None of the listed Chinook or steelhead Major Population Groups that could be affected by implementation of the PSMP currently reach desired status in the draft recovery plan. There is a significant lack of information for most of the steelhead populations and the sockeye population is still in danger of extinction.

The PSMP consists of a suite of a planning steps and potential measures to manage sediment deposition that affects the navigation channel. The PSMP does not commit to implementing any particular activities, but instead describes how future sediment management actions might be developed and carried out. The PSMP activities focus largely on removing sediment by dredging, but also include less-used management actions such as agitation to resuspend sediment, flushing sediment by drawdown, installing structures to change depositional patterns, upland sediment reduction, and changing the water elevation though dam operations or raising levees. Among these actions, only dredging is likely to be done on a regular basis. Of the remaining activities, some, if implemented, would likely be done only once (structure installation); others would require further study to determine how they would be implemented, if they are used at all.

The sediment problem areas identified by the Corps (Table 2) include a limited number of areas, with the greatest volume of sediment removal envisioned in the Lower Granite reservoir, toward the upstream end of the action area. When viewed as a whole, all of the dredging sites, structure installation sites, and in-water disposal areas amount to a small percentage of the total stream area. The winter work window limits the action temporally to no more than a 77-day period that lies almost entirely outside the migration period and when the least number of fish are present. There is no time of the year when fish are not present in the action area.

Any dredging, sediment disposal, and structure installation that the Corps decides to do following the Plan are subject to the in-water work window. The primary effect of these activities is through suspended sediment that is created when moving sediment or building in-water structures. The initial response of fish to increased amounts of suspended sediment is avoidance, which limits the exposure of fish to all potential adverse effects that exist within the sediment plume. These include the effects of sediment itself, contaminants resuspended with the sediment, and effects of the machinery that is creating the sediment. Due to the avoidance behavior, fish will generally avoid these potentially adverse effects. Dredging, in-water sediment disposal, and structure installation are localized actions that would all be done in a manner where suspended sediment would not have adverse effects on fish passage or spawning. Potential adverse effects are also minimized or avoided by protective measures that include screening sediments for contaminants, use of mechanical dredges (instead of hydraulic dredges), surveying for redds when appropriate, and sediment monitoring during instream work. At all times, fish would be able to escape effects of resuspended contaminants, and high concentrations of suspended sediment by moving laterally in the river to avoid most adverse effects. Adverse effects to spawning areas would be avoided by performing redd surveys, and adjusting work activities to avoid adverse effects to redds. A small number of individuals may fail to avoid adverse effects by moving, and those individuals could be harmed or killed, but this is likely to be a rare exception

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Effects of certain activities described in the PSMP (reservoir draw-down, agitation to resuspend sediment, and changing the water elevation) are difficult to predict at the programmatic level since crucial details on these activities are not yet available. Specific effects of these activities cannot be assessed until further details are enveloped at the project-level, should any of these activities be given further consideration by the COE. Since details regarding the implementation of these activities have not been developed in the PSMP at this time, the effects analysis in this opinion considered the various ways in which these activities could affect listed fish and critical habitat in general (summarized in Table 11).

Proposed activities such as reservoir drawdown to flush sediment, changes in reservoir operations, and raising levees, all have the potential to cause more widespread effects than the sediment-producing activities discussed above. Fish would not be able to avoid changes in flow or water elevation since these effects would span the entire river width and change habitat conditions for many miles, and perhaps affect the entire action area. However, these actions could not be done in a manner that is inconsistent with the FCRPS biological opinion, which constrains changes in reservoir operations and water. These constraints would likely limit any threat to listed fish or critical habitat at the plan-level. The environmental baseline and cumulative effects, include serious adverse effects on the listed species that occur in the action area and will continue to do so. However, because of protective measures and constraints on the activities that could be implemented under the PSMP, we cannot say that adoption of the PSMP is likely to result in population-level effects to listed species or adversely affect the conservation value of designated critical habitat.

2.7 Conclusion

After reviewing the current status of SRSS Chinook salmon, SRF Chinook salmon, SR sockeye, and SRB steelhead, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of SRSS Chinook salmon, SRF Chinook salmon, SR sockeye, and SRB steelhead. Similarly, the proposed action's effects to PCEs will not measurably diminish conservation value. NMFS concludes that the project will not destroy or adversely modify designated critical habitat for any of the subject species.

2.8 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

2.8.1 Amount or Extent of Take

The PSMP provides a process and guidance for sediment management in the lower Snake River but it does not authorize individual actions to occur. This biological opinion evaluates likely activities that may be undertaken pursuant to the PSMP that adversely affect listed Snake River salmon and steelhead. At the broad scale of this consultation and based on the nature of the PSMP, there is no currently authorized action that will result in take of listed species. The COE's PSMP informs future decisions that may result in take. Although we do not believe that an ITS is necessary in this context, out of abundance of caution and to address conflicting case law, NMFS is providing the following ITS.

Information regarding the amount and frequency of dredging activities is provided in sufficient detail to allow for an analysis of potential incidental take resulting from such activities, as described below. Because the PSMP does not authorize any particular project-level action and the COE must conduct a subsequent section 7 consultation that will analyze the specific effects of a proposed action, it is difficult for NMFS to numerically quantify whether any take may occur to listed species from this plan level document. Future consultations will consider the site-specific information related to duration, timing, and location, among other factors, available at that time, to assess whether and to what extent, incidental take is reasonably certain to occur. At that time, if take is anticipated, additional or different reasonable and prudent measures and implementing terms and conditions may be developed to minimize the impact of the incidental take on the species.

There is sufficient specificity regarding the impacts from dredging and disposal activities to allow NMFS to anticipate take associated with disposal and dredging at the plan level. Although this take cannot be numerically quantified, NMFS has developed ecological surrogates to create a clear trigger for determining when the anticipated amount of take that may occur from the PSMP would be exceeded and, if discretionary involvement or control is retained or authorized by law, when reinitiation of consultation would be required. The NMFS anticipates that take could occur from harm caused by physiological effects of suspended sediment and turbidity. Activities that produce suspended sediment also have the potential to result in take by resuspending toxic chemicals contained in sediments, if sediments cannot be handled in a manner that can keep contaminants at safe concentrations. However, without site specific information, we cannot at this point determine if such take is reasonably certain to occur. For that reason, we are not attempting to quantify take from resuspension of toxic chemicals in this ITS. Should such take be determined to be reasonably certain to occur for a site-specific proposal, this take will be dealt with in the site-specific ITS.

Besides the lack of specificity, the NMFS anticipates that such incidental take will be difficult to detect for the following reasons: at the plan level there is no practical way to determine when fish might be harmed by suspended sediment since there may be no outwardly visible signs of harm or injury; finding a dead species is unlikely since the immediate effects of take are likely to be sublethal, and subsequent deaths may occur later in time, after fish have moved out of the action area. Therefore, even though NMFS expects that incidental take of SRF Chinook salmon, SRSS Chinook salmon, and Snake River steelhead is reasonably certain to occur during the implementation of actions under the Plan, available data are insufficient to estimate an exact number of individuals that may be harmed. When the expected number of individuals that may be taken is not quantifiable, NMFS uses an environmental surrogate for monitoring and reporting.

The COE has provided general locations of likely sediment management actions, and general estimates of amounts of dredging and disposal activities. The COE provided a range of estimates of cubic yards dredged and a range of dredging frequencies by year. The maximum extent of take that is reasonably certain to occur is based on the higher quantity of cubic yards dredged and the most frequent dredging estimates, as follows:

- 500,000 cy of navigation dredging every 3 years
- 500,000 cy of in-water disposal of sediment every 3 years
- 1,000,000 cy of flow conveyance dredging every 10 years, and then 500,000 cy of flow conveyance dredging every year
- 15,000 cy of recreation dredging every 3 years
- 1,000 cy of wildlife dredging every 7 years

- <500 cy of sediment that is resuspended at wildlife mitigation areas every 7 years
- 250,000-350,000 cy of dredging to maintain a sediment trap

Based on the above information, NMFS has developed the following environmental surrogates for take that is reasonably certain to occur from suspended sediment and turbidity levels associated with dredging and disposal activities. The concentrations and durations of suspended sediment from PSMP activities are expected to reach thresholds where fish are harmed by physiological effects of stress or reduced growth. Conditions resulting in an SEV of 6 and turbidity levels of 25 NTU or more (Figure 5) are reasonably certain to harm listed salmon and steelhead. These conditions are expected to occur downstream of the sediment source at a distance of no more than 900 feet, and for a lateral distance of no more than 450 feet. These conditions may occur for a period of up to 77 days between December 15 and March 1, and may occur as often as annually. Instances where turbidity would exceed 25 NTU beyond a distance of 900 ft would be infrequent and unlikely to persist long enough to cause more than minor behavioral changes since state water quality standards require compliance with the turbidity criterion of no more than 5 NTU over background at a distance of 900 feet. Below 25 NTU, suspended sediment is likely to cause a variety of adverse effects to salmon and steelhead, but harm is not certain to occur since effects of turbidity vary in this range and these species often tolerate low levels of turbidity.

2.8.2 Effect of Take

In the accompanying Opinion, NMFS determined that this level of anticipated take is not likely to result in jeopardy to the species, or destruction, or adverse modification of critical habitat.

2.8.3 Reasonable and Prudent Measures

Reasonable and prudent measures are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02).

The COE will:

1. Prior to authorizing any action taken in accordance with the PSMP that “may affect” listed species, obtain an incidental take statement following section 7 consultation with NMFS.

2. Prior to dredging, determine and implement appropriate sampling methodology for screening sediments for contaminants, and use that information to develop the disposal plan so as to minimize effects from resuspension of contaminants.

3. Monitor turbidity during dredging and disposal activities.

4. Ensure that dredging will not occur in locations where SR fall chinook salmon redds might be damaged by mechanical disturbance of the riverbed or by suspended sediment.

5. Report quantities of cubic yards of dredged materials and inwater disposal, and results of monitoring.

2.8.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the Corps or any applicant must comply with them in order to implement the reasonable and prudent measures (50 CFR 402.14) The COE or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. To implement reasonable and prudent measure number 1, initiate consultation with NMFS under Section 7(a)(2) for any proposed future action taken in accordance with the PSMP, at the earliest possible time, that "may affect" listed species or their designated critical habitat.

2. To implement reasonable and prudent measure number 2 (contaminant sampling), the COE will:

    a. Prior to any dredging for navigation, conveyance, and sediment trapping, follow the 2009 Sediment Evaluation Framework for the Pacific Northwest, or later versions. Ensure that the NMFS is involved in reviewing the sampling plan and results of sampling. Use the information gained through this sediment sampling process to develop actions and disposal methods that minimize exposure of listed fish to harmful chemicals.

3. To implement reasonable and prudent measure number 3 (turbidity monitoring), the COE will:

    a. Monitor water quality (i.e., turbidity) conditions to ensure that the terms and conditions of the applicable state's Section 401 Water Quality Certification are being met. In instances where State water quality standards are exceeded, the COE shall implement management measures to control turbidity levels.

4. To implement reasonable and prudent measure number 4 (SR fall Chinook salmon redds), the COE will:

a. Conduct underwater surveys of work areas in which redds could potentially be found. Surveys would be performed once in November and once during the first 2 weeks of December prior to commencing work.
b. If redds are located, the COE will contact NMFS immediately with the approximate location relative to the proposed dredging. The COE will coordinate with NMFS to determine if dredging can proceed without harming or disturbing the redd(s) or needs to be delayed until fry are able to move out of the area.

5. To implement reasonable and prudent measure number 5 (Monitoring and Reporting), the COE will:

a. Develop an annual report for activities completed pursuant to the PSMP and submit it to NMFS by March 31 of each year. The report shall include the number and location of activities conducted, the cubic yards of sediment dredged and/or disposed of in-water, and results of turbidity and water quality monitoring. All reports will be sent to National Marine Fisheries Service, Snake Basin Office, Attention Snake Basin Director, 800 Park Boulevard, Suite 220, Boise, Idaho 83712-7743.

b. Cease activities and report to NMFS immediately if the extent of take is exceeded. The extent of take would be exceeded if:

i. dredge quantities exceed:
- 500,000 cy yards of Navigation dredging every 3 years
- 500,000 cy of in-water disposal of sediment every 3 years
- 1,000,000 cy/per year for 10 years, then 500,00 cy/yr afterwards for flow conveyance dredging
- 15,000 cy of recreation dredging every 3 years
- 1000 cy of Wildlife dredging every 7 years
- <500 cy of Wildlife agitation to resuspend every 7 years
- 250,000-350,000 cy of dredging to maintain a sediment trap

ii. For each dredging activity or in-water structure installation, turbidity shall not exceed applicable state standards or site-specific measures developed at the project-level.

iii. contaminant levels in sediments are disposed of in-water while exceeding criteria in the 2009 Sediment Evaluation Framework for the Pacific Northwest, the 2013 Dredged Material Evaluation and Disposal Procedures User Manual, or any subsequent revisions or successors to these documents; or if any chemicals not listed in these documents are found in amounts that may harm or kill listed salmon or steelhead.

NOTICE: If a sick, injured or dead specimen of a threatened or endangered species is found in the action area, the finder must notify NMFS Law Enforcement at (206) 526-6133 or (800) 853-1964, through the contact person identified in the transmittal letter for this opinion, or through the NMFS Snake Basin Office. The finder must take care in handling sick or injured specimens to ensure effective treatment, and in handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder should carry out instructions provided by Law Enforcement to ensure evidence intrinsic to the specimen is not disturbed unnecessarily.

2.9 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02). NMFS is recommending that the COE look for opportunities to partner with other land management agencies to reduce the input of sediments to the Snake or Clearwater Rivers or their tributaries so as to reduce the frequency of the need for dredging.

In addition, because only 2.2% of Lower Granite reservoir at 143,000 cfs (less at lower flows) is juvenile rearing habitat but 44% of the reservoir is predator habitat (riprapped banks), NMFS recommends that the COE investigate and adopt techniques to create additional shallow-water habitat (e.g., cover large areas of riprap with organic material that can support riparian vegetation and provide juvenile shallow water rearing habitat).

2.10 Reinitiation of Consultation

As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) The amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action on listed species or designated critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

2.11 "Not Likely To Adversely Affect" Determinations

The COE determined that the proposed action is not likely to adversely affect Middle Columbia River (MCR) steelhead (*O. mykiss*), Upper Columbia River (UCR) steelhead (*O. mykiss*), and Upper Columbia River spring-run Chinook salmon (*O. tshawytscha*), or their critical habitat.

NMFS concurs with these determinations. The range of these species and their critical habitat are entirely outside the action area. However, since the action area is near the confluence of the Snake and Columbia Rivers, these species may wander into the action area as adults.

The UCR spring-run Chinook salmon would not be adversely affected by the proposed action because adults are the only life stage that occurs in the Snake River, and they do not occur in the action area from December 15 through March 1. The earliest returns of Chinook salmon to the Ice Harbor Dam occur in the month of April. Juvenile UCR spring-run Chinook salmon do not occur in the action area because the offspring of any UCR spring-run Chinook salmon that spawn in the Snake River basin would no longer be considered part of the UCR spring-run Chinook salmon ESU (they would instead be part of the SR spring-summer Chinook ESU instead); and UCR spring-run Chinook salmon smolts migrating downstream in the Columbia River system would not go upstream into the Snake River. Critical habitat for the species would not be affected because there is no critical habitat for the species in the action area. Adult MCR and UCR steelhead might stray into the action area during the December 15 to March 1 work window. Out-of-basin strays entering the Snake River may continue upstream and spawn anywhere that SRB steelhead might spawn, or they may only occupy the Snake River briefly and move back downstream. The proposed action is unlikely to have an adverse effect on adult steelhead migrating through or holding in the action area since adults tend to occupy deeper water where neither dredging nor in-water disposal would occur, and they are capable of avoiding plumes of suspended sediment by moving to cleaner water. Sediment plumes are not expected to span the entire width of the river, and at least a few hundred feet of the river width would be clear of suspended sediments created by the proposed action.

3 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSULTATION

The consultation requirement of section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the COE and descriptions of EFH for Pacific coast salmon contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce (PFMC 1999).

3.1 Essential Fish Habitat Affected by the Project

The proposed action and action area are described in the BA and this letter. The project area includes habitat which has been designated as EFH for various life stages of Chinook salmon (*O. tshawytscha*) and coho salmon (*O. kisutch*).

3.2 Adverse Effects to Essential Fish Habitat

Based on information provided in the BA and the analysis of effects presented in the ESA portion of this document, NMFS concludes that proposed action will adversely affect EFH designated for Chinook salmon and coho salmon because it will have negative effects on water quality and benthic communities. The proposed project will alter a total of 118.3 acres of river bottom altering benthic habitat and macroinvertebrate production in the short term. The action will also temporarily impair water quality near the dredging equipment and Knoxway Bench. In addition, this action will create a total of 27.4 acres of new shallow water habitat, thereby permanently increasing the amount of a limited habitat type important to juveniles in the mainstem Snake River. These changes to EFH are long-lasting effects. NMFS believes the construction of permanent shallow water habitat ameliorates much of the temporary negative effects.

Specifically, NMFS has determined that the action will adversely affect EFH as follows:

1. Temporary degradation of water quality (turbidity, contaminants) from construction activities.

2. The alteration of current substrate and benthic forage by dredge and fill actions.

3. Maintenance of the channel will require continued, periodic dredging of certain areas of the Snake and Clearwater Rivers

3.3 Essential Fish Habitat Conservation Recommendations

NMFS believes that the following conservation measures are necessary to avoid, mitigate, or offset the impact of the proposed action on EFH.

1. The COE will initiate or continue studies on the availability and fish use of shallow water habitat in Lower Granite reservoir and in downstream reservoirs. Information of the distribution, connectivity and patch size of existing shallow water areas relative to seasonal flows and fish use will help determine if there are additional areas where shallow water habitat can be created and have the greatest benefit to salmonids.

NMFS expects that full implementation of these EFH Conservation Recommendations would protect designated EFH for Pacific coast salmon, by avoiding, minimizing or offsetting the adverse effects described in Section 3.2.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Federal agency must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation from NMFS. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations, unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many Conservation Recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the

EFH portion of this consultation, you clearly identify the number of Conservation Recommendations accepted.

3.5 Supplemental Consultation

The COE must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (DQ A) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the Opinion addresses these DQA components, documents compliance with the DQA, and certifies that this Opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users.

The intended users of this Opinion are the COE. Other interested users could include the Nez Perce Tribe, citizens of cities of Clarkston, Washington and Lewiston, Idaho; Walla Walla Garfield, Columbia, Whitman and Asotin Counties in Washington; Nez Perce County in Idaho and others interested in the conservation of SRSS Chinook salmon, SR sockeye, SRF Chinook salmon, and SRB steelhead. Individual copies of this Opinion were provided to the COE. This Opinion will be posted on NMFS West Coast Region web site (http://www.nwr.noaa.gov). The format and naming adheres to conventional standards for style.

4.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including NMFS ESA Consultation Handbook, ESA Regulations, 50 CFR 402.01, et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.920(j).

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the Literature Cited section. The analyses in this Opinion/EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with Northwest Region ESA quality control and assurance processes.

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Supporting Documents
Biological Opinions for
Current Immediate Need Action

U.S. Fish and Wildlife Service Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Washington Fish and Wildlife Office
Eastern Washington Field Office
11103 East Montgomery Drive
Spokane, Washington 99206

NOV 1 3 2014

In Reply Refer To:
01EWFW00-2013-F-0104

Michael S. Francis, Chief
Environmental Compliance Section
Walla Wall District Office
U.S. Army Corps of Engineers
201 North Third Avenue
Walla Walla, Washington 99362-1876

Dear Mr. Francis:

This letter transmits the U. S. Fish and Wildlife Service's Biological Opinion on the proposed Lower Snake River Channel Maintenance Project located in Asotin and Whitman Counties, Washington, and Nez Perce County, Idaho, and its effects on the bull trout (*Salvelinus confluentus*) and critical habitat for the bull trout. Formal consultation on the proposed action was conducted in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your February 24, 2014, request for formal consultation was received on February 25, 2014.

The enclosed Biological Opinion is based on information provided in the U.S. Army Corps of Engineers' (Corps) December 12, 2012, Biological Assessment (BA) for the Project; December 2012 Draft Environmental Impact Statement (DEIS) for the Programmatic Sediment Management Plan, developed pursuant to the National Environmental Policy Act (NEPA); various telephone conversations and electronic mail correspondence with Project staff at the Corps Walla Walla District Office; and other available sources of information, as referenced in the Biological Opinion. A complete record of this consultation is on file at our Eastern Washington Field Office in Spokane.

If you have any questions regarding the enclosed Biological Opinion, or our shared responsibilities under the Act, please contact Chris Warren or Michelle Eames at our Eastern Washington Field Office at (509) 891-6839.

Sincerely,

For Thomas L. McDowell, Acting Manager
Washington Fish and Wildlife Office

Enclosure

cc:
NMFS, Moscow, ID (Ries)

Endangered Species Act – Section 7 Consultation

Biological Opinion

Consultation for
Lower Snake River Channel Maintenance Project
Idaho and Washington

U.S. Fish and Wildlife Service Reference Number:
01EWFW00-2013-F-0104
Cross Reference Number: 01EWFW00-2014-F-0660

Agency: Walla Walla District
U.S. Army Corps of Engineers
Walla Walla, Washington

Consultation Conducted By: U.S. Fish and Wildlife Service
Eastern Washington Field Office
Spokane, Washington

FOR Thomas L. McDowell
Acting Manager
Washington Fish and Wildlife Office

13 Nov. 2014
Date

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Act	Endangered Species Act
BA	Biological Assessment
BLM	Bureau of Land Management
BMPs	Best Management Practices
BPA	Bonneville Power Administration
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHU	Critical Habitat Unit
Comp Plan	Lower Snake River Fish and Wildlife Compensation Plan
Corps	U.S. Army Corps of Engineers
CREP	Conservation Reserve Enhancement Program
cy	cubic yards
DEIS	Draft Environmental Impact Statement
DMMUS	Dredge Material Management Units
DPS	Distinct Population Segment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FCRPS	Federal Columbia River Power System
FMO	Forage, Migration, and Overwintering Habitat for Bull Trout
FR	Federal Register
HCP	Habitat Conservation Plan
HUC	Hydrologic Unit Code
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
ITS	Incidental Take Statement
LSMG	Local Sediment Management Group
LSRP	Lower Snake River Projects
MOP	Minimum Operating Pool
NEPA	National Environmental Policy Act of 1969, as amended
NMFS	National Marine Fisheries Service
NTU	Nephelometric Turbidity Unit
Opinion	Biological Opinion
PAH	Polycyclic Aromatic Hydrocarbons
PCE	Primary Constituent Element
PIT	Passive Integrated Transponder
Project	Snake River Channel Maintenance Project
PSMP	Programmatic Sediment Management Plan
RM	River Mile
Service	Fish and Wildlife Service
SEV	Severity of Ill Effect

SR	Snake River
SRF Chinook	Snake River Fall Chinook Salmon
TMDL	Total Maximum Daily Load
TSS	Total Suspended Sediments
USFWS	U.S. Fish and Wildlife Service
U.S.C.	United States Code
WDOE	Washington State Department of Ecology
WDFW	Washington Department of Fish and Wildlife

INTRODUCTION

This document represents the U.S. Fish and Wildlife Service's (Service) biological opinion (Opinion) based on our review of the U.S. Army Corps of Engineers' (Corps) proposed Snake River Channel Maintenance Project (Project), located in southeastern Washington and west central Idaho, and its effects on bull trout (*Salvelinus confluentus*) and bull trout critical habitat in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). The Corps' February 24, 2014, request for formal consultation on the Project was received by the Service on February 25, 2014.

This is a second tier consultation, conducted pursuant to the Service's biological opinion (01EWFW00-2014-F-0660) on the Lower Snake River Programmatic Sediment Management Plan (PSMP), dated November 13, 2014. The PSMP describes the Corps' decision-making process for sediment management activities, but does not prescribe site-specific actions. The programmatic biological opinion determined that implementation of activities conducted under the PSMP would not jeopardize the bull trout, and would not destroy or adversely modify critical habitat for the bull trout, but that future actions that may affect the bull trout or bull trout critical habitat and incidental take would be consulted on prior to implementation. These second-tier, site-specific consultations are expected to confirm that predicted quantities of dredged or deposited sediment in the PSMP are not exceeded, that potential effects to the bull trout or bull trout critical habitat are consistent with those considered under the PSMP, and that any incidental take of the bull trout would be addressed, as appropriate.

This Opinion is based on information provided in the Corps' December 12, 2012, Biological Assessment (BA) for the Project, December 2012 Draft Environmental Impact Statement (DEIS) for the PSMP, developed pursuant to the National Environmental Policy Act (NEPA), various telephone conversations and electronic mail correspondence with Project staff at the Corps' Walla Walla District Office, and other available sources of information, as referenced below. The Corps proposes the action under the authority of the Flood Control Act of 1952 (PL 87-874) which directs the Corps to maintain a 14-foot-deep, 250-foot-wide navigation channel in the Snake and Clearwater Rivers. A complete record of this consultation is on file at the Service's Eastern Washington Field Office in Spokane, Washington.

CONSULTATION HISTORY

The consultation history for the Service's Opinion on the PSMP is incorporated herein by reference. Additional information addressing the consultation history that is specific to the proposed Project is described below.

December 26, 2012 – The Service received a request from the Corps (dated December 17, 2012) for formal consultation on proposed winter 2013-2014 dredging activities in the lower Snake River, a BA addressing potential Project effects, and a DEIS for the Corps' proposed PSMP for the lower Snake River.

May 22, 2013 – The Service received a request from the Corps (dated May 21, 2013) for informal consultation on proposed additional sediment sampling for the Project and overall PSMP, and a BA addressing potential project effects. The sediment sampling BA also described several anticipated modifications to the proposed winter 2013-2014 dredging operations.

June 17, 2013 – The Service submitted a concurrence letter to the Corps addressing potential effects to listed species from the proposed additional sediment sampling, and concluded that the proposed activities "may affect, but [were] not likely to adversely affect" the bull trout or bull trout critical habitat.

August 5, 2013 – The Service received notification from the Corps that the Project would be delayed pending completion of the additional sediment sampling and further assessment of potential Project design changes.

February 25, 2014 – The Service received from the Corps the results of the additional sediment sampling, along with an assessment of the results, and descriptions of other Project design changes, including rescheduling of the proposed actions to winter 2014-2015. The Corps also provided a written request to re-start formal consultation for the Project. This current Opinion responds to the Corps' request for consultation on the proposed winter 2014-2015 dredging activities.

April 29, 2014 – The Service received from the Corps a revised Disposal Plan for the Project.

May 13, 2014 – The Service received from the Corps an updated sediments and contaminants modeling assessment for the Project.

July 31, 2014 – The Service received from the Corps a revised Monitoring Plan for the Project.

August 5, 2014 – The Service received from the Corps a BA (dated July 30, 2014) addressing the PSMP and a request to initiate consultation on the programmatic plan. The Service and Corps agreed to complete consultation on the PSMP prior to completing consultation on the proposed Project dredging activities.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those without independent utility apart from the action under consideration.

The Federal navigation channel in the Snake River refers to that portion of the Snake River inland navigation waterway maintained by the Corps. The navigation waterway begins at the Columbia/Snake River confluence and extends upstream past four dams to the head of the Lower Granite reservoir (Figure 1). The Corps maintains a 14-foot-deep, 250-foot-wide navigation channel (at minimum operating pool (MOP)) through these reservoirs. The proposed action consists of dredging of the following sites: (1) downstream navigation lock of Ice Harbor Dam (Snake RM 9.5); (2) the Federal navigation channel in the Snake and Clearwater Rivers confluence area (Snake RM 138 to Clearwater RM 2.0); (3) the berthing area for the Port of Clarkston, Washington (Snake RM 137.9 and 139); (4) the berthing area for the Port of Lewiston, Idaho (Clearwater River, RM 1 to 1.5). The proposed action also entails using dredged material as fill to construct a shallow water bench for juvenile habitat at Knoxway Bench (RM 116) immediately upstream of Knoxway Canyon.

Sedimentation at the downriver approaches to the navigation locks is an ongoing problem. Congress has authorized the Corps to provide navigation facilities, including locks to allow passage of a tug towing four barges, at each of the four lower Snake River dams. Accumulated cobble and gravel presently complicate boat passage into the Ice Harbor navigation lock. The Corps proposes to remove this material to restore passage to authorized dimensions.

The Corps also proposes issuing Regulatory (Section 404/10 permits) for dredging at commercial ports and berths operated by local port districts or private companies in Clarkston, Washington and Lewiston, Idaho. Most of these non-federal navigation areas consist of arterial channels leading from the main federal navigation channel to the port or berth as well as those areas at the port or berth used for loading, unloading, mooring, or turning around. Typically, these facilities also need to accommodate river tugs with up to four barges in tow. Further detail regarding the dredging sites follows below.

Confluence of Snake and Clearwater Rivers (Federal navigation channel). The Corps will remove approximately 458,472 cubic yards (cy) of material from the Federal navigation channel at the confluence of the Snake and Clearwater Rivers (Figure 2). Sediment samples were collected in August 2013 from the main navigation channel in the confluence area. In general, the grain size was higher in the Clearwater River dredge material management units (DMMUs) relative to the DMMUs below the confluence in the Snake River. For Clearwater DMMUs 7 – 11 the grain size averaged 96 percent sand, with a relatively narrow range of 92 – 99 percent. The DMMUs (1 – 6) below the confluence were still relatively course, but had a lower sand content that averaged 85 percent, and ranged from 69 to 93 percent.

Port of Clarkston. About 14,143 cy of material will be removed from four berthing areas at the Port of Clarkston: the crane dock at the downstream end of the Port property (RM 137.9), the Lewis-Clark Grain Terminal (RM 138.2), the recreation dock at RM 138.3, and the tour boat dock at the upstream end (RM 139) (Figure 3). The berthing area is a zone extending 50 feet out into the river from the port facilities and running the length of the port facilities. Maintenance in this area is the port's responsibility, and the Port of Clarkston will provide funding to the Corps for this portion of the work. Most of the area was dredged in 2005/2006. Sediment samples were collected in November 2012 and August 2013. The data showed that sediment composition ranged from 45 to 94 percent sand depending on the DMMU. Silt composition ranged from 3 percent to 41 percent.

Port of Lewiston. About 4,664 cy of material will be removed from the berthing area at the Port of Lewiston on the Clearwater River, approximately 1.5 miles upstream of the confluence with the Snake River (Figure 4). The berthing area is a zone extending 50 feet out into the river from the port facilities and running the length of the port facilities. Maintenance in this area is the port's responsibility, and the Port of Lewiston will provide funding to the Corps for this portion of the work. The area was dredged in 2005/2006. The August 2013 sediment samples showed that sediment composition averaged 95 percent sand, and nearly equal proportions of silt and clay.

Ice Harbor Lock Approach. About 3,205 cy of material will be removed from the Ice Harbor lock approach (Figure 5). Routine maintenance dredging has not occurred in this area since the 1970s although about 400 cubic yards of rock and cobble was dredged in Fall 2012 to remove an obstruction that presented a safety hazard in the downstream navigation lock approach. Sediment sampling showed that sediment composition was large rock substrate and cobbles greater than or equal to 2-6 inches.
The Corps anticipates dredging roughly 3,205 cy of rock and cobble from the Ice Harbor Lock downstream approach (McNary Dam Reservoir). Dredging at this site would be expected to take from 6 to 8 hours to complete, would require a single barge load to transport the materials, and would affect slightly less than four acres of rocky habitat in a linear pattern roughly 750 feet long by 225 feet wide (or roughly less than 20 percent of the width of the channel) near the river thalweg. After being loaded, the barge would travel upstream through the four lower Snake River dams. All other proposed Project activities would occur subsequently in Lower Granite Reservoir, primarily in the two areas of the dredging operations at the confluence of the Snake and Clearwater Rivers and the disposal operations at the Knoxway Canyon bench.

The materials to be dredged from the Ice Harbor Lock downstream approach are similar to the riverbed materials in adjacent areas outside of the navigation channel below the dam tailrace. The source of most of these materials is from sloughing of the local riverbed along the steep slopes of the channel due to hydraulic action of barge guidance operations and its redistribution during high flow events through the tailrace. These materials are too large to be readily suspended and transported further downstream by managed flows and, therefore, the Corps determined that mechanical removal would be required to maintain the channel.

Prior to commencing dredging operations at this site, the Corps would conduct underwater redd surveys for fall Chinook salmon within 900 feet downstream of the Ice Harbor Lock. If any redds are located within the proposed dredging template, the Corps would coordinate with NMFS to determine if dredging could proceed without harming or disturbing the redd(s), or if operations would need to be delayed until the fry were able to move out of the area.

The Corps proposes to conduct maintenance dredging in 2014/2015 (or the next available winter in-water work window) to meet the immediate need of providing a 14-foot water depth as measured at minimum operating pool (MOP), with authorized overdepth (up to 16 feet), at these four locations in the lower Snake River and lower Clearwater River. The Corps will use the dredged material to create additional shallow water habitat at the downstream end of Knoxway Bench. The Corp created the Knoxway Bench from material dredged in winter 2005/2006.

Sediment Removal Methods

A contractor will use mechanical methods, such as a clamshell, dragline, or shovel/scoop, to complete the dredging. Based on previous dredging activities, the method will likely be a clamshell. Dredged material will be loaded onto barges, most likely a bottom dump barge, for transport to the disposal site. Clamshell dredges with a capacity of approximately 15 cy and barges with capacity of up to 3,000 cy and maximum drafts of 14 feet will be used. It will take about 6 to 8 hours to fill a barge. The expected rate of dredging is 3,000 to 5,000 cy per 8-hour shift. The contractor could work up to 24 hours per day and 7 days per week if needed. While loading the barge, the contractor will be allowed to overspill excess water from the barge. Water quality monitoring will take place upstream (for background) and downstream of the dredge. Near real-time monitoring will allow a quick response to excessively high turbidity levels. These procedures are similar to those used during the previous dredging action in 2005/2006.

Figure 1. The Federal navigation channel in the Lower Snake River from the confluence with the Columbia River to the confluence with the Clearwater River at Clarkston, Washington. The four dredging locations are the navigation lock approach at Ice Harbor Dam, the Federal navigation channel at the confluence of the Snake and Clearwater Rivers, and the Ports of Lewiston and Clarkston. Dredged material will be used as fill at the Knoxway Canyon bench site to create shallow water habitat (Corps 2012b).

Figure 2. Confluence of the Snake and Clearwater Rivers with the Federal navigation channel dredging area identified. The Clearwater River enters from the east, the Snake River flows in from the south and continues downstream to the west. The Lower Granite Dam is approximately 39 miles downstream (west). The Corps will dredge approximately 458,472 cy of material and barge it downstream to the Knoxway Bench site (Photo courtesy Corps BA 2012).

Figure 3. Port of Clarkston berthing area where the Corp will dredge approximately 14,143 cy of material (Corps BA 2012).

Figure 4. Dredging area at the Port of Lewiston, Idaho where the Corps will remove approximately 4,664 cy of material (Corps 2012).

Figure 5. The Ice Harbor navigation lock approach where approximately 3,205 cy will be dredged and barged upriver to the Knoxway Canyon site.

Disposal Site

Dredged materials will be deposited in the water at the Knoxway Canyon Bench, which is located one-half mile upstream of Knoxway Canyon (Figure 6). Sediment has been accumulating in this low velocity area at an estimated rate of two inches per year since the construction of Lower Granite Dam. In 1992, the Corps visually inspected the substrate at this site during a reservoir drawdown test and determined it to be primarily silt. In 2005/2006, the Corps deposited approximately 420,000 cy of sand and silt at the upstream end of the Knoxway Bench site. They shaped the dredged material to create an estimated 3.7-acre shallow water habitat bench that NMFS expected juvenile salmonids to use, primarily juvenile Snake River Fall (SRF) Chinook salmon (Figure 7). Post project monitoring by the Corp confirmed juvenile salmonids have/are using the site for resting/rearing. The upper surface of this bench material is sand that was reshaped to gently slope towards the river.

Once a barge is full, a tugboat will push it to the disposal site. The barge will not discharge any material or water while in transit. For in-water disposal, the bottom of the barge will be opened at the disposal site to dump the material all at once. After unloading, the barge will return to the dredging site for additional loads. The proposed in-water discharge/habitat development site is located in the Lower Granite reservoir at RM 116. This site is an approximately 120-acre, mid-depth bench on the left bank of the Snake River about 0.5 river miles upriver of Knoxway Canyon.

Dredged material will be deposited downstream from the bench created in 2006, and extend riverward of the existing shoreline (Figure 7). The new material will occupy a 27.4-acre

Figure 6. Knoxway bench location. Knoxway bench is located at approximately RM 116, between Lower Granite Dam and the confluence of the Snake and Clearwater Rivers. (Google Earth Pro; insert photo Tiffan and Connor 2012).

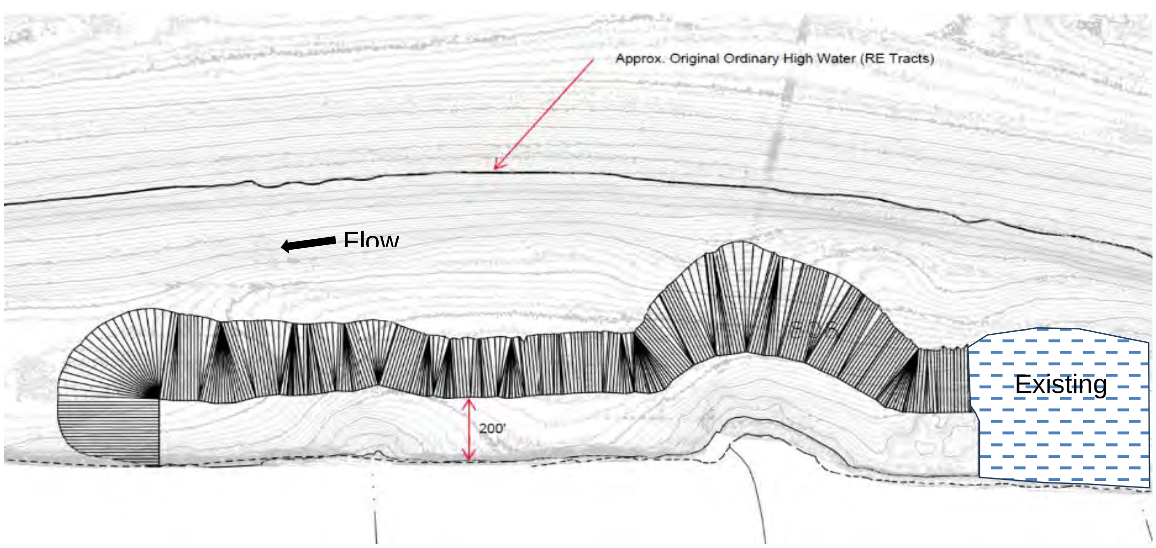

Figure 7. Dredge material placement showing the 200-foot wide shallow-water bench and the steeper side slopes (shaded).

footprint and will form a uniform, gently sloping shallow-water bench along roughly 2,500 linear feet of shoreline. The top of the bench will have roughly a 2 percent slope and will add approximately 11.4 acres of shallow water habitat (Figure 8). This area will be up to six feet deep at MOP with features preferred for foraging by outmigrating juvenile salmonids, particularly for SRF Chinook salmon juveniles. Placement of cobbles, rock, silt, and silt/sand mixture will occur in a manner that will extend the shore riverward along the proposed disposal site to enhance the rearing suitability of the mid-depth habitat bench by creating a low horizontal slope across the newly created shallow-water rearing habitat. The final step includes placing or re-handling the material to form a gently-sloping (2 to 5 percent) shallow area bench with a land-ward depth starting from 4-6 feet sloping down to 8-10 feet deep at the slope transition and 20 feet deep at toe, all measured at MOP.

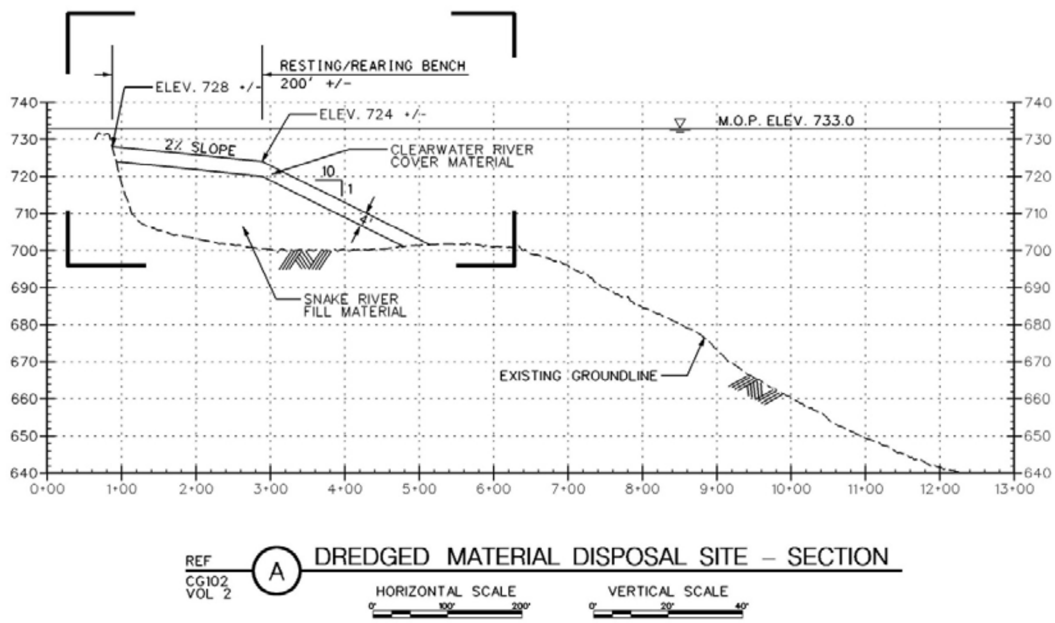

Figure 8. Cross sectional view of proposed disposal site at Knoxway Bench.

Water quality monitoring will occur before, during, and after dredging and disposal operations. A background reference monitoring station will be located approximately 300 feet upstream of all dredging or disposal activities. Project monitoring stations will be located at points 300 feet and 900 feet downstream of dredging and disposal activities. Measurements at the 300-foot station would be used for early warning of excessive turbidity, while the 900-foot station would be used as the compliance boundary for meeting State water quality standards. Compliance monitoring stations are located in the main direction of river flow and, to the extent practical, in the direct path of the plume. Based on results from 2005/2006 when turbidity levels returned to background levels within an hour after cessation of work in most cases, monitoring will continue for one hour following completion of work at each site.

Conservation Measures

A variety of minimization measures and best management practices (BMPs) will be implemented prior to or during dredging and disposal operations to avoid, reduce, or minimize the potential for direct and indirect effects of the project. These measures are designed to reduce or eliminate disturbance, turbidity, resuspension of contaminants, removal of biota, and noise.

ACTION AREA

The action area begins (at the downstream end) at the confluence of the Snake River with the Columbia River at river mile (RM) 0. The action area in the Snake River extends upstream to the confluence with the Clearwater River (approximately RM 146), and from RM 0 to approximately RM 3 on the Clearwater River. The action area also includes upland areas used for staging equipment or other logistical support. Use of these upland areas is unlikely to cause measurable effects to listed fish or critical habitat; therefore, this opinion is focused on the effects of dredging, filling, and barge traffic in the Snake River. The action area is based on the extent of dredging and filling effects, and the extent of indirect effects of navigation by large vessels, consisting almost exclusively of barge traffic.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this Opinion relies on the four following components: (1) the *Status of the Species*, which evaluates the rangewide condition of the bull trout, the factors responsible for that condition, and the species' survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the bull trout in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the bull trout; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the bull trout; and (4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the bull trout.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the species' current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the species in the wild.

The jeopardy analysis in this Opinion emphasizes consideration of the rangewide survival and recovery needs of the bull trout and the role of the action area in its survival and recovery. It is within this context that we evaluate the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Adverse Modification Determination

This Opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the Act to complete the following analysis with respect to critical habitat.

In accordance with policy and regulation, the adverse modification analysis in this Opinion relies on the four following components: 1) the *Status of Critical Habitat*, which evaluates the range-wide condition of designated critical habitat for the bull trout in terms of primary constituent elements (PCEs), the factors responsible for that condition, and the intended recovery function of the critical habitat overall; 2) the *Environmental Baseline*, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; 3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PCEs and how that will influence the recovery role of affected critical habitat units (CHUs); and 4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the PCEs and how that will influence the recovery role of affected CHUs.

For purposes of the adverse modification determination, the effects of the proposed Federal action on bull trout critical habitat are evaluated in the context of the rangewide condition of the critical habitat, taking into account any cumulative effects, to determine if the critical habitat rangewide would remain functional (or if areas within the range that are currently unsuitable, but capable, would retain their current ability for the PCEs to be functionally established) and continue to serve its intended recovery role for the bull trout.

The analysis in this Opinion places an emphasis on using the intended rangewide recovery function of critical habitat for bull trout and the role of the action area relative to that intended function as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the adverse modification determination.

STATUS OF THE SPECIES and STATUS OF CRITICAL HABITAT: Bull Trout

Discussions addressing the rangewide status of bull trout and bull trout critical habitat are provided in Appendix A.

ENVIRONMENTAL BASELINE

Regulations implementing the Act define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area (50 CFR 402.02). Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation, and the impacts of state and private actions which are contemporaneous with consultations in progress.

The following sections addressing the condition of the action area, the status of bull trout in the action area, and the status of critical habitat in the action area are consistent with the information addressed in the PSMP biological opinion. Much of that information is reiterated here to provide sufficient background and context for assessing the proposed Project.

Condition of the Action Area

Under historic river conditions, the deposition of heavier materials (e.g., gravel, rocks, boulders) in the lower Snake River was highly dependent on daily, seasonal, and multi-year flow patterns, while finer-grained suspended sediments tended to be deposited on the river floodplain, high on the channel margins, and in low velocity side channels and off-channel areas. Under these conditions, the riverbed was a complex mosaic of substrates with a variety of pools, runs, and shallow areas that were built and rebuilt repeatedly depending on continuously fluctuating flow patterns. Of particular significance to this consultation, the four lower Snake River dams have severely disrupted the sediment transport cycle of the historic river system. Since construction of the dams, formerly complex habitats in the mainstems of the lower Snake and Clearwater Rivers, as well as some of the lower reaches in the neighboring major tributaries, have been inundated. These impacts generally reduce rivers to single, relatively deep channels with much smaller or disconnected floodplains, side channels, and off-channel habitats (Sedell and Froggatt 1984; Ward and Stanford 1995; Ward et al. 1999). Currently, there are very few shallow water, sandy shoals downstream of the confluence of the Snake and Clearwater Rivers.

The dams and reservoirs within the action area are all part of the Federal Columbia River Power System, which is comprised of a series of multi-purpose, hydroelectric facilities constructed on the lower Snake and Columbia Rivers and operated by the Corps and U.S. Bureau of Reclamation. All of the dams on the lower Snake River are operated by the Corps as run-of-the-river facilities primarily for navigation, hydropower production, and flood control. Under current operations, the pool elevations of the reservoirs within the action area have a maximum potential fluctuation of about five feet. The reservoir shorelines throughout the action area are often steep and characterized by cliffs and talus substrate, while much of the remaining shoreline areas are lined with riprap (i.e., armoring of the banks with stone to prevent erosion) to protect adjacent structures. Relatively little riparian vegetation remains along the shorelines within the action area and the remaining riparian areas are highly fragmented.

In addition to construction of the dams themselves, numerous other human activities (e.g., construction of ports, docks, roads, railways, landscaping, agriculture) have contributed to altering or displacing shoreline riparian and in-stream habitats in the action area. These activities have further reduced the quantity and quality of nearshore habitat by eliminating native riparian vegetation, disrupting natural hydrological cycles, and disconnecting the river mainstems from their historic floodplains. In addition, many native plant species that evolved under the riverine ecosystem are not well suited to the largely static, slack water conditions that are currently present within the action area, and many shoreline areas now support vegetation assemblages that include vigorous stands of non-native, invasive plant species. These altered habitats often provide inadequate protection and refugia for various animal species within the action area.

The Corps maintains a navigation system in the Snake River that enables barges, and other large vessels that require a minimum depth of 14 feet, to travel upstream in the Snake River, from Ice Harbor Dam to Lewiston, Idaho. The Snake River navigation channel extends approximately 140 miles, from the confluence of the Columbia and Snake Rivers at Pasco, Washington, to the confluence of the Clearwater and Snake rivers, and a short distance upstream in the Clearwater River to the Port of Lewiston, at Lewiston, Idaho. Approximately 10 million tons of commercial cargo is transported on the lower Snake River each year with an annual value of between $1.5 and $2 billion (Corps 2012a). Movement of grain from upstream ports toward the Columbia River accounts for most of this cargo, the largest share of which is wheat. Approximately half of all the wheat exported from export terminals on the Lower Columbia River arrives by barge. Commercial barge traffic on the lower Snake River fluctuates from year to year, depending on crop production, the state of the U.S. economy, and trends in world trade. Over the last 20 years the total tonnages of cargo moved through the lower Snake River, and includes McNary Reservoir (cargo statistics do not differentiate between the Snake and Columbia River portions of McNary Reservoir) has ranged from a high of 8,670 million tons in 1995 to a low of 5,301 million tons in 2008.

The vast majority of the proposed activities and more significant anticipated effects of the Project would occur in Lower Granite Reservoir and, therefore, the following discussions address the existing conditions of this portion of the action area in more detail.

The co-occurrence of the river-to-reservoir interface with the confluence of the Snake and Clearwater Rivers cause both rivers to lose much of their energy at the extreme upstream portion of Lower Granite Reservoir, resulting in ongoing deposition of large quantities of transported sediment in this area. The materials deposited at the confluence are primarily coarse to fine sand, with most of the larger materials dropping out further upstream in the Snake and Clearwater Rivers and most of the finer sediments dispersing throughout the main body of the reservoir downstream of the confluence. The Corps estimates that the lower Snake River transports approximately three to four million cubic yards of new sediments each year, and 100 to 150 million cubic yards of sediment have been deposited in the lower Snake River, mostly in Lower Granite Reservoir, since construction of the dams in the mid-1900s. The Corps identified a wide range of potential contaminants that could be present in the river sediments near the confluence of the Snake and Clearwater Rivers, including total organic carbon, semi-volatile organic compounds, TAL metals, PCB, PAH, total petroleum hydrocarbons, halogenated pesticides, organophosphorus pesticides, organonitrogen pesticides, phenylurea pesticides, carbamate pesticides, and glyphosate herbicides. Some of these contaminants can be acutely or chronically harmful to salmonids at high concentrations (Allen and Hardy 1980).

River flows within Lower Granite Reservoir range from over 150,000 cubic feet per second (cfs) in the spring to around 16,000 cfs in the winter. The reservoir has an average width of about 2,080 feet, average depth of 56 feet, and maximum depth of 137 feet (Tiffan and Hatten 2012). Flow conditions in the uppermost portion of the reservoir (roughly 5-15 percent of the impoundment gradient), including the confluence of the Snake and Clearwater Rivers, more closely resemble those of a riverine environment, although the shoreline and in-stream habitats have been significantly altered from historic conditions. This reach comprises an important area for migrating salmonids due to its greater water velocities and generally cooler water temperatures due to inflow from the Clearwater River.

Approximately 10 percent of Lower Granite Reservoir is currently comprised of shallow water habitat (Bennett et al. 1997). Several shallow water areas in the reservoir were created from previous in-water disposal of dredged sediments. Some of the shallow water areas occur at the margins of in-channel islands and mid-channel shelves, and are maintained due to the relatively small fluctuations in water level (typically < 5 feet) resulting from operations at Lower Granite Dam. The consistent water levels of the reservoir also help to maintain benthic habitat and production of benthic invertebrates, which comprise an important food source for many potential prey species (e.g., anadromous salmonids) of adult bull trout. Shallow, backwater areas with low water velocities, relatively warm water temperatures, and accumulations of fine-grained sediments are very limited in the reservoir, and are favored by resident centrarchids (e.g., ray-finned fish such as bass and bluegill) for spawning and rearing. Aquatic macrophyte production in the reservoir is also very limited due to a lack of shallow, backwater areas.

Status of the Bull Trout in the Action Area

Within the broader region encompassing the action area, foraging, migration, and over-wintering habitats for bull trout primarily occur in the mainstems of the Snake, Clearwater, and Columbia Rivers and in the middle to lower reaches of major tributaries to these rivers, while spawning and rearing habitats occur in the extreme upper reaches of the major tributaries (USFWS 2002b, pp. 10-16). The action area encompasses approximately 130 miles of the mainstem of the lower Snake River and 2 miles of the mainstem of the lower Clearwater River just above its confluence with the Snake River. There are no defined core areas or local populations of bull trout within the action area. Any foraging, migrating, or over-wintering bull trout that occur within the action area originate from, or potentially interact with, the local populations within the major tributaries in closest proximity to the action area.

The major tributary nearest to the action area that is used by bull trout is the Tucannon River, which drains southern uplands in the Blue Mountains along the Washington / Oregon border and enters the Snake River at SRM 63, roughly 8 miles below Little Goose Dam and mid-point in the action area (Figure 1). Two other major tributaries used by bull trout in the broader region include Asotin Creek, which is upstream of the action area and enters the Snake River roughly 6 miles above its confluence with the Clearwater River (SRM 145), and the Walla Walla River, which is downstream of the action area and enters the Columbia River roughly 10 miles below its confluence with the Snake River (CRM 314). The nearest spawning and rearing habitats used by local populations of bull trout within the Tucannon, Asotin, Walla Walla, and upper Clearwater watersheds are approximately 35, 28, 60, and 80 miles from the action area, respectively. The status of bull trout within the mainstems of the lower Snake and Clearwater Rivers and the status of the local populations within each of these four neighboring watersheds are addressed separately, below.

In the following sections we describe the watersheds and, where relevant, the core areas and recovery units supporting bull trout that may use the action area for foraging, migration and overwintering. Relevant core areas and recovery units as they have been identified in the original (USFWS 2002) and revised (USFWS 2014) draft recovery plans for the bull trout are listed in Table 1.

Table 1. Relevant core areas and recovery units as identified by the Service in 2014 compared to those identified in 2002.

Current Core Area	**Current Recovery Unit**	**Former Core Area**	**Former Recovery Unit**
Touchet River	Mid Columbia	Touchet River	Umatilla-Walla Walla River Basins
Tucannon River	Mid Columbia	Tucannon River	Snake River Washington
Walla Walla River	Mid Columbia	Walla Walla River	Umatilla-Walla Walla River Basins
Asotin Creek	Mid Columbia	Asotin Creek	Snake River Washington
Seven Upper Clearwater Core areas, and Clearwater FMO Habitat Area	Mid-Columbia	Seven Upper Clearwater Core areas	Clearwater River

<u>Mainstems of the Lower Snake and Clearwater Rivers</u>

Historically, the mainstems of the lower Snake and Clearwater Rivers were used as foraging areas, migration corridors, and over-wintering habitats by fluvial bull trout that originated in tributary streams throughout the broader region. Presently, different portions of the mainstems are used to varying degrees by bull trout depending on the status of the local populations within the neighboring tributaries and the condition of migration corridors that connect the tributaries to the Snake and Clearwater Rivers. Currently, foraging, migrating, and over-wintering adult and subadult bull trout could occur in the lower Snake River reservoirs at any time of year, depending on the availability of suitable water temperatures, but are most likely to be present from November through May. Bull trout would be expected to occur primarily in areas of abundant food resources and cold water refugia while in the mainstems of the rivers, and would likely avoid areas of slack water, limited cover, or where predation by larger fish is possible, such as near docks and riprap.

The Corps regularly conducts fish counts at passage facilities on all four of the lower Snake River dams to monitor various salmonid populations. The Corps' salmonid monitoring program focuses on timing and runs for anadromous fish and was not developed to address bull trout; the anadromous fish monitoring does not continue throughout the year, notably excluding December through February when over-wintering bull trout would be expected to occur in the mainstem. Nevertheless, from 2006 through 2013, a total of 4, 125, 413, and 35 bull trout were documented in the fish ladders at the Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Dams, respectively (Table 2). While the collection of these data was relatively consistent and can be considered comparable among the Dams, they should be viewed with some caution as individual fish were not marked and may have been counted more than once. From 1998 through 2013, a total of 9, 3, and 2 bull trout were also opportunistically documented in juvenile bypass structures during anadromous smolt monitoring activities at the Lower Monumental, Little Goose, and Lower Granite Dams, respectively (Wills, in litt. 2014). Finally, the Service has also monitored individual bull trout in the lower Snake River that were marked using passive integrated transponder (PIT) tags (Wills, in litt. 2014). Between 2006 and 2011, a total of eight PIT-tagged bull trout were detected on 19 separate occasions, including the detection of the same two fish at the Ice Harbor and Lower Monumental Dams, five individuals at Little Goose Dam, and three at Lower Granite Dam (including two in common with the Little Goose Dam detections). The bull trout ranged in size from 135 mm (5.3 inches) to 410 mm (16.1 inches).

Table 2. Fish ladder counts of bull trout at Corps dams on the lower Snake River (2006 – 2013).

Dam Facilities	**Total Number of Bull Trout Recorded by Year**								**Total**
	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	
Ice Harbor	0	0	0	0	0	3	0	1	4
Lower Monumental	2	4	2	5	12	47	27	26	125
Little Goose	3	6	27	37	73	161	42	64	413
Lower Granite	2	8	8	6	8	1	2	0	35
Total	7	18	37	48	93	222	63	91	579

Studies have also documented bull trout originating from local populations in the upper Clearwater River watershed migrating downstream as far as Lewiston, Idaho (USFWS 2008b, p. 33), which is at the upper end of the action area just above the confluence of the Snake and Clearwater Rivers. The mainstem of the lower Clearwater River provides potential connectivity of these local populations to occupied areas within the broader region of the Snake and Columbia Rivers. Migratory corridors such as these also provide bull trout in the broader region with access to unoccupied but suitable habitats, enhanced foraging areas, and refuge from disturbances in other watersheds (Saunders et al. 1991).

Predatory fish occur in the action area. During recent sampling of all four reservoirs in the lower Snake River, studies found that smallmouth bass were the most common predator of all of the eight predatory species (northern pikeminnow, smallmouth and largemouth bass, walleye, yellow perch, white and black crappies, and channel catfish) (Seybold and Bennett 2010). Smallmouth bass were most abundant in Lower Granite reservoir, while northern pikeminnow were more abundant at sampling stations downstream of Lower Granite Dam. Walleye were only caught in Lower Monumental and Ice Harbor reservoirs. Largemouth bass, crappies, yellow perch, and channel catfish were most frequently caught in Lower Monumental and Ice Harbor reservoirs, though catch rates were low. Only the largest predatory fish would prey on bull trout in the action area.

<u>Tucannon River</u>

Genetic analyses indicate that there are currently five local populations of bull trout, and possibly a sixth, within the core area of the Tucannon River watershed (USFWS 2008b, p. 4). These local populations are fairly isolated from local populations in other regional tributaries (USFWS 2010a, p. 427). Both resident and migratory forms of bull trout still occur in the Tucannon River watershed (Martin et al. 1992; WDFW 2004), and some migratory bull trout likely use the mainstem of the Snake River in the general vicinity of the Tucannon River confluence on a seasonal basis (Underwood et al. 1995; WDFW 2004). The Corps' fish count data (Table 2) and other opportunistic bull trout observations (i.e., incidental captures and PIT tag studies) suggest that most of the bull trout documented in the lower Snake River likely originate from the Tucannon River core area, although records also indicate that some of these bull trout originated from other local populations in the Grande Ronde, Salmon, Asotin, or Clearwater Rivers.

Bull trout still occupy most of their historic range in the Tucannon River watershed and, prior to around 2000, this population was considered relatively large (USFWS 2010a, p. 428). However, redd counts and capture records suggest that the population had undergone a pronounced decline by around 2007. For example, the average number of redds documented annually in the upper watershed dropped from over 100 during the early 2000s to less than 20 by 2007 (Mendel et al. 2008), while the number of migrating bull trout documented annually at the Tucannon Hatchery trap (located at approximately Tucannon River mile 35) went from over 250 to around 50 during the same time period (Mendel, in litt. 2008). Many of the bull trout captured in 2007 were also considered in poor health with new or recent injuries (cuts and scrapes) around their heads and gills. The cause(s) of this decline and the poor condition of some of the captured fish are unknown, although two large fires occurred in the Tucannon River watershed during the mid-2000s that resulted in higher sediment delivery to streams in the core area (USFWS 2008b, p. 6). Loss of nutrients and a declining prey base from dwindling anadromous salmonid populations and physical (e.g., dams, fences, nets, weirs) or temperature barriers in the mainstem Tucannon River and its tributaries are also likely contributing factors. More recent information indicates that the Tucannon River population may have rebounded somewhat since 2007, with over 230 bull trout observed annually during trapping and survey activities in 2012 and 2013 (WDFW 2013, p. 7; WDFW 2014, p. 10).

The local populations of bull trout within the Tucannon River watershed can still generally move freely among their natal streams, which largely occur in protected areas of the upper watershed that limit activities that could threaten bull trout (USFWS 2008b, p 12). However, there are likely seasonal temperature barriers in the migratory corridors from the river mouth upstream for roughly 30 miles of the lower reaches during the summer (USFWS 2008b, p. 6). The Tucannon Hatchery trap may also be a partial barrier to bull trout movements during the trapping season from January to September. In addition, recreational dams on several Tucannon River tributaries have been known to block migration of bull trout in the watershed. Ongoing threats within these migratory corridors likely prevent bull trout in this core area from recovering (USFWS 2008b, p. 12). These threats include crop production, irrigation withdrawals, livestock grazing, logging, hydropower production, management of non-native fish species, recreation, urbanization, and transportation networks.

The following are brief descriptions of planning and management actions specific to the

Tucannon River watershed that may generally improve conditions for bull trout in this core area.

The final Tucannon River Model Watershed Plan, developed by the Bonneville Power Administration (BPA) in cooperation with the Natural Resource Conservation Service, WDFW, and Columbia Conservation District, was completed in 1995. The initiative identified various projects that could address limiting factors for salmonids in the Tucannon River, and represents a grass-roots planning effort that has resulted in local landowner support and participation.

Within the Tucannon River watershed, there are a number of landowners enrolled under the Conservation Reserve Enhancement Program (CREP) administered by the U.S. Department of Agriculture (USFWS 2008b, p. 10). These contracts help protect over 1,000 acres of land and 50 miles of riparian habitat in the watershed. There are also various program efforts to improve the efficiency of irrigation projects within the watershed, which have helped maintain roughly 11 cfs of water in the river and placed roughly 951 acre-feet of water under conservation trust agreements. In addition, there have been 48 irrigation diversion screens installed and six diversion pump sites eliminated in the watershed.

The Broughton Land Company HCP has facilitated various measures to improve habitat conditions for bull trout in the Tucannon River watershed (USFWS 2008b, pp 10-11). In addition to enrolling lands under the CREP and irrigation efficiency programs discussed above, other measures implemented for this HCP include establishing riparian buffers, improved grazing management, and developing off-stream livestock watering sites.

In association with various projects, including floodplain restoration work by the Snake River Salmon Recovery Board, the U.S. Forest Service and WDFW have added large woody debris to several streams in the Tucannon River watershed (USFWS 2008b, p. 6). Work to remove or mitigate potential fish passage barriers (e.g., under-sized culverts, recreational dams) in this core area has also been undertaken. In general, ongoing management actions by these resource agencies will improve instream habitat, water temperature, large woody debris, and passage conditions for bull trout in the Tucannon River watershed.

<u>Asotin Creek</u>

Historically, bull trout distribution in the Asotin Creek watershed was thought to be extensive and this core area supported both resident and migratory life forms (USFS 1998a; WDFW 2004). Anecdotal accounts describe anglers catching large (> 20 inch) bull trout from Asotin Creek in the early 1970s (USFWS 2010a, p. 439), and the large sizes of these fish indicate that they probably used the mainstem Snake River to forage, migrate, and over-winter. Currently, a single local population of bull trout is known to occur in the Asotin Creek watershed, although there may be other as yet undetected local populations still present (USFWS 2010a, p. 439). Based on the relatively small sizes of surveyed fish and their occurrence primarily in headwater locations, it is possible that only resident bull trout remain in this core area and that they are largely isolated from other local populations (USFWS 2008b, pp. 17-18; USFWS 2010a, p. 439). However, recent trapping operations have documented a small number of juvenile and migratory adult bull trout near the mouth of Asotin Creek. It is unknown if the adult fish originated from

Asotin Creek or from local populations in other core areas (e.g., Grande Ronde River, Upper Clearwater River) that utilize lower Asotin Creek seasonally as a cold water refuge or for foraging. Genetic samples have been collected from these fish, but they have not been analyzed so the source core area(s) of these fish remains uncertain.

Recent redd counts in the Asotin Creek watershed, although inconsistent, indicate this population may have further declined since about 2000. For example, in 1999 a total of 68 redds were observed in the two upper watershed tributaries known to support bull trout spawning and rearing, while only 12 redds were documented in these same two tributaries in 2006 (USFWS 2008b, p. 19). Bull trout numbers in the Asotin Creek watershed have been at critically low levels (Martin et al. 1992; WDFW 2004; USFS 1998a).

In general, bull trout in this core area have the potential to move freely among their natal streams, however, their movements throughout the lower watershed and into the mainstem Snake River are likely limited due to unsuitable water temperatures during the summer, sub-surface flows of some tributaries due to water withdrawals, and the existence of Head Gate Dam near the mouth of Asotin Creek and several smaller dams on upper tributary streams within the watershed (USFWS 2008b, pp. 20-22). In addition, the lower reaches of Asotin Creek are becoming increasingly urbanized. Residential development in this area has been identified as a primary limiting factor to migratory bull trout. Stream channels near these residential areas are heavily used by domestic animals and humans and are typically altered with riprap or by diking, which can result in increased water temperatures and degraded stream complexity, cover conditions, and prey populations. Finally, the upper portion of the Asotin Creek watershed has been identified as a high fire-prone landscape by the U.S. Forest Service.

Based on the limited amount of known spawning and rearing habitat and the very low population size of primarily resident fish, threats from dewatering, water quality impairments, legacy effects from past forest management practices, and potential fire within spawning and rearing habitats all contribute significantly to threaten bull trout within this core area (USFWS 2008b, p. 26). To reverse the currently depressed condition of bull trout in the Asotin Creek watershed, occupied habitat would need to be further protected and enhanced, while unoccupied habitat would need to be restored so that the population could expand via natural reestablishment, or possibly via a supplementation program (USFWS 2010a, p. 439).

The following are brief descriptions of planning and management actions specific to the Asotin Creek watershed that may generally improve conditions for bull trout in this core area.

The final Asotin Creek Model Watershed Plan, developed by BPA in cooperation with the Natural Resources Conservation Service, WDFW, and Columbia Conservation District, was completed in 1995. The initiative identified various projects that could address limiting factors for salmonids in Asotin Creek, and represents a grass-roots planning effort that has resulted in local landowner support and participation.

There have been hundreds of acres of riparian habitat and several miles of stream reaches protected under CREP in this core area. In addition, various other agency and private conservation activities have taken place, including reduced or modified grazing practices throughout most of the basin, upgraded culverts, road closures and obliteration, and riparian fencing (USFWS 2008b, pp. 22-25). Several recent initiatives to purchase and protect key areas for salmonid populations or to establish easements to address development or other land use activities are also ongoing in Asotin County. These efforts should generally contribute to improving the condition of aquatic habitats for bull trout throughout the watershed.

Walla Walla River

There are at least five local populations of bull trout in the Walla Walla River watershed, two of which occur in the Walla Walla River core area and three of which occur in the Touchet River core area (an occupied tributary of the Walla Walla River). Currently, there is no evidence that bull trout move between these core areas (USFWS 2008b, p. 47). In addition, recent genetic analyses indicate that bull trout within these two core areas are genetically distinct and have remained relatively isolated from one another for some time. There is no apparent genetic differentiation between the migratory and resident forms of bull trout within each core area (USFWS 2008b, p. 49). Migratory bull trout from both core areas have been detected moving into the Columbia River (USFWS 2008b, pp. 44 and 63), including an estimated 192 individuals from 2007 through 2009 (Barrows et al. 2012, p. 9). However, only a very few bull trout have ever been known to return to the Walla Walla core area or to move upstream in the Columbia River to the mouth of the Snake River (Barrows et al. 2014, p. 1).

The Walla Walla River core area still supports both resident and migratory forms of bull trout and is considered a stronghold population within the broader region (USFWS 2010a, p. 410). During the early 2000s, the bull trout population in this core area was considered fairly large with total annual redd counts exceeding 300. However, recent studies suggest that one local population may have experienced a slight decline while the other may have declined by over 50 percent by the late 2000s (USFWS 2008b, pp. 45-46). Further, these apparent declines were mainly due to a loss of migratory bull trout. The available information indicates that adequate winter flows in the upper Walla Walla River watershed are the main factor in maintaining migratory bull trout in this core area, yet the reliability of these flows may be threatened by recent management actions (USFWS 2008b, p. 50). While bull trout have been documented moving throughout the Walla Walla River core area on a seasonal basis and connectivity between the local populations is possible, current habitat conditions (e.g., high water temperatures, low flows due to water diversions) severely limit bull trout from moving freely in much of the lower and middle reaches of the river from about June through November.

Resident and migratory bull trout also still occur within the Touchet River core area (USFWS 2008b, p. 59). The local populations of bull trout within this core area are genetically distinguishable from one another (USFWS 2008b, p. 65). Based on redd surveys, bull trout in the Touchet River core area may have declined slightly during the mid-2000s, but appear to have remained relatively stable since about 1998 (Mendel et al. 2014, pp. 47-49). Very few bull trout have been documented at any time of year in the lower Touchet River below roughly river mile 44 near Waitsburg, Washington (USFWS 2008b, p. 61).

Several factors likely contribute to the depressed conditions of the local populations of bull trout within the Walla Walla River watershed (USFWS 2008b, pp. 63-65). These include construction of small recreational and irrigation dams, mining, road construction and maintenance, local fires, urban development, channelization, irrigation, and flood control measures. In various reaches throughout the watershed, these impacts have led to increased water temperatures and sedimentation levels, inadequate seasonal flows, reduced habitat complexity due to a lack of large woody debris and deep pools, and an increase in non-native predatory or competitive fish species.

The following are brief descriptions of planning and management actions specific to the Walla Walla River watershed that may generally improve conditions for bull trout in these core areas.

With regard to Federal actions, the Service entered into a settlement agreement in 2000 with three local irrigation districts to maintain instream flows in a stretch of the Walla Walla River that had been seasonally dewatered by irrigation diversions. Previous to this agreement, thousands of fish, including numerous bull trout, were impacted annually and it was necessary to implement salvage operations to try and rescue those that became stranded in the dewatered reach. Since implementation of the agreement, fish strandings are no longer a problem in this area. In 2007, the Service completed a section 7 consultation with the Corps regarding the maintenance and operation of the Mill Creek Flood Control Project (USFWS 2008b, p. 51). This effort resulted in further measures to avoid or minimize incidental take of bull trout in the Walla Walla River and addressed river hydrology, bull trout strandings, connectivity of available habitats and fish passage, water quality, and protocols to address emergency operations. In order to help protect Chinook salmon in the South Fork Walla Walla River, the Bureau of Land Management (BLM) has implemented access restrictions to address potential impacts to Federal property due to summer fording of stream channels by vehicles. These measures also helped to protect a migratory corridor and potential prey species for bull trout. Finally, the Forest Service has implemented controlled burns to help avoid or reduce potential impacts from more catastrophic wild fires in the upper Walla Walla River watershed.

With regard to state and tribal efforts, WDFW has implemented game fish regulations within the Walla Walla River watershed that should help to control potential predator species of juvenile and sub-adult bull trout. In addition, the Confederated Tribes of the Umatilla Indian Reservation developed a reintroduction program for Chinook salmon, which has provided a potential prey base for bull trout and may generally improve nutrient cycling within the river system.

Other local conservation initiatives that have been undertaken within the Walla Walla River watershed include installing new or improved fish ladders at several passage barriers, implementing programs to improve irrigation efficiencies and in-stream flows, consolidating and screening various water diversion structures, and implementing measures to reduce the risk of wildfire. Numerous acres of riparian habitat and miles of stream channels within the Walla Walla River watershed have also been enrolled under the CREP. In addition, The Broughton Land Company HCP addresses improved management for bull trout on enrolled properties within the watershed. All of these efforts have helped to generally improve the habitat conditions for bull trout within the two Walla Walla River core areas.

Upper Clearwater River

The upper Clearwater River watershed encompasses 45 known local populations and 27 possible local populations distributed among seven core areas. These core areas are found in the South Fork Clearwater River, North Fork Clearwater River, Selway River, and Lochsa River. Local populations of bull trout in these core areas exhibit migratory (fluvial and adfluvial forms) and resident life history strategies. Except for the North Fork Clearwater River watershed, which is blocked by Dworshak Dam roughly 2 miles above its confluence with the Clearwater River, it is likely that the local populations of bull trout in the upper Clearwater River drainages can move freely between the core areas.

Relatively little is known about the status and trends of the local bull trout populations in the upper Clearwater River watershed and substantial areas of some river reaches remain unsurveyed. Bull trout use of the lower mainstem Clearwater River is seasonal, as summer water temperatures exceed those suitable for bull trout. Conversely, operations at Dworshak Dam may alter the natural temperature regime of river flows by reducing water temperatures below the North Fork Clearwater River confluence, which has the potential to disrupt natural cues for bull trout in the lower reaches to migrate to spawning locations (USFWS 2008b, pp. 32-33). However, it is currently unknown how these thermal changes may affect spawning migrations of bull trout from the upper Clearwater River core areas.

Land and water management activities that may depress local populations of bull trout and degrade habitat conditions in the upper Clearwater River watershed are similar to those in the other regional river systems. These activities may include operation and maintenance of dams and other diversion structures, forest management practices, livestock grazing, agricultural run-off, road construction and maintenance, mining, and the presence of non-native fish species. Dams and diversion structures with inadequate passage or screening facilities can contribute to isolating and fragmenting some local bull trout populations in the upper Clearwater River watershed. Various forestry and grazing practices can impact local bull trout populations by increasing water temperatures through reduced shading of streamside vegetation, decreasing the recruitment of large woody debris, eliminating pools, increasing streambank erosion and sedimentation rates, and generally degrading water quality and aquatic habitat complexity. Some agricultural practices can also impact local bull trout populations through added inputs of pesticides, herbicides, and sediments to aquatic habitats.

The following are brief descriptions of planning and management actions specific to the upper Clearwater River watershed that may generally improve conditions for bull trout in these core areas.

In cooperation with several Federal and other State agencies, the IDFG developed a management plan for bull trout in 1993 (USFWS 2002e, pp. 84-85). As part of the plan, IDFG updated maps of all known bull trout occurrences, spawning and rearing areas, and potential habitats in the State. The plan also calls for IDFG to annually report on all recovery actions that have been undertaken for bull trout in the State. IDFG has undertaken nutrient enhancement actions in Dworshak Dam and implemented eradication programs for non-native fish species in the upper Clearwater River watershed, which could improve conditions for bull trout in these core areas (USFWS 2008b, p. 8). The Idaho Department of Lands (IDL) has developed site specific implementation plans to alleviate identified water quality threats (e.g., from grazing, agricultural run-off) throughout the watershed (USFWS 2002e, pp. 85-86). In addition, IDL has been actively graveling roads that closely parallel bull trout streams to help minimize sediment delivery, and has adopted more stringent stream shading standards to insure that timber harvest activities will not increase water temperatures.

The Service entered into an HCP with the Plum Creek Timber Company in 2000 (USFWS 2002e, p. 87). This HCP helped address existing concerns, improved ongoing management, and should help to reduce potential future impacts to bull trout from actions on the enrolled lands. The U.S. Forest Service and BLM have undertaken various efforts to rehabilitate areas where roads are contributing excess sediment to bull trout habitat throughout the core areas (USFWS 2002e, p. 88). These activities have included upgrading culverts on existing roads and decommissioning other roads. The Forest Service has also developed various timber management prescriptions for the upper Clearwater River watershed to help avoid or reduce potential impacts from wild fires (USFWS 2008b, p. 7). In 1995, the Nez Perce Tribe developed a reintroduction program for coho salmon (*O. kisutch*), which has provided a potential prey base for bull trout and may generally improve nutrient cycling within the river system (USFWS 2002e, p. 90). Many other past and ongoing agency efforts primarily designed to improve conditions for anadromous salmonids have also benefitted bull trout by increasing potential prey abundance, improving aquatic habitats, and enhancing connectivity between core areas within the upper Clearwater River watershed (USFWS 2002e, p. 83).

Summary

Connectivity is important between bull trout local populations, core areas, and forage, migration, and overwintering (FMO) habitats. The lower Snake and Clearwater Rivers provide FMO habitat for bull trout from core areas in the Touchet River, Tucannon River, Walla Walla River, Asotin Creek, and upper Clearwater River. FMO habitats are important to migratory bull trout, since they grow larger and are more fecund than residents, therefore contributing to population stability in core areas. Relative to other salmonids, few bull trout occur within the lower Snake and Clearwater Rivers and little is known about their specific movements and habitat use patterns while in the mainstems of these rivers. Most of the available distribution data in the mainstem Snake and Clearwater Rivers was obtained during salmon monitoring or capture efforts and does not provide information from December to February, when bull trout are expected to use the mainstems for foraging and over wintering. The available information indicates that a relatively small number of bull trout may occur in the action area during the proposed activities and that these fish would represent migrants traveling among the major tributaries within the broader Snake, Clearwater, and Columbia River systems.

Status of Critical Habitat for Bull Trout in the Action Area

Designated critical habitat for bull trout includes the free flowing reaches of the Snake and Clearwater Rivers and their reservoirs to the ordinary high water elevations and normal operating pool elevations, respectively. The action area encompasses the lower half of the Mainstem Snake River CHU and a small portion of the most downstream extent of the Clearwater River CHU. These CHUs are essential to the recovery of bull trout because they contain PCEs that comprise suitable foraging, migration, and over-wintering habitats within the action area and they provide potential connectivity between multiple core areas in neighboring major tributaries throughout the broader region (USFWS 2010a, pp. 527 and 583). The current conditions of the PCEs that comprise bull trout critical habitat within the action area are described below.

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) that contribute to water quality and quantity and provide thermal refugia.

   Currently there are no known springs, seeps, groundwater sources, or subsurface flows that significantly influence the available bull trout habitats. It is typical for rivers to have regions of hyporheic flows, therefore we assume that these regions occur within the Action Area and provide thermal refugia for bull trout. In addition, during the winter months when the proposed actions would occur, water temperatures are not likely to be limiting to bull trout and, therefore, any potential Project effects to this PCE would be considered insignificant.

2. Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, over-wintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

   The Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Dams have altered the lower Snake and Clearwater Rivers within the action area by converting this portion of the historic river system to a series of reservoir (i.e., adfluvial) environments. The operation of these dams disrupts bull trout migration by delaying or impeding upstream and downstream movements and creating conditions where bull trout may be injured or killed by various sources, including mechanical impingement in the dams and elevated dissolved gas levels in the dams' outflows.

3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

   The lower Snake and Clearwater Rivers currently support an abundant food base for adult and subadult migrating and over-wintering bull trout. This is primarily because the relatively stable water levels of the reservoirs help to maintain benthic habitat and the production of benthic invertebrates, which comprise an important food source for many prey species of adult bull trout. Potential forage fish for bull trout, such as juvenile salmon, steelhead, and whitefish (family Salmonidae), sculpins (family Cottidae), suckers (family Catostomidae), and minnows (family Cyprinidae), are present throughout the lower Snake River.

4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks, and unembedded substrates to provide a variety of depths, gradients, velocities, and structure.

   The reservoir environments and flow regimes that are currently present in the lower Snake and Clearwater Rivers within the action area are significantly altered from the historic riverine conditions that existed. Generally, the reservoirs have relatively stable channels and streambanks characterized by cliffs and talus substrate. In some areas, especially in the vicinity of the dams and urban areas, the shorelines have been extensively armored with riprap to protect adjacent structures. Relatively little riparian vegetation remains along the shorelines within the action area. In addition, floodplain encroachment by industrial, commercial, and private development over large portions of the action area have further degraded the historic habitat characteristics (e.g., riparian areas, off-channel habitats, water temperatures) of the original riverine environments. Consequently, the conditions and processes (e.g., seasonal flow patterns, channel complexity, large wood recruitment, litter fall) that supported historic riverine environments within the action area have been replaced with more simplified, adfluvial habitats since construction of the dams.

5. Water temperatures ranging from 36 °F to 59 °F, with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form, geography, elevation, diurnal and seasonal variation, shading (e.g., provided by riparian habitat), streamflow, and local groundwater influence.

   The timing, frequency, magnitude, and duration of water temperature and flow regimes in the lower Snake and Clearwater Rivers have been significantly altered by human activities, such as hydropower production and irrigated agriculture, since at least the mid-1900s. As a result, water temperatures in the lower Snake and Clearwater Rivers, including the action area, often exceed 68^{o} F during the summer (USFWS 2010b, p. 36). Summer water temperatures in major tributaries neighboring the action area (e.g., Tucannon River, Asotin Creek) are also significantly elevated, primarily as a result of warm return flows from adjacent farmland and developed areas, and contribute to the degraded water temperature conditions within the action area. Because of dam release flows of impounded water during the winter, water temperatures in the action area are also typically warmer during the winter compared to many tributary reaches and historic mainstem river conditions (USFWS 2010b, p. 36)), although these somewhat warmer winter temperatures are not likely to negatively impact bull trout.

6. In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo over-winter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates is characteristic of these conditions. The size and amount of fine sediment suitable to bull trout will likely vary from system to system.

   The available historical data suggests that the areas inundated by the lower Snake River reservoirs following completion of the dams did not include any bull trout spawning or early rearing habitats, but that the areas were used as foraging, migration, and over-wintering habitats by adult and subadult bull trout. Therefore, the action area has likely never supported spawning or rearing habitats for bull trout and this PCE is not considered present within the action area.

7. A natural hydrograph, including peak, high, low, and base flows, within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.

The operation of dams throughout the Snake and Clearwater River watersheds has significantly altered the natural river hydrograph within the action area, primarily by decreasing spring and summer flows and increasing fall and winter flows from historic river conditions. The flow conditions in the uppermost portion of the action area, including the confluence of the Snake and Clearwater Rivers, more closely resemble those of a riverine environment, however, the shoreline and in-stream habitats have been significantly altered from historic conditions.

8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

   The water quality of the lower Snake River is described as excellent (Class A) (Washington Administrative Code [WAC] Chapter 173-201A-030), whereas historic flow and temperature regimes within the action area have been significantly altered since construction of the dams. The Corps identified a wide range of potential contaminants that could be present in the river sediments proposed for dredging near the confluence of the Snake and Clearwater Rivers, including total organic carbon, semi-volatile organic compounds, TAL metals, PCB, PAH, total petroleum hydrocarbons, halogenated pesticides, organophosphorus pesticides, organonitrogen pesticides, phenylurea pesticides, carbamate pesticides, and glyphosate herbicides. Some of these contaminants can be acutely or chronically harmful to salmonids at high concentrations (Allen and Hardy 1980).

   Water quantities are likely not limiting for bull trout in the action area.

9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout [*Salvelinus namaycush*], walleye [*Sander vitreus*], northern pike [*Esox lucius*], smallmouth bass [*Micropterus dolomieu*]), interbreeding (e.g., brook trout [*Salvelinus fontinalis*]), or competing (e.g., brown trout [*Salmo trutta*]) species that, if present, are adequately temporally and spatially isolated from bull trout.

   Various non-native predatory fish species that are known to prey on juvenile and sub-adult salmonids and potentially larger fish like bull trout are present in the action area. Known predatory fish include (Seybold and Bennett 2010): northern pikeminnow, smallmouth and largemouth bass, walleye, yellow perch, white and black crappies, and channel catfish.

Consultations and Conservation Efforts in the Action Area

The Service addressed consultations and conservation efforts in the action area in the PSMP biological opinion, and that information is incorporated herein by reference.

Effects of Climate Change in the Action Area: Bull Trout and Critical Habitat

The Service addressed the effects of climate change in the action area in the PSMP biological opinion, and that information is incorporated herein by reference.

Conservation Role of the Action Area: Bull Trout and Critical Habitat

The conservation of the coterminous U.S. population of the bull trout is dependent upon the persistence of bull trout within each of five interim recovery units. Persistence of bull trout within each interim recovery unit is dependent upon maintaining viable core areas. Viable core areas are dependent on the persistence of local bull trout populations, which are in turn dependent upon reliable habitat connectivity for migratory bull trout that provides for genetic and demographic resiliency, especially in response to stochastic events. Therefore, interim recovery units should provide for the long-term persistence of self-sustaining, complex, interacting local populations of bull trout in core areas distributed throughout the species range. The relatively small number and potential isolation of local bull trout populations in the Tucannon River, Asotin Creek, and Walla Walla River core areas makes them vulnerable to extirpation from stochastic events, and increases the importance of maintaining connectivity between them.

The conservation role of the action area is to provide foraging, migration, and over-wintering habitats for bull trout in the lower Snake and Clearwater Rivers, as well as to indirectly support viable core area populations including those within the Tucannon River, Asotin Creek, Walla Walla River, and upper Clearwater River watersheds. Therefore, the lower Snake and Clearwater Rivers are essential to the long-term conservation of bull trout in the region (USFWS 2010a, pp. 427 and 527). Although currently fragmented by the presence of dams, the lower Snake and Clearwater Rivers continue to play an important role in maintaining the migratory life history strategy of local bull trout populations and potential interactions between them in the neighboring tributaries, including genetic exchange and recolonizing opportunities. The lower Snake and Clearwater Rivers also provide an abundant food source for migrating and over-wintering bull trout during fall, winter, and spring (USFWS 2010a, p. 584). Forage fish such as juvenile and sub-adult salmonids, sculpins, suckers, and minnows are present throughout the action area. Mainstem habitats in the lower Snake and Clearwater Rivers will likely become increasingly important to bull trout as recovery plans are implemented in the neighboring tributaries and the status of their local populations improves (USFWS 2010a, p. 584).

The conservation role of the action area is to provide foraging, migration, and over-wintering habitats for bull trout in the lower Snake and Clearwater Rivers, as well as to indirectly support viable core area populations including those within the Tucannon River, Asotin Creek, Walla Walla River, and upper Clearwater River watersheds.

EFFECTS OF THE ACTION

The Act's implementing regulations define "effects of the action" as the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The following discussions address the potential effects of the proposed Project on bull trout and designated critical habitat for bull trout.

Effects to Bull Trout

Actions at the Ice Harbor Lock Downstream Approach

The Corps anticipates dredging roughly 3,205 cy of rock and cobble from the Ice Harbor Lock downstream approach (McNary Dam Reservoir). Dredging at this site would be expected to take from 6 to 8 hours to complete, would require a single barge load to transport the materials, and would affect slightly less than four acres of rocky habitat in a linear pattern roughly 750 feet long by 225 feet wide (or roughly less than 20 percent of the width of the channel) near the river thalweg. After being loaded, the barge would travel upstream through the four lower Snake River dams. All other proposed Project activities would occur subsequently in Lower Granite Reservoir, primarily in the two areas of the dredging operations at the confluence of the Snake and Clearwater Rivers and the disposal operations at the Knoxway Canyon bench.

The materials to be dredged from the Ice Harbor Lock downstream approach are similar to the riverbed materials in adjacent areas outside of the navigation channel below the dam tailrace. The source of most of these materials is from sloughing of the local riverbed along the steep slopes of the channel due to hydraulic action of barge guidance operations and its redistribution during high flow events through the tailrace. These materials are too large to be readily suspended and transported further downstream by managed flows and, therefore, the Corps determined that mechanical removal would be required to maintain the channel.

Prior to commencing dredging operations at this site, the Corps would conduct underwater redd surveys for fall Chinook salmon within 900 feet downstream of the Ice Harbor Lock. If any redds are located within the proposed dredging template, the Corps would coordinate with NMFS to determine if dredging could proceed without harming or disturbing the redd(s), or if operations would need to be delayed until the fry were able to move out of the area.

Very few bull trout have been documented at the Ice Harbor Dam fish ladder (Table 2). While little is known about their specific movements and habitat use patterns in the lower Snake River, the available information indicates that very few, if any, bull trout would be present in the area for the relatively short duration of time that it would take to complete the fall Chinook redd surveys and dredging operations at the downstream approach. Furthermore, boats, personnel, and equipment performing redd surveys and the surface operations of the tug boat and barge would be expected to create only minor amounts of disturbance in the area or while in transit, and the action area is already subject to other shipping, boating, and shoreline activities. Barge traffic associated with the Ice Harbor Lock activites is likely to be similar to levels already occurring in the rivers. Operation of the dredging equipment would be expected to create a moderate amount of disturbance at each dredge site. However, the proposed dredging footprint is only roughly 225 feet wide, while the river channel is over 1,200 feet wide at this point. Furthermore, the actual area impacted by the dredging equipment at any one time would represent a small fraction of the total dredging footprint.

Even if a small number of bull trout may be present in the area during dredging activities, potential disturbance effects would be of short duration (roughly 8 hours) and limited to the immediate area surrounding the barge to the river bottom, while the broader river channel with similar available substrates would remain undisturbed. In addition, due to the large size of the materials to be dredged and the flow conditions of the site, it is expected that minimal amounts of fine-grained sediments or potential contaminants would be liberated during the dredging operations. Only minor amounts of downstream turbidity would be expected and any turbidity plumes would quickly dissipate considering the water volume and flow characteristics of the site. Therefore, it is expected that any bull trout that may be present in the area would be able to move away from the disturbance and avoid the minor amounts of turbidity created.

Based on the above, the Service concludes that the proposed activities at the Ice Harbor Lock downstream approach would not impact any high-quality habitats potentially used by bull trout or create any significant disturbance in areas likely to be occupied by bull trout at the time of the proposed activities. For these reasons, the effects from these proposed actions are expected to be insignificant to the bull trout. Therefore, considering the current status of the bull trout and the anticipated project effects in this portion of the action area, the Service concludes that the proposed survey and dredging operations at the Ice Harbor Lock downstream approach may affect, but are not likely to adversely affect the bull trout.

Actions in Lower Granite Reservoir

Surface operations include the use of boats, tug boats, barges, and equipment to perform redd surveys, conduct dredging and disposal (does not consider the actual dredging or disposal), and to travel to and from the dredging and disposal locations. The use of boats, tugs, barges are expected to create only minor amounts of disturbance in the area or while in transit. The action area is already subject to other shipping, boating, and shoreline activities. Operation of the dredging equipment would be expected to create a minor amount of disturbance to bull trout that may be present within the action area at each dredge site. Surface operations associated with the Project are likely to be similar to levels already occurring in the rivers. The Service concludes that the proposed surface operations have insignificant effects on the bull trout, and are not discussed further.

Any shoreline or upland staging areas or other ancillary Project activities (e.g., securing supplies, transporting personnel) would take place in previously developed or heavily disturbed sites, and would be expected to have no effect on bull trout. Therefore, the remainder of this section addresses the proposed dredging activities that would take place at the confluence of the Snake and Clearwater Rivers within Lower Granite Reservoir, and the proposed disposal activities that would take place at the Knoxway Canyon bench in Lower Granite Reservoir.

Few bull trout have been documented at the confluence of the Snake and Clearwater Rivers or within the main body of Lower Granite Reservoir. While little is known about their specific movements and habitat use patterns in this portion of the action area, the available information indicates that low densities of bull trout would be present in the vicinity during the dredging and disposal operations. The winter season, the time of the proposed action, is the more likely time of bull trout presence, and there could be various direct effects to any bull trout that may be present as a result of the proposed Project activities. Potential direct effects include injury, death, entrainment, and disturbance; effects from suspended sediment; re-suspension and redistribution of contaminants; and loss or degradation of foraging and migration habitats. The following discussions address each of these potential direct effects to bull trout in Lower Granite Reservoir.

In-water Construction Noise and Entrainment, or Injury

The Corps anticipates that nearly all dredging would be completed using a clamshell bucket. Clamshell buckets are not likely to injure or entrain fish under typical operating conditions because they descend to the substrate in an open position and ascend to the surface in a closed position. The force generated by the descent of the bucket drives the jaws into the substrate. Upon retrieval, the jaws fully close to contain the sediment. It is possible, yet very unlikely, that bull trout near the riverbed could be injured or killed as the jaws of the bucket descend and contact the substrate, or that they could become entrained in the bucket as it closes prior to ascending. Likewise at the disposal site, it is possible, yet very unlikely, that bull trout in the immediate area could be engulfed, injured, or killed as barge loads are released and the materials descend through the water column, or by equipment during final contouring operations.

These potential effects would be most likely to occur just as operations begin at a given work site. Dredging and disposal results in a considerable amount of splashing, noise, and movement of equipment both in and out of water each time a scoop or bucket is dropped into the water and pulled back to the surface, or as the barge is ready to unload the dredged material. The disturbance caused by operating a mechanical dredge is likely to elicit a startle response in any bull trout that are in the vicinity of the dredge and also discourage more distant fish from moving toward the dredge site.

Drabble (2012) investigated the potential for disposal of dredge materials to bury marine organisms, and found that organisms vulnerable to burial consisted primarily of those that live near the bottom or are incapable of making a rapid escape. The same principle was also described by Nightengale and Simenstad (2001) who noted that juvenile white sturgeon in the Columbia River were susceptible to burial by in-water sediment disposal due to their small size, limited swimming ability, and tendency to physically rest on the stream bottom. Bull trout do not have any of the characteristics that make fish vulnerable to burial. Adult and subadult bull trout have relatively high swimming speeds that enable them to rapidly escape when they are alarmed, and they do not rest on the stream bottom, although they may stay near cover on the bottom. Nonetheless, the Service expects that any bull trout that may be present would avoid the immediate area of disturbance once operations are underway and therefore, the Service concludes that the in-water construction would have insignificant effects on the bull trout.

The Corps has committed to address the potential for impacts due to entrainment or injury of bull trout that may occur in the immediate area during dredging and disposal operations. The Corps has also committed to preserve any dead specimens of bull trout that are encountered, to document any information associated with their cause of death, and to provide these to the Service as soon as possible. To do this, the Corps would conduct visual monitoring of the waters surrounding active dredging and disposal work sites for any sick, injured, or dead fish, and notify the Service or NMFS as appropriate. If a sick, injured, or dead fish is encountered, and it can be safely recovered, it would be placed in a container of cold river water until its identity can be confirmed. If it is determined to be a bull trout, the Corps would notify the Service's Division of Law Enforcement as soon as possible for further instructions (see Reporting Requirements). If a healthy bull trout becomes entrained by the operations, the Corps would make every reasonable attempt to safely return the specimen back to the river away from the immediate work site as soon as possible.

Project activities at the dredging sites within the Federal navigation channel and the two ports would add to the existing amount of human-generated noise and activity at the confluence of the Snake and Clearwater Rivers, both in the main river channel and near the shoreline. In addition, Project barges and dredging equipment could remain at one site within the river channel for up to several days, as opposed to the transitory presence of most existing boat and barge traffic at the river confluence. However, the existing boat and barge traffic in this portion of the action area currently generates considerable noise and human activity on a regular basis. The proposed Project activities would take place at these already impacted sites, would be confined to the immediate area where work is occurring for several days at a time, and would be expected to contribute only minor amounts of additional disturbance within the broader area of the river confluence.

At the Knoxway Canyon disposal site, each barge and its tug would typically only remain at the site for up to about 20 minutes as the barge is unloaded, similar to existing transitory boat traffic in this area, whereas equipment and personnel could remain at the disposal site for over a week during final contouring operations. However, the actual work sites for re-handling the materials would represent a small fraction of the total disposal footprint and most of this work would take place in recently disturbed, newly created shallow water habitat well away from the river thalweg, where any bull trout and their potential prey species (e.g., juvenile salmonids) that may be present would be most likely to occur during the proposed work window (NMFS 2004, pp. 19-20).

Effects from turbidity and suspended sediments:

The Corps anticipates dredging approximately 477,279 cy of sediments from the Federal navigation channel and the two ports at the confluence of the Snake and Clearwater Rivers and, in addition to the single barge load of material from the Ice Harbor Lock downstream approach, depositing them at the Knoxway Canyon bench. Dredging operations could take the entire 77-day work window (from December 15 to March 1), run 24 hours per day (1848 hours), and require approximately 160 barge loads to transport the materials. Dredging would affect over 118 acres of sandy, shallow water and mid-depth habitats from the shoreline to the thalweg and span up to 50 percent of the width of the river channel. After being loaded, each barge would travel approximately 22 miles downstream to the Knoxway Canyon bench to deposit its load before returning to the active dredge site. The Ice Harbor Lock barge would travel upstream to the Knoxway Canyon bench area.

Activities at the disposal site would be periodic as each barge is unloaded, occurring for up to 20 minutes approximately every 8 hours. It is estimated that it would take up to an additional hour for turbidity plumes created at the disposal site to dissipate to background levels. Final contouring operations at the disposal site would be nearly continuous for potentially up to one week. Disposal operations would directly impact over 27 acres of existing mid-depth habitats. All of these activities will result in increased turbidity and suspended sediment levels.

Quantifying suspended sediments and turbidity levels and assessing their potential effects on fish is complicated by several factors. First, suspended sediments and turbidity from in-water activities will typically decrease as distance from the activities increases. How quickly suspended sediments and turbidity levels attenuate in space and time (i.e., their dilution factors) depends on the quantity of materials in suspension, the particle sizes of suspended sediments, the amount and velocity of river flow, and the physical and chemical properties of the sediments. Second, the potential impacts of these sediments on fish is not only related to turbidity and suspended sediment levels, but also to the particle sizes and constituents of the suspended sediments and the species and other characteristics (e.g., age, habitat use) of the fish potentially impacted. Third, it is difficult to determine how bull trout will react to increased sediment plumes. They may try to avoid the plume by migrating away from the increased sediment, or they may settle to the bottom of the river and wait out the plume.

In salmonids, excessive turbidity and suspended sediments can elicit a number of adverse effects to bull trout (Table 3). These potential adverse effects may be correlated to projected project turbidity concentrations and duration (Table 4). The turbidity concentrations and duration were determined from the Corps' 2005/2006 turbidity monitoring data for similar type dredging and disposal activities.

Table 3. Summary of potential adverse effects to fish resulting from elevated suspended sediment levels (after Anderson et al. 1996, Newcombe and Jensen 1996, Bash et al. 2001, and USFWS 2010c).

Physiological	**Behavioral**	**Habitat**
Gill Trauma; Increased Coughing; Increased Respiration Rate[1]	Alarm Reaction; Avoidance Response; Abandonment of Cover[1]	Reduction in Spawning Habitat
Impaired Osmoregulation[1]	Territoriality[1]	Effect on Hyporheic Upwelling
Impaired Blood Chemistry (increases in levels of stress hormones) [1]	Reduction in Feeding Rates and Feeding Success; Increased Exposure to Predation[1]	Reduction in Benthic Invertebrate Habitat
Reduced Fitness; Impaired Growth and Reproduction; Increased Susceptibility to Disease; Delayed Hatching; Reduced Fish Density; Direct Mortality[2]	Impaired Homing and Migration[1]	Damage to Redds

[1] Behavioral and sublethal effects.
[2] Lethal and paralethal effects.

Table 4. Potential adverse effects on juvenile and adult salmonids associated with exposure to elevated suspended sediment levels[1] over given time periods (after Newcombe and Jensen 1996 and USFWS 2010c)..

Description of Effect	**NTU Level (TSS)**	**Duration**
Behavioral: Alarm Reaction, Avoidance Response, Abandonment of Cover	62 (148) 41 (99) 17 (40) 8 (20)	Instantaneous Up to 1 hour Up to 3 hours Up to 7 hours
Sublethal: Short- to Long-Term Reduction in Feeding Rates or Success, Moderate to Major Respiratory or Physiological Stress, Impaired Homing, Moderate Habitat Degradation, Poor Condition	461 (1097) 372 (885) 145 (345) 70 (167)	Instantaneous Up to 1 hour Up to 3 hours Up to 7 hours
Lethal / Paralethal: Reduced Growth Rates, Delayed Hatching, Reduced Fish Densities, Severe Habitat	9251 (22026) 3403 (8103)	Instantaneous Up to 1 hour

Degradation, Direct Mortality	1252 (2981) 461 (1097)	Up to 3 hours Up to 7 hours

[1] Salmonids can be adversely affected by total suspended sediments (TSS, measured in mg/L), but monitoring often evaluates turbidity which is measured in NTUs. Schroeder (2014, p.2) determined that the dredging plume modeling data showed a ratio of 2.4 mg/L TSS to 1 NTU; or NTU levels roughly equivalent to 0.42 reported TSS levels (after Corps 2014f).

Although no data are available specifically for bull trout, increases in suspended sediments and turbidity may affect bull trout behavior in several ways. Fish may avoid high concentrations of suspended sediments altogether (Hicks et al. 1991), whereas lower concentrations may reduce feeding efficiency (Sigler et al. 1984). In addition, social behaviors (e.g., schooling) may be altered by suspended sediment (Berg and Northcote 1985).

High concentrations of suspended sediment can result in physiological responses (i.e., gill flaring, coughing, increase in blood sugar levels) that may affect survival, growth, and behavior of salmonids and stream biota upon which they feed (Harvey and Lisle 1998). Moderate levels of turbidity (e.g., 35-150 nephelometric turbidity units (NTU)) may also accelerate foraging rates among some juvenile salmonids, likely because of reduced vulnerability to predators due to camouflaging effects (Gregory and Northcote 1993). Although suspended sediment has the potential to injure or kill fish, the typical response of salmonids to increasing amounts of suspended sediment is to move in an attempt to avoid the sediment (Bash et al. 2001; ENCORP 2009, Robertson et al. 2006; Servizi and Martens 1992). With this behavior pattern, fish that are capable of swimming against the current in a river can often escape plumes of suspended sediment if cleaner waters are available nearby.

Another effect from turbidity and suspended sediments is when the particles settle and contribute to local sedimentation of the riverbed. Sedimentation can cause a number of adverse effects to salmonids, including displacing potential prey species (Spence et al. 1996), negatively influence the exchange of streamflow and shallow alluvial groundwater, and generally depress riverine productivity (Newcombe and Jensen 1996; NMFS 2004, p. 19). Considering the water volume, flow characteristics, and existing habitat conditions of the Snake River below the dredging and disposal sites, the Service does not expect that any adverse effects to bull trout would occur due to excessive sedimentation of the riverbed downstream of the dredging.

Dredging may enable barge traffic that can cause brief episodes of increased turbidity near the shore from wakes generated by moving vessels. Turbidity caused by wakes would be limited to near-shore areas that have deposits of fine sediment. The duration and frequency of turbidity increases from barge wakes is unlikely to rise to a level that would adversely affect bull trout.

The PSMP biological opinion discussed suspended turbidity effects on salmonids in general, and bull trout in particular. The information is summarized as follows:

- The average background turbidity levels in the Snake and Clearwater Rivers during the winter dredging period in 2005 and 2006 was less than 5 NTU. Data collected in 2005-2006 indicates that background turbidity was lowest at the confluence of the Snake and

Clearwater Rivers and increased farther downstream in the Snake River.

- During dredging at the Port of Clarkston, at 300 feet downstream and 3 feet above the substrate, turbidity levels exceeded standards (greater than 5 NTU above background, which is the point of compliance for Washington State water quality standards) by an average of 4.58 NTUs (totaling 9.58 NTUs above background), 11.6 percent of the time; and at 3 feet below the surface, an average exceedance of 2.62 NTU (totaling 7.63 NTUs above background) occurred 1.8 percent of the time. At 600 feet downstream, the shallow probe turbidity values exceeded compliance levels (more than 5 NTUs above background) 20 percent of the time, with an average of 3.87 NTU (8.87 NUTs above background). The deep probe exceeded compliance levels 35 percent of the time, with an average of 5.84 NTU (10.84 NTUs above background) (BA). During previous dredging and disposal efforts, turbidity levels occasionally ranged from 6 to 15 NTUs above background for several hours at a distance of 900 feet downstream. The majority of the time during dredging activities, turbidity remained within 5 NTU over background.

- Based on the data collected during dredging in 2005/2006 and the estimated levels and duration that would cause behavioral, sublethal or lethal effects to salmonids or bull trout; it is expected that turbidity levels within 900 feet of a dredge would increase to levels that will cause behavioral responses (alarm, avoidance, abandonment of cover) in adult and subadult bull trout that are within the turbidity plume, and potentially higher turbidity levels that cause sublethal effects and physiological stress (Table 4).
- The Service received the 2005/2006 monitoring data for turbidity levels that exceeded the 5 NTU threshold, and ran the Newcombe and Jensen (1996) analysis. At both the 300 feet and 600 feet monitoring stations, increased turbidity levels resulted in SEV of 3 to 6. These SEV levels indicate behavioral and sublethal effects ranging from abandonment of cover, avoidance response, short-term reduction in feeding rates and success, and moderate physiological stress with increased coughing and respiration rates. As described above, an SEVof 6 indicates adverse effects to adult bull trout, through causing moderate levels of physiological stress.

- Schroeder 2014 anticipated that the turbidity plumes created would not exceed 5 NTUs above background beyond 3,000 feet downstream or 450 feet laterally (under the worst case scenario) within the river channel below any work zone at any one time. These dimensions would equate to roughly 30 acres of affected surface area that would extend to the riverbed; this area would move as the dredge moves.

- Based on the modeling provided by Schroeder, the results of previous monitoring, and the analysis in bullets above, it is likely that bull trout remaining in turbidity plumes may be exposed to turbidity levels indicating behavioral changes from exposure to at least 20 mg/L (8 NTU) for periods of at least 7 hours, and nearer the dredge higher levels of turbidity which indicate physiological stress. These exposures may occur within an area of 450 feet measured laterally cited in the BA, and up to 300 feet downstream typically, or 900 feet downstream in a worst case scenario. At closer

> locations to the dredging site, it is likely that bull trout remaining in the plume would be exposed to higher levels of suspended sediment, resulting in sublethal adverse effects described in Table 4.

To monitor for State water quality standards for the Project, the Corps will measure turbidity at 300 and 900 feet away from the dredging and disposal activities. While the State water quality standards do not by themselves provide a turbidity or suspended sediment level that indicates adverse effect to bull trout, the monitoring stations can be used as a proxy for monitoring levels that may indicate adverse effects closer to the dredge or disposal activity. Therefore, for the purposes of this Opinion, Washington State water quality standards (i.e., NTU criteria) are used as a reasonable proxy for monitoring and quantifying adverse effects to bull trout, and the levels of adverse effect are described in more detail below.

The typical winter work window of December 15 to March 1 in the Snake River was developed mainly for anadromous fish, and don't minimize impacts to the bull trout that use the Snake River for foraging, migration, and overwintering. Bull trout may occur in the action area year-round. While densities of bull trout are likely low, their distribution in the winter is not well known. Typical salmon and steelhead monitoring and capture facilities, including ladders, do not run or are not monitored throughout the winter. Bull trout migrate large distances, and may occur in the dredging or disposal areas in the winter.

Based on the Corps's 2005/2006 turbidity monitoring data, the Service does not expect that any lethal effects to bull trout due to suspended sediments and turbidity from the proposed Project activities will occur. However, various sublethal effects, including behavioral responses, and physiological stress, would be expected to occur to any bull trout that may be present and exposed to elevated turbidity and suspended sediment levels. Due to the long extended dredging operations (77 days) during the time when bull trout may be in the area, the Service expects exposure of subadult and adult bull trout is reasonably certain to occur, despite the low densities of bull trout within the action area. Project impacts associated with increased turbidity and suspended sediments resulting from the proposed in-water work will be temporary and would be expected to last for various lengths of time. The Service expects that the proposed dredging and disposal operations will result in adverse effects to bull trout up to 900 feet downstream of the dredging and disposal activities.

The Corps will establish 800 foot by 600 foot work zones for dredging above set monitoring locations (Corps 2014b). The Corps will continuously record turbidity levels at two set locations downstream of the established work zone, 300 feet for early warning, and 900 feet for compliance. These turbidity monitoring locations are the same as work progresses through the established dredging and disposal work zones. As such, the early warning and compliance monitoring stations could be as much as 1,100 feet and 1,700 feet from the generation points of the plume (i.e., operation of the clamshell and water discharge from the barge), respectively, and as much as 300 feet laterally off-set in the channel. It is anticipated that the turbidity plumes created by the proposed Project could result in adverse effects to bull trout within 900 feet downstream and 450 feet laterally below any work site (i.e., actual location of the dredge and barge). These dimensions equate to roughly 9.3 surface acres of the river channel down to the riverbed at any one time. This plume may occur anywhere within a roughly 41 acre (i.e., 1,700 feet by 1,050 feet) area from the upstream end of, and encompassing, each established work zone. The location of the 300 foot and 900 foot monitoring locations will be known, and the Corps committed in the BA that water quality monitoring will be conducted at the dredging and disposal sites in near real-time so that operational changes can occur rapidly if water quality standards are exceeded. Data for future sediment modelling will be more precise if the Corps also tracks the location of the dredging and disposal activity in relation to the monitoring sites.

Based on the above information and the results of monitoring that has occurred during past dredging and disposal operations, the Service does not anticipate any lethal or paralethal effects to bull trout due to turbidity from the proposed Project activities. This is because, even under worst-case scenarios, turbidity levels approaching these extreme values would be expected to only rarely occur over a very restricted area (Corps 2014d, pp. 4-7) and the potential for physical injury to any fish that may be present would be of greater concern. However, various sublethal effects, including potential behavioral responses, would be expected to affect small numbers of bull trout that remain within or enter the turbidity plumes created downstream of each active work site. The Service expects that adverse effects to bull trout through behavior modification will occur no more than 900 feet downstream of dredging activities, and adverse effects through physiological stress will occur within 300 feet. Adverse effects will occur at the following turbidity levels (Table 4).

Within 900 feet:

- When NTUs exceed 62 NTUs at any time.
- When NTUs exceed 41 NTUs for 1 continuous hour.
- When NTUs exceed 17 NTUs for up to 3 hours, cumulatively.
- When NTUs exceed 8 NTUs for up to 7 hours, cumulatively.

Within 300 feet:

- When NTUs exceed 461 at any time.
- When NTUs exceed 372 for up to 1 continuous hour.
- When NTUs exceed 145 for up to 3 hours, cumulatively.
- When NTUs exceed 70 for up to 7 hours, cumulatively.

Re-suspension and Redistribution of Contaminants: The dredging and filling operations will have a negative effect on water quality while operations ensue by increasing suspended sediment and turbidity. Contaminants bound to sediments removed by dredging will be resuspended in the water column for roughly the same distance and duration as the suspended sediment. A fraction of the resuspended contaminants are likely to separate from the sediment particles and remain in the water column as dissolved or suspended chemicals. All sediments proposed for dredging are screened for the presence of contaminants prior to dredging, following procedures by USACE et al (2013) and Michelsen (2011). These screening procedures trigger bioassays and intensive sediment sampling and chemical analysis if contaminants are found at specified concentrations that are set below state and Federal water quality standards.

Using appropriate sampling designs and currently available protocols, the Corps tested for the presence of over 200 compounds in the sediments proposed for dredging near the confluence of the Snake and Clearwater Rivers (Corps 2012b, pp. 15-22). Most of the provisional results of these tests were either below instrument detection limits or far below existing regulatory criteria, while some indicated that certain compounds (i.e., phenol and 4-methylphenol) required additional testing to determine their potential toxicity in the sediments and resulting turbidity plumes. These additional tests involved bio-assays where the survival and response of surrogate aquatic macroinvertebrates (i.e., an amphipod [*Hyalella azteca*] and a midge [*Chironomus dilutus*]) were subject to comparable exposures of the subject contaminants. None of these subsequent tests found contaminant concentrations that exceeded established criteria that would be considered harmful to the environment and, thus, the sediments were determined to be appropriate for in-water disposal since they did not exceed regulatory thresholds or established criteria. None of the tests found significant amounts of chemicals known to bioaccuumulate.

There remains some uncertainty as to the potential exposure and risks to the aquatic environment from 4-methylphenol in the turbidity plumes (NMFS, in litt. 2014, p. 1; Corps 2014e, p. 1). To help address these concerns, the Corps would collect water samples up to three times per day for the first two weeks of operations at the 300 foot sampling location when turbidity levels there exceed the State standards. Samples would be analyzed under laboratory conditions to determine specific levels of 4-methylphenol, total suspended solids, and turbidity. Due to the anticipated time lag between sample collections and the availability of results, the data would be used to generally improve the information base and, potentially, to help develop adaptive management measures for possible future dredging and disposal operations or other sediment control actions.

None of the potential contaminants tested exceeded existing regulatory thresholds or other established criteria, based on the current best available scientific information. However, bioaccumulation and related effects are of concern, as pollutants can reach concentrations in higher trophic level organisms (e.g., salmonids) that far exceed ambient environmental levels (Meador et al. 2004; Meador et al. 2006; Meador et al. 1995). Bioaccumulation may therefore cause delayed stress, injury or death as chemicals of concern move from lower trophic levels (e.g., benthic invertebrates or other prey species) to predators long after the chemicals of concern have entered the environment or food chain. The result is that some organisms may experience adverse effects of some chemicals of concern even while the regulatory thresholds are met when measured in surface water or sediments, although these may be more accurately described as indirect effects.

Other non-pesticide compounds that are common constituents of urban pollution and agricultural runoff also adversely affect salmonids, and likely similarly affect bull trout. Exposure to metals, chlorinated hydrocarbons and aromatic hydrocarbons causes olfactory inhibition, immunosuppression and increased disease susceptibility (Arkoosh et al. 1998; Baldwin et al. 2003; Meador et al. 2006; Sandahl et al. 2007; Sprague 1968). Ammonia is present in the aquatic environment due to agricultural run-off and decomposition of biological waste and can be toxic to fish, especially when the pH is relatively high (above 7.5) as is the case in the Snake River (Dixon Marine Services 2006). However, the ammonia concentrations determined during the 2005-2006 dredging indicates that levels remained below the current Environmental Protection Agency (EPA) standards (2009). Additionally, ammonia does not have bioaccumulation potential common to fat soluble organic compounds.

Another area of uncertainty is how the proposed actions may actually redistribute potential contaminants within the action area. In-water disposal operations would involve dumping the dredged sediments directly from a barge into the river, which would redistribute any potential contaminants from the dredging sites at the confluence of the Snake and Clearwater Rivers to the disposal site at the Knoxway Canyon bench. Further, most of the potential contaminants of concern are bound to the finest particulates (i.e., silts), which are more likely to move over time with river flows. To help address this concern, the Corps proposes to further limit the possible risks of redistributing potential contaminants by conducting the disposal process in steps. The first step would be to place the large rocks and cobbles from the Ice Harbor Lock downstream approach at the bottom of the bench to provide underwater structure to help form the base of the embankment. This would be followed by placement of material from the Federal navigation channel in the Snake River and the Port of Clarkston, which contains the majority of fines and other constituents that may be of concern, to cover the rocky material and create an underwater shelf several feet below the desired final grade of the embankment. Next, material from the Port of Lewiston and the Federal navigation channel in the Clearwater River, which contains nearly pure coarse sand, would be placed on top of the shelf to form a “cap” of sandy material several feet deep to cover and isolate any potential contaminants from the substrate / water interface. Based on current information regarding chemical effects to bull trout and other salmonids, the Project expose bull trout to re-suspended chemicals, but not at levels that are known to have direct adverse effects.

Effects to Foraging and Migration Habitats: The most important habitat attributes to bull trout that may occur at the confluence of the Snake and Clearwater Rivers and the area of the Knoxway Canyon bench are the presence of abundant food items, including juvenile and sub-adult anadromous salmonids and other fish, and an unobstructed river corridor that allows movement. As described in the Status of the Species (Appendix A) bull trout are opportunistic feeders, with specific food habits primarily a function of their size and life-history strategy. Resident and juvenile migratory bull trout feed on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987, p. 58; Goetz 1989, pp. 33-34; Donald and Alger 1993, pp. 239-243). Subadult and adult migratory bull trout feed on various fish species (Leathe and Graham 1982, p. 95; Fraley and Shepard 1989, p. 135; Donald and Alger 1993, p. 242; Brown 1994, p. 21). Bull trout of all sizes, other than fry, have been known to eat fish as large as half of their own length (Beauchamp and VanTassell 2001). In turn, many of the potential prey species of bull trout likewise depend on an unobstructed river corridor and abundant benthic organisms (e.g., oligachaetes and chironomids) for food, which are supported by the sandy and silty substrates within these areas (Bennett and Shrier 1986). Populations of these invertebrates, along with the anadromous salmonids that depend on them for food, are likely to be locally reduced during and immediately following the proposed dredging and disposal operations.

However, as these benthic communities typically occupy habitat types that are prone to disturbance under natural conditions, they could be expected to recolonize the dredged areas and disposal site within several months following the operations through dispersal from adjacent undisturbed areas (Corps 2012c, p. 91).

The Corps proposes to dredge sediment accumulations over 118 acres of currently shallow to mid-depth (up to 16 feet deep) habitats at the confluence of the Snake and Clearwater Rivers. The Corps also proposes to cover over 27 acres of mid-depth (up to roughly 25 feet deep) habitat with the dredged materials at the Knoxway Canyon bench. These areas currently represent varying degrees of suitability as rearing habitat for anadromous salmonids, as suitability is largely determined by depth, substrate type, and location relative to the shoreline. The proposed dredging operations would affect approximately 12 percent of the shallow water habitat in the confluence area, but the majority of near-shore habitats would remain largely untouched. Dredging in this area would result in a more uniform riverbed, but it would still be composed primarily of sand and the change in depth of these sites due to the dredging operations would not be expected to reduce the suitability of these habitats or impair passage for migrating bull trout or other salmonids. The disposal operations are also expected to negatively impact benthic habitats in the near-term at the Knoxway Canyon bench, however, the condition of these habitats for anadromous salmonids, and thus for bull trout that may prey on them, would be improved after completion of the Project. Any possible impediments to movement and foraging at the disposal site would be temporary and a significant portion of the river channel would remain available. Other nearby feeding areas would likely be available for their continued use, and bull trout may benefit from additional foraging habitats created at the Knoxway Canyon bench. Therefore the effects to bull trout are expected to be temporary, there are other foraging habitats available, and effects to bull trout are not anticipated to measurably reduce numbers, reproduction or distribution of the species in the action area.

Indirect Effects

Maintenance of a navigation channel indirectly affects bull trout by enabling barges to continue their use of the river in the vicinity of the dredge sites. Barge traffic exists under the environmental baseline, and a portion of the barge usage is allowed to continue through the proposed action. It is impossible to estimate exactly how much barge traffic is enabled by this proposed action versus past dredging actions and the existence of the dams and related infrastructure. Potential effects of barges include spillage or leakage of contaminants (such as fuels, oils, greases), generation of wakes and turbidity by moving vessels, and through creation of overhead shade when shipping vessels are moored. Smaller vessels such as barges that operate in water less than 14 feet (such as the Snake River navigation channel) do not create wakes large enough to strand fish (Pearson and Skalski 2011). Along the shoreline, wave action generated by barges can sometimes create bank erosion that can impair water quality and damage riparian vegetation and near-shore fish habitat. Boat-generated wakes have the greatest potential to cause bank erosion where the river channel is narrow, where boat use is regular and concentrated and close to shore, and where river systems and not subject to high erosive flows (McConchie and Toleman 2003). Other circumstances that increase the likelihood of erosion include lack of protective bank vegetation, high erodibility of the bed and bank materials, oversteepened banks, narrow channel width, and high vessel speed (McConchie and Toleman 2003). In general the banks of the Snake River are not conducive to erosion from barge wakes because the channel is relatively wide, erodible materials are removed by annual floods, barges do not travel close to shore (except when berthing), and the shorelines along the river are predominantly composed of coarse rocks that are too large to be moved by wave action. Bank erosion is unlikely to be caused by barges in the Snake River.

Even though barge wakes are unlikely to cause bank erosion, the wakes are likely to cause brief episodes of turbidity along the shoreline each time a vessel passes, as described by Whitfield and Becker (2014). Turbidity from barge wakes reduces visibility and at certain thresholds it can cause a short-reduction in feeding rates. The duration of turbid conditions following the passage of a barge is likely to be relatively brief, since the flowing waters in the river rapidly dissipate suspended sediments. Episodes of turbidity caused by barge wakes are likely to persist for well under an hour due to the river current, and turbidity levels from wakes are unlikely to exceed the threshold where reductions in feeding rates have been observed at 1-hour exposures (Table 1). No data could be found regarding turbidity caused by barge wakes in the Snake River; however, dredging and disposal of dredged materials are likely to create far more turbidity than a barge wake, and the turbidity observed previously at Snake River dredging sites is well below the threshold where feeding stops with a 1-hour exposure to 1097 NTUs. In the 2006 dredging, 99% of turbidity results at 300 feet were less than 30 NTUs above background (Schroeder 2014). Brief disruptions in behavior caused by barge wakes are unlikely to have a significant effect since the bulltrout are capable of swimming against the waves and turbidity is likely to below levels that affect fish behavior.

When vessels such as barges are moored, they create the effect of a floating island that blocks sunlight underneath and alters currents near the surface. A variety of studies have found that predatory fish gain an advantage over their prey by hiding near overhead cover that creates low light conditions. The most significant piscivores in the action area that prey on salmon and steelhead are northern pikeminow and smallmouth bass, and to a lesser extent, walleye (Rieman and Beamesderfer 1991). Northern pikeminow and smallmouth bass may sometimes use shade to avoid detection by their prey (Chapman 2007). Smallmouth bass in particular have a strong affinity to in-water structures and they are common predators of subyearling salmonids in the Columbia River drainage (Carrasquero 2001). However, barges lack the physical habitat complexity that provides hiding places found among the pilings that often support in-water structures. Although moored barges provide shadows, the effects of barges might not be comparable to fixed structures supported by piles. Although predatory fish may use overhead cover from barges to prey on listed fish, moored barges in the action area are unlikely to offer much advantage to predators for several reasons because the sporadic mooring of vessels would not provide a consistent or predictable environment that would enable predatory fish to congregate.

Effects to Critical Habitat for Bull Trout

<u>Actions at the Ice Harbor Lock Downstream Approach</u>

The proposed Project activities at the Ice Harbor Lock downstream approach would be expected to have no effect on six PCEs (1, 4, 5, 6, 7, and 9). As discussed above in effects to bull trout, the proposed activities may result in increases in the level of turbidity and suspended sediments within the immediate area of the Ice Harbor Lock downstream approach. However, these potential impacts would not be expected to create any significant or long-lasting physical, biological, or other barrier that would impede bull trout migration patterns (PCE 2) or to result in any measureable effects to bull trout food resources (PCE 3) or water quality parameters (PCE 8) at the site. For these reasons, the effects from these proposed actions are expected to be insignificant to critical habitat for bull trout. Therefore, considering the current status of bull trout, its critical habitat, and project effects in this portion of the action area, the Service concludes that the proposed survey and dredging operations at the Ice Harbor Lock downstream approach may affect, but are not likely to adversely affect critical habitat for bull trout.

Actions in Lower Granite Reservoir

As discussed above in Effects to Bull Trout, the transport operations of the barges and surface operations of other supporting watercraft are expected to create only minor amounts of potential disturbance to bull trout that may be present within the action area. Furthermore, any shoreline or upland staging areas or other ancillary Project activities would take place in previously developed or heavily disturbed sites, and would be expected to have insignificant effect on critical habitat for bull trout. Therefore, the remainder of this section addresses the proposed dredging activities that would take place at the confluence of the Snake and Clearwater Rivers and the proposed disposal activities that would take place at the Knoxway Canyon bench in Lower Granite Reservoir.

The proposed dredging and disposal activities in Lower Granite Reservoir would be expected to have no effect on four PCEs (1, 6, 7, and 9), while other PCEs are affected. The following discussions provide more detail regarding potential Project effects on each of these PCEs in Lower Granite Reservoir.

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) that contribute to water quality and quantity and provide thermal refugia.

   The proposed dredging and disposal activities in Lower Granite Reservoir would not impact any known springs, seeps, or groundwater sources or areas of hyporheic flows in the action area.

2. Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, over-wintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

   The proposed dredging and disposal activities in Lower Granite Reservoir would be expected to impact migration habitats for bull trout within the action area amounting up to 9.3 surface acres of the river channel to the riverbed on a moving-window basis (i.e., as work progresses through the dredging and disposal work zones) at any one time during dredging and disposal operations and for one additional hour following completion of work at each site. These impacts would be due to impaired water quality due to excessive turbidity. The total area ultimately subject to these impacts would include the combined area of all the work zones established to address the entire dredging and disposal footprints and an area 900 feet by 450 feet downstream of these zones at any one time. Depending on work conditions during the dredging operations, these impacts would be expected to be nearly continuous for up to eight weeks at the confluence of the Snake and Clearwater Rivers. The impacts at the Knoxway Canyon bench would be expected to be periodic for up to 80 minutes every eight hours during disposal operations and nearly continuous for up to one week during final contouring operations. The size and duration of the activity may result in water quality impediments to migration in local areas, but would not impact the whole river. The Service concludes that these impacts would not significantly impair the continuing function of this PCE of critical habitat for bull trout in the action area because ample areas within the river channel adjacent to the affected sites would remain undisturbed.

3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

   The proposed dredging and disposal activities in Lower Granite Reservoir would be expected to not adversely affect the available food resources for bull trout in the action area amounting up to 145 acres of benthic habitat. These impacts would be due to physical disturbance of existing riverbed substrates and subsequent impacts to potential prey species (e.g., anadromous salmonids, other fish, and their food sources) for bull trout. The total area impacted would include about 118 acres at the confluence of the Snake and Clearwater Rivers and about 27 acres at the Knoxway Canyon bench. The impacts would be expected to last for up to several months following completion of the operations. The Service concludes that these impacts would not significantly impair the continuing function of this PCE of critical habitat for bull trout in the action area because ample areas within the river channel adjacent to the affected sites would remain undisturbed.

4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks, and unembedded substrates to provide a variety of depths, gradients, velocities, and structure.

   The proposed dredging and disposal activities in Lower Granite Reservoir would be expected to slightly improve the complexity of the aquatic environment in the area of the Knoxway Canyon bench by increasing the availability of shallow water rearing habitats for anadromous salmonids, These potential effects would be expected to result in a very slight improvement in the potential prey base for bull trout that may occur within the action area. The dredging areas would add additional areas of deeper channel at the dredging location. The deeper pool-type habitats are not limiting in the Snake and Clearwater Rivers, and would have insignificant effects on this PCE in the action area.

5. Water temperatures ranging from 36 °F to 59 °F, with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form, geography, elevation, diurnal and seasonal variation, shading (e.g., provided by riparian habitat), streamflow, and local groundwater influence.

   The proposed dredging and disposal activities in Lower Granite Reservoir may result in very slight increases in water temperatures due to greater effects from solar radiation and less mixing of the water column in the immediate vicinity of the newly created shallow water habitats at the Knoxway Canyon bench. However, these potential effects would not be expected to result in any measureable effects to bull trout that may occur within the action area and, therefore, effects to PCE 5 would be considered insignificant.

6. In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo over-winter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates is characteristic of these conditions. The size and amount of fine sediment suitable to bull trout will likely vary from system to system.

   The proposed dredging and disposal activities in Lower Granite Reservoir would not impact any spawning or rearing habitats for bull trout.

7. A natural hydrograph, including peak, high, low, and base flows, within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.

   The proposed dredging and disposal activities in Lower Granite Reservoir would not impact the hydrograph of the Snake or Clearwater Rivers in the action area.

8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

   There should be no effect on water quantity.

   Effects from resuspended contaminants were discussed in more detail under bull trout effects. The dredging and filling operations will have a negative effect on water quality while operations ensue by increasing suspended sediment and turbidity. The direct and indirect effects of potential contaminants on listed salmonids are not currently known with certainty or readily predictable. All sediments proposed for dredging were screened for the presence of contaminants prior to dredging, following procedures by USACE et al (2013) and Michelsen (2011). These screening procedures trigger bioassays and intensive sediment sampling and chemical analysis if contaminants are found at specified concentrations that are set below state and Federal water quality standards. Thirty-seven chemicals of concern have been identified in sediments found in rivers in the Pacific Northwest (USACE et al. 2013). These chemicals may be toxic to humans or aquatic organisms at certain concentrations. However, none of the contaminants tested in 2011 and 2013 for the Project exceeded established criteria that would be considered harmful to the environment.

The proposed dredging and disposal activities in Lower Granite Reservoir would be expected to impact the water quality for bull trout within the action area due to excessive turbidity. The extent, intensity, and timing of these water quality impacts from turbidity and suspended sediment would be the same as those described above in the bull trout effects section. Although the effects to the water quality near the dredging and disposal areas are adverse, the Service concludes that these impacts would not significantly impair the continuing function of this PCE of critical habitat for bull trout in the action area because ample areas within the river channel adjacent to the affected sites would remain undisturbed. Any turbidity effects from barge wakes that are indirect effects from the Project are likely to be short term and insignificant to water quality in the action area.

9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout [*Salvelinus namaycush*], walleye [*Sander vitreus*], northern pike [*Esox lucius*], smallmouth bass [*Micropterus dolomieu*]), interbreeding (e.g., brook trout [*Salvelinus fontinalis*]), or competing (e.g., brown trout [*Salmo trutta*]) species that, if present, are adequately temporally and spatially isolated from bull trout.

   Although predatory fish may use overhead cover from barges to prey on listed fish, moored barges are unlikely to offer much advantage to predators for several reasons: the sporadic mooring of vessels would not provide a consistent or predictable environment that would enable predatory fish to congregate at the ports; salmon smolts (ie: bull trout prey) tend to avoid shaded areas and shorelines (Kemp et al 2005). The Service expects thee proposed dredging and disposal activities in Lower Granite Reservoir would not change the occurrence of any non-native predatory, interbreeding, or competing fish species in the action area.

Based on the above information, the Service concludes that the potential negative effects of the proposed dredging and disposal activities in Lower Granite Reservoir on critical habitat for bull trout would not be expected to create any long-lasting physical, biological, or other barrier that would significantly impede bull trout migration patterns (PCE 2); and would not have long term effects on bull trout food resources (PCE 3), complex habitat (PCE 4), water temperatures (PCE 5), or water quality parameters (PCE 8) within the action area. Therefore, the Service concludes that critical habitat for bull trout in the action area would remain functional (or sites within the action area that are currently unsuitable, but capable, would retain their current ability for the PCEs to be functionally established) and continue to serve its intended recovery role of providing sufficient forage, migration, and over-wintering habitats for the bull trout.

CUMULATIVE EFFECTS: Bull trout and Critical Habitat

Cumulative effects include the effects of future State, Tribal, local governmental, non-governmental, or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions that may affect bull trout or critical habitat for bull trout within the action area are not considered in this Opinion because they would require separate section 7 consultation pursuant to the Act. Cumulative effects were described in the consultation on the PSMP, and because that consultation is close in time to this, the cumulative effects discussion is identical and is incorporated by reference.

CONCLUSION

This Opinion for the proposed Project was developed as a second-tier consultation pursuant to the PSMP biological opinion and, therefore, it is necessary to assess its consistency with that programmatic consultation. As described above, the estimated amount of Project material to be dredged and then deposited in-water is approximately 480,500 cy, and the actual amount may range up to 500,000 cy. This is consistent with the amounts assessed in the PSMP biological opinion, which indicates that up to 500,000 cy of material may be dredged and deposited every 3-5 years (the last significant dredging operation in the action area occurred in 2006).

Little is known about the specific movements and habitat use patterns of bull trout in the action area. However, the available information indicates that low numbers of bull trout would likely be present in the action area during the proposed Project, especially given that few surveys have been done for bull trout in the mainstem, anadromous fish monitoring and capture does not occur in the winter, and the more likely time of bull trout using the action area would be the winter. The Service assumes individual bull trout will be exposed to the following effects:

- Surface operations: The existing boat and barge traffic in the action area currently generate considerable noise and human activity on a regular basis, and the actual work sites for the proposed activities represent a small fraction of the total operational footprints. Therefore, the Project activities would be expected to contribute only minor amounts of additional disturbance within the action area, resulting in insignificant effects to the bull trout.

- In-water construction and entrainment: It is expected that any bull trout that may be present would be able to escape potential injury or death from the dredging device, as well as from the operations and equipment at the disposal site. This is primarily because these potential effects would be most likely to occur just as operations begin at a given work site, the operation of the dredge would likely cause a startle response in bull trout in the immediate area, and any bull trout that may be present could be expected to avoid the immediate area of disturbance once operations are underway. Furthermore, the Corps has incorporated Project monitoring and management measures to reduce the probability of impacts due to entrainment or injury of bull trout during the proposed activities. Therefore, bull trout are unlikely to be entrained, buried, or injured by the dredge itself.

- Habitat and Water Quality Effects: The Project will affect 118 acres of benthic habitat through dredging, and build a shallow-water bench over 27 acres through in-water disposal. Sediments were sampled for contaminants, and none were found to exceed toxic criteria. Foraging habitat for the bull trout will be affected, but there will be other non-disturbed foraging habitat available.

- Turbidity and suspended sediments: The dredging and disposal activities will result in levels of suspended sediments and turbidity that are likely to have sublethal physiological effects that may injure bull trout that are exposed to the turbidity plume. Project impacts associated with turbidity resulting from the proposed in-water work would be temporary and different aspects would be expected to last for various lengths of time, but would likely continue 24 hours per day for the entire 77 day work window (1848 hours), and at any one time the turbidity plume may extend 900 feet x 450 feet and cover an area of 9.3 acres.

Considering the above information, the Service concludes that the action area would continue to provide adequate foraging, migration, and over-wintering habitats for bull trout that may be present in the lower Snake and Clearwater Rivers. In addition, the action area would continue to provide potential connectivity of local populations of bull trout between multiple core areas in neighboring major tributaries throughout the broader region, including those within the Tucannon River, Asotin Creek, Walla Walla River, and upper Clearwater River watersheds. Potential direct effects to bull trout are expected to be limited in scope and duration, and potential indirect effects are currently unclear or are expected to represent more subtle, long-term impacts to bull trout. The available information indicates that cumulative effects may be positive or negative to bull trout over the long-term within the action area, however, given the geographic scope of the action area, the assessment of cumulative effects is currently very general. Based on the above, the Service concludes that the proposed Project would not be expected to significantly impact the conservation role of the action area or to diminish the distribution or survival of local populations of bull trout within the broader region. Therefore, the Service concludes that the Project would not significantly impact bull trout within the Columbia Basin interim recovery unit or within the coterminous U.S. range of the species.

Considering the above information, the proposed Project is not expected to significantly alter any critical habitat indicators for bull trout at the scale of the associated CHUs. Specifically, the proposed dredging and disposal activities would be expected to have no effect on four PCEs (1, 6, 7, and 9), and would result in effects on five PCEs (2, 3, 4, 5, and 8) of critical habitat for bull trout. However, the potential negative effects of the Project on critical habitat for bull trout would not be expected to create any long-lasting physical, biological, or other barrier that would significantly impede bull trout migration patterns (PCE 2), bull trout food resources (PCE 3), complex habitat (PCE 4), water temperatures (PCE 5), or water quality parameters (PCE 8) within the action area. The ability of the action area to support sufficient foraging, migration, and over-wintering habitats for bull trout and to provide connectivity between neighboring core areas would be maintained in the Mainstem Snake River and Clearwater River CHUs. Therefore, the Service concludes that critical habitat for bull trout in the action area would remain functional (or sites within the action area that are currently unsuitable, but capable, would retain their current ability for the PCEs to be functionally established) and continue to serve its intended recovery role for the bull trout.

The Service has reviewed the current status of the bull trout and critical habitat for the bull trout, the environmental baseline for the action area, the effects of the proposed Project, and cumulative effects within the action area. While an indeterminate number of bull trout may be adversely affected by the proposed activities (e.g., sublethal effects due to turbidity and temporary degradation of habitat conditions), it is the Service's biological opinion that the Project, as proposed, is not likely to jeopardize the continued existence of bull trout within the Columbia River interim recovery unit and is not likely to destroy or adversely modify designated critical habitat for the bull trout within the mainstem Snake River or Clearwater River CHUs. Incidental take may occur to individual bull trout exposed to suspended sediment and turbidity levels that indicate adverse effects.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is defined by the Service as an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the Port of Lewiston and Port of Clarkston, as appropriate, for the exemption of section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the ports to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its potential impact on the bull trout to the Service as specified in this incidental take statement [50 CFR 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

The Service has determined that lethal take is unlikely, but bull trout are reasonably certain to be harmed or harassed by temporary exposure to unsuitable water quality conditions due to excessive turbidity and suspended sediments. Harm and harassment would be temporary and, depending on the specific activities involved, of a duration lasting from several hours to several months during and following completion of the proposed activities.

The Service anticipates that the incidental take of bull trout will be difficult to detect in the aquatic environment for the following reasons: 1) the number of bull trout that may be present within the action area at the time of the proposed activities is unknown, but expected to be very low; 2) it is extremely unlikely that sublethal effects to individual bull trout associated with temporary exposure to unsuitable water quality conditions would be noticeable to an observer; and 3) finding an injured bull trout within the aquatic environment is highly unlikely.

Available data are insufficient to estimate an exact number of individuals taken. In these situations, the Service uses an environmental surrogate to create a clear trigger for determining when the anticipated amount of take would be exceeded and, if discretionary involvement or control is retained or authorized by law, when reinitiation of consultation would be warranted.

For the proposed Project, these environmental surrogates are based on a quantity and areal extent of suspended sediment and turbidity conditions that are anticipated within the action area. These surrogates, and the anticipated incidental take of bull trout associated with them, are described below.

Incidental take of adult and subadult bull trout is anticipated in the form of ***harassment*** through a significant disruption of normal behaviors from exposure to high levels of turbidity associated with dredging and disposal activities from the location of the activity to a point 900 feet downstream. The turbidity plume moves throughout the dredging and disposal areas with the sediment producing activity. Take will result when levels of turbidity reach or exceed any of the following parameters:

1) 62 NTUs above background at any time
2) 41 NTUs above background for 1 continuous hr
3) 17 NTUs above background for up to 3 hrs, cumulatively
4) 8 NTUs above background for up to 7 hrs, cumulatively

Incidental take of subadult and adult bull trout in the form of ***harm*** through injury from exposure to high levels of turbidity associated with dredging and disposal activities from the location of the activity to a point 300 feet downstream. Take will result when levels of turbidity reach or exceed the following:

1) 461 NTUs above background at any time
2) 372 NTUs above background for 1 continuous hr
3) 145 NTUs above background for up to 3 hrs, cumulatively
4) 70 NTUs above background for up to 7 hrs, cumulatively

These impacts are expected to occur during the proposed 77-day work window (December 15, 2014 to March 1, 2015 or December 15, 2015 to March 1, 2016).

EFFECT OF THE TAKE

In the accompanying Opinion, the Service determined that the anticipated level of incidental take due to the Project is not likely to jeopardize the continued existence of the bull trout or adversely modify designated critical habitat for the bull trout.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize the impacts of incidental take of bull trout.

1. Minimize turbidity during fill and bench construction actions. Monitor to ensure that water quality certification expectations are being met and incidental take is not exceeded.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measure described above and outline required reporting and monitoring requirements. These terms and conditions are non-discretionary.

1. The Corps shall require barges to drop dredged material at Knoxway Bench in a manner that minimizes turbidity. Sediment-producing activities shall pause when turbidity levels measured 900 feet downstream exceed the state water quality certification thresholds. Restart activities only when in compliance with the measures identified in the Corps' monitoring plan.

2. The Corps shall develop and implement a water quality monitoring program to determine compliance with State of Washington turbidity criteria and thresholds for incidental take.

    i. Turbidity will be measured at stations located 300 and 900 feet downstream from the work zone at the dredging or disposal site, and at background stations.
    ii. The Corps shall visually monitor the turbidity plume twice daily during the first three days of operations at each of the dredging sites and the disposal site to confirm the plume does not exceed 50% of the total river width.
    iii. Relative to information collected at the monitoring stations, the Corps shall continuously monitor and record the locations of the dredge and barge (i.e., work sites) within each established dredging and disposal work area.
    iv. The Corps shall complete a final monitoring report after all activities are completed and submit it to the Service within six months of project completion. All reports will be sent to: Field Supervisor, Eastern Washington Field Office, 11103 E. Montgomery Dr., Spokane Valley, WA, 99206.

The Service believes that bull trout will be incidentally taken as a result of the proposed action, through exceedance of turbidity thresholds within 900 feet of the dredging and disposal actions. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

Reporting Requirements

The Service is to be notified immediately if any dead, injured, or sick bull trout are documented. Initial notification must be made to the Service's Law Enforcement Office in Richland, Washington, at (509) 727-8358. Notification must include the date, time, precise location of the injured animal or carcass, and any other pertinent information. Care shall be taken in handling sick, injured, or dead specimens to preserve biological materials in the best possible state for later analysis of cause of death, if such occurs. In conjunction with the care of any sick or injured bull trout or preservation of biological materials from a dead animal, the Corps has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed.

Within 72 hours of documenting any sick, injured, or dead bull trout, the Corps shall also notify the Service's Eastern Washington Field Office in Spokane, Washington, at (509) 891-6839. During Project implementation, the Corps shall also immediately notify the Service's Eastern Washington Field Office if any emergency or unanticipated situations related to implementation of the Project may be detrimental to bull trout. Any such occurrences shall be appropriately documented by the Corps and any such reports shall be provided to the Service.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to further develop the available information base concerning listed species or other natural resources associated with a proposed action. The Service provides the following conservation recommendations with regard to the proposed Project.

1. The Corps should continue to monitor and undertake investigations to further study the presence, condition (e.g., age, size class), distribution, timing, and habitat use patterns of bull trout in the mainstems of the Snake, Clearwater, and Columbia Rivers and in the

neighboring major tributaries. The Service believes that the current sampling methods likely underestimate the number of bull trout that use the lower Snake and Clearwater Rivers, particularly when juvenile salmon are not being counted at the dams. The Corps should coordinate with the Service to develop a cooperative monitoring plan to obtain more reliable information about bull trout activities, habitat use patterns, seasonal movements, distribution, and status throughout the broader region encompassing the action area.

2. Juvenile Pacific lamprey (*Entosphenus tridentatus*) are often found in silty and sandy substrates (Arntzen et al. 2012), and they typically have a patchy distribution related to environmental variables such as water depth and velocity, light level, organic content, chlorophyll concentration, proximity to spawning areas, and riparian canopy (Moser et al. 2007). Pacific lamprey are at least seasonally present within the action area (Corps 2012a, p. 3-8) and it is possible that they could occur within the proposed dredging and disposal footprint. The Corps should implement monitoring and recovery measures, similar to those defined above under the Terms and Conditions for bull trout, for any Pacific lamprey that may be encountered during the proposed Project activities. Likewise, the Corps should conduct long-term monitoring measures and investigations for Pacific lamprey, similar to the above recommendation for bull trout, within the action area.

In order for the Service to be kept informed of Corps actions that may minimize or avoid adverse effects to, or benefit listed species or their habitats, or those that may expand the available information base, the Service requests notification if the Corps implements any conservation recommendations or additional conservation measures associated with the Project.

REINITIATION NOTICE

This concludes formal consultation on the Snake River Channel Maintenance 2014-2015 Project outlined in the February 26, 2014, request for formal consultation. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation

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APPENDIX A – Status of the Species and Status of Critical Habitat: Bull Trout

STATUS OF THE SPECIES (Bull Trout)

Listing Status

The coterminous United States population of the bull trout (*Salvelinus confluentus*) was listed as threatened on November 1, 1999 (64 FR 58910). The threatened bull trout generally occurs in the Klamath River Basin of south-central Oregon; the Jarbidge River in Nevada; the Willamette River Basin in Oregon; Pacific Coast drainages of Washington, including Puget Sound; major rivers in Idaho, Oregon, Washington, and Montana, within the Columbia River Basin; and the St. Mary-Belly River, east of the Continental Divide in northwestern Montana (Bond 1992, p. 2; Brewin and Brewin 1997, p. 215; Cavender 1978, pp. 165-166; Leary and Allendorf 1997, pp. 716-719).

Throughout its range, bull trout are threatened by the combined effects of habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality, entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels, and introduced non-native species (64 FR 58910). Although all salmonids are likely to be affected by climate change, bull trout are especially vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the requirement for cold water temperatures (Battin et al. 2007, pp. 6672-6673; Rieman et al. 2007, p. 1552). Poaching and incidental mortality of bull trout during other targeted fisheries are additional threats.

The bull trout was initially listed as three separate Distinct Population Segments (DPSs) (63 FR 31647; 64 FR 17110). The preamble to the final listing rule for the United States coterminous population of the bull trout discusses the consolidation of these DPSs with the Columbia and Klamath population segments into one listed taxon and the application of the jeopardy standard under section 7 of the Endangered Species Act (Act) relative to this species (64 FR 58910):

> Although this rule consolidates the five bull trout DPSs into one listed taxon, based on conformance with the DPS policy for purposes of consultation under section 7 of the Act, we intend to retain recognition of each DPS in light of available scientific information relating to their uniqueness and significance. Under this approach, these DPSs will be treated as interim recovery units with respect to application of the jeopardy standard until an approved recovery plan is developed. Formal establishment of bull trout recovery units will occur during the recovery planning process.

On September 4, 2014, the Service announced the availability of a revised draft recovery plan for the coterminous U.S. population of bull trout (79 FR:52741). This revised recovery plan focuses on the identification and management of known threat factors in core areas in six proposed recovery units. The revised draft recovery plan updated the recovery criteria; however, the recovery unit implementation plans have not yet been drafted and will be announced in 2015 with an additional public comment period.

Current Status and Conservation Needs

In recognition of available scientific information relating to their uniqueness and significance, five segments of the coterminous United States population of bull trout are considered essential to the survival and recovery of this species and are identified as interim recovery units: 1) Jarbidge River, 2) Klamath River, 3) Columbia River, 4) Coastal-Puget Sound, and 5) St. Mary-Belly River (USFWS 2002a, pp. iv, 2, 7, 98; 2004a, Vol. 1 & 2, p. 1; 2004b, p. 1). Each of these interim recovery units is necessary to maintain the bull trout's distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions.

A summary of the current status and conservation needs of the bull trout within the interim recovery units is provided below and a comprehensive discussion is found in the U.S. Fish and Wildlife Service's (Service) draft recovery plans for the bull trout (USFWS 2002a, pp. vi-viii; 2004a, Vol. 2 p. iii-x; 2004b, pp. iii-xii).

The conservation needs of bull trout are often generally expressed as the four "Cs": cold, clean, complex, and connected habitat. Cold stream temperatures, clean water quality that is relatively free of sediment and contaminants, complex channel characteristics (including abundant large wood and undercut banks), and large patches of such habitat that are well connected by unobstructed migratory pathways are all needed to promote conservation of bull trout at multiple scales ranging from the coterminous to local populations (a local population is a group of bull trout that spawn within a particular stream or portion of a stream system). The recovery planning process for bull trout (USFWS 2002a, pp. 49-50; 2004a, Vol 1 & 2 pp. 12-18; 2004b, pp. 60-86) has also identified the following conservation needs: 1) maintenance and restoration of multiple, interconnected populations in diverse habitats across the range of each interim recovery unit, 2) preservation of the diversity of life-history strategies, 3) maintenance of genetic and phenotypic diversity across the range of each interim recovery unit, and 4) establishment of a positive population trend. Recently, it has also been recognized that bull trout populations need to be protected from catastrophic fires across the range of each interim recovery unit (Rieman et al. 2003).

Central to the survival and recovery of bull trout is the maintenance of viable core areas (USFWS 2002a, pp. 53-54; 2004a, Vol. 1 pp. 210-218, Vol 2. pp. 61-62; 2004b, pp. 15-30, 64-67). A core area is defined as a geographic area occupied by one or more local bull trout populations that overlap in their use of rearing, foraging, migratory, and overwintering habitat. Each of the interim recovery units listed above consists of one or more core areas. There are 121 core areas recognized across the coterminous range of the bull trout (USFWS 2002a, pp. 6, 48, 98; 2004a, Vol. 1 p. vi, Vol. 2 pp. 14, 134; 2004b, pp. iv, 2; 2005, p. ii).

<u>Jarbidge River Interim Recovery Unit</u>

This interim recovery unit currently contains a single core area with six local populations. Less than 500 resident and migratory adult bull trout, representing about 50 to 125 spawning adults, are estimated to occur in the core area. The current condition of the bull trout in this interim recovery unit is attributed to the effects of livestock grazing, roads, incidental mortalities of released bull trout from recreational angling, historic angler harvest, timber harvest, and the introduction of non-native fishes (USFWS 2004b). The draft bull trout recovery plan (USFWS 2004b) identifies the following conservation needs for this interim recovery unit: 1) maintain the current distribution of the bull trout within the core area, 2) maintain stable or increasing trends in abundance of both resident and migratory bull trout in the core area, 3) restore and maintain suitable habitat conditions for all life history stages and forms, and 4) conserve genetic diversity and increase natural opportunities for genetic exchange between resident and migratory forms of the bull trout. An estimated 270 to 1,000 spawning bull trout per year are needed to provide for the persistence and viability of the core area and to support both resident and migratory adult bull trout (USFWS 2004b).

Klamath River Interim Recovery Unit

This interim recovery unit currently contains three core areas and seven local populations. The current abundance, distribution, and range of the bull trout in the Klamath River Basin are greatly reduced from historical levels due to habitat loss and degradation caused by reduced water quality, timber harvest, livestock grazing, water diversions, roads, and the introduction of non-native fishes (USFWS 2002a). Bull trout populations in this interim recovery unit face a high risk of extirpation (USFWS 2002a). The draft Klamath River bull trout recovery plan (USFWS 2002a) identifies the following conservation needs for this interim recovery unit: 1) maintain the current distribution of bull trout and restore distribution in previously occupied areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all life history stages and strategies, 4) conserve genetic diversity and provide the opportunity for genetic exchange among appropriate core area populations. Eight to 15 new local populations and an increase in population size from about 2,400 adults currently to 8,250 adults are needed to provide for the persistence and viability of the three core areas (USFWS 2002a).

Columbia River Interim Recovery Unit

The Columbia River interim recovery unit includes bull trout residing in portions of Oregon, Washington, Idaho, and Montana. Bull trout are estimated to have occupied about 60 percent of the Columbia River Basin, and presently occur in 45 percent of the estimated historical range (Quigley and Arbelbide 1997, p. 1177). This interim recovery unit currently contains 97 core areas and 527 local populations. About 65 percent of these core areas and local populations occur in central Idaho and northwestern Montana. The Columbia River interim recovery unit has declined in overall range and numbers of fish (63 FR 31647). Although some strongholds still exist with migratory fish present, bull trout generally occur as isolated local populations in headwater lakes or tributaries where the migratory life history form has been lost. Though still widespread, there have been numerous local extirpations reported throughout the Columbia River basin. In Idaho, for example, bull trout have been extirpated from 119 reaches in 28 streams (IDFG in litt. 1995). The draft Columbia River bull trout recovery plan (USFWS 2002c) identifies the following conservation needs for this interim recovery unit: 1) maintain or expand the current distribution of the bull trout within core areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all bull trout life history stages and strategies, and 4) conserve genetic diversity and provide opportunities for genetic exchange.

This interim recovery unit currently contains 97 core areas and 527 local populations. About 65 percent of these core areas and local populations occur in Idaho and northwestern Montana. The condition of the bull trout within these core areas varies from poor to good. All core areas have been subject to the combined effects of habitat degradation and fragmentation caused by the following activities: dewatering; road construction and maintenance; mining; grazing; the blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species. The Service completed a core area conservation assessment for the 5-year status review and determined that, of the 97 core areas in this interim recovery unit, 38 are at high risk of extirpation, 35 are at risk, 20 are at potential risk, 2 are at low risk, and 2 are at unknown risk (USFWS 2005, pp. 2, Map A, pp. 73-83).

Coastal-Puget Sound Interim Recovery Unit

Bull trout in the Coastal-Puget Sound interim recovery unit exhibit anadromous[1], adfluvial, fluvial, and resident life history patterns. The anadromous life history form is unique to this interim recovery unit. This interim recovery unit currently contains 14 core areas and 67 local populations (USFWS 2004a). Bull trout are distributed throughout most of the large rivers and associated tributary systems within this interim recovery unit. Bull trout continue to be present in nearly all major watersheds where they likely occurred historically, although local extirpations have occurred throughout this interim recovery unit. Many remaining populations are isolated or fragmented and abundance has declined, especially in the southeastern portion of the interim recovery unit. The current condition of the bull trout in this interim recovery unit is attributed to the adverse effects of dams, forest management practices (e.g., timber harvest and associated road building activities), agricultural practices (e.g., diking, water control structures, draining of wetlands, channelization, and the removal of riparian vegetation), livestock grazing, roads, mining, urbanization, poaching, incidental mortality from other targeted fisheries, and the introduction of non-native species. The draft Coastal-Puget Sound bull trout recovery plan (USFWS 2004a) identifies the following conservation needs for this interim recovery unit: 1) maintain or expand the current distribution of bull trout within existing core areas, 2) increase

[1] Bull trout migrate from saltwater to freshwater to reproduce are commonly referred to as anadromous. However, bull trout and some other species that enter the marine environment are more properly termed amphidromous. Unlike strictly anadromous species, such as Pacific salmon, amphidromous species often return seasonally to fresh water as subadults, sometimes for several years, before returning to spawn (Brenkman and Corbett 2005, p. 1075; Wilson 1997, p. 5). Due to its more common usage, we will refer to bull trout has exhibiting anadromous rather than amphidromous life history patterns in this document.

bull trout abundance to about 16,500 adults across all core areas, and 3) maintain or increase connectivity between local populations within each core area.

St. Mary-Belly River Interim Recovery Unit

This interim recovery unit currently contains six core areas and nine local populations (USFWS 2002b). Currently, bull trout are widely distributed in the St. Mary-Belly River drainage and occur in nearly all of the waters that it inhabited historically. Bull trout are found only in a 1.2-mile reach of the North Fork Belly River within the United States. Redd count surveys of the North Fork Belly River documented an increase from 27 redds in 1995 to 119 redds in 1999. This increase was attributed primarily to protection from angler harvest (USFWS 2002b). The current condition of the bull trout in this interim recovery unit is primarily attributed to the effects of dams, water diversions, roads, mining, and the introduction of non-native fishes (USFWS 2002b). The draft St. Mary-Belly River bull trout recovery plan (USFWS 2002b) identifies the following conservation needs for this interim recovery unit: 1) maintain the current distribution of the bull trout and restore distribution in previously occupied areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all life history stages and forms, 4) conserve genetic diversity and provide the opportunity for genetic exchange, and 5) establish good working relations with Canadian interests because local bull trout populations in this interim recovery unit are comprised mostly of migratory fish, whose habitat is mostly in Canada.

Life History

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993, pp. 1-18). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. The resident form tends to be smaller than the migratory form at maturity and also produces fewer eggs (Fraley and Shepard 1989, p. 1; Goetz 1989, pp. 15-16). Migratory bull trout spawn in tributary streams where juvenile fish rear 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989, pp. 135-137; Goetz 1989, pp. 22-25), or saltwater (anadromous form) to rear as subadults and to live as adults (Cavender 1978, pp. 139, 165-68; McPhail and Baxter 1996, p. 14; WDFW et al. 1997, pp. 17-18, 22-26). Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. They are iteroparous (they spawn more than once in a lifetime). Repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Fraley and Shepard 1989, pp. 135-137; Leathe and Graham 1982, p. 95; Pratt 1992, p. 6; Rieman and McIntyre 1996, p. 133).

The iteroparous reproductive strategy of bull trout has important repercussions for the management of this species. Bull trout require passage both upstream and downstream, not only for repeat spawning but also for foraging. Most fish ladders, however, were designed specifically for anadromous semelparous salmonids (fishes that spawn once and then die, and require only one-way passage upstream). Therefore, even dams or other barriers with fish passage facilities may be a factor in isolating bull trout populations if they do not provide a downstream passage route. Additionally, in some core areas, bull trout that migrate to marine waters must pass both upstream and downstream through areas with net fisheries at river mouths. This can increase the likelihood of mortality to bull trout during these spawning and foraging migrations.

Growth varies depending upon life-history strategy. Resident adults range from 6 to 12 inches total length, and migratory adults commonly reach 24 inches or more (Goetz 1989, pp. 29-32; Pratt 1984, p. 13) The largest verified bull trout is a 32-pound specimen caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982).

Habitat Characteristics

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993, p. 7). Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors (Fraley and Shepard 1989, pp. 137, 141; Goetz 1989, pp. 19-26; Bond in Hoelscher and Bjornn 1989, p. 57; Howell and Buchanan 1992, p. 1; Pratt 1992, p. 6; Rich 1996, pp. 35-38; Rieman and McIntyre 1993, pp. 4-7; Rieman and McIntyre 1995, pp. 293-294; Sedell and Everest 1991, p. 1; Watson and Hillman 1997, pp. 246-250). Watson and Hillman (1997, pp. 247-249) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993, p. 7), bull trout should not be expected to simultaneously occupy all available habitats (Rieman et al. 1997, p. 1560).

Migratory corridors link seasonal habitats for all bull trout life histories. The ability to migrate is important to the persistence of bull trout (Gilpin, in litt. 1997, pp. 4-5; Rieman and McIntyre 1993, p. 7; Rieman et al. 1997, p. 1114). Migrations facilitate gene flow among local populations when individuals from different local populations interbreed or stray to nonnatal streams. Local populations that are extirpated by catastrophic events may also become reestablished by bull trout migrants. However, it is important to note that the genetic structuring of bull trout indicates there is limited gene flow among bull trout populations, which may encourage local adaptation within individual populations, and that reestablishment of extirpated populations may take a long time (Rieman and McIntyre 1993, p. 7; Spruell et al. 1999, pp. 118-120). Migration also allows bull trout to access more abundant or larger prey, which facilitates growth and reproduction. Additional benefits of migration and its relationship to foraging are discussed below under “Diet.”

Cold water temperatures play an important role in determining bull trout habitat quality, as these fish are primarily found in colder streams (below 15 °C or 59 °F), and spawning habitats are generally characterized by temperatures that drop below 9 °C (48 °F) in the fall (Fraley and Shepard 1989, p. 133; Pratt 1992, p. 6; Rieman and McIntyre 1993, p. 7).

Thermal requirements for bull trout appear to differ at different life stages. Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Baxter et al. 1997, pp. 426-427; Pratt 1992, p. 6; Rieman and McIntyre 1993, p. 7; Rieman et al. 1997, p. 1117). Optimum incubation temperatures for bull trout eggs range from 2 °C to 6 °C (35 °F to 39 °F) whereas optimum water temperatures for rearing range from about 6 °C to 10 °C (46 °F to 50 °F) (Buchanan and Gregory 1997, pp. 121-122; Goetz 1989, pp. 22-24; McPhail and Murray 1979, pp. 41, 50, 53, 55). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 8 °C to 9 °C (46 °F to 48 °F), within a temperature gradient of 8 °C to 15 °C (4 °F to 60 °F). In a landscape study relating bull trout distribution to maximum water temperatures, Dunham et al. (2003) found that the probability of juvenile bull trout occurrence does not become high (i.e., greater than 0.75) until maximum temperatures decline to 11 °C to 12 °C (52 °F to 54 °F).

Although bull trout are found primarily in cold streams, occasionally these fish are found in larger, warmer river systems throughout the Columbia River basin (Buchanan and Gregory 1997, pp. 121-122; Fraley and Shepard 1989, pp. 135-137; Rieman and McIntyre 1993, p. 2; Rieman and McIntyre 1995, p. 288; Rieman et al. 1997, p. 1114). Availability and proximity of cold water patches and food productivity can influence bull trout ability to survive in warmer rivers (Myrick et al. 2002). For example, in a study in the Little Lost River of Idaho where bull trout were found at temperatures ranging from 8 °C to 20 °C (46 °F to 68 °F), most sites that had high densities of bull trout were in areas where primary productivity in streams had increased following a fire (Gamett, pers. comm. 2002).

All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989, pp. 135-137; Goetz 1989, pp. 22-25; Hoelscher and Bjornn 1989, p. 54; Pratt 1992, p. 6; Rich 1996, pp. 35-38; Sedell and Everest 1991, p. 1; Sexauer and James 1997, pp. 367-369; Thomas 1992, pp. 4-5; Watson and Hillman 1997, pp. 247-249). Maintaining bull trout habitat requires stability of stream channels and maintenance of natural flow patterns (Rieman and McIntyre 1993, p. 7). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997, pp. 367-369). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring (Fraley and Shepard 1989, pp. 135-137; Pratt 1992, p. 6; Pratt and Huston 1993, pp. 70-72). Pratt (1992, p. 6) indicated that increases in fine sediment reduce egg survival and emergence.

Bull trout typically spawn from August through November during periods of increasing flows and decreasing water temperatures. Preferred spawning habitat consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989, p. 135). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989, p. 15; Pratt 1992, p. 8; Rieman and McIntyre 1996, p. 133). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992, p. 8). After hatching, fry remain in the substrate, and time from egg deposition to emergence may surpass 200 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Ratliff and Howell 1992 in Howell and Buchanan 1992, pp. 10, 15; Pratt 1992, pp. 5-6).

Early life stages of fish, specifically the developing embryo, require the highest inter-gravel dissolved oxygen (IGDO) levels, and are the most sensitive life stage to reduced oxygen levels. The oxygen demand of embryos depends on temperature and on stage of development, with the greatest IGDO required just prior to hatching.

A literature review conducted by the Washington Department of Ecology (WDOE 2002) indicates that adverse effects of lower oxygen concentrations on embryo survival are magnified as temperatures increase above optimal (for incubation). In a laboratory study conducted in Canada, researchers found that low oxygen levels retarded embryonic development in bull trout (Giles and Van der Zweep 1996, pp. 54-55). Normal oxygen levels seen in rivers used by bull trout during spawning ranged from 8 to 12 mg/L (in the gravel), with corresponding instream levels of 10 to 11.5 mg/L (Stewart et al. 2007). In addition, IGDO concentrations, water velocities in the water column, and especially the intergravel flow rate, are interrelated variables that affect the survival of incubating embryos (ODEQ 1995). Due to a long incubation period of 220+ days, bull trout are particularly sensitive to adequate IGDO levels. An IGDO level below 8 mg/L is likely to result in mortality of eggs, embryos, and fry.

Migratory forms of bull trout may develop when habitat conditions allow movement between spawning and rearing streams and larger rivers, lakes or nearshore marine habitat where foraging opportunities may be enhanced (Brenkman and Corbett 2005, pp. 1073, 1079-1080; Frissell 1993, p. 350; Goetz et al. 2004, pp. 45, 55, 60, 68, 77, 113-114, 123, 125-126). For example, multiple life history forms (e.g., resident and fluvial) and multiple migration patterns have been noted in the Grande Ronde River (Baxter 2002). Parts of this river system have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem Snake River. Such multiple life history strategies help to maintain the stability and persistence of bull trout populations to environmental changes. Benefits to migratory bull trout include greater growth in the more productive waters of larger streams, lakes, and marine waters; greater fecundity resulting in increased reproductive potential; and dispersing the population across space and time so that spawning streams may be recolonized should local populations suffer a catastrophic loss (Frissell 1999, pp. 15-16; MBTSG 1998, pp. iv, 48-50; Rieman and McIntyre 1993, pp. 18-19; USFWS 2004a, Vol. 2, p. 63). In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbances make local habitats temporarily unsuitable. Therefore, the range of the species is diminished, and the potential for a greater reproductive contribution from larger fish with higher fecundity is lost (Rieman and McIntyre 1993, pp. 1-18).

Diet

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. A single optimal foraging strategy is not necessarily a consistent feature in the life of a fish, because this strategy can change as the fish progresses from one life stage to another (i.e., juvenile to subadult). Fish growth depends on the quantity and quality of food that is eaten (Gerking 1994), and as fish grow, their foraging strategy changes as their food changes, in quantity, size, or other characteristics. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987, p. 58; Donald and Alger 1993, pp. 239-243; Goetz 1989, pp. 33-34). Subadult and adult migratory bull trout feed on various fish species (Brown 1994, p. 21; Donald and Alger 1993, p. 242; Fraley and Shepard 1989, p. 135; Leathe and Graham 1982, p. 95). Bull trout of all sizes other than fry have been found to eat fish up to half their length (Beauchamp and VanTassell 2001). In nearshore marine areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) (Goetz et al. 2004, p. 114; WDFW et al. 1997, p. 23).

Bull trout migration and life history strategies are closely related to their feeding and foraging strategies. Migration allows bull trout to access optimal foraging areas and exploit a wider variety of prey resources. Optimal foraging theory can be used to describe strategies fish use to choose between alternative sources of food by weighing the benefits and costs of capturing one source of food over another. For example, prey often occur in concentrated patches of abundance ("patch model") (Gerking 1994). As the predator feeds in one patch, the prey population is reduced, and it becomes more profitable for the predator to seek a new patch rather than continue feeding on the original one. This can be explained in terms of balancing energy acquired versus energy expended. For example, in the Skagit River system, anadromous bull trout make migrations as long as 121 miles between marine foraging areas in Puget Sound and headwater spawning grounds, foraging on salmon eggs and juvenile salmon along their migration route (WDFW et al. 1997). Anadromous bull trout also use marine waters as migration corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter (Brenkman and Corbett 2005, p. 1079; Goetz et al. 2004, pp. 36, 60).

<u>Changes in Status of the Coastal-Puget Sound Interim Recovery Unit</u>

Although the status of bull trout in Coastal-Puget Sound interim recovery unit has been improved by certain actions, it continues to be degraded by other actions, and it is likely that the overall status of the bull trout in this population segment has not improved since its listing on November 1, 1999. Improvement has occurred largely through changes in fishing regulations and habitat-restoration projects. Fishing regulations enacted in 1994 either eliminated harvest of bull trout or restricted the amount of harvest allowed, and this likely has had a positive influence on the abundance of bull trout. Improvement in habitat has occurred following restoration projects intended to benefit either bull trout or salmon, although monitoring the effectiveness of these projects seldom occurs. On the other hand, the status of this population segment has been adversely affected by a number of Federal and non-Federal actions, some of which were addressed under section 7 of the Act. Most of these actions degraded the environmental baseline; all of those addressed through formal consultation under section 7 of the Act permitted the incidental take of bull trout.

Section 10(a)(1)(B) permits have been issued for Habitat Conservation Plans (HCP) completed in the Coastal-Puget Sound population segment. These include: 1) the City of Seattle's Cedar

River Watershed HCP, 2) Simpson Timber HCP (now Green Diamond Resources), 3) Tacoma Public Utilities Green River HCP, 4) Plum Creek Cascades HCP, 5) Washington State Department of Natural Resources (WSDNR) State Trust Lands HCP, 6) West Fork Timber HCP, and 7) WSDNR Forest Practices HCP. These HCPs provide landscape-scale conservation for fish, including bull trout. Many of the covered activities associated with these HCPs will contribute to conserving bull trout over the long-term; however, some covered activities will result in short-term degradation of the baseline. All HCPs permit the incidental take of bull trout.

Changes in Status of the Columbia River Interim Recovery Unit

The overall status of the Columbia River interim recovery unit has not changed appreciably since its listing on June 10, 1998. Populations of bull trout and their habitat in this area have been affected by a number of actions addressed under section 7 of the Act. Most of these actions resulted in degradation of the environmental baseline of bull trout habitat, and all permitted or analyzed the potential for incidental take of bull trout. The Plum Creek Cascades HCP, Plum Creek Native Fish HCP, Storedahl Daybreak Mine HCP, and WSDNR Forest Practices HCP addressed portions of the Columbia River population segment of bull trout.

Changes in Status of the Klamath River Interim Recovery Unit

Improvements in the Threemile, Sun, and Long Creek local populations have occurred through efforts to remove or reduce competition and hybridization with non-native salmonids, changes in fishing regulations, and habitat-restoration projects. Population status in the remaining local populations (Boulder-Dixon, Deming, Brownsworth, and Leonard Creeks) remains relatively unchanged. Grazing within bull trout watersheds throughout the recovery unit has been curtailed. Efforts at removal of non-native species of salmonids appear to have stabilized the Threemile and positively influenced the Sun Creek local populations. The results of similar efforts in Long Creek are inconclusive. Mark and recapture studies of bull trout in Long Creek indicate a larger migratory component than previously expected.

Although the status of specific local populations has been slightly improved by recovery actions, the overall status of Klamath River bull trout continues to be depressed. Factors considered threats to bull trout in the Klamath Basin at the time of listing – habitat loss and degradation caused by reduced water quality, past and present land use management practices, water diversions, roads, and non-native fishes – continue to be threats today.

Changes in Status of the Saint Mary-Belly River Interim Recovery Unit

The overall status of bull trout in the Saint Mary-Belly River interim recovery unit has not changed appreciably since its listing on November 1, 1999. Extensive research efforts have been conducted since listing, to better quantify populations of bull trout and their movement patterns. Limited efforts in the way of active recovery actions have occurred. Habitat occurs mostly on Federal and Tribal lands (Glacier National Park and the Blackfeet Nation). Known problems due to instream flow depletion, entrainment, and fish passage barriers resulting from operations of the U.S. Bureau of Reclamation's Milk River Irrigation Project (which transfers Saint Mary-Belly River water to the Missouri River Basin) and similar projects downstream in Canada constitute the primary threats to bull trout and to date they have not been adequately addressed under section 7 of the Act. Plans to upgrade the aging irrigation delivery system are being pursued, which has potential to mitigate some of these concerns but also the potential to intensify dewatering. A major fire in August 2006 severely burned the forested habitat in Red Eagle and Divide Creeks, potentially affecting three of nine local populations and degrading the baseline.

Effects of Climate Change on Bull Trout

The Service's analyses include consideration of ongoing and projected changes in climate. The terms "climate" and "climate change" are defined by the Intergovernmental Panel on Climate Change (IPCC). "Climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

Climate change is likely to play an increasingly important role in determining the abundance of ESA-listed species and the conservation value of designated critical habitats in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. Areas with elevations high enough to maintain temperatures well below freezing for most of the winter and early spring will be less affected. Low-elevation areas are likely to be more affected. During the last century, average regional air temperatures increased by 1.5°F, with increases as much as 4°F in isolated areas (USGCRP 2009). Average regional temperatures are likely to increase an additional 3°F to 10°F over the next century (USGCRP 2009). Overall, about one-third of the current cold-water fish habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (USGCRP 2009).

Precipitation trends during the next century are less certain than for temperature, but more precipitation is likely to occur during October through March, less may occur during summer months, and more winter precipitation is likely to fall as rain rather than snow (ISAB 2007, USGCRP 2009). Significant reductions in both total snow pack and low-elevation snow pack in the Pacific Northwest is predicted over the next 50 years (Mote and Salathé 2010) – changes that will shrink the extent of the snowmelt-dominated habitat available to salmonids. Where snow occurs, a warmer climate will cause earlier runoff, which will increase flows in early spring but will likely reduce flows and increase water temperature in late spring, summer, and fall (ISAB 2007, USGCRP 2009).

As the snow pack diminishes and seasonal hydrology shifts to more frequent and severe early large storms, stream flow timing and increased peak river flows may limit salmonid survival (Mantua et al. 2010). Lower stream flows and warmer water temperatures during summer will degrade summer rearing conditions, in part by increasing the prevalence and virulence of fish diseases and parasites (USGCRP 2009). To avoid waters above summer maximum temperatures, juvenile rearing may be increasingly found only in the confluence of colder tributaries or other areas of cold water refugia (Mantua et al. 2010). Other adverse effects are likely to include altered migration patterns, accelerated embryo development, premature emergence of fry, variation in quality and quantity of tributary rearing habitat, and increased competition and predation risk from warm-water, non-native species (ISAB 2007).

The earth's oceans are also warming, with considerable interannual and inter-decadal variability superimposed on the longer-term trend (Bindoff et al. 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmonids, while cooler ocean periods have coincided with relatively high abundances (Scheuerell and Williams 2005; Zabel et al. 2006; USGCRP 2009). Ocean conditions adverse to salmonids may be more likely under a warming climate (Zabel et al. 2006).

Ocean acidification resulting from the uptake of carbon dioxide by ocean waters threatens corals, shellfish, and other living things that form their shells and skeletons from calcium carbonate (Orr et al. 2005; Feely et al. 2012). Such ocean acidification is essentially irreversible over a time scale of centuries (Royal Society 2005). Increasing carbon dioxide concentrations are reducing ocean pH and dissolved carbonate ion concentrations, and thus levels of calcium carbonate saturation. Over the past several centuries, ocean pH has decreased by about 0.1 (an approximately 30 percent increase in acidity) and is projected to decline by another 0.3 to 0.4 pH units (approximately 100 to 150 percent increase in acidity) by the end of this century (Orr et al. 2005; Feely et al. 2012). As aqueous carbon dioxide concentrations increase, carbonate ion concentrations decrease, making it more difficult for marine calcifying organisms to form biogenic calcium carbonate needed for shell and skeleton formation. The reduction in pH also affects photosynthesis, growth, and reproduction of marine organisms. The upwelling of deeper ocean water deficient in carbonate, and thus potentially detrimental to the food chains supporting juvenile salmonids, has recently been observed along the U.S. west coast (Feely et al. 2008).

Climate change is expected to make recovery targets for ESA-listed species more difficult to achieve. Actions improving freshwater and estuarine habitats can offset some of the adverse impacts of climate change. Examples include restoring connections to historical floodplains and estuarine habitats, protecting and restoring riparian vegetation, purchasing or applying easements to lands that provide important cold water or refuge habitat, and leasing or buying water rights to improve summer flows (Battin et al. 2007; ISAB 2007).

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STATUS OF BULL TROUT CRITICAL HABITAT (Rangewide)

Legal Status

Current Designation

The Service published a final critical habitat designation for the coterminous United States population of the bull trout on October 18, 2010 (70 FR 63898); the rule became effective on November 17, 2010. A justification document was also developed to support the rule and is available on our website (http://www.fws.gov/pacific/bulltrout). The scope of the designation involved the species' coterminous range, including six draft recovery units [Mid-Columbia, Saint Mary, Columbia Headwaters, Coastal, Klamath, and Upper Snake (75 FR 63927)]. The Service's 1999 coterminous listing rule identified five interim recovery units (50 CFR Part 17, pg. 58910), which includes the Jarbidge River, Klamath River, Columbia River, Coastal-Puget Sound, and Saint Mary-Belly River population segments (also considered as interim recovery units). Our five year review recommended re-evaluation of these units based on new information (USFWS 2008, p. 9). However, until the bull trout draft recovery plan is finalized, the current five interim recovery units will be used for purposes of section 7 jeopardy analyses and recovery planning. The adverse modification analysis in this biological opinion does not rely on recovery units, relying instead on the listed critical habitat units and subunits.

Rangewide, the Service designated reservoirs/lakes and stream/shoreline miles as bull trout critical habitat (Table X). Designated bull trout critical habitat is of two primary use types: 1) spawning and rearing, and 2) foraging, migration, and overwintering (FMO).

Table X. Stream/shoreline distance and reservoir/lake area designated as bull trout critical habitat by state.

State	Stream/Shoreline Miles	Stream/Shoreline Kilometers	Reservoir /Lake Acres	Reservoir/ Lake Hectares
Idaho	8,771.6	14,116.5	170,217.5	68,884.9
Montana	3,056.5	4,918.9	221,470.7	89,626.4
Nevada	71.8	115.6	-	-
Oregon	2,835.9	4,563.9	30,255.5	12,244.0
Oregon/Idaho	107.7	173.3	-	-
Washington	3,793.3	6,104.8	66,308.1	26,834.0
Washington (marine)	753.8	1,213.2	-	-
Washington/Idaho	37.2	59.9	-	-
Washington/Oregon	301.3	484.8	-	-
Total	19,729.0	31,750.8	488,251.7	197,589.2

The 2010 revision increases the amount of designated bull trout critical habitat by approximately 76 percent for miles of stream/shoreline and by approximately 71 percent for acres of lakes and reservoirs compared to the 2005 designation.

This rule also identifies and designates as critical habitat approximately 1,323.7 km (822.5 miles) of streams/shorelines and 6,758.8 ha (16,701.3 acres) of lakes/reservoirs of unoccupied habitat to address bull trout conservation needs in specific geographic areas in several areas not occupied at the time of listing. No unoccupied habitat was included in the 2005 designation. These unoccupied areas were determined by the Service to be essential for restoring functioning migratory bull trout populations based on currently available scientific information. These unoccupied areas often include lower main stem river environments that can provide seasonally important migration habitat for bull trout. This type of habitat is essential in areas where bull trout habitat and population loss over time necessitates reestablishing bull trout in currently unoccupied habitat areas to achieve recovery.

The final rule continues to exclude some critical habitat segments based on a careful balancing of the benefits of inclusion versus the benefits of exclusion. Critical habitat does not include: 1) waters adjacent to non-Federal lands covered by legally operative incidental take permits for habitat conservation plans (HCPs) issued under section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (Act), in which bull trout is a covered species on or before the publication of this final rule; 2) waters within or adjacent to Tribal lands subject to certain commitments to conserve bull trout or a conservation program that provides aquatic resource protection and restoration through collaborative efforts, and where the Tribes indicated that inclusion would impair their relationship with the Service; or 3) waters where impacts to national security have been identified (75 FR 63898). Excluded areas are approximately 10 percent of the stream/shoreline miles and 4 percent of the lakes and reservoir acreage of designated critical habitat. Each excluded area is identified in the relevant Critical Habitat Unit (CHU) text, as identified in paragraphs (e)(8) through (e)(41) of the final rule. See Tables Y and Z for the list of excluded areas. It is important to note that the exclusion of waterbodies from designated critical habitat does not negate or diminish their importance for bull trout conservation. Because exclusions reflect the often complex pattern of land ownership, designated critical habitat is often fragmented and interspersed with excluded stream segments.

Table Y.—Stream/shoreline distance excluded from bull trout critical habitat based on tribal ownership or other plan.

Ownership and/or Plan	Kilometers	Miles
Lewis River Hydro Conservation Easements	7.0	4.3
DOD – Dabob Bay Naval	23.9	14.8
HCP – Cedar River (City of Seattle)	25.8	16.0
HCP – Washington Forest Practices Lands	1,608.30	999.4
HCP – Green Diamond (Simpson)	104.2	64.7
HCP – Plum Creek Central Cascades (WA)	15.8	9.8
HCP – Plum Creek Native Fish (MT)	181.6	112.8
HCP–Stimson	7.7	4.8
HCP – WDNR Lands	230.9	149.5
Tribal – Blackfeet	82.1	51.0
Tribal – Hoh	4.0	2.5
Tribal – Jamestown S'Klallam	2.0	1.2
Tribal – Lower Elwha	4.6	2.8

Tribal – Lummi	56.7	35.3
Tribal – Muckleshoot	9.3	5.8
Tribal – Nooksack	8.3	5.1
Tribal – Puyallup	33.0	20.5
Tribal – Quileute	4.0	2.5
Tribal – Quinault	153.7	95.5
Tribal – Skokomish	26.2	16.3
Tribal – Stillaguamish	1.8	1.1
Tribal – Swinomish	45.2	28.1
Tribal – Tulalip	27.8	17.3
Tribal – Umatilla	62.6	38.9
Tribal – Warm Springs	260.5	161.9
Tribal – Yakama	107.9	67.1
Total	3,094.9	1,923.1

Table Z. Lake/Reservoir area excluded from bull trout critical habitat based on tribal ownership or other plan.

Ownership and/or Plan	Hectares	Acres
HCP – Cedar River (City of Seattle)	796.5	1,968.2
HCP – Washington Forest Practices Lands	5,689.1	14,058.1
HCP – Plum Creek Native Fish	32.2	79.7
Tribal – Blackfeet	886.1	2,189.5
Tribal – Warm Springs	445.3	1,100.4
Total	7,849.3	19,395.8

Conservation Role and Description of Critical Habitat

The conservation role of bull trout critical habitat is to support viable core area populations (75 FR 63898:63943 [October 18, 2010]). The core areas reflect the metapopulation structure of bull trout and are the closest approximation of a biologically functioning unit for the purposes of recovery planning and risk analyses. CHUs generally encompass one or more core areas and may include FMO areas, outside of core areas, that are important to the survival and recovery of bull trout.

Thirty-two CHUs within the geographical area occupied by the species at the time of listing are designated under the final rule. Twenty-nine of the CHUs contain all of the physical or biological features identified in this final rule and support multiple life-history requirements. Three of the mainstem river units in the Columbia and Snake River basins contain most of the physical or biological features necessary to support the bull trout's particular use of that habitat, other than those physical biological features associated with Primary Constituent Elements (PCEs) 5 and 6, which relate to breeding habitat.

The primary function of individual CHUs is to maintain and support core areas, which 1) contain bull trout populations with the demographic characteristics needed to ensure their persistence and contain the habitat needed to sustain those characteristics (Rieman and McIntyre 1993, p. 19); 2) provide for persistence of strong local populations, in part, by providing habitat conditions that encourage movement of migratory fish (Rieman and McIntyre 1993, pp. 22-23; MBTSG 1998, pp. 48-49); 3) are large enough to incorporate genetic and phenotypic diversity, but small enough to ensure connectivity between populations (Hard 1995, pp. 314-315; Healey and Prince 1995, p. 182; Rieman and McIntyre 1993, pp. 22-23; MBTSG 1998, pp. 48-49); and 4) are distributed throughout the historic range of the species to preserve both genetic and phenotypic adaptations (Hard 1995, pp. 321-322; Rieman and McIntyre 1993, p. 23; Rieman and Allendorf 2001, p. 763; MBTSG 1998, pp. 13-16).

The Olympic Peninsula and Puget Sound CHUs are essential to the conservation of anadromous[2] bull trout, which are unique to the Coastal-Puget Sound population segment. These CHUs contain marine nearshore and freshwater habitats, outside of core areas, that are used by bull trout from one or more core areas. These habitats, outside of core areas, contain PCEs that are critical to adult and subadult foraging, overwintering, and migration.

Primary Constituent Elements for Bull Trout

Within the designated critical habitat areas, the PCEs for bull trout are those habitat components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering. Based on our current knowledge of the life history, biology, and ecology of this species and the characteristics of the habitat necessary to sustain its essential life-history functions, we have determined that the following PCEs are essential for the conservation of bull trout.

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.

2. Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.

[2] Bull trout migrate from saltwater to freshwater to reproduce are commonly referred to as anadromous. However, bull trout and some other species that enter the marine environment are more properly termed amphidromous. Unlike strictly anadromous species, such as Pacific salmon, amphidromous species often return seasonally to fresh water as subadults, sometimes for several years, before returning to spawn (Brenkman and Corbett 2005, p. 1075; Wilson 1997, p. 5). Due to its more common usage, we will refer to bull trout has exhibiting anadromous rather than amphidromous life history patterns in this document.

5. Water temperatures ranging from 2 °C to 15 °C (36 °F to 59 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.

6. In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system.

7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.

8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

The revised PCE's are similar to those previously in effect under the 2005 designation. The most significant modification is the addition of a ninth PCE to address the presence of nonnative predatory or competitive fish species. Although this PCE applies to both the freshwater and marine environments, currently no non-native fish species are of concern in the marine environment, though this could change in the future.

Note that only PCEs 2, 3, 4, 5, and 8 apply to marine nearshore waters identified as critical habitat. Also, lakes and reservoirs within the CHUs also contain most of the physical or biological features necessary to support bull trout, with the exception of those associated with PCEs 1 and 6. Additionally, all except PCE 6 apply to FMO habitat designated as critical habitat.

Critical habitat includes the stream channels within the designated stream reaches and has a lateral extent as defined by the bankfull elevation on one bank to the bankfull elevation on the opposite bank. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge that generally has a recurrence interval of 1 to 2 years on the annual flood series. If bankfull elevation is not evident on either bank, the ordinary high-water line must be used to determine the lateral extent of critical habitat. The lateral extent of designated lakes is defined by the perimeter of the waterbody as mapped on standard 1:24,000 scale topographic maps. The Service assumes in many cases this is the full-pool level of the waterbody. In areas where only one side of the waterbody is designated (where only one side is excluded), the mid-line of the waterbody represents the lateral extent of critical habitat.

In marine nearshore areas, the inshore extent of critical habitat is the mean higher high-water (MHHW) line, including the uppermost reach of the saltwater wedge within tidally influenced freshwater heads of estuaries. The MHHW line refers to the average of all the higher high-water heights of the two daily tidal levels. Marine critical habitat extends offshore to the depth of 10 meters (m) (33 ft) relative to the mean lower low-water (MLLW) line (zero tidal level or average of all the lower low-water heights of the two daily tidal levels). This area between the MHHW line and minus 10 m MLLW line (the average extent of the photic zone) is considered the habitat most consistently used by bull trout in marine waters based on known use, forage fish availability, and ongoing migration studies and captures geological and ecological processes important to maintaining these habitats. This area contains essential foraging habitat and migration corridors such as estuaries, bays, inlets, shallow subtidal areas, and intertidal flats.

Adjacent shoreline riparian areas, bluffs, and uplands are not designated as critical habitat. However, it should be recognized that the quality of marine and freshwater habitat along streams, lakes, and shorelines is intrinsically related to the character of these adjacent features, and that human activities that occur outside of the designated critical habitat can have major effects on physical and biological features of the aquatic environment.

Activities that cause adverse effects to critical habitat are evaluated to determine if they are likely to “destroy or adversely modify” critical habitat by no longer serving the intended conservation role for the species or retaining those PCEs that relate to the ability of the area to at least periodically support the species. Activities that may destroy or adversely modify critical habitat are those that alter the PCEs to such an extent that the conservation value of critical habitat is appreciably reduced (75 FR 63898:63943; USFWS 2004, Vol. 1. pp. 140-193, Vol. 2, pp. 69-114). The Service’s evaluation must be conducted at the scale of the entire critical habitat area designated, unless otherwise stated in the final critical habitat rule (USFWS and NMFS 1998, pp. 4-39). Thus, adverse modification of bull trout critical habitat is evaluated at the scale of the final designation, which includes the critical habitat designated for the Klamath River, Jarbidge River, Columbia River, Coastal-Puget Sound, and Saint Mary-Belly River population segments. However, we consider all 32 CHUs to contain features or areas essential to the conservation of the bull trout (75 FR 63898:63901, 63944). Therefore, if a proposed action would alter the physical or biological features of critical habitat to an extent that appreciably reduces the conservation function of one or more critical habitat units for bull trout, a finding of adverse modification of the entire designated critical habitat area may be warranted (75 FR 63898:63943).

Current Critical Habitat Condition Rangewide

The condition of bull trout critical habitat varies across its range from poor to good. Although still relatively widely distributed across its historic range, the bull trout occurs in low numbers in many areas, and populations are considered depressed or declining across much of its range (67 FR 71240). This condition reflects the condition of bull trout habitat. The decline of bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, impoundments, dams, water diversions, and the introduction of nonnative species (63 FR 31647, June 10 1998; 64 FR 17112, April 8, 1999).

There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout and their habitat, and continue to do so. Among the many factors that contribute to degraded PCEs, those which appear to be particularly significant and have resulted in a legacy of degraded habitat conditions are as follows: 1) fragmentation and isolation of local populations due to the proliferation of dams and water diversions that have eliminated habitat, altered water flow and temperature regimes, and impeded migratory movements (Dunham and Rieman 1999, p. 652; Rieman and McIntyre 1993, p. 7); 2) degradation of spawning and rearing habitat and upper watershed areas, particularly alterations in sedimentation rates and water temperature, resulting from forest and rangeland practices and intensive development of roads (Fraley and Shepard 1989, p. 141; MBTSG 1998, pp. ii - v, 20-45); 3) the introduction and spread of nonnative fish species, particularly brook trout and lake trout, as a result of fish stocking and degraded habitat conditions, which compete with bull trout for limited resources and, in the case of brook trout, hybridize with bull trout (Leary et al. 1993, p. 857; Rieman et al. 2006, pp. 73-76); 4) in the Coastal-Puget Sound region where amphidromous bull trout occur, degradation of mainstem river FMO habitat, and the degradation and loss of marine nearshore foraging and migration habitat due to urban and residential development; and 5) degradation of FMO habitat resulting from reduced prey base, roads, agriculture, development, and dams.

Effects of Climate Change on Bull Trout Critical Habitat

One objective of the final rule was to identify and protect those habitats that provide resiliency for bull trout use in the face of climate change. Over a period of decades, climate change may directly threaten the integrity of the essential physical or biological features described in PCEs 1, 2, 3, 5, 7, 8, and 9. Protecting bull trout strongholds and cold water refugia from disturbance and ensuring connectivity among populations were important considerations in addressing this potential impact. Additionally, climate change may exacerbate habitat degradation impacts both physically (e.g., decreased base flows, increased water temperatures) and biologically (e.g., increased competition with non-native fishes).

Consulted on Effects for Critical Habitat

The Service has formally consulted on the effects to bull trout critical habitat throughout its range. Section 7 consultations include actions that continue to degrade the environmental baseline in many cases. However, long-term restoration efforts have also been implemented that provide some improvement in the existing functions within some of the critical habitat units.

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Supporting Documents
Biological Opinions for
Current Immediate Need Action

National Marine Fisheries Service
Biological Opinion

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, Washington 98115

NMFS Tracking Number: WCR-2014-1723

November 14, 2014

Lt. Col. Timothy R. Vail
Department of the Army
Walla Walla District, Corps of Engineers
201 North Third Avenue
Walla Walla, Washington 99362-1876

Re: Endangered Species Act section 7 Formal Consultation and Magnuson-Stevens Act Essential Fish Habitat Consultation for the 20142015 Channel Maintenance Dredging in the Lower Snake River and Clearwater River (5th Field HUCs: 1706011004, 1706011001, 1706010708, 1706010702, 1706010303, 1706030613); Walla Walla, Columbia, Garfield, and Asotin Counties, Washington; Nez Perce County, Idaho

Dear Lt. Col. Vail:

The enclosed document contains a biological opinion (Opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) on the effects of dredging the Snake River downstream of Ice Harbor Dam (river mile (RM) 9.5), three sites at the confluence of the Snake and Clearwater Rivers in Lower Granite Reservoir (Snake RM 137.9 to 139; Clearwater RM 0 to 2), and using the dredged materials to create shallow water habitat (filling) at RM 116 of the Snake River. In this Opinion, NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of ESA-listed Snake River spring/summer-run Chinook salmon (*Oncorhynchus tshawytscha*), Snake River fall-run Chinook salmon (*O. tshawytscha*), Snake River sockeye salmon (*O. nerka*), or Snake River Basin steelhead (*O. mykiss*), or any of their designated critical habitat; and NMFS concurs with the Corps of Engineers' determinations that the action is not likely to adversely affect Middle Columbia River Steelhead (*O. mykiss),* Upper Columbia River Steelhead (*O. mykiss*), and Upper Columbia River spring run Chinook salmon (*O. tshawytscha*).

As required by section 7 of the ESA, NMFS provided an incidental take statement with the Opinion. The incidental take statement describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements, that the Federal agency and any person who performs the action must comply with

This document also includes the results of our analysis of the action's likely effects on essential fish habitat (EFH) pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes one Conservation Recommendation to avoid, minimize, or otherwise offset potential adverse effects to EFH. These Conservation Recommendations are a non-identical set of the ESA terms and conditions. Section 305(b)(4)(B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH Conservation Recommendations, the Walla Walla District of the COE must explain why, including the justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many Conservation Recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, in your statutory reply to the EFH portion of this consultation, we ask that you clearly identify the number of Conservation Recommendations accepted.

If you have any questions, please contact Bob Ries at (208) 882-6148 or electronic mail at bob.ries@noaa.gov.

Sincerely,

for William W. Stelle, Jr.
Regional Administrator

Enclosure

cc M. Eames – FWS
R. Hennekey – IDFG
B.Tice – COE
M. Lopez – NPT

:

Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation

Lower Snake Programmatic Sediment Management Plan

Fourth Field Hydrologic Unit Codes: 1706011004, 1706011001, 1706010708, 1706010702, 1706010303, 1706030613; Walla Walla, Columbia, Garfield, and Asotin Counties, Washington; Nez Perce County, Idaho

NMFS Consultation Number: WCR-2014-1704

Action Agency: U.S. Army Corps of Engineers, Walla Walla District

Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?	Is Action Likely to Jeopardize the Species?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
Snake River spring/summer-run Chinook salmon (*Oncorhynchus tshawytscha*)	Threatened	Yes	No	No
Snake River fall-run Chinook salmon (*O. tshawytscha*)	Threatened	Yes	No	No
Snake River sockeye salmon (*O. nerka*)	Endangered	Yes	No	No
Snake River Basin Steelhead (*O. mykiss*)	Threatened	Yes	No	No
Middle Columbia River Steelhead (*O. mykiss*)	Threatened	No	No	No
Upper Columbia River Steelhead (*O. mykiss*)	Threatened	No	No	No
Upper Columbia River spring Chinook salmon (*O. tshawytscha*)	Threatened	No	No	No

Fishery Management Plan that Describes EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued by:

for William W. Stelle, Jr.
Regional Administrator

Date: November 14, 2014

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ACRONYM GLOSSARY

BA	Biological Assessment
CFR	Code of Federal Regulations
cfs	cubic feet per second
COE	U.S. Army Corps of Engineers
CRITFC	Columbia River Inter-Tribal Fish Commission
cy	cubic yard
DART	Data Access in Real Time
DMMU	Dredge Material Management Unit
DPS	Distinct Population Segment
DQA	Data Quality Act
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FR	Federal Register
HUC	Hydrologic Unit Code
ICTRT	Interior Columbia Basin Technical Recovery Team
ISAB	Independent Scientific Advisory Board
ITS	Incidental Take Statement
MCR	Middle Columbia River (steelhead)
MPG	Major Population Group
MOP	Minimum Operating Pool
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act of 1969, as amended
NMFS	National Marine Fisheries Service
NTU	Nephelometric Turbidity Unit
Opinion	Biological Opinion
PCE	Primary Constituent Element
PFMC	Pacific Fishery Management Council
PSMP	Programmatic Sediment Management Plan
RM	River Mile
SEF	Sediment Evaluation Framework
SMS	Sediment Management Standards
SR	Snake River
SRB	Snake River Basin (steelhead)
SRF	Snake River fall-run (Chinook)

SRSS	Snake River spring/summer-run (Chinook)
UCR	Upper Columbia River (steelhead)
U.S.C.	United States Code
VSP	Viable Salmonid Population
WDOE	Washington State Department of Ecology

1 INTRODUCTION

This introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

The biological opinion (Opinion) and incidental take statement portions of this document were prepared by the National Marine Fisheries Service (NMFS) in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531, *et seq*.), and implementing regulations at 50 CFR 402.

NMFS also completed an essential fish habitat (EFH) consultation. It was prepared in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 *et seq*.) and implementing regulations at 50 CFR 600.

The Opinion and EFH Conservation Recommendations are both in compliance with section 515 of the Treasury and General Government Appropriations Act of 2001 (Data Quality Act) (44 U.S.C. 3504(d)(1) *et seq*.), and underwent pre-dissemination review.

1.2 Consultation History

On December 21, 2012, NMFS received a biological assessment (BA) and a request for ESA and MSA consultations from the U.S. Army Corps of Engineers (COE) for dredging at four locations in the Snake River and depositing the dredged material in the water to create a shallow bench (USACE 2012b). The COE later suspended consultation in an effort to further assess contaminants found in sediment. On February 19, 2014, the COE sent NMFS a memo that describing results of the chemical analysis of the sediments, results of bioassays performed on the sediments, and a determination that the sediments were suitable for in-water disposal. NMFS received from the COE a memo via email on February 25, 2014, requesting that consultation be restarted and NMFS resumes consultation on this date.

Additional details regarding the proposed action were also received by NMFS on various dates in 2014 after resuming consultation. The additional information included:

- Memo describing sediment analysis and suitability for in-water disposal, February 19, 2014;
- Sediment disposal site profile drawing, February 19, 2014;
- Modified disposal site drawings, February 19, 2014;
- e-mail describing stability of sediment disposal sites, March 3, 2014;

- Revised volumes of dredging material in the BA, March 27, 2014;
- Revision of sediment disposal site plans, April 29, 2014;
- e-mail describing amount of time needed to complete dredging, May 12, 2014;
- Report on modeled suspended sediment and contaminant concentrations during dredging and filling (Gidley & Schroeder 2014), May 28, 2014;
- Technical summary of 4-methyl phenol occurrence, fate, and toxicity (Kreitinger 2014), May 28, 2014;
- Preliminary monitoring plan, June 13, 2014;
- Report on predicted turbidity plumes (Schroeder 2014); July 25, 2014;
- Final monitoring plan, July 31, 2014;

The COE proposes the action under the authority of the Flood Control Act of 1952 (PL 87-874) which directs the COE to maintain a 14-foot-deep, 250-foot-wide navigation channel in the Snake and Clearwater Rivers. The administrative record for this consultation is on file at the Snake Basin Office in Boise, Idaho.

This paragraph documents key points of the prior dredging and related consultations for NMFS-listed species. The COE's previous dredging actions have required two ESA section 7 formal consultations since 2001 (2001-301; 2003-01293). The 2003 consultation was challenged in litigation and the parties reached a settlement that permitted the COE to perform a limited, one-time maintenance dredge and fill in 2005/2006 but with the condition that the COE complete a National Environmental Policy Act (NEPA) analysis on the long-term management of sediment in the lower Snake River. In response to the 2004 litigation, the COE has developed a Programmatic Sediment Management Plan (PSMP) for the lower Snake River and Environmental Impact Statement for the PSMP. The COE initiated consultation with NMFS on the PSMP on August 5, 2014, and NMFS has completed an Opinion concluding that consultation (consultation number WCR-2014-1704). This consultation analyzes the site-specific actions described above.

1.3 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those without independent utility apart from the action under consideration.

The Federal navigation channel in the Snake River refers to that portion of the Snake River inland navigation waterway maintained by the COE. The navigation waterway begins at the Columbia and Snake Rivers confluence and extends upstream past four dams to the head of the Lower Granite reservoir (Figure 1). The COE maintains a 14-foot-deep, 250-foot-wide navigation channel (at minimum operating pool (MOP)) through these reservoirs. The proposed action consists of dredging of the following sites: (1) Downstream navigation lock of Ice Harbor Dam (Snake river mile (RM) 9.5); (2) the Federal navigation channel in the Snake and Clearwater Rivers confluence area (Snake RM 138 to Clearwater RM 2.0); (3) the berthing area for the Port of Clarkston, Washington (Snake RM 137.9 and 139); (4) the berthing area for the Port of Lewiston, Idaho (Clearwater River, RM 1 to 1.5). The proposed action also entails using dredged material as fill to construct a shallow water bench for juvenile habitat at Knoxway Bench (RM 116) immediately upstream of Knoxway Canyon.

Sedimentation at the downriver approaches to the navigation locks is an ongoing problem. Congress has authorized the COE to provide navigation facilities, including locks to allow passage of a tug towing four barges, at each of the four lower Snake River dams. Accumulated cobble and gravel presently complicate boat passage into the Ice Harbor navigation lock. The COE proposes to remove this material to restore passage to authorized dimensions.

The COE also proposes issuing regulatory (section 404/10 permits) for dredging at commercial ports and berths operated by local port districts or private companies in Clarkston, Washington and Lewiston, Idaho. Most of these non-Federal navigation areas consist of arterial channels leading from the main Federal navigation channel to the port or berth as well as those areas at the port or berth used for loading, unloading, mooring, or turning around. Typically, these facilities

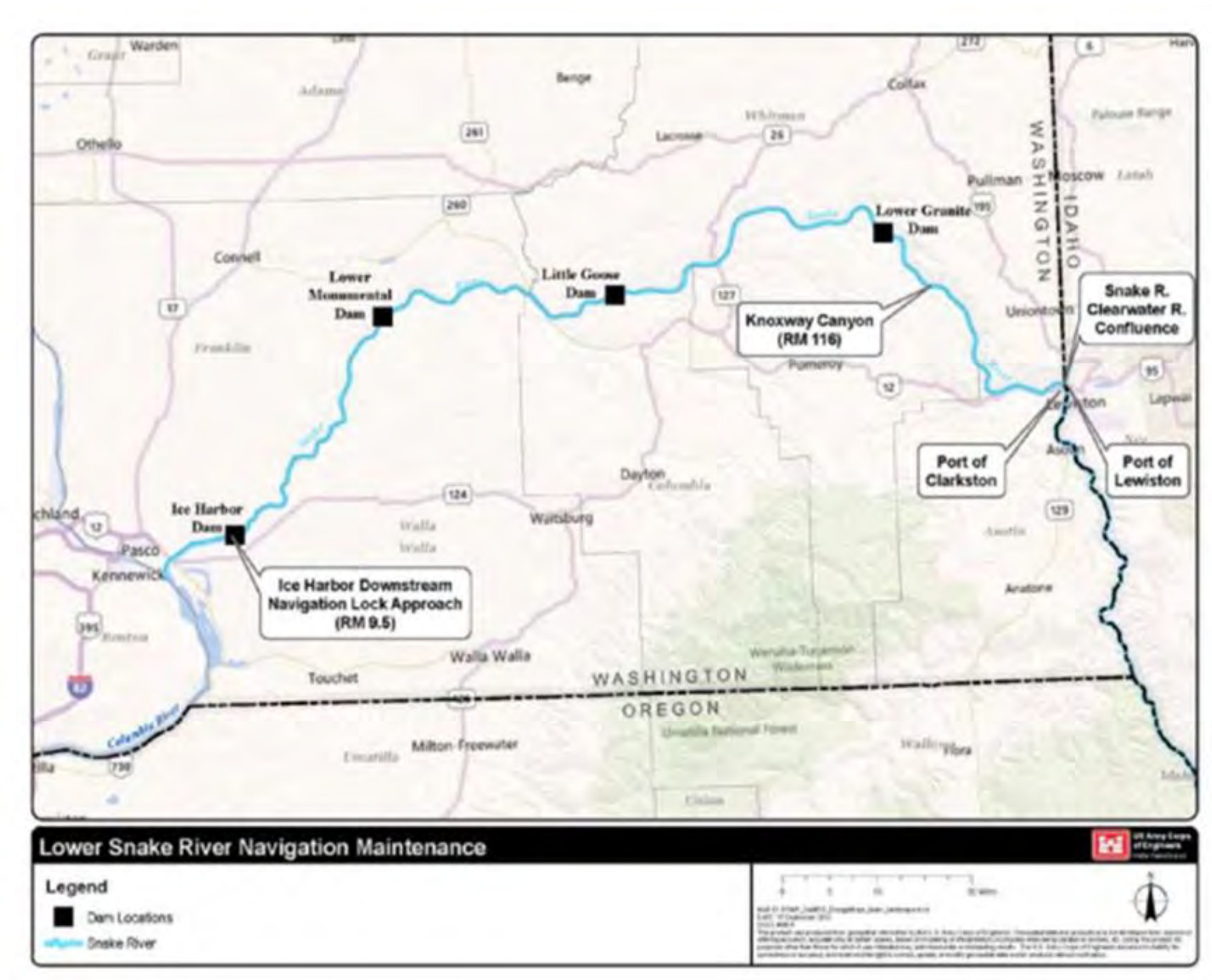

Figure 1. The Federal navigation channel in the lower Snake River from the confluence with the Columbia River to the confluence with the Clearwater River at Clarkston, Washington. The four dredging locations are the navigation lock approach at Ice Harbor Dam, Ports of Lewiston, and Clarkston and the Federal navigation channel at the Snake and Clearwater Rivers Confluence. Dredged material will be used as fill at the Knoxway Bench (Canyon) site to create shallow water habitat (USACE 2012b).

also need to accommodate river tugs with up to four barges in tow. Further detail regarding the dredging sites follows below.

Confluence of Snake and Clearwater Rivers (Federal Navigation Channel). The COE will remove approximately 458,472 cubic yards (cy) of material from the Federal navigation channel at the confluence of the Snake and Clearwater Rivers (Figure 2). Sediment samples were collected in August 2013 from the main navigation channel in the confluence area. In general, the grain size was higher in the Clearwater River dredge material management units (DMMUs) relative to the DMMUs below the confluence in the Snake River. For Clearwater DMMUs 7 – 11 the grain size averaged 96% sand, with a relatively narrow range of 92% – 99%. The DMMUs (1 to 6) below the confluence were still relatively course, but had a lower sand content that averaged 85%, and ranged from 69% to 93%.

Figure 2. Confluence of the Snake and Clearwater Rivers with the Federal navigation channel dredging area identified. The Clearwater River enters from the east, the Snake River flows in from the south and continues downstream to the west. The Lower Granite Dam is approximately 39 miles downstream (west). The COE will dredge approximately 458,472 cy of material and barge it downstream to the Knoxway Bench site (USACE 2012b).

Port of Clarkston. About 14,143 cy of material will be removed from four berthing areas at the Port of Clarkston: the crane dock at the downstream end of the Port property (RM 137.9), the Lewis-Clark Grain Terminal (RM 138.2), the recreation dock at RM 138.3, and the tour boat dock at the upstream end (RM 139) (Figure 3). The berthing area is a zone extending 50 feet out into the river from the port facilities and running the length of the port facilities. Maintenance in this area is the port's responsibility, and the Port of Clarkston will provide funding to the COE for this portion of the work. Most of the area was dredged in 2005/2006. Sediment samples were collected in November 2012 and August 2013. The data showed that sediment composition ranged from 45% to 94% sand depending on the DMMU. Silt composition ranged from 3% to 41%.

Figure 3. Port of Clarkston berthing area where the Corp will dredge approximately 14,143 cy of material (USACE 2012b).

Port of Lewiston. About 4,664 cy of material will be removed from the berthing area at the Port of Lewiston on the Clearwater River, approximately 1.5 miles upstream of the confluence with the Snake River (Figure 4). The berthing area is a zone extending 50 feet out into the river from the port facilities and running the length of the port facilities. Maintenance in this area is the port's responsibility, and the Port of Lewiston will provide funding to the COE for this portion of the work. The area was dredged in 2005/2006. The August 2013 sediment samples showed that sediment composition averaged 95% sand, and nearly equal proportions of silt and clay.

Figure 4. Dredging area at the Port of Lewiston, Idaho where the COE will remove approximately 4,664 cy of material (USACE 2012b).

Ice Harbor Lock Approach. Approximately 3,205 cy of material will be removed from the Ice Harbor lock approach (Figure 5). Routine maintenance dredging has not occurred in this area since the 1970s although about 400 cys of rock and cobble was dredged in fall 2012 to remove an obstruction that presented a safety hazard in the downstream navigation lock approach. Sediment sampling showed that sediment composition was large rock substrate and cobbles greater than or equal to 2 to 6 inches.

Figure 5. The Ice Harbor navigation lock approach where approximately 3,205 cy will be dredged and barged upriver to the Knoxway Canyon site.

The COE proposes maintenance dredging in 2014/2015 (or the next available winter in-water work window) to meet the immediate need of providing a 14-foot water depth as measured at MOP, with authorized overdepth (up to 16 feet), at these four locations in the lower Snake River and lower Clearwater River. The COE will use the dredged material to create additional shallow water habitat at the downstream end of Knoxway Bench. The Corp created the Knoxway Bench from material dredged in winter 2005/2006.

Sediment Removal Methods

A contractor will use mechanical methods, such as a clamshell, dragline, or shovel/scoop, to complete the dredging. Based on previous dredging activities, the method will likely be a clamshell. Dredged material will be loaded onto barges, most likely a bottom dump barge, for transport to the disposal site. Clamshell dredges with a capacity of approximately 15 cy and barges with capacity of up to 3,000 cy and maximum drafts of 14 feet will be used. It will take approximately 6 to 8 hours to fill a barge. The expected rate of dredging is 3,000 to 5,000 cy per 8-hour shift. The contractor could work up to 24 hours per day and 7 days per week if needed. While loading the barge, the contractor will be allowed to overspill excess water from the barge. Water quality monitoring will take place upstream (for background) and downstream of the dredge. Near real-time monitoring will allow a quick response to avoid exceeding water quality standards. These procedures are similar to those used during the previous dredging action in 2005/2006.

Disposal Site

Dredged materials will be deposited in the water at the Knoxway Bench, which is located 0.5 miles upstream of Knoxway Canyon (Figure 6). Sediment has been accumulating in this low velocity area at an estimated rate of 2 inches per year since the construction of Lower Granite Dam. In 1992, the COE visually inspected the substrate at this site during a reservoir drawdown test and determined it to be primarily silt. In 2005/2006, the COE deposited approximately 420,000 cy of sand and silt at the upstream end of the Knoxway Bench site. They shaped the dredged material to create an estimated 3.7-acre shallow water habitat bench that NMFS expected juvenile salmonids to use, primarily juvenile Snake River fall-run (SRF) Chinook salmon (Figure 6). Post project monitoring by the COE confirmed juvenile salmonids have and are using the site for resting and rearing. The upper surface of this bench material is sand that was reshaped to gently slope towards the river.

Once a barge is full, a tugboat will push it to the disposal site (Figure 6). The barge will not discharge any material or water while in transit. For in-water disposal, the bottom of the barge will be opened at the disposal site to dump the material all at once. After unloading, the barge will return to the dredging site for additional loads. The proposed in-water discharge/habitat development site is located in the Lower Granite reservoir at RM 116. This site is an approximately 120-acre, mid-depth bench on the left bank of the Snake River about 0.5 river miles upriver of Knoxway Canyon.

Figure 6. Knoxway bench location. Knoxway bench is located at approximately RM 116, between Lower Granite Dam and the confluence of the Snake and Clearwater Rivers.

Dredged material will be deposited downstream from the bench created in 2006, and extend riverward of the existing shoreline (Figure 7). The new material will occupy a 27.4-acre footprint and will form a uniform, gently sloping shallow-water bench along roughly 2,500 linear feet of shoreline. The top of the bench will have a 3% to 5% slope and will add approximately 11.4 acres of shallow water habitat. This area will be up to six feet deep at MOP with features preferred for foraging by outmigrating juvenile salmonids, particularly for SRF Chinook salmon juveniles. Placement of cobbles, rock, silt, and silt/sand mixture will occur in a manner that will extend the shore riverward along the proposed disposal site to enhance the rearing suitability of the mid-depth habitat bench, by creating a low horizontal slope across the newly created shallow-water rearing habitat (Figure 8). The final step includes placing or re-handling the material to form a gently-sloping (3% to 5%) shallow area bench with a land-ward depth starting from 4-6 feet sloping down to 8 to 10 feet deep at the slope transition and 20 feet deep at toe, all measured at MOP (See Figure 8).

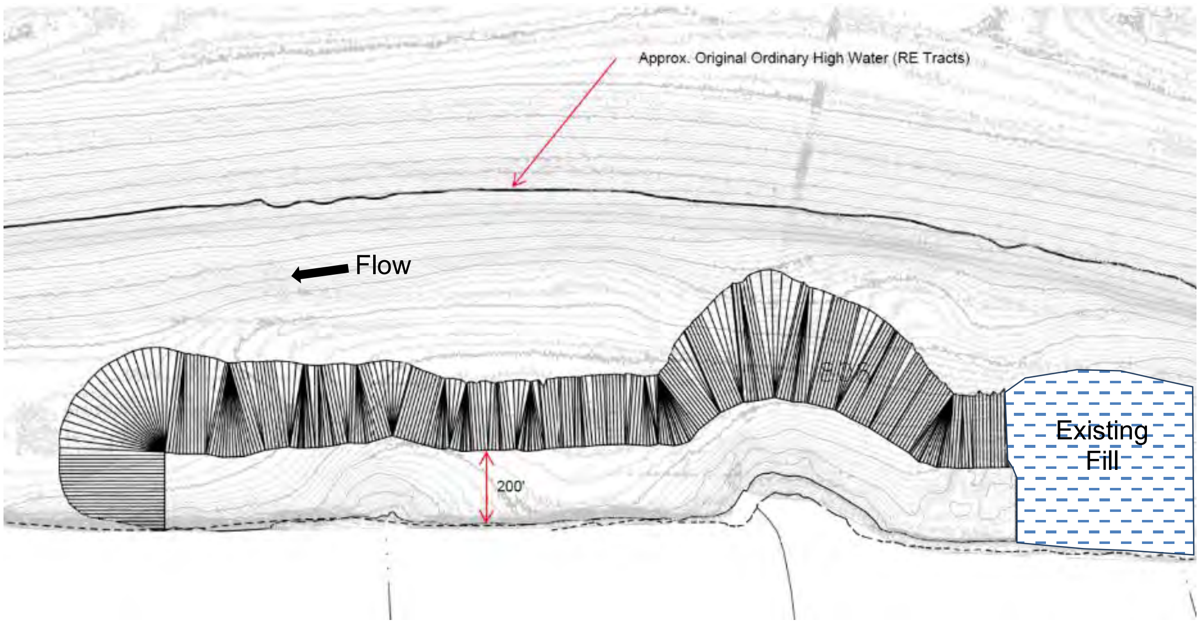

Figure 7. Dredge material placement showing the 200-foot wide shallow-water bench and the steeper side slopes (shaded).

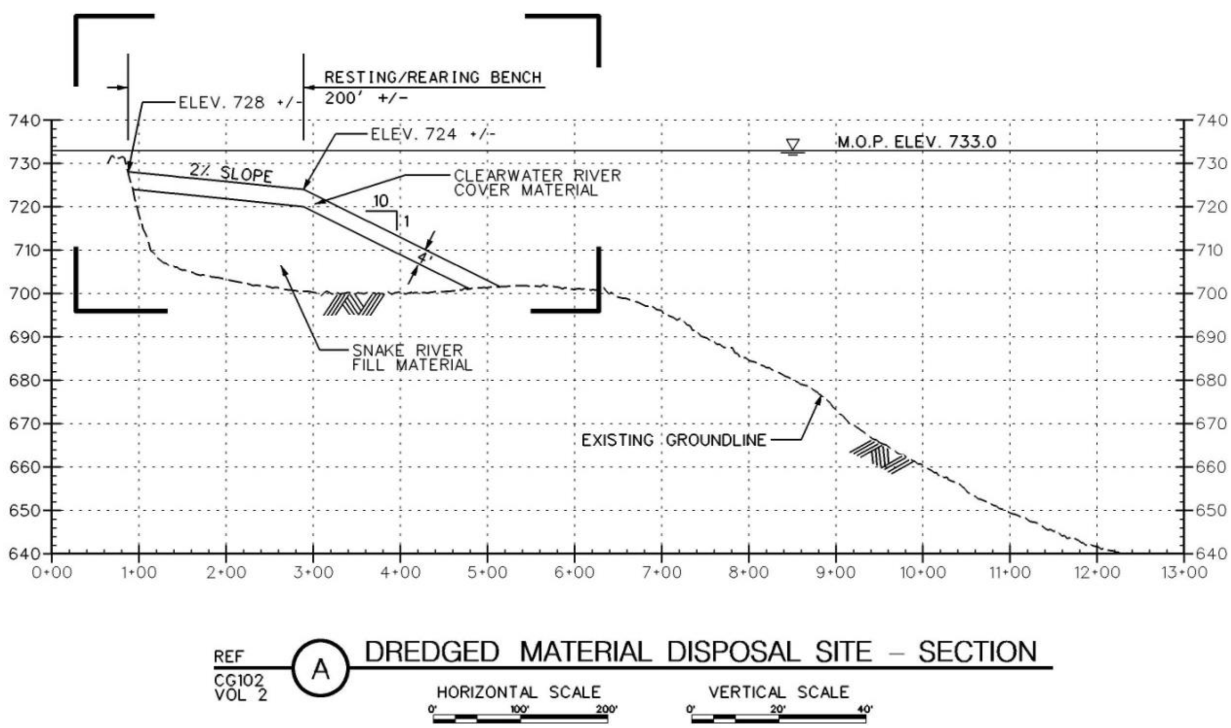

Figure 8. Cross sectional view of proposed disposal site at Knoxway Bench.

Water quality monitoring will occur before, during, and after dredging and filling operations. A background reference monitoring station will be located approximately 300 feet upstream of all dredging or filling activities. Project monitoring stations will be located at points 300 feet and 900 feet downstream of dredging and of filling activities. Measurements at the 300-foot station would be used for early warning of excessive turbidity, while the 900-foot station would be used as the compliance boundary for meeting state water quality standards. Compliance monitoring stations are located in the main direction of river flow and, to the extent practical, in the direct path of the plume. Based on results from 2005/2006 when turbidity levels returned to background levels within an hour after cessation of work in most cases, monitoring will continue for 1 hour following completion of work at each site.

1.4 Action Area

"Action area" means all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area begins (at the downstream end) at the confluence of the Snake River with the Columbia River at RM 0. The action area in the Snake River extends upstream to the confluence with the Clearwater River (approximately RM 146), and from RM 0 to approximately RM 3 on the Clearwater River. The action area also includes upland areas used for staging equipment or other logistical support. Use of these upland areas is unlikely to cause measurable effects to listed fish or critical habitat; therefore, this Opinion is focused on the effects of dredging, filling, and barge traffic in the Snake River. The action area boundaries encompass the entire lower Snake River navigation channel due to effects of navigation by large vessels (consisting almost exclusively of barge traffic) that is facilitated by dredging. The footprint of the dredging and filling effects are a small portion of the action area.

The species of listed anadromous fish in the action area are Snake River spring/summer-run (SRSS) Chinook salmon, SRF Chinook salmon, Snake River (SR) sockeye salmon, Snake River (SRB) steelhead, Upper Columbia spring run salmon, Middle Columbia River (MCR) steelhead, and Upper Columbia River (UCR) steelhead (Table 1). Both adult and juvenile life stages of the Snake River species use the action area as a migration corridor. In addition, SRF Chinook salmon spawn in some areas of the mainstem Snake and Clearwater rivers, primarily upstream of the action area but occasionally in the tailrace areas of the mainstem dams. The portions of the mainstem Snake and Clearwater Rivers in the action area also provide adult holding habitat and rearing habitat for SRF Chinook salmon, SRSS Chinook salmon and SRB steelhead. The action area is also designated as EFH for Chinook salmon and coho salmon (PFMC1999). Columbia River species (MCR steelhead, UCR steelhead, and Upper Columbia spring run chinook salmon) are present in the action area only as occasional strays.

Table 1. Federal Register notices for final rules that list threatened and endangered species, designate critical habitats, or apply protective regulations to listed species considered in this consultation. Listing status: "T" means listed as threatened, "E" means listed as endangered under the ESA.

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon (*Oncorhynchus tshawytscha*)			
Snake River spring/summer-run	T 6/28/05; 70 FR 37160 Originally 4/22/92; 57FR14653	12/28/93; 58 FR 68543 revised 10/25/99; 64 FR 57399	6/28/05; 70 FR 37160
Snake River fall-run	T 6/28/05; 70 FR 37160 Originally 4/22/92 57FR14653	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Upper Columbia spring run	E 6/28/05; 70 FR 37160	9/02/05; 70 FR 52360	ESA Section 9 applies
Sockeye salmon (*O. nerka*)			
Snake River sockeye	E 6/28/05; 70 FR 37160 Orig. 11/20/91 56 FR 58619	12/28/93; 58 FR 68543	ESA section 9 applies
Steelhead (*O. mykiss*)			
Snake River Basin	T 1/05/06 71 FR 834; 8/18/97 62 FR 4397	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Middle Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River	T 8/24/09; 74 FR 42605	9/02/05; 70 FR 52630	2/01/06; 71 FR 5178

2 ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, Federal agencies must ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an Opinion stating how the agency's actions would affect listed species and their critical habitat. If incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement (ITS) that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures and terms and conditions to minimize such impacts.

The COE has determined the proposed action is likely to adversely affect SRSS Chinook salmon (*Oncorhynchus tshawytscha*), SRF Chinook salmon (*O. tshawytscha*), SR sockeye salmon (*O. nerka*), and SRB steelhead (*O. mykiss*), and their designated critical habitat.

The proposed action is not likely to adversely affect Middle Columbia River steelhead (*O. mykiss*), Upper Columbia River steelhead (*O. mykiss*), and their critical habitat. The action area does not include critical habitat for these species, and it is used only occasionally by adult fish that stray into the Snake River while migrating toward spawning areas in the Columbia River basin. The analysis for these species and their critical habitat is found in the "Not Likely to Adversely Affect" Determinations section (2.11).

2.1 Analytical Approach of the Biological Opinion

This Opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of a listed species," which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

The adverse modification analysis considers the impacts of the Federal action on the conservation value of designated critical habitat. This Opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.[1]
We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.
- Reach jeopardy and adverse modification conclusions.
- If necessary, define a reasonable and prudent alternative to the proposed action.

1 Memorandum from William T. Hogarth to Regional Administrators, Office of Protected Resources, NMFS (Application of the "Destruction or Adverse Modification" Standard Under Section 7(a)(2) of the Endangered Species Act) (November 7, 2005).

2.2 Rangewide Status of the Species and Critical Habitat

This Opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The Opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential physical and biological features that help to form that conservation value.

One factor affecting the rangewide status of Snake River salmon and steelhead, and aquatic habitat at large is climate change. Several studies have revealed that climate change has the potential to affect ecosystems in nearly all tributaries throughout the state (Battin *et al*. 2007; Independent Scientific Advisory Board [ISAB] 2007). While the intensity of effects will vary by region (ISAB 2007), climate change is generally expected to alter aquatic habitat (water yield, peak flows, and stream temperature). As climate change alters the structure and distribution of rainfall, snowpack, and glaciations, each factor will in turn alter riverine hydrographs. Given the increasing certainty that climate change is occurring and is accelerating (Battin *et al*. 2007), NMFS anticipates salmonid habitats will be affected. Climate and hydrology models project significant reductions in both total snow pack and low-elevation snow pack in the Pacific Northwest over the next 50 years (Mote and Salathé 2009) changes that will shrink the extent of the snowmelt-dominated habitat available to salmon. Such changes may restrict our ability to conserve diverse salmon life histories.

In the Pacific Northwest, most models project warmer air temperatures, increases in winter precipitation, and decreases in summer precipitation. Average temperatures in the Pacific Northwest are predicted to increase from 0.1 ºC to 0.6ºC per decade (Mote and Salathé 2009). Warmer air temperatures will lead to more precipitation falling as rain rather than snow. As the snow pack diminishes, seasonal hydrology will shift to more frequent and severe early large storms, changing stream flow timing and increasing peak river flows, which may limit salmon survival (Mantua *et al*. 2009). The largest driver of climate-induced decline in salmon populations is projected to be the impact of increased winter peak flows, which scour the streambed and destroy salmon eggs (Battin *et al*. 2007).

Higher water temperatures and lower spawning flows, together with increased magnitude of winter peak flows are all likely to increase salmon mortality. The ISAB (2007) states that higher ambient air temperatures will likely cause water temperatures to rise. Salmon and steelhead require cold water for spawning and incubation. As climate change progresses and stream temperatures warm, thermal refugia will be essential to persistence of many salmonid populations. Thermal refugia are important for providing salmon and steelhead with patches of suitable habitat while allowing them to undertake migrations through or to make foraging forays into areas with greater than optimal temperatures. To avoid waters above summer maximum temperatures, juvenile rearing may be increasingly found only in the confluence of colder tributaries or other areas of cold water refugia (Mantua *et al*. 2009).

Climate change is expected to make recovery targets for these salmon populations more difficult to achieve. Habitat action can address the adverse impacts of climate change on salmon. Examples include restoring connections to historical floodplains and freshwater and estuarine habitats to provide fish refugia and areas to store excess floodwaters, protecting and restoring riparian vegetation to ameliorate stream temperature increases, and purchasing or applying easements to lands that provide important cold water or refuge habitat (Battin *et al*. 2007; ISAB 2007).

2.2.1 Status of the Species

This section describes the present condition of the SRSS Chinook salmon, SRF Chinook salmon, and SR sockeye salmon evolutionarily significant units (ESUs), and the SSRB steelhead distinct population segment (DPS). The status of a salmonid ESU or DPS is expressed in terms of likelihood of persistence over 100 years, or in terms of risk of extinction within 100 years. NMFS uses McElhaney *et al*.'s (2000) description of a viable salmonid population (VSP) that defines "viable" as less than a 5% risk of extinction within 100 years and "highly viable" as less than a 1% risk of extinction within 100 years. A third category, "maintained," represents a less than 25% risk within 100 years (moderate risk of extinction). To be considered viable (with a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100-year time frame), an ESU or DPS should have multiple populations so that a single catastrophic event is less likely to cause the ESU/DPS to become extinct, and so that the ESU/DPS may function as a metapopulation as necessary to sustain population-level extinction and recolonization processes (ICTRT 2005). The risk level of the ESU/DPS is built up from the aggregate risk levels of the individual populations and major population groups (MPGs, defined below) that make up the ESU/DPS.

Attributes associated with a VSP are the levels of abundance (number of adult spawners in natural production areas), productivity (adult progeny per parent), and the spatial structure and diversity necessary to: (1) Safeguard the genetic diversity of the listed ESU or DPS; (2) enhance its capacity to adapt to various environmental conditions; and (3) allow it to become self-sustaining in the natural environment. In 2007, the Interior Columbia Basin Technical Recovery Team (ICTRT) further defined population-level viability criteria to address, in combination, all four of the key parameters: (1) Abundance, (2) productivity, (3) spatial structure and (4) diversity (ICTRT 2007). These viability attributes are influenced by survival, behavior, and experiences throughout the entire life cycle, characteristics that are influenced in turn by habitat and other environmental and anthropogenic conditions. The present risk faced by the ESU/DPS informs NMFS' determination of whether additional risk will appreciably reduce the likelihood that the ESU/DPS will survive or recover in the wild.

The four species discussed in this Opinion that use the lower Snake River include SRSS Chinook salmon, SRF Chinook salmon, SR sockeye salmon, and SRB steelhead. In 2003, and updated in 2005, the ICTRT identified independent populations of each species based on genetic information, geography, life-history traits, morphological traits, and population dynamics (Table 2). Within each ESU or DPS, the ICTRT further aggregated populations into MPGs, which are a group of populations that share similar environments, life-history characteristics, and geographic proximity within an ESU (McElhany *et al*. 2000). All 52 populations identified (all species combined) use all or significant portions of the mainstem of the lower Snake River for migration, spawning, or rearing.

On August 15, 2011, NMFS announced the results of an ESA 5-year review for salmon and steelhead in the Interior Columbia Recovery Domain (76 FR 50448). After reviewing new information on the viability of these species, ESA section 4 listing factors, and efforts being made to protect the species, NMFS concluded that all salmon and steelhead in the Snake River sub-domains should retain their 2005 (salmon) or 2006 (steelhead) ESA listing classifications.

Table 2. ESA-listed salmon and steelhead populations that use the lower Snake River subbasin (ICTRT 2003; 2005; 2007; and Ford 2011).

Species	Populations
Snake River spring/summer-run Chinook salmon	28 extant ; 4 extirpated (Includes 15 hatchery programs)
Snake River fall-run Chinook salmon	1 extant (includes 4 hatchery programs); 2 extirpated
Snake River sockeye salmon	1 (all Snake River Basin fish and Redfish Lake captive propagation)
Snake River Basin steelhead	23 extant; 1 blocked and 1 extinct

For the status of critical habitat, NMFS reviews the condition of the essential physical or biological features throughout the designated area, and the conservation values of the various watersheds in the designated area to determine whether the proposed action will destroy or adversely modify those specific conservation values. The regulatory definition of “destruction or adverse modification” at 50 CFR 402.02 is not used in this Opinion. Instead, this analysis relies on statutory provisions of the ESA, including those in section 3 that define “critical habitat” and “conservation,” in section 4 that describe the designation process, and in section 7 that sets forth the substantive protections and procedural aspects of consultation, and on agency guidance for application of the “destruction or adverse modification” standard (Hogarth 2005).

Snake River Spring/Summer-run Chinook Salmon

The SRSS Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653). This ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Several factors led to NMFS' conclusion that Snake River spring/summer Chinook were threatened: (1) Abundance of naturally produced Snake River spring and summer Chinook runs had dropped to a small fraction of historical levels; (2) short-term projections were for a continued downward trend in abundance; (3) hydroelectric development on the Snake and Columbia Rivers continued to disrupt Chinook runs through altered flow regimes and impacts on estuarine habitats; and (4) habitat degradation existed throughout the region, along with risks associated with the use of outside hatchery stocks in particular areas (Good *et al.* 2005). On August 15, 2011, in the agency's most recent 5-year review for the Snake River ESU, NMFS concluded that the species should remain listed as threatened (76 FR 50448).

Current runs returning to the Clearwater River drainages were not included in the SRSS Chinook salmon ESU. Lewiston Dam in the lower mainstem of the Clearwater River was constructed in 1927 and functioned as an anadromous block until the early 1940s (Matthews and Waples 1991). In the 1940s spring and summer Chinook salmon runs were reintroduced into the Clearwater system via hatchery outplants. As a result, when determining the status of SRSS Chinook for ESA listing, NMFS concluded that even if a few native salmon survived the hydropower dams, "the massive outplantings of nonindigenous stocks presumably substantially altered, if not eliminated, the original gene pool" (Matthews and Waples 1991).

Life History. The SRSS Chinook salmon are characterized by their return times. Runs classified as spring Chinook salmon are counted at Bonneville Dam beginning in early March and ending the first week of June; summer runs are those Chinook adults that pass Bonneville Dam from June through August. Returning adults will hold in deep mainstem and tributary pools until late summer, when they move up into tributary areas and spawn. In general, spring-run type Chinook salmon tend to spawn in higher-elevation reaches of major Snake River tributaries in mid- through late August, and summer-run type Chinook salmon spawn approximately 1 month later than spring-run fish. Summer-run Chinook salmon tend to spawn lower in the Snake River drainages, although their spawning areas often overlap with spring-run spawners.

The SRSS Chinook spawn follow a "stream-type" life history characterized by rearing for a full year in the spawning habitat and migrating in early to mid-spring as age-1 smolts (Healey 1991). Eggs are deposited in late summer and early fall, incubate over the following winter, and hatch in late winter and early spring of the following year. Juveniles rear through the summer, and most overwinter and migrate to sea in the spring of their second year of life. Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer-rearing or overwintering areas. The SRSS Chinook salmon return from the ocean to spawn primarily as 4- and 5-year-old fish, after 2 to 3 years in the ocean. A small fraction of the fish return as 3-year old "jacks," heavily predominated by males (Good *et al*. 2005).

Spatial Structure and Diversity. The Snake River ESU includes all naturally spawning populations of spring/summer Chinook in the mainstem Snake River (below Hells Canyon Dam) and in the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins (57 FR 23458), as well as the progeny of 15 artificial propagation programs (70 FR 37160). The hatchery programs include the South Fork Salmon River (McCall Hatchery), Johnson Creek, Lemhi River, Pahsimeroi River, East Fork Salmon River, West Fork Yankee Fork Salmon River, and Upper Salmon River (Sawtooth Hatchery) programs in Idaho; and the Tucannon River (conventional and captive broodstock programs), Lostine River, Catherine Creek, Lookingglass Creek, Upper Grande Ronde River, Imnaha River, and Big Sheep Creek programs in Oregon. The historical SRSS Chinook ESU likely also included populations in the Clearwater River drainage and extended above the Hells Canyon Dam complex.

Within the Snake River ESU, the ICTRT identified 28 extant and four extirpated or functionally extirpated populations of spring/summer-run Chinook salmon, listed in Table 3 (ICTRT 2003; McClure *et al.* 2005). The ICTRT aggregated these populations into five MPGs: lower Snake River, Grande Ronde/Imnaha Rivers, South Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River. For each population, Table 3 shows the current risk ratings that the ICTRT assigned to the four parameters of a VSP (spatial structure, diversity, abundance, and productivity).

In general, current spatial structure risk is low in this ESU and is not preventing the recovery of the species. Spring/summer Chinook salmon spawners are distributed throughout the ESU albeit at very low numbers. Diversity risk, on the other hand, is somewhat higher, driving the moderate and high combined spatial structure/diversity risks shown in Table 3 for some populations. In the Upper Salmon, for example, high diversity risks are caused by chronically high proportions of hatchery spawners in natural areas, and by loss of access to tributary spawning and rearing habitats and the associated reduction in life history diversity (Ford 2011). Diversity risk will need to be lowered in multiple populations in order for the ESU to recover (ICTRT 2007, ICTRT 2010a).

Abundance and Productivity. Historically, the Snake River drainage is thought to have produced more than 1.5 million adult spring/summer Chinook salmon in some years (Matthews and Waples 1991), yet by the mid-1990s counts of natural-origin fish passing Lower Granite Dam dropped to less than 10,000 (IDFG 2007). Natural-origin returns have since increased somewhat but remain highly variable and a fraction of historic estimates (Ford 2011). Between 2002 and 2012, the number of wild adult fish passing Lower Granite Dam annually ranged from 8,808 to 31,619 (IDFG 2014). For individual populations, abundance remains below viability thresholds for all populations, reflected in the ICTRT's high risk rating for abundance/productivity for each population listed in Table 3 (Ford 2011). For some populations, mean abundance from 2000 to 2009 was extremely low, such as for the Yankee Fork and Camas Creek populations, which had recent mean abundances of just 21 and 30 natural spawners, respectively, compared to minimum viability targets of at least 500 spawners (Ford 2011). Relatively low natural production rates and spawning levels remain a major concern across the ESU, and each extant population in the ESU currently faces a high risk of extinction over the next 100 years (Table 3).

Table 3. Summary of viable salmonid population (VSP) parameter risks and overall current status for each population in the Snake River spring/summer Chinook salmon ESU (Ford 2011).

MPG	Population	VSP Parameter Risk		Overall Viability
		Abundance/	**Spatial Structure/**	
South Fork Salmon River (Idaho)	Little Salmon River	High	High	High Risk
	South Fork Salmon River mainstem	High	Moderate	High Risk
	Secesh River	High	Low	High Risk
	East Fork South Fork Salmon River	High	Low	High Risk
Middle Fork Salmon River (Idaho)	Chamberlain Creek	High	Low	High Risk
	Middle Fk. Salmon River below Indian	High	Moderate	High Risk
	Big Creek	High	Moderate	High Risk
	Camas Creek	High	Moderate	High Risk
	Loon Creek	High	Moderate	High Risk
	Middle Fk. Salmon River above Indian Ck.	High	Moderate	High Risk
	Sulphur Creek	High	Moderate	High Risk
	Bear Valley Creek	High	Low	High Risk
	Marsh Creek	High	Low	High Risk
Upper Salmon River (Idaho)	North Fork Salmon River	High	Low	High Risk
	Lemhi River	High	High	High Risk
	Salmon River Lower Mainstem	High	Low	High Risk
	Pahsimeroi River	High	High	High Risk
	East Fork Salmon River	High	High	High Risk
	Yankee Fork Salmon River	High	High	High Risk
	Valley Creek	High	Moderate	High Risk
	Salmon River Upper Mainstem	High	Moderate	High Risk
	Panther Creek			Extirpated
Lower Snake (Washington)	Tucannon River	High	Moderate	High Risk
	Asotin River			Extirpated
Grande Ronde and Imnaha Rivers (Oregon/ Washington)	Wenaha River	High	Moderate	High Risk
	Lostine/Wallowa River	High	Moderate	High Risk
	Minam River	High	Moderate	High Risk
	Catherine Creek	High	Moderate	High Risk
	Upper Grande Ronde R.	High	High	High Risk
	Imnaha River	High	Moderate	High Risk
	Big Sheep Creek			Extirpated
	Lookingglass Creek			Extirpated

Snake River Fall-Run Chinook Salmon

The Snake River fall Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653). This ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Snake River fall Chinook salmon have substantially declined in abundance from historic levels, primarily due to the loss of primary spawning and rearing areas upstream of the Hells Canyon Dam complex (57 FR 14653). Additional concerns for the species have been the high percentage of hatchery fish returning to natural spawning grounds and the relatively high aggregate harvest impacts by ocean and in-river fisheries (Good *et al.* 2005). On August 15, 2011, NMFS completed a 5-year review for the Snake River fall Chinook salmon ESU and concluded that the species should remain listed as threatened (76 FR 50448).

Life History. The SRF Chinook salmon enter the Columbia River in July and August, and migrate past the lower Snake River mainstem dams from August through November. Fish spawning takes place from October through early December in the lower mainstem of the Snake River and the lower reaches of several of the associated major tributaries including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers (Connor and Burge 2003; Ford 2011). Spawning has occasionally been observed in the tailrace areas of the four mainstem dams (Dauble *et al*. 1999; Dauble *et al*. 1995; Dauble *et al*. 1994; Mueller 2009). Juveniles emerge from the gravels in March and April of the following year. The reach of the Snake River upstream of the action area is the warmest spawning area, and it offers a relatively high level of opportunity for growth. In comparison, the lower reach of the Clearwater River is the coolest spawning area and it offers a relatively low level of opportunity for growth.

Until recently, SRF Chinook have been assumed to follow an “ocean-type” life history (Dauble and Geist 2000; Good *et al*. 2005; Healey 1991; NMFS 1992) where they migrate to the Pacific Ocean during their first year of life, normally within 3 months of emergence from spawning substrate as age-0 smolts, to spend their first winter in the ocean. Ocean-type Chinook salmon juveniles tend to display a “rear as they go” rearing strategy in which they continually move downstream through shallow shoreline habitats their first summer and fall until they disperse off shore and become more pelagic and migratory in the winter and following spring (Connor and Burge 2003; Coutant and Whitney 2006). However, in recent years several studies have shown that another life history pattern exists where a significant number of smaller SRF Chinook juveniles overwinter in Snake River reservoirs prior to outmigration. These fish begin migration later than most, arrest their seaward migration and overwinter in reservoirs on the Snake and Columbia Rivers, then resume migration and enter the ocean in early spring as age 1 smolts (Connor and Burge 2003; Connor *et al*. 2002; Connor *et al*. 2005; Hegg *et al*. 2013). Connor *et al*. (2005) termed this life history strategy “reservoir-type.” Scale samples from natural-origin adult fall Chinook salmon taken at Lower Granite Dam continue to indicate that approximately half of the returns overwintered in freshwater (Ford 2011). Tiffan and Connor (2012) showed that subyearling fish favor water less than 6 feet deep.

Spatial Structure and Diversity. The SRF Chinook salmon ESU includes one extant population of fish spawning in the lower mainstem of the Snake River and the lower reaches of several of the associated major tributaries including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers. The ESU also includes four artificial propagation programs: the Lyons Ferry Hatchery and the Fall Chinook Acclimation Ponds Program in Washington; the Nez Perce Tribal

Hatchery in Idaho; and the Oxbow Hatchery in Oregon and Idaho (70 FR 37160). Historically, this ESU included two large additional populations spawning in the mainstem of the Snake River upstream of the Hells Canyon Dam complex, an impassable migration barrier. The spawning and rearing habitat associated with the current extant population represents approximately 20% of the total historical habitat available to the ESU (Dauble and Geist 2000). A high proportion of current spawning is concentrated in the Snake River upstream from Asotin Creek, but recent spawner surveys document spawning across many major tributaries within the population boundaries (e.g., Arnsberg *et al*. 2013, 2014). Spatial structure risk for the existing ESU is therefore low (Ford 2011) and is not precluding recovery of the species.

There are several diversity concerns for SRF Chinook salmon, leading the ICTRT to give the lower Snake River fall Chinook population a moderate diversity risk rating. One concern is the high proportion of hatchery fish spawning naturally. For the 5-year period ending in 2008, 78% of the estimated total spawners were of hatchery origin (Ford 2011). The moderate diversity risk is also driven by changes in major life history patterns; shifts in phenotypic traits; high levels of genetic homogeneity in samples from natural-origin returns; selective pressure imposed by current hydropower operations; and cumulative harvest impacts (Ford 2011). The moderate diversity risk for the population leads to a moderate cumulative spatial structure/diversity risk. Diversity risk will need to be reduced to low in order for this population to be considered highly viable, a requirement for recovery of the species (ICTRT 2007).

Abundance and Productivity. Historical abundance of Snake River fall Chinook salmon is estimated to have been 416,000 to 650,000 fish (NMFS 2006), but numbers declined drastically over the 20th century, with only 78 natural-origin fish passing Lower Granite Dam in 1990 (Joint Columbia River Management Staff 2014b). The first hatchery-reared Snake River fall Chinook salmon returned to the Snake River in 1981, and since then the number of hatchery returns has increased steadily, such that hatchery fish dominate the Snake River fall Chinook run. Natural-origin returns have also increased. The recent 10-year (1998 to 2008) mean abundance of natural-origin fall Chinook passing Lower Granite Dam was 2,200 adults, and the recent short-term trend in natural-origin spawners was strongly positive, with the population increasing at an average rate of 16% per year. This 10-year mean abundance is below the ICTRT's recovery goal of a minimum mean of 3,000 natural-origin spawners for the species' single extant population (Ford 2011). Combining the 10-year mean natural spawning escapement estimate of 2,200 with productivity estimates of 1.07 to 1.28 results in an abundance/productivity rating of moderate risk for this population (Ford 2011). The cumulative moderate risks for both abundance/productivity and spatial structure/diversity put this population at moderate risk of extinction over the next 100 years, or "maintained" status (Ford 2011). Natural-origin adult returns over the last 5 years may lessen abundance risk because counts have continued to increase. Natural-origin SRF Chinook salmon returning to Lower Granite Dam totaled 4,977 in 2009; 7,995 in 2010; 8,778 in 2011; 12,797 in 2012, and 21,124 in 2013 (Joint Columbia River Management Staff 2014b).

Snake River Sockeye Salmon

This ESU includes all anadromous and residual sockeye salmon from the Snake River basin, Idaho, as well as artificially propagated sockeye salmon from the Redfish Lake captive propagation program. The ESU was first listed as endangered under the ESA in 1991, the listing was reaffirmed in 2005 (70 FR 37160 and 37204). Reasons for the decline of this species include high levels of historic harvest, dam construction including hydropower development on the Snake and Columbia Rivers, water diversions and water storage, predation on juvenile salmon in the mainstem river migration corridor, and active eradication of sockeye from some lakes in the 1950s and 1960s (56 FR 58619; ICTRT 2003). On August 15, 2011, NMFS completed a 5-year review for the Snake River sockeye salmon ESU and concluded that the species should remain listed as endangered (76 FR 50448).

Life History. Snake River sockeye salmon adults enter the Columbia River primarily during June and July, and arrive in the Sawtooth Valley peaking in August. The Sawtooth Valley supports the only remaining run of Snake River sockeye salmon. The adults spawn in lakeshore gravels, primarily in October (Bjornn *et al.* 1968). Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in the gravel for 3 to 5 weeks, emerge from April through May, and move immediately into the lake. Once there, juveniles feed on plankton for 1 to 3 years before they migrate to the ocean, leaving their natal lake in the spring from late April through May (Bjornn *et al.* 1968). Snake River sockeye salmon usually spend 2 to 3 years in the Pacific Ocean and return to Idaho in their 4^{th} or 5^{th} year of life.

Spatial Structure and Diversity. Within the Snake River ESU, the ICTRT identified historical sockeye salmon production in five Sawtooth Valley lakes, in addition to Warm Lake and the Payette Lakes in Idaho and Wallowa Lake in Oregon (ICTRT 2003). The sockeye runs to Warm, Payette, and Wallowa Lakes are now extinct, and the ICTRT identified the Sawtooth Valley lakes as a single MPG for this ESU. The MPG consists of the Redfish, Alturas, Stanley, Yellowbelly, and Pettit Lake populations (ICTRT 2007). The only extant population is Redfish Lake, supported by a captive broodstock program. Hatchery fish from the Redfish Lake captive propagation program have also been outplanted in Alturas and Pettit Lakes since the mid-1990s in an attempt to reestablish those populations (Ford 2011). With such a small number of populations in this MPG, increasing the number of populations would substantially reduce the risk faced by the ESU (ICTRT 2007).

Currently, the Snake River sockeye salmon run is highly dependent on a captive broodstock program operated at the Sawtooth Hatchery and Eagle Hatchery. Although the captive brood program rescued the ESU from the brink of extinction, diversity risk remains high without sustainable natural production (Ford 2011).

Abundance and Productivity. Prior to the turn of the 20^{th} century (ca. 1880), around 150,000 sockeye salmon ascended the Snake River to the Wallowa, Payette, and Salmon River basins to spawn in natural lakes (Evermann 1896, as cited in Chapman *et al.* 1990). The Wallowa River sockeye run was considered extinct by 1905, the Payette River run was blocked by Black Canyon Dam on the Payette River in 1924, and anadromous Warm Lake sockeye in the South Fork Salmon River basin may have been trapped in Warm Lake by a land upheaval in the early 20th century (ICTRT 2003). In the Sawtooth Valley, the Idaho Department of Fish and Game eradicated sockeye from Yellowbelly, Pettit, and Stanley Lakes in favor of other species in the 1950s and 1960s, and irrigation diversions led to the extirpation of sockeye in Alturas Lake in the early 1900s (ICTRT 2003), leaving only the Redfish Lake sockeye. From 1991 to 1998, a total of just 16 natural-origin adult anadromous sockeye salmon returned to Redfish Lake. These 16 natural-origin fish were incorporated into a captive broodstock program that began in 1992 and has since expanded so that the program currently releases hundreds of thousands of juvenile fish each year in the Sawtooth Valley (Ford 2011). With the increase in hatchery production, adult returns to Sawtooth Valley have increased in past few years to 833 in 2009, 1,355 in 2010, 1,117 in 2011, 257 in 2012, and 272 in 2013 (IDFG 2011, NMFS 2014a). The increased abundance of hatchery reared Snake River sockeye reduces the risk of immediate loss, yet levels of naturally produced sockeye returns remain extremely low (Ford 2011). The ICTRT's viability target is at least 1,000 naturally produced spawners per year in each of Redfish and Alturas Lakes and at least 500 in Pettit Lake (ICTRT 2007).

The species remains at high risk across all four risk parameters (spatial structure, diversity, abundance, and productivity). Although the captive brood program has been highly successful in producing hatchery *O. nerka*, substantial increases in survival rates across all life history stages must occur in order to reestablish sustainable natural production (Ford 2011). Low survival rates outside of the Sawtooth Valley are limiting the recovery of the species (NOAA Fisheries 2011).

Snake River Basin Steelhead

The Snake River steelhead was listed as a threatened ESU on August 18, 1997 (62 FR 43937), with a revised listing as a DPS on January 5, 2006 (71 FR 834). This DPS occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Reasons for the decline of this species include substantial modification of the seaward migration corridor by hydroelectric power development on the Snake and mainstem Columbia Rivers, and widespread habitat degradation and reduced streamflows throughout the Snake River basin (Good *et al.* 2005). Another major concern for the species is the threat to genetic integrity from past and present hatchery practices, and the high proportion of hatchery fish in aggregate run of Snake River Basin steelhead over Lower Granite Dam (Good *et al.* 2005; Ford 2011). On August 15, 2011, in the agency's most recent 5-year review for the Snake River DPS, NMFS concluded that the species should remain listed as threatened (76 FR 50448).

Life History. Adult Snake River Basin steelhead enter the Columbia River from late June to October to begin their migration inland. After holding over the winter in larger rivers in the Snake River basin, steelhead disperse into smaller tributaries to spawn from March through May. Earlier dispersal occurs at lower elevations and later dispersal occurs at higher elevations. Juveniles emerge from the gravels in 4 to 8 weeks, and move into shallow, low-velocity areas in side channels and along channel margins to escape high velocities and predators (Everest and Chapman 1972). Juvenile steelhead then progressively move toward deeper water as they grow in size (Bjornn and Rieser 1991). Juveniles typically reside in fresh water for 1 to 3 years, although this species displays a wide diversity of life histories. Smolts migrate downstream during spring runoff, which occurs from March to mid-June depending on elevation, and typically spend 1 to 2 years in the ocean.

Steelhead can spawn more than once and adults may return to the ocean after spawning. Repeat spawning rates for steelhead are highly variable (e.g., range from under 1% to over 50% in the Pacific Northwest) and are regulated by several biological, ecological, and anthropogenic factors. Under natural conditions these fish would swim back downstream to the Pacific Ocean to feed and restore depleted energy reserves before attempting to spawn again. In 1999 the Yakama Nation and the Columbia River Inter-Tribal Fish Commission (CRITFC) partnered on a project to capture these fish in the spring as they start back downstream and "recondition" them in hatchery facilities home basins e.g., Clearwater River, Yakima River, Methow River. The Nez Perce Tribe captures kelts at Lower Granite Dam from March through June for reconditioning at the Dworshak National Fish Hatchery before release back into the Snake River basin in the late fall so they can spawn again the following spring.

Spatial Structure and Diversity. This species includes all naturally-spawning steelhead populations below natural and manmade impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho, as well as the progeny of six artificial propagation programs (71FR834). The hatchery programs include Dworshak National Fish Hatchery, Lolo Creek, North Fork Clearwater River, East Fork Salmon River, Tucannon River, and the Little Sheep Creek/Imnaha River steelhead hatchery programs. The Snake River Basin steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

The ICTRT identified 24 extant populations within this DPS, organized into five MPGs (ICTRT 2003). The ICTRT also identified a number of potential historical populations associated with watersheds above the Hells Canyon Dam complex on the mainstem Snake River, a barrier to anadromous migration. The five MPGs with extant populations are the Clearwater River, Salmon River, Grande Ronde River, Imnaha River, and lower Snake River. In the Clearwater River, the historic North Fork population was blocked from accessing spawning and rearing habitat by Dworshak Dam. Current steelhead distribution extends throughout the DPS, such that spatial structure risk is generally low. For each population in the DPS, Table 4 shows the current risk ratings that the ICTRT assigned to the four parameters of a VSP (spatial structure, diversity, abundance, and productivity).

The SRB DPS steelhead exhibit a diversity of life-history strategies, including variations in fresh water and ocean residence times. Traditionally, fisheries managers have classified SRB steelhead into two groups, A-run and B-run, based on ocean age at return, adult size at return, and migration timing. A-run steelhead predominantly spend 1 year at sea and are assumed to be associated with low to mid-elevation streams in the Snake River Basin. The B-run steelhead are larger with most individuals returning after 2 years in the ocean. The ICTRT has identified each population in the DPS as either A-run or B-run. Initial results from new research, however, indicate that some populations in the Snake River basin assumed to be either A-run or B-run may support a mixture of the two run types (Ford 2011). Maintaining life history diversity is important for the recovery of the species.

Diversity risk for the DPS is low to moderate, and drives the moderate combined spatial structure/diversity risks shown in Table 4 for some populations. Moderate diversity risks for some populations are caused by the high proportion of hatchery fish on natural spawning grounds. Reductions in hatchery-related diversity risks would increase the likelihood of these populations reaching viable status.

Abundance and Productivity. Historical estimates of steelhead production for the entire Snake River basin are not available, but the basin may have supported more than half the total steelhead production from the Columbia River basin (Mallet 1974, as cited in Good *et al.* 2005). Historical estimates do exist for portions of the basin. Estimates of steelhead passing Lewiston Dam (removed in 1973) on the lower Clearwater River were 40,000 to 60,000 adults (Ecovista *et al.* 2003). Based on relative drainage areas, the Salmon River basin likely supported substantial production as well (Good *et al.* 2005). In contrast, at the time of listing, the 5-year (1991 to 1996) mean abundance for natural-origin steelhead passing Lower Granite Dam was 11,462 adults (Ford 2011). Steelhead passing Lower Granite Dam include those returning to: (1) The Grande Ronde and Imnaha Rivers in Oregon; (2) the Asotin Creek in Washington; and (3) the Clearwater and Salmon Rivers in Idaho. A more recent 5-year (2003 to 2008) mean abundance passing Lower Granite Dam was larger at 18,847 natural-origin fish (Ford 2011). These natural-origin fish represent just 10% of the total steelhead run over Lower Granite Dam of 162,323 adults for the same time period. However, a large proportion of these fish return to the hatcheries or are removed by selective harvest prior to reaching spawning areas, such that the relatively high hatchery proportions in the aggregate run over Lower Granite Dam are not representative of the proportions in spawning escapements into most population-level tributaries (Ford 2011). Natural-origin steelhead returns to the Snake River (counted July 1 through June 30 of the following year) have further increased in recent years with Lower Granite Dam counts of 44,239 returning natural-origin adults in 2009 to 2010; 44,839 in 2010 to 2011; 40,151 in 2011 to 2012; and 26,173 in 2012 to 2013 (Joint Columbia River Management Staff 2014a).

Despite recent increases in steelhead abundance, population-level natural-origin abundance and productivity inferred from aggregate data indicate that many populations in the DPS are likely below the viability targets necessary for species recovery (Ford 2011). Population-specific abundance estimates are not available for most Snake River steelhead populations. Instead, the ICTRT estimated average population abundance and productivity using annual counts of natural-origin steelhead passing Lower Granite Dam, generating separate estimates for a surrogate A-run and B-run population. Most population abundance/productivity risks shown in Table 4 are based on a comparison of the surrogate population current abundance and productivity estimates to a population viability threshold of 1,000 natural-origin spawners and a productivity of 1.14 recruits per spawner. The surrogate A-run population has a mean abundance of 556 spawners and productivity of 1.86, indicating a moderate abundance/productivity risk. The surrogate B-run population has a mean abundance of 345 spawners and productivity of 1.09, indicating a high abundance/productivity risk (ICTRT 2010b, Appendix B-1). Based on these tentative risk ratings, all populations except for one are currently at either high or moderate risk of extinction over the next 100 years. Joseph Creek in Oregon, for which population-specific abundance information is available, is the only population in the DPS currently rated as viable (Ford 2011).

Table 4. Summary of viable salmonid population (VSP) parameter risks and overall current status for each population in the Snake River Basin steelhead DPS (Ford 2011).

MPG	Population	VSP Parameter Risk		Overall Viability Rating
		Abundance/ Productivity	Spatial Structure/ Diversity	
Lower Snake River	Tucannon River	High	Moderate	High Risk?[1]
	Asotin Creek	Moderate	Moderate	High/Moderate Risk?
Grande Ronde River	Lower Grande Ronde		Moderate	Moderate Risk?
	Joseph Creek	Very Low	Low	Highly Viable
	Wallowa River	High	Low	High Risk?
	Upper Grande Ronde	Moderate	Moderate	Moderate Risk
Imnaha River	Imnaha River	Moderate	Moderate	Moderate Risk
Clearwater River (Idaho)	Lower Mainstem Clearwater River	Moderate	Low	Moderate Risk?
	South Fork Clearwater River	High	Moderate	High Risk?
	Lolo Creek	High	Moderate	High Risk?
	Selway River	High	Low	High Risk?
	Lochsa River	High	Low	High Risk?
	North Fork Clearwater River			Extirpated
Salmon River (Idaho)	Little Salmon River	Moderate	Moderate	Moderate Risk?
	South Fork Salmon River	High	Low	High Risk?
	Secesh River	High	Low	High Risk?
	Chamberlain Creek	Moderate	Low	Moderate Risk?
	Lower Middle Fork Salmon River	High	Low	High Risk?
	Upper Middle Fork Salmon River	High	Low	High Risk?
	Panther Creek	Moderate	High	Moderate Risk?
	North Fork Salmon River	Moderate	Moderate	Moderate Risk?
	Lemhi River	Moderate	Moderate	Moderate Risk?
	Pahsimeroi River	Moderate	Moderate	Moderate Risk?
	East Fork Salmon River	Moderate	Moderate	Moderate Risk?
	Upper Mainstem Salmon River	Moderate	Moderate	Moderate Risk?
Hells Canyon	Hells Canyon Tributaries			Extirpated

[1] The question mark indicates that information on the population size is incomplete.

2.2.2 Status of Critical Habitat

For the status of critical habitat designated for the listed species considered in this consultation, NMFS reviews the condition of the essential physical or biological features throughout the designated area, and the conservation values of the various watersheds (fifth field hydrologic unit code, (HUC)) in the designated area (NMFS 1993; 1999; 2005).

Critical habitat for SRSS Chinook salmon, SRF Chinook salmon, and SR sockeye salmon was designated on December 28, 1993. In 1999, NMFS revised the SRSS Chinook salmon habitat to remove an area above a natural waterfall barrier on Napias Creek. The 1993 (and 1999) designations for SRSS Chinook salmon, SRF Chinook salmon and SR sockeye salmon included "the bottom and water of the waterways and the adjacent riparian zone. The riparian zone includes those areas within 300 feet" of the normal high water line (64 FR 57399).

Critical habitat for SRB steelhead was designated in 2005 and includes the stream channels within designated stream reaches, and a lateral extent as defined by the ordinary high-water line (33 CFR 319.11). In designating critical habitat, NMFS looked for two categories or types: (1) Specific areas within the geographical area occupied by the species at the time of listing, if they contain essential physical and biological features (Chinook and sockeye salmon) or primary constituent elements (PCEs) (steelhead) of designated critical habitat (hereinafter collectively referred to as PCEs); and (2) specific areas outside the geographical area currently occupied by the species if the area itself is essential for conservation of the species. NMFS identified PCEs in both freshwater and saltwater for all anadromous fish species; however, since the action area occurs entirely in freshwater, only freshwater PCEs (Table 5) are considered in this Opinion.

The four species addressed in this Opinion occupy much of the same geographic area albeit for different life history phases. Although some life history characteristics differ, such as adult upstream migration timing and age at which juveniles migrate downstream, within the subbasin where the action area is located, all species require many of the same habitat functions provided by the designated critical habitat. The PCEs designated for steelhead and the essential physical and biological features designated for salmon are jointly referred to as PCEs in this consultation. The specific critical habitat PCE's that are relevant to this consultation are those associated with freshwater migration, spawning, and rearing. The lower Snake and lower Clearwater Rivers function as a migration corridor for adults and juveniles of all species, and also provides SRF Chinook salmon spawning habitat in some areas (dam tailraces) and serves as rearing habitat, particularly by "reservoir" type SRF Chinook salmon juveniles from the Clearwater River (Connor *et al*. 2005; Hegg *et al*. 2013; Tiffan and Connor 2012).

Many factors over the past century, both human-caused and natural, have contributed to the decline of both quantity (significantly large areas blocked by dams) and quality of critical habitat for all of the Snake River species considered in this Opinion. Power generation, urban development, logging, grazing, and agriculture have reduced or eliminated access and reduced the functional capacity of remaining critical habitat and resulted in the loss of important spawning and rearing habitat and the loss or degradation of migration corridors. The Dworshak Dam at RM 1.9 on the North Fork of the Clearwater River and the Hells Canyon Complex at RM 247 of the Snake River are not fish passable and prevent access to hundreds of miles of formerly accessible habitat.

Table 5. Types of sites and essential physical and biological features designated as PCEs, and the species life stage each PCE supports.

Site	Essential Physical and Biological Features/PCEs	ESA-listed Species Life Stage
Snake River Basin Steelhead[a]		
Freshwater rearing	Water quantity & floodplain connectivity to form and maintain physical habitat conditions	Juvenile growth and mobility
	Water quality and forage[b]	Juvenile development
	Natural cover[c]	Juvenile mobility and survival
Freshwater migration	Free of artificial obstructions, water quality and quantity, and natural cover[c]	Juvenile and adult mobility and survival
Snake River Fall and Spring/summer Chinook Salmon		
Spawning and Juvenile Rearing	Spawning gravel, water quality and quantity, cover/shelter, food, riparian vegetation, and space	Juvenile and adult
Migration	Substrate, water quality and quantity, water temperature, water velocity, cover/shelter, food[d], riparian vegetation, space, safe passage	Juvenile and adult
Snake River Sockeye Salmon		
Migration	Substrate, water quality and quantity, water temperature, water velocity, cover/shelter, food[d], riparian vegetation, space, safe passage	Juvenile and adult

a. Additional PCEs pertaining to estuarine, nearshore, and offshore marine areas have also been described for Snake River Basin steelhead. These PCEs will not be affected by the proposed action and have therefore not been described in this letter of concurrence.
b. Forage includes aquatic invertebrate and fish species that support growth and maturation.
c. Natural cover includes shade, large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
d. Food applies to juvenile migration only.

Development and operation of hydroelectric dams on the Snake and Clearwater Rivers have dramatically altered, reduced or completely eliminated freshwater migration, spawning and rearing PCEs in large segments of both rivers and the lower reaches of tributaries (e.g. available SRF Chinook salmon habitat is reduced by 80% from historical levels). There are currently four hydroelectric dams in the mainstem Columbia River migration corridor downstream of the action area, another four in the mainstem Snake and one in the North Fork Clearwater Rivers within the existing range of all four species. Although major efforts have been made to improve migration by reducing juvenile mortality and improving adult passage, the safe passage element of the migration PCE is impaired as smolts are killed or injured by every hydroelectric dam they must pass along this critical migration corridor. These Columbia River and lower Snake River dams also pose migration challenges to returning adults.

Where habitat is accessible, freshwater rearing and spawning PCEs have also been impaired, as impounded water behind hydroelectric dams has reduced formerly complex mainstem habitats to mostly single channels with little complexity (e.g. little or no shallow water habitat or off channel habitat). Hydroelectric development has also impaired the water volume by altering the natural flow regime of the Snake River (decreasing spring and summer flow while increasing fall and winter flow). Both rearing and migration behaviors are impacted as fluctuations in river elevation and flow velocity due to power operations slow juvenile migration through reservoirs, disturb riparian areas, and strand fish in shallow areas as levels recede. Similarly, hydro development has also degraded the water temperature characteristics through altered natural thermal patterns, again affecting rearing (SRF Chinook), and migration habitats.

The water quality element of the freshwater spawning, rearing, and migration PCEs are also impaired by agricultural and urban development throughout the range of critical habitat. Urban and agricultural runoff, irrigation return flows, as well as municipal and industrial wastewater outflows have increased water temperatures and introduced high levels of sediment and other pollutants into this migration corridor. Before mainstem dams were constructed, habitat was lost or severely damaged in tributary streams by construction and operation of irrigation dams, channelization of streams, removal of riparian vegetation, and other activities generally associated with farming, grazing, logging, and development.

Although designated critical habitat for all Snake River species is degraded in places, and in some cases highly degraded, the dramatic reduction in accessible area because of the dams increases the conservation value of the remaining watersheds. In addition, the Snake River from the downstream end of the action area (Ice Harbor Dam) is the essential link to all upstream natal streams. The lower Snake River in the action area connects every watershed and population for SRSS Chinook salmon, SRF Chinook salmon, SR sockeye salmon ESUs, and the SRB steelhead DPS with the ocean, and is used by rearing and migrating juveniles, and spawning and migrating adults.

Climate change is expected to alter critical habitat as described above in Section 2.2 by generally increasing temperature and peak flows and decreasing base flows. Although changes will not be spatially homogenous, effects of climate change are expected to decrease the capacity of critical habitat to support successful spawning, rearing, and migration.

2.3 Environmental Baseline

The “environmental baseline” includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

NMFS describes the environmental baseline in terms of the biological requirements for habitat features and processes necessary to support all life stages of each of the four ESA-listed species within the action area. The species considered in this Opinion reside in or migrate through the action area. Thus, for this action area, the biological requirements for SRSS Chinook salmon, SRF Chinook salmon, SR sockeye salmon, and SRB steelhead are the habitat characteristics that support successful completion of spawning, rearing, and migration. An environmental baseline that does not meet the biological requirements of a listed species may increase the likelihood that adverse effects of the proposed action will result in jeopardy to a listed species or in destruction or adverse modification of a designated critical habitat.

Federal Hydropower System

The lower Snake River is confined and controlled by four hydroelectric, concrete, run-of-the-river dams, all part of the Federal Columbia River Power System (FCRPS). The three lower dams, Ice Harbor, Lower Monumental and Little Goose each create a reservoir that extends upstream to the next dam. The fourth dam, Lower Granite creates a reservoir that extends 46 miles upstream to Asotin, Washington. At RM 139.2, the Clearwater River enters the reservoir at Lewiston Idaho.

Ice Harbor Dam and Reservoir*:* Located at RM 9.5, construction began in 1955, completed in 1961. The reservoir is known as Lake Sacajawea and stretches upstream to the base of Lower Monumental Dam, 32 miles upstream. The Wallula Channel, formed from the backup of Snake River entering the Columbia River, runs 10 miles (16 km) downstream from the base of the dam.

Lower Monumental Dam and Reservoir: Lake Herbert G. West, which extends 28 miles (45 km) upstream (east) to the base of Little Goose Dam, is formed behind the dam. Construction began in 1961 with the dam and three generators completed in 1969.

Little Goose Dam and Reservoir**:** Construction began in 1963. The main structure and three generators were completed in 1970. The reservoir, Lake Bryan, runs upstream 37 miles to Lower Granite Dam.

Lower Granite Reservoir**:** Located at RM 107.5, construction on Lower Granite Dam began in 1965 with the main structure and three generators completed in 1972. This is the most upstream dam in the Snake River system that has a fish ladder to allow anadromous fish to migrate upstream for spawning. Lower Granite Lake extends upstream from the dam 39 miles to Lewiston, Idaho, into the lower Clearwater River. The reservoir influence on the Snake River ends shortly upstream of Clarkston, Washington. The next dam upstream, Hell's Canyon Dam, is at RM 247, approximately 100 river miles upstream from Asotin, Washington. The Snake River between Asotin, Washington and the Hells Canyon Dam is free flowing, although flows are regulated by the dam.

Current conditions within much of the mainstem Snake and Clearwater Rivers are degraded relative to historic conditions. Dams and their associated reservoirs have modified much of the mainstem habitat downstream of the Clearwater River confluence previously used by SRF Chinook salmon for spawning and altered the functional capacity of the habitat for all rearing and migrating salmon and steelhead. Formerly complex habitat in the mainstem and lower tributaries of the Snake River have been reduced, for the most part, to single channels with reduced or disconnected floodplains, side channels or off-channel habitats (Sedell and Froggatt 1984; Ward and Stanford 1995). A study of the available rearing habitat in Lower Granite Reservoir by Tiffan and Hatten (2012) estimated that 44% of the shoreline of the reservoir is lined with riprap. Most riprapped shorelines were located along the road and railway along the north side of the reservoir and along the roadway on the south side of the reservoir from Silcott Island to Clarkston, Washington. The entire shoreline of the Clearwater River within the action area (RM 0 to 1.9) is lined with riprap. In addition, estimates of shallow water rearing habitat, areas less than 6 feet deep, found only 217 acres or 2.2% of the reservoir area is suitable juvenile shallow water rearing habitat.

Hydroelectric dams have eliminated or reduced mainstem spawning and rearing habitat and have altered the normal flow regime of the Snake and Clearwater Rivers, decreasing spring and summer flows, increasing fall and winter flow and altering natural thermal patterns (Coutant 1999). Power operations cause fluctuating flow levels and river elevations, affecting fish movement through the reservoirs, disturbing shoreline or shallow water areas and possibly stranding fish in shallow areas when flows recede quickly. A substantial fraction of the mortality experienced by juvenile outmigrants through the portion of the migratory corridor affected by the FCRPS occurs in the reservoirs. This includes about half of the mortality of all in-river migrating juvenile salmon and steelhead (NMFS 2008a). The altered habitats in many reservoirs reduce smolt migration rates and create more favorable habitat conditions for fish predators, including native northern pikeminnow, nonnative walleye and smallmouth bass (ISG 1998; NRC 1996).

In the lower Snake River and the lower reach of the Clearwater River, dams have changed food web interaction both directly and indirectly. Impoundments have directly increased predation risk for anadromous salmon and steelhead smolts by delaying downstream migration, thereby prolonging their exposure to piscivorous birds and fishes. Impoundments have also changed trophic interaction indirectly by creating extensive new habitat (e.g., riprap banks) that favors some native piscivorous fishes like northern pikeminnow and providing new opportunities for non-native piscivores like walleye and smallmouth bass (Beamesderfer and Rieman 1988; Kareiva *et al*. 2000; Petersen and Poe 1993). The new and poorly understood food webs that have developed in run-of-the-river reservoirs in recent decades may not support the energetic needs of over winter juvenile rearing, spring-migrating salmon and steelhead or other native organisms. Future changes in run-of-the-river food webs can be expected as new non-native species become established, and these additions also may have unanticipated effects on the nutritional condition and fitness of migrating juvenile salmon (Kareiva *et al*. 2000).

In addition, numerous anthropogenic features or activities in the action area (e.g., dams, ports, docks, roads, railroads, bank stabilization, irrigation withdrawals, and landscaping) have become permanent fixtures on the landscape, and have displaced and altered native riparian habitat. Consequently, the potential for normal riparian processes (e.g., litter fall, channel complexity, and large wood recruitment) to occur is diminished and aquatic habitat has become simplified. Shoreline development has reduced the quantity and quality of nearshore salmon and steelhead habitat by eliminating native riparian vegetation, displacing shallow water habitat with fill materials, and by disconnecting the Snake River from historic floodplain or side channel areas. Further, riparian species that evolved under the environmental gradients of riverine ecosystems are not well suited to the present hydraulic setting of the action area (i.e., static, slackwater pools), and are thus often replaced by invasive, non-native species. The riparian system is fragmented, poorly connected, and provides inadequate protection of habitats and refugia for sensitive aquatic species.

Lower Granite Reservoir is located on the lower Snake River in southeastern Washington, and is the first of eight mainstem impoundments that juvenile salmonids encounter as they migrate seaward and the last of eight mainstem dams that adults must pass to reach spawning areas. Lower Granite Dam is located at RM 107.5 as measured from the confluence of the Snake and Columbia Rivers. The reservoir extends 46 miles upstream to Asotin, Washington. At RM 139.2, the Clearwater River enters the reservoir at Lewiston, Idaho. Lower Granite Reservoir is a run-of-the-river reservoir and is operated primarily for hydropower and flood control. Flows range can range above 150,000 cubic feet per second (cfs) in the spring to lows around 16,000 cfs in the winter. The reservoir has an average channel width of 2,080 feet. Water depth averages 56 feet and ranges from less than 3 feet in shallow shoreline areas to a maximum of 137 feet (Tiffan and Hatten 2012). Under current operations, the normal pool elevation typically has a maximum potential fluctuation of about 5 feet. To protect roads and railways, much of the shoreline is lined with riprap (Tiffan and Hatten 2012). In the lower one-half of the reservoir, natural shorelines are generally steep, often characterized by cliffs and talus substrate with little riparian vegetation.

Snake River Navigation Channel

The COE maintains a navigation system in the Snake River that enables barges, and other large vessels that require a minimum depth of 14 feet, to travel upstream in the Snake River, from Ice Harbor Dam to Lewiston, Idaho. The Snake River navigation channel extends approximately 140 miles, from the confluence of the Columbia and Snake Rivers at Pasco, Washington, to the confluence of the Clearwater and Snake Rivers, and a short distance upstream in the Clearwater River to the Port of Lewiston, at Lewiston, Idaho. Approximately 10 million tons of commercial cargo is transported on the lower Snake River each year with an annual value of between $1.5 and $2 billion (USACE 2012). Movement of grain from upstream ports toward the Columbia River accounts for most of this cargo, the largest share of which is wheat. Approximately half of all the wheat exported from export terminals on the lower Columbia River arrives by barge. Commercial barge traffic on the lower Snake River fluctuates from year to year, depending on crop production, the state of the U.S. economy, and trends in world trade. Over the last 20 years the total tonnages of cargo moved through the lower Snake River, and includes McNary Reservoir (cargo statistics do not differentiate between the Snake and Columbia River portions of McNary Reservoir) has ranged from a high of 8,670 million tons in 1995 to a low of 5,301 million tons in 2008.

The Federal navigation channel through the lower Snake River affects all four listed anadromous fish species through effects of barges and dredging that is needed to maintain a shipping channel. The effects of barge operations on critical habitat include spillage or leakage of contaminants (such as fuels, oils, greases), generation of wakes and turbidity by moving vessels, and through creation of overhead shade when shipping vessels are moored. Barge traffic has likely caused minor effects to fish through direct impacts of moving vessels, and the habitat effects described above. Effects of shipping vessels are limited in severity due to physical characteristics of the Snake River and the size of the vessels that can navigate the river. The river is relatively wide, which allows fish ample room to avoid moving barges and dredging effects. The 14-foot depth of the navigation channel also limits commercial traffic to barges which have a shallow draft that is not capable of producing high-amplitude wakes that might strand fish or cause trauma from the wave energy. While barges are moored, the vessels may serve as overhead cover that might be used by fish that prey on juvenile salmonids; although this is unlikely to occur since the smolts of sockeye and Chinook salmon and steelhead generally avoid shady areas. The effects of barges are discussed in greater detail in the *Indirect Effects* section of this Opinion.

Dredging needed to maintain the navigation channel increases water depth at dredge sites for an indeterminate duration, that may vary from a year to several decades, depending on the rate of sediment accumulation. There are 48 locations where sediment accumulation has required dredging in the past or where sediment accumulation presents a potential problem in the future. Dredged material has been used to create shallow benches along the shore. The changes in depth have no effect on habitat value beyond the immediate areas where dredging or disposal occur. The overall habitat value has been little changed by the dredging since the amount of area that has been dredged is an insignificant portion of the river, and the increased depth at the dredge sites is of little consequence to listed fish or their predators. The shallow bench area created by in-water sediment disposal is beneficial to subyearling fall Chinook salmon, but the benefits have minor significance since the shallow bench habitat created by sediment disposal is a relatively small area.

Sediment Accumulation in the Action Area

The existence and operation of the lower Snake River dams and reservoirs prevent the normal transport and deposition of sediment throughout the system. Under a normative flow, without the dams, fine-grained material tends to be deposited on the river floodplain, high on the channel margins and in low velocity side channels and off-channel areas. Under a normative flow, the riverbed would be a complex mosaic of substrate materials with a variety of pools, runs and shallow areas built and rebuilt. The alluvial riffle areas that previously collected suitable spawning gravel for SRF Chinook salmon are now found in the tailraces of the dams and upstream of the action area. Currently there are very few natural, shallow water, sandy shoals downstream of the Snake and Clearwater confluence area. As a result, juveniles that use shallow water areas to rest and feed during seaward migrations (and SRF Chinook juveniles that reside in the reservoirs for a year) must travel significant distances between foraging areas.

Most sediment entering Lower Granite Reservoir deposits near the confluence of the Snake and Clearwater Rivers. Historically, the COE has periodically removed some of this material by dredging to provide access to ports and to maintain the navigation channel. In the past, the COE has used dredge material to create shallow water benches, primarily for subyearling SRF Chinook salmon habitat. This approach was used in 1989 to construct a 0.91 acre island in Lower Granite Reservoir (Centennial Island RM 119; (Chipps *et al*. 1997)) and in 2006 to create shallow water habitat at Knoxway Bench (RM 116.6). The shallow-water habitats surrounding Centennial Island are heavily used by subyearlings and Knoxway Bench is also used (Tiffan and Connor 2012). The COE's current definition of shallow-water habitat is water <20 feet deep, however with recent information on the higher use of habitat less than 6 feet deep, this criterion continues to be evaluated as part of research efforts (Tiffan and Connor 2012; USACE 2012).

Of particular significance to this consultation, the lower Snake River dams have severely disrupted the sediment transport with the river channel. The confluence of the lower Snake River and Clearwater Rivers, where most of the dredging will occur, is the approximate point of the river-to-reservoir interface for the Lower Granite reservoir. Lewiston, Idaho, and Clarkston, Washington bound the confluence (Figure 9).

The combination of river-to-reservoir interface and the confluence of the two rivers cause both rivers to lose energy. The result is an ongoing deposition of sediment within the confluence area. The material deposited in this area is primarily sand; most of the larger material drops out farther upstream where the rivers start to slow. The Snake River downstream of the confluence annually transports approximately 3 to 4 million cubic yards of new sediments. The COE estimates that 100 to 150 million cubic yards of sediment have been deposited upstream of the four lower Snake River dams (mostly in Lower Granite Reservoir) since Ice Harbor Dam became operational in 1961.

Sediment sources throughout both the Clearwater and Snake basins have been evaluated to determine if sediment supply to the action area might be reduced. However, analyses of sediment sources in the Northern Rocky Mountains by Goode *et al*. (2012) and Clark *et al*. (2013) show that any likely effect of Federal or no-Federal actions that increase or decrease sediment production will be vastly overwhelmed by agricultural inputs and natural sediment - producing events such as debris flows and wildfires. The average annual sediment yield in the Snake River at the upstream end of the Lower Granite reservoir is estimated to be 2.3 million cubic yards, from a contributing area of 27,000 square miles (Clark *et al*. 2013). It therefore appears that opportunities to reduce the amount of sediment delivered to the action area might be limited.

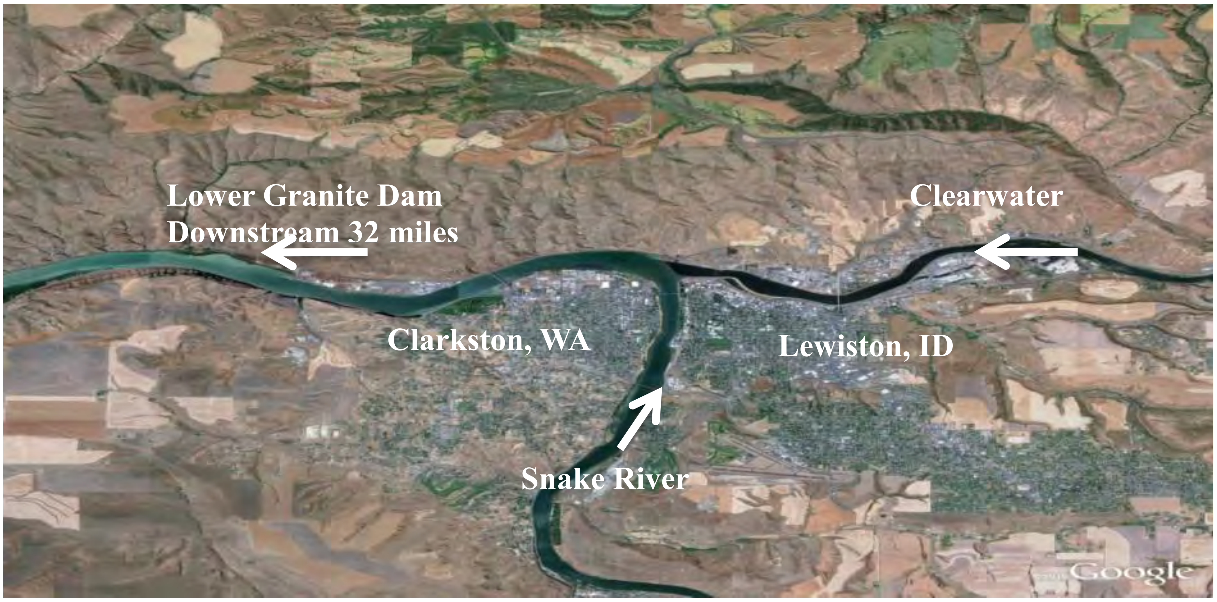

Figure 9. An overhead view of the Snake River and Clearwater River confluence. As the rivers meet they also enter the slack water reservoir created by Lower Granite Dam. Because the rivers both slow down at this location, large quantities of suspended material is deposited in this area.

Sediment samples collected in 2011 in the main navigation channel in the confluence area indicate that sand is the dominant material in the navigation channel combined with small amounts of silt near the mooring (shoreline) areas. At the Ice Harbor navigation lock the dredged material is mostly gravel and cobble, from 2 to 6 inches and larger, similar to the riverbed materials in adjacent areas outside the navigation channel and below the dam. The COE believes the source of this material to be a redistribution of local riverbed material caused by flow passing through the spillways during high flows and sloughing from the steep slopes of the channel through hydraulic action of barge guidance in the lock and passage through the lock.

NMFS has completed ESA section 7 consultation on numerous activities that involve sediment delivery or sediment delivery reduction that may affect the existing sediment deposited in the Lower Granite Reservoir. Those actions have occurred primarily many miles upstream of the action area in the Clearwater River basin or Salmon River basin. Most of those actions have been permitted or carried out by the US Forest Service, Bureau of Land Management, Federal Highway Administration, or COE. Those land, road, and streambank/streambed management activities have involved a relatively small amount of sediment compared to the natural and other anthropogenic sediment sources that are in the baseline. Those consultations have also been designed to minimize sediment delivery from the proposed activities. NMFS has consulted with the COE, Bonneville Power Administration, and the U. S. Bureau of Reclamation on the operation of the FCRPS; and the 2014 Supplemental Biological Opinion on this action reviews information regarding all of the factors influencing the environmental baseline in Lower Granite Reservoir (NMFS 2014b).

Presence of Species and Critical Habitat

The entire action area is designated critical habitat for all four listed species of anadromous fish. Fish presence in the action area consists of different size groups and age classes of salmon and steelhead during migration, adult SRF Chinook spawning (possibly in dam tailraces) starting in late October, incubating eggs through the winter, alevins and fry in the spring and juveniles (primarily SRF Chinook with smaller numbers of SRSS Chinook and steelhead) rearing in the reservoirs year round. The majority of adult upstream migration begins at Ice Harbor and Lower Granite Dams in early April and continues until the end of November with the occasional adult Chinook or steelhead still moving upstream in December (Table 6). Adult steelhead that move upstream between April and November will often hold in deep water in the mainstem until winter or spring flows increase in the tributaries enough for them to complete migration into headwater streams.

Table 6. Ten-year (2001-2010) historical run timing (first observation – last observation) for adults of each species at Ice Harbor and Lower Granite Dams. The 95% date in parentheses represents the latest date in the 10-year period when 95% of the run has passed that dam. Data is from the Columbia River from 2001 through 2010 (University of Washington School of Aquatic & Fishery Sciences; DART 2013).

Species (Adults)	Ice Harbor Dam (95% date)	Lower Granite Dam (95% date)
SRSS Chinook adult	04/01 – 08/11 (7/9)	03/20 – 8/17 (7/17)
SRF Chinook adult	08/12 – 10/30 (10/13)	08/17 – 12/15 (10/26)
SR sockeye	05/21 – 10/02 (8/28)	06/11 – 11/27 (11/27)
SRB steelhead	04/01 – 10/31 (10/23)	03/01 – 12 /30 (11/20)

Data for the 10-year (2003 to 2012) historical run timing of smolts indicates movement downstream begins as early as March 7 at the Lewiston trap on the Snake River and 2 weeks later at the Lower Granite Dam. The same years of data for smolts at Lower Monumental Dam (the downstream extent of smolt counts on the Snake River) indicates that 95% of all outmigrating smolts of all species have passed the dam before the first week in August. Small numbers of Chinook and sockeye smolts have been observed as late as November 1 at Lower Granite Dam and October 1 at Lower Monumental. Because smolt monitoring on the Snake River only occurs between March 26 (Lower Granite, others are April 1) and October 31, there are no dam counts of 'reservoir-type' SRF Chinook subyearlings moving downstream during the winter. However, when Tiffan and Connor (2012) conducted a study to describe juvenile fall Chinook salmon use of a selected group of shallow water habitat complexes in the lower Snake River reservoirs from spring 2010 through winter 2011, they found the lowest numbers of juvenile Chinook in Lower Granite Reservoir and the highest numbers in Ice Harbor Reservoir. Tiffan and Connor (2012) also found that the number of Chinook juveniles in Lower Granite Reservoir declined over the winter while the numbers downstream in Little Goose reservoir increased suggesting that as juveniles grew they moved downstream.

2.4 Effects of the Action on the Species and their Designated Critical Habitat

"Effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those caused by the proposed action and are later in time, but still are reasonably certain to occur. The future use of the proposed structures are interrelated or interdependent activities identified by NMFS during this consultation.

2.4.1 Effects on Critical Habitat

Implementation of the proposed action is likely to affect freshwater rearing and freshwater migration sites for all subject species, and could affect a small amount of SRF Chinook salmon spawning area in the Ice Harbor Dam navigation lock. The specific attributes of designated critical habitat affected by the proposed action are substrate, water quality, forage, and safe passage. The proposed action will not affect water quantity or floodplain connectivity.

Substrate

Dredging will disturb approximately 118 acres of river bottom, primarily in the Federal navigation channel at the confluence of the Snake and Clearwater Rivers, and sediment disposal will disturb approximately 27 acres. The primary effects of the proposed action on the substrate are dislodging benthic invertebrates and moving sediment from dredge locations to the disposal sites. The dredging will not substantially change the substrate size composition since the sediments after dredging will be similar to the size of materials that existed before dredging. None of the dredging or fill activities will occur in areas where substrates are suitable for spawning, except for the navigation lock dredge site at Ice Harbor Dam. At navigation lock, the uppermost layers of the gravel build-up will be removed, while leaving similarly-sized deposits in place. The suitability of the navigation lock entrance for spawning would not be changed by dredging since the dredging will not occur in a location that is known to be used for spawning, and the dredged area would retain gravels that are similar to the materials removed by the dredging. If redds are present in an area where they might be affected by dredging, the dredging would not proceed until it could be done in a time or manner that does not adversely affect the redds.

Water Quality

All sediments proposed for dredging have been screened for the presence of contaminants at each of the dredging sites, following procedures by USACE *et al.* (2013) and Michelsen (2011). The screening procedures look for the presence of 37 chemicals of concern have been identified in sediments found in rivers in the Pacific Northwest (USACE *et al*. 2013). These chemicals may be toxic to humans or aquatic organisms at certain concentrations. The screening concentrations procedures are set below state and Federal water quality standards and are used to determine when additional sediment sampling and bioassays are needed when contaminants are found in the sediment.

Sediment samples from the proposed dredge sites were tested for contaminants in 2011 (USACE 2012b) and 2013 (USACE 2014) following the procedures described above. Dichlorprop was detected in one sample from the Port of Clarkston in 2011 but was not found again in 2013. On August 6, 2013, consultation was stopped after the COE discovered concentrations of phenol and 4-methylphenol that exceeded screening levels established by USACE *et al* (2013) at some of the dredging sites. A subsequent literature review of phenol and 4-methypheol toxicity (Johnson 2014) indicated that 4-methylphenol in the water column might be toxic to listed salmon and steelhead under certain conditions. Bio-assays with sediments from the dredge sites indicated that the chemical concentrations in the samples were not toxic to organisms living in the sediment and that the chemicals did not bioaccumulate. Additional analysis by the COE was performed to assess the potential toxicity of phenol and 4-methylphenol in the water column. Toxicity analysis by (Kreitinger 2014) indicated that the concentrations of these chemicals in the sediment were below thresholds considered toxic to macroinvertebrates, and concentrations likely to occur in the water column were below thresholds from Johnson (2014) that are toxic to fish. All other contaminants of concern in the sediment samples analyzed in 2013 (USACE 2014) were either undetectable or were found in concentrations below the USACE *et al* (2013) screening limits. The screening limits are likely to be below levels where short-term exposure to contaminated sediment would cause deleterious effects to growth or survival of salmon or steelhead (USACE 2014).

The dredging and filling operations will have a negative effect on water quality during operations by increasing suspended sediment and turbidity, but there is no enduring effect on water quality. Monitoring of previous dredging activities by Dixon Marine Services (2006) found that suspended sediment and turbidity effects cease within a few hours after operations end . Contaminants bound to sediments removed by dredging will be resuspended in the water column for roughly the same distance and duration as the suspended sediment. A fraction of the resuspended contaminants are likely to separate from the sediment particles and remain in the water column as dissolved or suspended chemicals.

Dredging may also facilitate barge traffic that can cause brief episodes of increased turbidity near the shore from wakes generated by moving vessels. Turbidity caused by wakes would be limited to near-shore areas that have deposits of fine sediment. The duration and frequency of turbidity increases from barge wakes is unlikely to rise to a level that would diminish the value of the habitat as cover from predators or as a foraging area used by juvenile salmon and steelhead.

Given the transient nature of adverse water quality effects, and the timing of the action to avoid key periods when the action area is used by anadromous fish for migration, effects of the action on water quality will not meaningfully decrease the function of the PCEs in the action area.

Forage

The proposed action will have a short-term effect on benthic invertebrates by crushing, covering, or dislodging them during dredging and filling activities (Harvey 1986; Harvey and Lisle 1998). The alteration of the riverbed will cause localized reductions in invertebrate populations found in the sediment and on the sediment surface (benthic invertebrates). The reductions are likely to be short-lived as disturbed areas are likely to be recolonized within several months after project completion (Fowler 2004; Yount and Nemi 1990; Griffith and Andrews 1981; Harvey 1986; Harvey and Lisle 1998). In a pre- and post-dredging study of dredge effects on benthic invertebrates and sediment characteristics in the lower Columbia River (RM 43.2) by McCabe and Hinton (1996), clamshell dredging had no detectable effect on the standing crops of benthic invertebrates.

Safe Passage

The effects of the proposed action on fish passage are likely to be inconsequential. Sediment plumes and noise disturbance feom dredging and filling are likely to briefly disrupt moving fish that encounter these operations, and force fish to swim around the areas disturbed by turbidity or noise. Fish that encounter disruptions generally return to their normal behavior soon after encountering a dredge or sediment plume (ENCORP 2009). All of the ESA-listed Snake River species considered in this Opinion migrate through the area as adults and juveniles. The work window is December 15 to March 1; a few months after 95% of all outmigrating juveniles have passed downstream into the Columbia River. Both adult and juvenile salmon and steelhead would be capable of moving through the action area at all times since dredging activities and turbidity do not span the entire channel all at once, and migrating fish prefer deep waters that tend to be on the opposite side of the river from depositional areas where dredging occurs.

Relevance of Effects on Primary Constituent Elements to Conservation Value

As described above, the proposed action will temporarily alter substrate, water quality, fish passage conditions, and forage near the dredge and disposal sites. However, the overall conservation value of critical habitat in the action area will not be diminished since the usage of the action area for winter rearing, adult holding, or migration would be virtually unchanged. The dredge sites themselves are marginal habitats that have little conservation value for anadromous fish, and dredging has no long-term effect on these sites. The persistence of the newly created shallow water habitat at the Knoxway Bench is expected to have a positive effect by providing low velocity areas essential to smaller fish and reduced vulnerability to predation by larger fish (Tiffan and Connor 2012) although the effect cannot be measured. The possibility that the newly-created shallow water habitat would benefit salmonid predators at the expense of listed fish has been investigated, but this not been observed (Naughton *et al*. 2010); while use of the areas by juvenile Chinook has been documented (Seybold and Bennett 2010; Tiffan and Connor 2012).

<u>2.4.2 Direct Effects on Species</u>

The direct effects of the proposed action are expected from the dredging and filling that will occur between December 15 and March 1, during the work window. These effects include: (1) A temporary reduction in water quality from increased suspended sediment and possible contaminants; (2) displacement from work sites due to disturbance from mechanical equipment and creation of suspended sediment; (3) increase in shallow-water habitat; and (4) temporary reduction in benthic and epibenthic invertebrates in areas where sediments are disturbed by dredging, filling, and reshaping.

Effects of Suspended Sediment

Dredging and the inwater disposal of dredged materials will disturb the river bottom and suspend a significant volume of fine sediments in the water column. Suspended sediment reduces light penetration and scatters light in a manner that creates turbidity. Suspended sediment can also affect fish through a variety of direct pathways: abrasion (Servizi and Martens 1992), gill trauma (Bash *et al* 2001), behavioral effects such as gill flaring, coughing, and avoidance (Berg and Northcote 1985; Bisson and Bilby 1982; Servizi and Martens 1992; Sigler *et al*. 1984), interference with olfaction and chemosensory ability (Wenger and McCormick 2013); and changes in plasma glucose levels (Servizi and Martens 1987). These effects of suspended sediment on salmonids generally decrease with particle size and increase with particle concentration and duration of exposure (Bisson and Bilby 1982; Gregory and Northcote 1993; Servizi and Martens 1987, Newcombe and Jensen 1996). The severity of sediment effects is also affected by physical factors such as particle hardness and shape, water velocity, and effects on visibility (Bash *et al*. 2001). Although increased amounts of suspended sediment cause numerous adverse effects on fish and their environment, salmonids are relatively tolerant of low to moderate levels of suspended sediment. Gregory and Northcote (1993) have shown that moderate levels of turbidity (35 to 150 NTU) can accelerate foraging rates among juvenile Chinook salmon, likely because of reduced vulnerability to predators (camouflaging effect).

Although there are many potential adverse effects of suspended sediment on fish, avoidance behavior can mitigate adverse effects when fish are capable of moving to an area with lower concentrations of suspended sediment. Salmon and steelhead typically avoid suspended sediment. Salmonids may move laterally (Servizi and Martens 1992) or downstream to avoid turbid areas (McLeay *et al*. 1987). Avoidance of turbid water may begin as turbidities approach 30 NTU (Sigler *et al*. 1984; Lloyd 1987). Servizi and Martens (1992) noted a threshold for the onset of avoidance at 37 NTU (300 mg/l TSS). However, Berg and Northcote (1985) provide evidence that juvenile coho salmon did not avoid moderate turbidity increases when background levels were low, but exhibited significant avoidance when turbidity exceeded a threshold that was relatively high (>70 NTU). Under the proposed action, fish should be capable of avoiding turbidity. Turbidity measurements taken at a distance of 300 feet laterally from the dredge in 2005/2006 were less than 5 NTU above background 85% of the time

When suspended sediment settles out of suspension, it can cause detrimental effects on spawning and rearing habitats by filling interstitial spaces between gravel particles (Anderson *et al*. 1996; Suttle *et al*. 2004). Sedimentation can: (1) Bury salmonid eggs or smother embryos; (2) destroy, alter or displace prey habitat; and (3) destroy, alter or displace spawning habitat (Spence *et al*. 1996). Excessive sedimentation can reduce the flow of water and supply of oxygen to eggs and alevins in redds. This can decrease egg survival, decrease fry emergence rates (Bash *et al*. 2001; Cederholm and Reid 1987; Chapman 1988), delay development of alevins (Everest *et al*. 1987), reduce growth and cause premature hatching and emergence (Birtwell 1999).

Box 1. Severity of ill effects scores.

SEV	Description of Effect
	Nill Effect
0	No behavioral effects
	Behavioral effects
1	Alarm reaction
2	Abandonment of cover
3	Avoidance response
	Sublethal effects
4	Short-term reduction in feeding rates and feeding success;
5	Minor physiological stress: Increased rate of coughing; increased respiration rate
6	Moderate physiological stress
7	Moderate habitat degradation; impaired homing
8	Indications of major physiological stress: long-term reduction in feeding rate; long-term reduction in feeding success; poor condition
	Lethal and Paralethal Effects
9	Reduced growth rate; delayed hatching; reduced fish density
≥10	Increasing rates of mortality

During previous dredging efforts in the Snake River, turbidity levels occasionally ranged from 6 NTU to 15 NTU for several hours and a similar situation is likely to occur under the present action. The average background turbidity levels in the Snake and Clearwater Rivers during the winter dredging period in 2005 and 2006 was less than 5 NTU. Data collected in 2005 and 2006 indicates that background turbidity was lowest at the confluence of the Snake and Clearwater Rivers and increased farther downstream in the Snake River. During dredging at the Port of Clarkston, at 300 feet downstream and 3 feet above the substrate, hourly-average turbidity levels exceeded the state of

Washington standard of 5 NTU above background 11.6% of the time, by an average of 4.6 NTUs; and at 3 feet below the surface, the WA standard was exceeded 1.8% of the time, by an average of 2.6 NTU. At 600 feet downstream, the shallow probe turbidity values exceeded the Washington standard 20% of the time by an average of 3.9 NTU and the deep probe exceeded the Washington standard 35% of the time by an average of 5.8 NTU.

Newcombe and Jensen (1996) developed an index that is used in this Opinion to predict the severity of ill effects experienced by fish when exposed to suspended sediment (Box 1). The "severity of ill effects score" (SEV) is based on the concept of a dose-response relationship, where the severity of effect increases in relation to the dosage. Under Newcombe and Jensen's (1996) model, the "dosage" is dependent on the sediment concentration and the duration of exposure, and the SEV score represents the fish's response. The U.S. Fish and Wildlife Service (Muck 2010) developed guidance for using the SEV score to represent thresholds for incidental take, such as "harm," or "harass." The precise thresholds for take vary with different species, lifestages, and the physical characteristics of the sediment particles (such as hardness, size and angularity).

Newcombe and Jensen (1996) based their SEV scores on suspended sediment concentrations expressed as the unit weight of sediment per unit volume of water, while in the proposed action, water quality criteria for suspended sediment are expressed as turbidity measured in NTUs. Turbidity is a measure of how much a beam of light is scattered by particles suspended in water, and for any given particle type, there is a relationship between particle concentration and the amount of light scattering; therefore turbidity measurements can be used to estimate suspended sediment concentrations or vice versa. For Snake River sediments, Schroeder (2014) determined the ratio of suspended sediment concentrations (mg/l) to turbidity (NTU) to be 2.4 mg/l per NTU. To develop SEV scores based on turbidity, numbers from Newcombe and Jensen (1996) are converted to turbidity units so the units of measure in this analysis are consistent with the units the COE uses for monitoring suspended sediment.

In this Opinion, SEV 6 is used to represent an approximate threshold where suspended sediment might harm juvenile or adult salmon and steelhead by causing moderate physiological stress, and SEV 10 represents an approximate threshold where fish might be killed (Box 1). In Figure 10, the severity scores of SEV 6 (broken line) and SEV 10 (solid line) are plotted to characterize the effects of suspended sediment on salmon and steelhead over a wide range of turbidity levels and exposure durations. The lower, dotted portion of the broken line represents circumstances where salmonids can often tolerate low levels of turbidity and the responses of fish vary in this range.

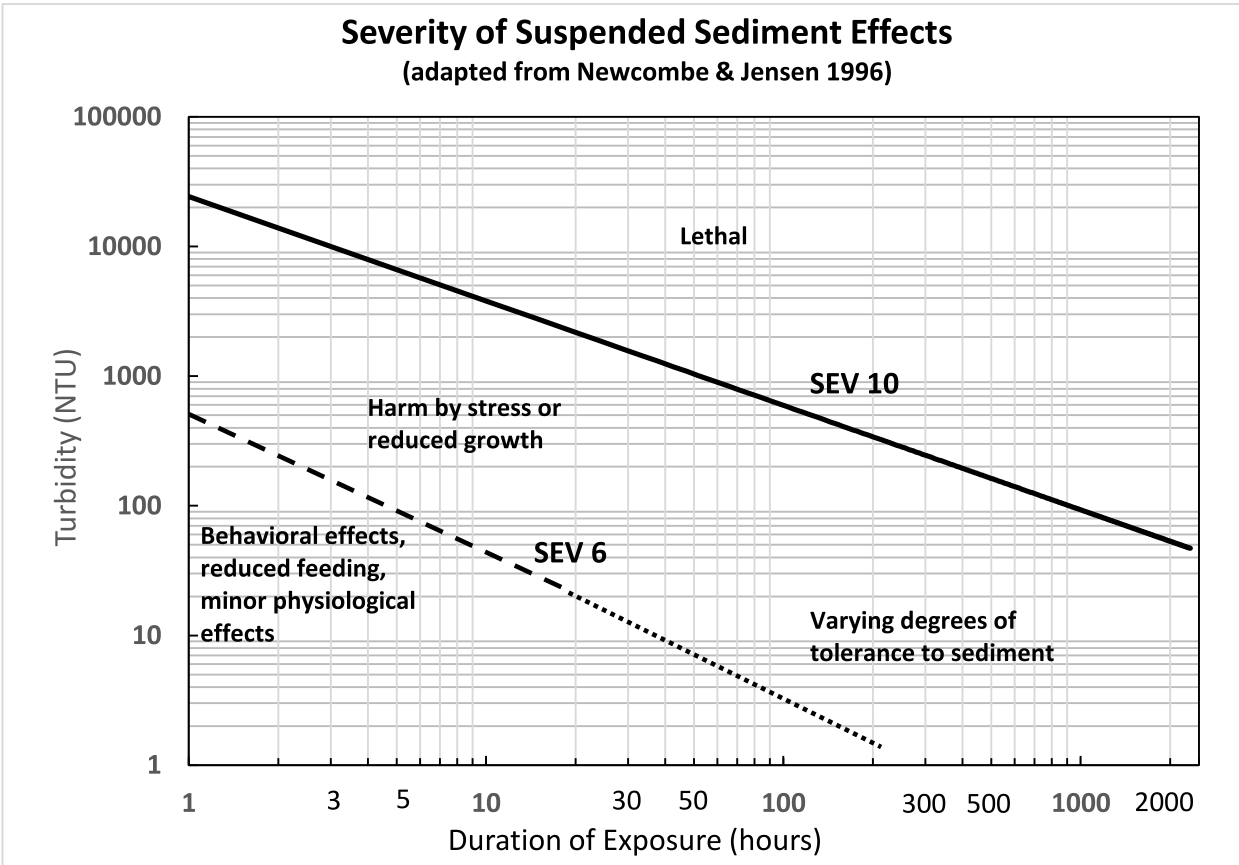

Figure 10. Relationship of turbidity, duration of exposure, and severity of effects. Adapted from Figure 1 in Newcombe and Jensen (1996); based on Schroeder's (2014) ratio of 2.4 mg/l suspended sediment to 1 NTU. The lines represent Newcombe and Jensen's sever severity scores: broken line: SEV= 6; solid line: SEV=10. See above text for explanation.

>changes above this line are in redline/strikeout, changes are not tracked below this line <

The highest turbidity observed at previous dredging sites 300 feet or more downstream from the dredge was 29 NTU over background (total of 34 NTU when added to average background turbidity) for several hours (Schroeder 2014). Using Figure 10, it can be seen that 34 NTUs would be unlikely to harm fish with exposures less than 10 hours. The lowest turbidity level found by NMFS to caused sublethal harm is found in Sigler *et al*. (1984), where they observed a reduction in growth of newly-emerged steelhead and coho salmon when exposed to constant turbidity of 25 NTU for 14 days. With the required turbidity standard of no more than 5 NTU over background, and background turbidity typically less than 5 NTU, turbidity will typically be less than 10 NTU throughout most of the turbidity plumes below dredge sites. Exposure to 10 NTUs would not cause harm at durations less than roughly 50 hours (Figure 10). Turbidity from dredging and disposal may exist 24 hours per day throughout the entire 76-day work window (1,848 hours), which is a sufficient duration to cause harm if fish did not move to avoid the turbidity, but lethal effects would not occur at levels allowed by the state of Washington standards or with levels of turbidity observed in previous dredging efforts. Any fish that remain in the turbidity plume for more than a day or two are likely to be harmed by suspended sediment; however, at 300 feet or more from the dredge suspended sediment concentrations are low enough that there is ample time for fish to move out of the plume before they are harmed. Bisson and Bilby (1982) found that juvenile coho salmon typically exhibited avoidance behavior at the outset of exposure to increased turbidity, but among the fish that did not initially move away from turbidity, an increasing proportion of fish moved out of turbid water as turbidity increased.

During the past efforts to create the shallow water bench near Knoxway Canyon, turbidity was much higher than the dredge sites and it remained high for longer durations. Dixon Marine Services (2006) attributed the exceedances at the disposal site to the deposited sediment sliding down the slope. The dimensions of the disposal area have been widened in the proposed action to lessen the occurrence of sliding material and sliding sediment is not an issue at the dredge sites. Operations in 2005 had to cease at the disposal site for more than 10 hours because of elevated turbidity. The threshold for this operation was raised to 75 NTU in order to complete the project. Based on Figure 10, exposure to suspended sediment created by reshaping the bench may cause sublethal effects such as physiological stress or reduced growth if fish do not move out of the sediment plume to avoid the turbidity. Lethal effects from suspended sediment are unlikely since fish can readily avoid the suspended sediment by moving laterally in the river, and fish are unlikely to remain in the sediment plume long enough to experience lethal effects. At 75 NTUs, lethal effects might occur after approximately 26 days of continuous exposure, but fish experiencing stress from turbidity are likely to move to cleaner water well-before 26 days.

Movement out of the turbidity plume requires easy access to clear water. Previous monitoring indicates that the lateral width of the sediment plume from dredging is 450 feet or less, with a downstream distance of 900 feet (USACE 2014). At The lateral extent of turbidity was monitored in 2005 at the Knoxway disposal site, which is the location where the greatest amount of suspended sediment was observed. A monitoring station was located 300 feet laterally from the disposal site and roughly 300 feet downstream. Turbidity exceeded the 5 NTU above background standard on 179 occasions (hourly readings) near the bottom of the river and on 14 occasions closer to the surface. The average exceedance at the deep station averaged 4.7 NTU over the standard (9.7 NTU total) and exceedance at the shallow station averaged 2.8 NTU over the standard (7.8 NTU total). With a lateral extent of sediment plumes of roughly 450 feet, much of the river width would be unaffected by turbidity from the action, thus allowing fish to move out of sediment plumes into clearer water.

Worst-case and typical turbidity levels from dredging (Figure 11) were developed by Schroeder (2014) based monitoring data from the 2005 dredging and low modeling. The yellow line on the graph at 25 NTU represents the approximate threshold where fish might be harmed if they remained in the sediment plume for more than 1 day. The graph shows that under typical circumstances, dredging is unlikely to harm fish in the sediment plume for a duration less than 24 hours at any distance from the dredge, while under the worst case, harm might occur in the first 300 feet with a 24-hour exposure. Under the worst case, continuous exposure to the sediment plume beyond 24 hours could cause a reduction in feeding or physiological stress in adults or juveniles. However, initial exposure to turbidity is likely to cause fish to abandon areas with high suspended sediment concentrations, and thus avoid prolonged exposure adverse effects of sediment other than forcing fish to move.

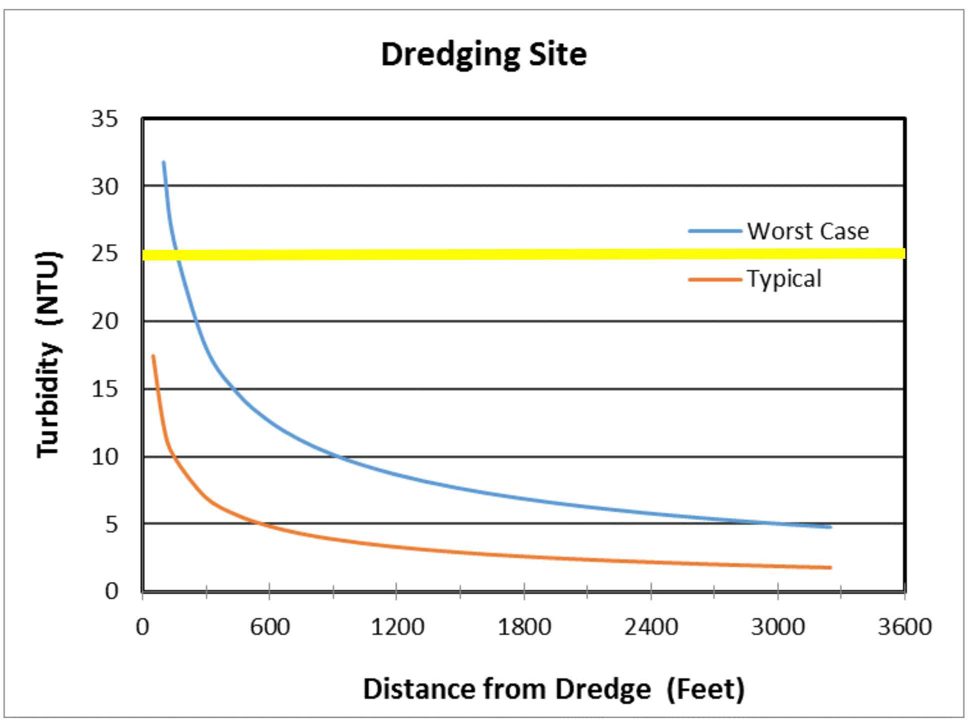

Figure 11. Modeled turbidity predictions (from Schroeder 2014). Turbidity levels beyond a distance of 300 feet downstream from dredging operations are likely to remain below the threshold (yellow line) where reduced feeding or physiological stress would occur with prolonged exposure.

The number of juvenile fish likely to be exposed to potentially-harmful turbidity from the proposed action can be estimated from fish densities and the size of the area where suspended sediment will exceed 25 NTU. The 25 NTU threshold in Figure 11 is based on the findings of Sigler *et al*. (1984), where they observed a reduction in growth of newly-emerged steelhead and coho salmon exposed to constant turbidity of 25 NTU for 14 days . As shown in Figure 11, under typical circumstances, fish would not be harmed by sediment from dredging, but under the worst-case circumstances, potentially-harmful sediment concentrations may occur within roughly 300 feet downstream from the dredge. The area below each dredge site where turbidity may be 25 NTU is 135,000 feet^2 (450 feet wide x 300 long); and the area for the disposal site is 540,000 feet^2 (1,200 feet long x 450 feet wide), based on extrapolation of the modeling results from Schoroeder (2014). The total area for all four dredge sites and the disposal site combined is 1,080,000 feet^2 (100,300 m^2).

According to Tiffan and Connor (2012), the grand mean density of fall Chinook subyearlings at depths of 6.5 to 20 feet (similar to the depth where the dredging and fill will occur) is 0.002 fish per m^2. Based on the 100,300 m^2 area were turbidity may exceed 20 NTU over background, and a fish density of 0.002 fish per m^2, this results in an estimate of 2,006 juvenile salmon that might be exposed to harmful amounts of suspended sediment if they fail to move out of the plume . The majority of these fish are likely move out of the sediment plume when it is first encountered; therefore, few of these fish are likely to be harmed or injured by the suspended sediment. A small number of juvenile steelhead and spring/summer Chinook salmon may also occur in the sediment plumes, but these lifestages are generally not present during the work window. Adult steelhead in the action area are even less likely to be exposed to harmful concentrations of suspended sediment than juveniles since the distance they need to move in order to avoid the sediment, in relation to their body length, is much shorter than the relative distance for juveniles, and therefore requires less effort to move. Adult steelhead are also likely to be in deeper waters that tend to be toward the opposite shore. For the majority of fish exposed to increased concentrations of suspended sediment, the greatest effects would be the energetic cost of moving away from the sediment, and any consequences of moving to a different location, which could be increased exposure to predators or conditions for growth that are more favorable or less favorable than their original position.

Effects of Contaminants

Numerous chemical contaminants can be found in Snake River and Clearwater River sediments. The contaminants can become resuspended in the water column when sediments are excavated, deposited, or reshaped. Listed fish can potentially be exposed directly to chemicals that become resuspended in the water, or exposed indirectly through the consumption of contaminated prey that become dislodged from disturbed sediments. The consequences of exposure to contaminants is discussed below.

The COE identified polycyclic aromatic hydrocarbons , organophosphates, chlorinated herbicides, ammonia, oil, grease, glyphosate, AMPA, dioxin, heavy metals, and others as potential contaminants that have frequently been found in Snake River sediments. Many of the contaminants in Snake River sediments may be acutely or chronically harmful to salmonids (NMFS 2008b; 2009; 2010; 2011; 2012). Certain levels of exposure to metals, chlorinated hydrocarbons and aromatic hydrocarbons can cause olfactory inhibition, immunosuppression and increased disease susceptibility (Arkoosh *et al*. 1998; Baldwin *et al*. 2003; Meador *et al*. 2006; Sandahl *et al*. 2007; Sprague 1968). Exposure to phenol or 4-methylphenol, which are found in some of the dredge sites, can have a wide range of lethal and sublethal toxic effects that vary with the duration of exposure and concentration of the contaminants (Tables 7 and 8). Fish that experience sublethal effects of contaminants may have increased vulnerability to predators or suffer from physical impairments that may reduce the fish's growth rate, reproductive success, or survival rate if the effects are persistent. Fish might also recover with little consequence when they are no longer exposed to contaminants.

Table 7. Studies documenting the toxicity of water-borne phenols to salmonids.

Concen-tration (mg/L)	Species	Endpoint	**Source** (as cited in Johnson 2014)
11.7	Brown trout	24 hr LC50[1]	Miller and Ogilvie 1975
11	Brown trout fingerlings	7 day LC50	Lazorchak and Smith 2007
9	Rainbow trout	48 hr LC50	Swift 1975
6	Rainbow trout fingerlings	7 day LC 50	Lazorchak and Smith 2007
6	Brown trout fingerlings	7 day growth IC 25[2]	Lazorchak and Smith 2007
4	Rainbow trout fingerlings	7 day growth IC 25	Lazorchak and Smith 2007
1.1	Laval rainbow trout	LC50	DeGraeve *et al*. 1980
0.6	Rainbow trout	Changes in liver weight, liver cell morphology, plasma protein and albumen	Monfared and Salati 2013
0.3	Larval rainbow trout	growth	Hodson *et al*. 1984
0.2	Larval rainbow trout	growth	DeGraeve *et al*. 1980
0.12	Larval Rainbow trout	27 day LC 50	Milleman *et al*. 1984
0.19	Larval Rainbow trout	23 day LC50	Black *et al*. 1983
0.1	Rainbow trout eggs	Reduced hatching success in soft water	Birge 1979
0.1	Rainbow trout eggs and larvae	27 day LC 50 in soft water	Birge 1979
0.07	Rainbow trout eggs and larvae	27 day LC 50 in hard water	Birge 1979
0.05	Rainbow trout fingerlings	Changes in activity, ventilation rate, other behaviors	Kaiser *et al*. 1995
0.01	Rainbow trout eggs	Reduced hatching success in hard water	Birge 1979

[1] LC50 is the lethal dose at which 50% of the population is killed in a given period of time.

[2] IC25 (inhibition concentration) is the chemical concentration in water likely to cause a 25% reduction in the rate of survival, growth or reproduction.

The COE collected sediment samples in 2011 (USACE 2012b) and 2013 (USACE 2014) to determine the chemical content of sediments at the proposed dredging sites. Several chemicals found in 2011 were not present in samples from 2013. Contaminant concentrations in the sediment were compared to the 2009 sediment criteria contained in the Sediment Evaluation Framework for the Pacific Northwest (SEF) and the Washington State Department of Ecology (WDOE) 2013 sediment management standards (SMS) to determine if contaminants exceed the criteria. The sediment samples were analyzed for grain size, total organic carbon, percent solids, TAL metals, PCBs (Arochlors), semi-volatile organic compounds, polycyclic aromatic hydrocarbons, total petroleum hydrocarbons (diesel-heavy oil range), halogenated pesticides, organophosphorus pesticides, organonitrogen pesticides, phenylurea pesticides, carbamate pesticides, glyphosate, and high resolution dioxin/furan congeners. Elutriate samples (water filtered from a water/sediment mixture after thorough mixing) were also analyzed for some of the sites to evaluate the potential release of contaminants from disturbed sediments.

Table 8. Studies documenting the toxicity of 4-methylphenol (p-cresol) to salmonids and other fish.

Concentration (mg/L)	**Species**	**Endpoint**	**Source** (as cited in Johnson 2014)
11.3	Raimbow trout	4-day LC100	Bergman and Anderson 1977
8.6	Rainbow Trout	4-day LC50	Bergman and Anderson 1977
7.9	Rainbow Trout	4-day LC50	Degraeve *et al*. 1980
7.4	Rainbow trout	4-day LC50	Hodson *et al*. 1984
5	Rainbow trout	2-day LC50	Shumway and Palensky 1973
3.82	Rainbow trout	6 hrs Physiological changes	McKim *et al*. 1985
3.36	Pink salmon	4-day LC50	Korn *et al*. 1985
3.0	Rainbow trout	2- days Liver enzyme changes	Dixon *et al*. 1987
2.8	Rainbow Trout	4-day NOEC[1] concentration for mortality	Bergman and Anderson 1977
0.12	Rainbow trout	Tainting of fish	Shumway and Parkening 1973
2.57	Fathead minnow	Growth 32 days	Barron and Adelman 1984
0.4	Fathead minnow	Biochemical changes (nucleic acid & protein) 4 days	Barron and Adelman 1984

[1] NOEC is the no observed effect concentration

Out of the 37 chemicals analyzed in the 2011 and 2013 sediment samples, two chemicals were found at levels that exceeded the screening level criteria. Screening levels are thresholds used to determine if sediment samples contain sufficient levels of contamination to warrant further investigation. In the 2013 sediment grab sample analysis, phenol exceeded screening levels in one of three sample sites at the west dredging unit at the Port of Clarkston; and 4-methylphenol exceeded screening limits in five of six samples from either side of the Port of Clarkston, and at the Port of Clarkston grain elevator (USACE 2014). As a result of these exceedences, NMFS reviewed toxicity information on phenol and 4-methylphenol. Johnson (2014) reported that concentrations of phenol and 4-methylphenol measured in some of the sediment samples from Snake and Clearwater Rivers from the proposed dredging sites were high enough to potentially cause injury in salmon and other fish under theoretical environmental circumstances. The likelihood of injury would be influenced by a number of factors, including the volume of sediment released with concentrations above toxicity thresholds, the organic carbon content of those sediments, sediment dispersion patterns, and the hardness of the water into which the sediment was released.

The COE conducted STFATE and DREDGE modeling (Gidley and Schroeder 2014) to predict water column concentrations of phenol and 4-methylphenol from both dredging and disposal operations, based on conditions likley to occur in the action area and the contamionant concentrations found in the sediment samples. The results of the modeling indicated that phenol concentrations were several orders of magnitude below the lowest threshold in Table 7. Modeled concentrations of 4-methylphenol were compared to the 2.8 mg/L 4-day no observable effect concentration (Table 8). This threshold is the most relevant effects threshold for predicting toxic effects to listed salmon and steelhead from the proposed action: The 4-day duration of exposure is similar to what might be expected during dredging (rather than the value reported in Table 8 for a 27-day exposure); the value is based on the same fish genus as steelhead; and lower thresholds observed in hard water are not representative of the soft water conditions found in the action area.

The STFATE model was set to predict concentrations over distances from 150 feet to 3600 feet from the disposal activity. The worst case scenario at the 150 feet point of compliance for disposal operations was based on 3000 cy discharge at low velocity (0.2 feet/sec) and high suspended solids (5290 mg/L) and resulted in 0.03 mg/L for 4-methylphenol and 0.02 mg/L for phenol, well below concentrations that may result in impacts. For dredging activity, the DREDGE model output for 0.8 feet/sec and total suspended solids of 62 mg/L (almost 10-fold greater than background) resulted in predicted concentrations at the 150 point feet of compliance of 0.00097 mg/L for 4-methylphenol and 0.000034 mg/L for phenol, again, well below concentrations that may result in impacts (Table 8). Consequently, adverse effects from exposure to phenol or 4-methylphenol in the water column are unlikley to occur. As an added precaution, the most highly contaminated sediments will be placed at the bottom of the disposal area, and the uppermost sediment layer will be composed of the cleanest sands to further reduce contaminant concentrations in the water column.

Ammonia is another chemical that can be elevated by dredging. Ammonia is present in the aquatic environment due to agricultural run-off and decomposition of biological waste. Ammonia is potentially toxic to fish, and high pH and warmer temperatures increase its toxicity. Elevated ammonia concentrations are likely to occur at the dredging sites and at the Knoxway Bench disposal site at concentrations below the Environmental Protection Agency's (EPA) acute criteria. The extent and duration of elevated ammonia concentrations are likely to roughly coincide with the areas subjected to plumes of suspended sediment, with the highest concentrations in close proximity to dredge or disposal sites, and diminishing concentrations as water moves downstream. Chronic exposure to ammonia from the proposed action is unlikely since fish tend to move out of sediment plumes due to effects of suspended sediment. Acute exposures to ammonia are likely to occur when fish migrate through the area, or when operations begin at a new site or resume after ceasing operations long enough for sediment or other contaminants to return to background levels.

Ammonia concentrations measured hourly during the 2006 dredging at the Port of Clarkston and at the Knoxway Canyon disposal site were all below EPA's acute criteria for waters supporting *Oncorhynchus* species (EPA 2013). Acute toxicity of ammonia to rainbow trout has been extensively studied, and ammonia is unlikely to harm or kill fish when ammonia is below EPA acute criteria (Brinkman *et al*. 2009; EPA 2013). Brief exposures to elevated concentrations of ammonia could cause behavioral changes that abate when the concentrations return to background or when fish move out of contaminated waters. As with suspended sediment, if fish remain in sediment plumes for more than several days they may be harmed by effects of ammonia, but this situation is unlikely to occur. Adult steelhead overwintering in the action area would experience similar exposures, but with little consequence since adults are not vulnerable to the predators that prey on juvenile fish, and the dredging would cease around the time when steelhead begin to disperse to spawning areas.

Exposure to contaminants through the food chain can sometimes have serious implications for salmonid health and survival if they consume prey that is contaminated with chemicals that bioaccumulate or if a significant portion of the food base is lost when contaminants kill prey species. The potential for the proposed action to affect the food base was tested with several assays. Sediment samples were collected from proposed dredge sites where contaminant concentrations exceeded water quality criteria, as well as from two reference areas upstream of the area. The samples were tested for toxicity using a 10-day *Hyalella azteca* survival test and the 20-day *Chironomus dilutus* survival and growth tests. Survival and growth in test sediments were statistically indistinguishable from control and reference sediments (USACE 2014). These test results provide adequate evidence that the sediments are non-toxic to the benthic community, and would not reduce the availability of invertebrate prey species.

Sediment samples collected in 2013 were analyzed for chemicals of concern[2] that have either a known source in the Snake River drainage or which have been found in previous sampling efforts. In all samples analyzed, chemicals of concern were either undetected, or detected at levels below the regulatory guidelines (USACE 2014). The results of the analysis show that concentrations of chemical contaminants in the sediments are below thresholds that cause adverse health or behavioral effects to listed fish through direct exposure to chemicals that escape from the sediments. The sediments also contained no significant amounts of chemicals with a known potential to bioaccumulate.

2 List of chemicals identified by the Washington Department of Ecology as chemicals that are toxic and are either persistent or which have the potential to bioaccumulate.

The potential for toxic effects is also reduced by the following measures the COE has designed to minimize the exposure of salmonids to listed contaminants:

1. Conduct dredging and disposal during the winter. During winter, adult salmon are not present and juvenile salmonids in the area are at their lowest densities. In addition, the low temperatures found in winter further reduce the potential for bioaccumulation of toxic chemicals. Aquatic organisms are either dormant or have very low metabolic rates in the winter, which limits the rate that toxic chemicals can be assimilated;

2. Continued sediment sampling and analysis for contaminants, including ammonia, during disturbance activities, so that contaminated sediments unsuitable for inwater disposal (based on the screening procedures described above) would not be placed in water;

3. Staging the dredging operations to ensure that shallow water bench will have clean sands placed on top of sediments that have trace amounts of contaminants to form a cap from clean materials;

4. Require the contractor to implement practices to prevent spills of fuel, or hydraulic leaks during the dredging and filling operation. A key component is requiring all refueling to be done at established terminals, which have proper equipment for preventing and containing spill.

Injuries from Dredging Equipment

Dredging equipment can potentially injure or kill fish from trauma caused by entraining or scooping fish from the stream, or from moving machinery. The likelihood that fish will be killed or injured by dredge equipment depends on a variety of circumstances: the type of equipment used, the swimming abilities of the fish, and the likelihood that fish would be present at the dredge site. There are two types of dredges based on their mode of operation – hydraulic and mechanical. Hydraulic dredges use a stream of water to create a strong suction field from which some fish cannot escape (Reine and Clarke 1998). Studies of hydraulic dredging show that a variety of aquatic organisms, including juvenile salmonids, may be entrained by hydraulic dredges (Drabble 2012; Nightingale and Simenstad 2001; Carlson *et al*. 2001); however, hydraulic dredges are not proposed for use.

Dredging equipment that will be used in the proposed action is limited to mechanical dredges, which could be a dragline, clamshell bucket, or scoop. Mechanical dredges work by scooping materials from the bottom and lifting them out of the water with a boom or cable. Mechanical dredges do not have the capability to entrain fish since there is no tractive force to draw fish toward the dredge. Organisms with poor swimming ability can be scooped up by mechanical equipment. A considerable amount of splashing, noise, and movement of equipment in and out of water occurs each time a scoop or bucket is dropped into the water and pulled back to the surface. The disturbance caused by operating a mechanical dredge is likely to elicit a startle response in salmon or steelhead that are in the vicinity of the dredge and also discourage more distant fish from moving toward the dredge site. Suspended sediment created by the dredging is also likely to discourage fish from approaching the dredge equipment since the initial response of a fish to increased levels of suspended sediment that is described by Newcombe and Jensen (1996) is to move away from the source. A plume of suspended sediment would surround the dredge equipment and act as a deterrent to fish.

The chances of a listed fish encountering dredge equipment are reduced by the timing and location of the activities. The winter work window ensures that all listed salmon and steelhead in the action area would be large enough to have developed swimming abilities that enable them to avoid mechanical dredge equipment. At the proposed dredge sites, fish have ample room to avoid dredging activities since the river is substantially wider than the area affected by a dredge. The dredge sites are also located at depths that are unlikely to be used by listed fish. The dredging will occur in water less than 14 feet deep and recent studies indicate that in winter, both juvenile and adult salmon and steelhead prefer deeper waters (Tiffan and Connor 2012).

At the Ice Harbor dredge site, there is a possibility that one or more redds might occur in the area to be dredged. The COE has committed to thoroughly survey any areas proposed for dredging where SRF Chinook redds might occur (i.e., near and within the Ice Harbor navigation lock approach) prior to dredging, and then dredge around or otherwise avoid any observed redds. Surveys are likely to detect fall Chinook redds, if present, but if a redd goes unnoticed, the entire redd could possibly be destroyed. In multiple redd surveys since 1993, no redds have been found within the navigation lock approaches of any of the lower Snake River dams (Dauble *et al*. 1999; Mueller 2009; Mueller and Coleman 2007; Mueller and Coleman 2008). The probability of a redd being present at the Ice Harbor site is low to begin with, and the redd survey further reduces the possibility that a redd would be destroyed. Given these circumstances it is very unlikely a redd will be destroyed.

In view of the above factors, listed salmon or steelhead are unlikely to be injured or killed by the dredging equipment. There are numerous factors that discourage juvenile or adult fish from getting close enough to the dredge to risk injury, and redds are unlikely to be encountered due to the fact they have not been observed previously at the dredging sites and specific efforts to identify any redds before dredging make it even less likely they will be disturbed.

Death or Injury from Inwater Sediment Disposal

Inwater disposal of dredge spoils can bury juvenile fish or expose them to extremely high concentrations of suspended sediment if materials descend too rapidly for the fish to escape. Past dumping of dredged material showed the material tended to fall to the river bottom in a clump rather than disperse. Clumped material falls rapidly and entrains water during descent. Fish and other aquatic organisms can be entrained in the sediment plume and become buried. Drabble (2012) investigated the potential for disposal of dredge materials to bury marine organisms, and found that organisms vulnerable to burial consisted primarily of those that live near the bottom or are incapable of making a rapid escape. The same principle was also described by Nightengale and Simenstad (2001) who noted that juvenile white sturgeon in the

Columbia River were susceptible to burial by in-water sediment disposal due to their small size, limited swimming ability, and tendency to physically rest on the stream bottom. Subyearling Chinook salmon and adult salmonids that are present in winter do not have any of the characteristics that make fish vulnerable to burial. All life stages of salmon and steelhead have relatively high swimming speeds that enable them to rapidly escape when they are alarmed, and they do not rest on the stream bottom.

The timing of the proposed action and the habitat preferences of salmon and steelhead also make burial or injuries from in-water disposal unlikely. Very few SRF Chinook salmon subyearlings use the shallow water bench area in the winter, and even fewer were in water less than 20 feet deep by late fall or early winter (Tiffan 2013; Tiffan and Connor 2012). The few fish that Tiffan and Connor detected near the shoreline spent less than an hour in the area before moving downstream into deeper water. By winter subyearling SRF Chinook salmon and all other listed anadromous fish are large enough to have developed swimming abilities and habits that would enable them to escape from the disposal area before sediment could bury or injure them when they are in an unconfined area. If fish were located in depressions, near mounds of sediment, or other types of cover within in the disposal area, these physical features could act as barriers that prevent rapid escape. In nearly all circumstances fish would likely evade burial or injury when sediment is released at the disposal site, particularly after the initial load is dumped. The initial load of sediment is likely to disperse fish from the disposal site. However, if fish are in a confined area directly below the barge when opens up to dump sediment, some fish may be buried or injured by the disposal. Adult fish are unlikely to be buried or injured by disposal since they occupy deeper, central portions of the channel.

Disruption and Displacement of Fish

Dredging and filling operations create disturbances that could significantly disrupt normal behavior patterns in situations where a fish is incapable of moving to an area where they will not be affected by the disturbance. Since listed fish in the action area are all physically capable of avoiding the equipment, disturbances caused by noise, turbidity, and use of equipment in the water are likely to prompt fish to move away from dredging or filling operations. When a fish moves to avoid dredging or filling activities, it could be affected in several ways: there would be an energetic cost from the movement (Barton and Schreck 1987); juvenile fish may encounter increased vulnerability to predation (Frid and Dill 2002); and conditions in the new environment might be more or less favorable for growth and survival.

In a large river such as the Snake River, juvenile salmon displaced from dredging or filling sites can easily move laterally to avoid the disturbance from the dredging and filling operations. The effects of moving to a different area are likely to be benign since similar habitat occurs throughout the action area, and fish would not need to swim far to find similar habitat. A brief disruption from moving from one spot to another is unlikely to have any lasting effect due to energy expenditures or disruption in feeding. Carlson (2001) found that fish displaced by dredging in the Columbia River resumed normal positions and normal behavior within a short time after moving. The observations by Carlson (2001) indicate that fish are unlikely to incur significant energetic costs to avoid a dredge and find suitable habitat, and the physical characteristics of large rivers make it likely that fish can move to an area that does not meaningfully differ from their initial position. Predation risk would not change significantly since the smallest fish in the action area are SRF Chinook, and by winter they would generally be too large to fall prey to piscivorous fish (c.f. Tiffin and Connor 2012). In the event that a juvenile fish falls prey to a predator as a result of displacement, such low numbers of all species are likely to be near each disturbance site such that any adverse effects that might occur from displacement or avoidance would not cause discernable population effects.

Potential effects to Snake River Fall-Run Chinook Salmon Spawning

Fall Chinook salmon are the only anadromous fish species in the action area that has eggs incubating in redds during the winter work window. Since 1993, SRF Chinook salmon have been observed in deeper water areas downstream of Lower Granite, Little Goose, Lower Monumental, and Ice Harbor Dams in tailwater areas near the outfall flow downstream of the dams. When redds were found near the dams they were adjacent to the outfall flow from juvenile fish bypass systems and on the powerhouse side of the river in 13 to 27 feet of depth on cobble substrate. Dredging equipment operated during the winter in the proximity of a spawning area has the potential to harm or kill eggs incubating in the redds. However, under the proposed action, there is little potential to affect incubating eggs since none of the dredging sites occur in locations where redds have been previously observed.

The only site where dredging might occur in close proximity to gravels that might potentially be used by SRF Chinook salmon for spawning is the dredge site near navigation lock at the Ice Harbor Dam. In multiple red surveys at since 1993, no redds have been found within the navigation lock approaches of any of the lower Snake River dams (Dauble *et al*. 1999; Mueller 2009; Mueller and Coleman 2007; Mueller and Coleman 2008). However, since potential spawning habitat exists near the proposed dredging area at the Ice Harbor Dam navigation lock entrance, there is a slight possibility that a redd containing incubating eggs could be present. The eggs incubating in a redd could be killed if a redd were located in the Ice Harbor Dam dredging area or a short distance downstream and if the redd is unnoticed. To ensure that redds will not go unnoticed, the COE will conduct underwater surveys of the proposed dredging site at Ice Harbor Dam and within 900 feet downstream of the Ice Harbor navigation lock in November and the first 2 weeks of December prior to commencing dredging. Techniques similar to those used by Battelle from 1993 to 2008 will be employed (Dauble *et al*. 1996; Dauble *et al*. 1994; Dauble and Watson 1997; Mueller and Coleman 2007; Mueller and Coleman 2008). This technique has used a combination of a boat mounted underwater video camera tracking system to look at the bottom of the river to identify redds. Results of the surveys will be transferred to the COE within 2 days of the survey dates in order for compilation prior to December 15, at which time the COE can communicate results to NMFS for appropriate action. If no redds are located, then the COE will proceed with proposed dredging within the boundaries of the surveyed template. If one or more redds are located within the proposed dredging template and such redds are verified with video, then the COE will coordinate with NMFS to determine if dredging can proceed without damaging the redd(s) or needs to be delayed until fry are able to move out of the area.

As a result of the winter work window and efforts to locate and avoid redds, the proposed activity is unlikely to cause damage to redds or harm incubating eggs.

Modification of Shallow Water Habitat

Shallow water habitat is among the most productive habitat in aquatic ecosystems and it is heavily used by juvenile Chinook during the spring and summer in the Snake River (Tiffan 2013; Tiffan and Connor 2012; Tiffan and Hatten 2012). There are numerous potential biological benefits of in-water sediment disposal for salmonids and other fishes. They include providing suitable resting, rearing, feeding, and predator avoidance habitat. Studies indicate that all of these benefits apparently exist at some level as predator abundances and predation rates are similar to natural, unaltered habitats, and juvenile salmonid fish usage is increased compared to other areas. Several years of monitoring dredge disposal sites in the Snake River indicate that the often expressed concern that feeding habitat for predator fishes is increased has not been observed in Lower Granite Reservoir (Seybold and Bennett 2010).

Currently, lower Granite Reservoir contains about 217 acres of rearing habitat less than 6 feet deep, when the flow is 143,000 cfs, which equates to about 2.2% of the reservoir area. Most rearing habitat is located upstream of Centennial Island at RM 120 and little exists in the lower half due to steep lateral bed slopes and unsuitable substrate along the shorelines. Without information on patch size or connectivity, even that low value of 2.2% is not necessarily helpful. As part of the 2005/2006 dredging action, the Corp used dredged material to build an estimated 3.7-acre shallow water habitat shelf, now called the Knoxway Bench, approximately 0.5 miles upstream of Knoxway Canyon for summer rearing juvenile fall Chinook salmon. At that time, the COE considered shallow water habitat to be anything less than 20 feet in depth. Since that time, studies have shown that during the spring and summer, juvenile Chinook preferred shoreline areas less than 6 feet deep (Tiffan and Connor 2012; Tiffan and Hatten 2012). Therefore, the COE will use material from the proposed dredging to continue the construction of shallow water habitat less than 6 feet deep at the downstream end of Knoxway Bench. The new material will occupy a 27.4-acre footprint and will form a uniform, gently sloping shallow-water bench along about 3,500 linear feet of shoreline. The top of the bench will have a 2% slope and will provide about 11.4 acres of additional aquatic habitat up to 6 feet deep at MOP with features optimized for resting/rearing of outmigrating juvenile salmonids, particularly for SRF Chinook salmon. The COE anticipates there will be about 18 acres of lesser-quality shallow water habitat at depths of 6 to 20 feet on the slope of the bench.

A recent study by Tiffan and Connor (2012) of four shallow water habitat areas (including Knoxway Bench) found natural-origin fry and parr present within all four sites from early spring through early summer, and parr were more abundant than fry. Water less than 6 feet deep was highly used for rearing by natual-orign SRF Chinook salmon subyearlings during the spring and summer, while the 6- to 20-foot depth interval was more often used by hatchery SRF Chinook salmon subyearlings and SRSS and SRF Chinook salmon yearlings. Overall, mean spring and summer apparent density of natural-origin subyearlings was over 15 times higher within the 6 feet or less depth interval than within the 6- to 20-foot depth interval. Tiffan and Connor (2012) also found that the density of natual-origin subyearlings in shallow water habitat was negatively correlated with distance from the riverine spawning areas. Although a “sizeable portion” of SRF Chinook juveniles remained in the Snake River after the usual spring and summer migration, use of the shallow water habitat during fall and winter was severely limited. Radio telemetry data collected between November and March indicated that although many tagged fish passed the shallow water habitat study areas, relatively few fish entered them and the median time spent at given shallow water sites was less than 90 minutes. They also found that during the fall and winter, juveniles show a preference for deep water and avoid shallow or nearshore (within 80 feet) areas.

While it appears that various depth intervals of the existing Knoxway Bench are providing some benefit to certain species and life-stages during spring and summer, the use of the habitat is not consistent year round. That does not necessarily reduce its beneficial functions since shallow water habitat is not widely dispersed throughout the Snake River, and its rarity increases the importance of what little shallow habitat there is. The primary SRF spawning areas are upstream of Knoxway Bench where temperature during incubation and early rearing promotes diverse life history strategies among the different spawning aggregates (e.g., Grande Ronde River versus the Clearwater River) (Connor *et al*. 2002; Connor *et al*. 2003). Natural SRF Chinook salmon emergence and movement from the various spawning aggregates into the Lower Granite Reservoir is a protracted event that extends from early spring until early fall. Thus, there is a large potential for natural subyearlings to use shallow water habitat complexes throughout the spring and summer.

The short-term effects of filling the relatively small amount of shallow water habitat at the Knoxway Bench are expected to be minor as recent studies (Tiffan 2013; Tiffan and Connor 2012; Tiffan and Hatten 2012) have shown that juvenile ESA-listed fish do not use shallow or nearshore areas during the winter when the placement of fill material will occur. Based on the most recent information, the construction of 11.4 acres of habitat less than 6 feet in depth and an additional 16 acres of 6 to 20 feet mid-depth habitat is expected to contribute to improved rearing conditions during the spring and summer, for SRSS and SRF Chinook salmon juveniles and SRB steelhead juveniles.

Changes in Food Availability

The proposed action is likely to affect feeding behavior and food availability. Feeding behavior will be affected by reduced visibility in areas where turbidity is elevated by the proposed action and availability of benthic prey species is likely to be reduced where the riverbed is altered by excavation or filling.

Feeding behavior would be altered by reduced visibility if fish were to remain in turbid areas. Juvenile steelhead and coho salmon have shown decreased growth rates when reared under chronically-turbid water in artificial streams as a result of decreased food consumption (Newcombe and MacDonald 1991; Sigler *et al*. 1984). In natural environments, salmonids typically avoid turbid waters when possible (Bisson and Bilby 1982; Sigler *et al* 1984; Berg and

Northcote 1985). Since most fish are likely to avoid turbidity by moving out of the plume, effects of turbidity on feeding behavior are likely to be avoided by the majority of fish that encounter turbidity. However, some fish may remain in the turbidity plume. Since salmonids rely at least partly on vision to capture prey, turbidity can decrease their ability to locate and capture prey (Barrett *et al*. 1992; Vineyard and O'Brien 1976), although examples exist where feeding rates are not reduced by turbidity (e.g. Rowe *et al*. 2003; Gregory and Northcote 1993). , There are also environments in the Pacific Northwest where salmonids thrive in naturally-turbid waters as an apparent result of reduced predation on juvenile salmonids (Gregory 1993). Turbidity appears to act as a form of protective cover for juvenile salmonids (Gregory 1993). Turbidity that is used as cover may provide an advantage to planktivorous fish such as subyearling Chinook salmon when avian or piscivorous predators are present. In some situations, turbidity may be high enough to reduce predation risk without causing substantial decrease in their ability to capture zooplankton (De Robertis *et al*. 2003). Given the various ways fish might respond to turbidity, the effects on individuals may be advantageous, neutral, or disadvantageous, but the majority of fish are likely to avoid turbidity and thus be largely unaffected by turbidity.

Feeding may also be affected by the physical disturbance of the riverbed. As discussed previously, the proposed action is likely to alter local populations of benthic invertebrates by crushing, covering, or dislodging them during dredging and filling activities. The availability of benthic invertebrate prey will be reduced in disturbed areas; however this alteration is likely to have little effect on listed fish. Benthic invertebrates are not a significant part of the diet of salmon and steelhead smolts or adults; and salmonids in northern latitudes apparently are well-adapted to cope with periods of low food consumption in winter. In Columbia River reservoirs, Rondorf *et al*. (1990) found that subyearling Chinook salmon fed mostly on planktonic *Daphnia spp*. and terrestrial insects. In another study, Bratovich and Kelley (1998) found that 97% of the food items eaten by steelhead smolts in the estuarine portions of Lagunas Creek, California, were planktonic *Neomysis* shrimp. The availability of planktonic invertebrates will not be affected by disturbance of the substrate; therefore, the principle food source will not be changed by disturbance of the riverbed. Since benthic invertebrates are not likely to be an important food source for salmon and steelhead, the negative effect of the action on benthic invertebrates is likely to be unimportant.

The impacts of changes in the prey base and feeding behavior are also minimized by the winter work window. Salmonids in northern latitudes typically experience a period of time in winter when feeding and growth are limited by low food availability, or by cold temperatures or short photoperiods that prevent fish from taking full advantage of available food (Triebenbach *et al*. 2009). This period of restricted winter feeding is typically is followed by a period of elevated growth rates and rapid restoration of lost energy reserves in the spring (Triebenbach *et al*. 2009). This phenomenon is described by Ali *et al* (2003) as "compensatory growth," and it has been demonstrated in laboratory experiments on sockeye salmon (e.g., Bilton and Robins 1973), Chinook salmon (e.g., Hopkins and Unwin 1997), rainbow trout (e.g., Simpkins *et al*. 2003), and coho salmon (e.g. Griffioen and Narver 1974).

Considering the ways that the action might reduce availability of prey, and ways that salmon and steelhead might respond to turbidity or changes in prey, individual fish may be affected by the action in different ways. The majority of fish are likely to avoid changes in feeding by moving away from areas affected by the proposed action. Fish that do not move out of turbid areas may experience lower feeding rates or higher feeding rates when exposed to effects of in stream work activities. The consequences of altered food availability or altered feeding rates are unlikely to cause significant changes in the growth or survival of fish due to the timing of the activity to coincide with low temperatures, low abundance, and a period when fish naturally consume very little food; and due to compensatory growth mechanisms that mitigate effects of winter food deficits.

2.4.3 Indirect Effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur (50 CFR 402.02). Nearly all effects of the action occur contemporaneously with the dredging and filling operations. Indirect effects may occur if fish later respond to habitat changes from dredging and in-water sediment disposal by shifting their locations, and through the effects of barge traffic that is enabled by the proposed action. Much of the barge traffic exists as part of the environmental baseline, and is not dependent on the proposed action. It is impossible to estimate exactly how much barge traffic is enabled by this proposed action versus past dredging actions and the existence of the dams and related infrastructure. This analysis does not attempt to quantify barge effects specifically attributable to this action, which is not feasible, but instead describes generally the effects of barge traffic and related infrastructure on listed species and critical habitat.

The various species of fish that occur in the action area may be attracted to or repelled from dredged areas in response to changes in water depth, substrate topography, or sediment coarseness. However, in a river system as large as the lower Snake River, the physical changes at several dozen dredge sites are unlikely to change the suitability of the habitat for any of the species in the action area. The dredge sites are relatively deep habitats with fine-textured substrate both before and after the dredging; consequently the character of the habitat is little changed. In-water sediment disposal results in a substantial increase in shallow rearing habitat for subyearling fall Chinook at the disposal site, but the effects are not meaningful in the context of the action area as a whole.

As described previously in the *Environmental Baseline* of this Opinion, maintenance of a navigation channel potentially affects all four species of listed anadromous fish by facilitating barge usage in the vicinity of the dredge sites. The effects of barges in the lower Snake River are relatively minor. Barge traffic exists under the environmental baseline, and a portion of the barge usage is facilitated by the proposed action. Barge traffic can cause several physical effects that influence the characteristics of riverine habitats used by listed anadromous fish. Potential effects of barges include spillage or leakage of contaminants (such as fuels, oils, greases), generation of wakes and turbidity by moving vessels, and through creation of overhead shade when shipping vessels are moored. Some effects from having commerce activities on the shoreline may exist as an indirect result of barging but these are insignificant due to the very small area that these activities affect. Small fish that are incapable of swimming against the wave energy caused by wakes can become stranded on the shore or injured by trauma. Trauma to juvenile salmon and steelhead from wakes is unlikely since they are capable of swimming in strong currents soon after emergence, and by the time they emerge from redds, they have reached a size where they would not be vulnerable to trauma from boat wakes. In studies of traumatic injuries from wakes Holland (1986) and another study by Odum *et al*. (1992) found no evidence that larval or age-0 fish were injured by barge wakes. Stranding is also unlikely in the Snake River. Wakes from large, deep-draft ships are known to strand juvenile Chinook along the shoreline, but smaller vessels such as barges that operate in water less than 14 feet (such as the Snake River navigation channel) do not create wakes large enough to strand fish (Pearson and Skalski 2011). Ships that are capable of generating wakes that strand fish require a draft deeper than the 14-foot depth of the Snake River navigation channel.

Along the shoreline, wave action generated by barges can sometimes create bank erosion that can impair water quality and damage riparian vegetation and near-shore fish habitat. Boat-generated wakes have the greatest potential to cause bank erosion where the river channel is narrow, where boat use is regular and concentrated and close to shore, and where river systems and not subject to high erosive flows (McConchie and Toleman 2003). Other circumstances that increase the likelihood of erosion include lack of protective bank vegetation, high erodibility of the bed and bank materials, oversteepened banks, narrow channel width, and high vessel speed (McConchie and Toleman 2003). In general the banks of the Snake River are not conducive to erosion from barge wakes because the channel is relatively wide, erodible materials are removed by annual floods, barges do not travel close to shore (except when berthing), and the shorelines along the river are predominantly composed of coarse rocks that are too large to be moved by wave action. Bank erosion is unlikely to be caused by barges in the Snake River.

Even though barge wakes are unlikely to cause bank erosion, the wakes are likely to cause brief episodes of turbidity along the shoreline each time a vessel passes, as described by Whitfield and Becker (2014). Shallow, near-shore areas are likely to be important to juvenile salmonids for feeding (Naughton *et al*. 2010). Turbidity from barge wakes reduces visibility and at certain thresholds it can cause a short-reduction in feeding rates. The duration of turbid conditions following the passage of a barge is likely to be relatively brief, since the flowing waters in the river rapidly dissipate suspended sediments. Episodes of turbidity caused by barge wakes are likely to persist for well under an hour due to the river current, and turbidity levels from wakes are unlikely to exceed the threshold where reductions in feeding rates have been observed at 1-hour exposures (Figure 10). No data could be found regarding turbidity caused by barge wakes in the Snake River; however, dredging and disposal of dredged materials are likely to create far more turbidity than a barge wake, and the turbidity observed previously at Snake River dredging sites is well below the threshold where feeding stops with a 1-hour exposure to 1097 NTUs. In the 2006 dredging, 99% of turbidity results at 300 feet were less than 30 NTUs above background (Schroeder 2014). Brief disruptions in behavior caused by barge wakes are unlikely to have a significant effect since the fish are capable of swimming against the waves and turbidity is likely to below levels that affect fish behavior.

Fish that occupy deep water or locations away from the shore would not be affected by wakes or turbidity, but some fish species could be directly affected by the barges themselves. In a review of recreational boating effects, Whitfield and Becker (2014) found that some species of fish are affected by moving vessels by becoming startled by noise or motion, colliding with a vessel, or being struck with a propeller. These effects vary according to the species and size of the fish, and the speed of the boat. Anecdotal evidence of salmon and steelhead behavior in the action area indicates that passing vessels are unlikely to have a significant effect. Salmon and steelhead are often caught by fisherman a short distance from boats propelled by idling gas engines or trolling motors, suggesting that the fish are not disturbed by boats beyond a certain distance. Boat strikes also appear to be unlikely. Xie *et al*. (2008) observed avoidance reactions of migrating adult sockeye salmon when the motor boat and fish were separated by a distance less than 7 m, but saw no reaction beyond this distance. Since moving vessels trigger an avoidance reaction in salmon and steelhead before the vessel reaches the fish, they are unlikely to be injured or killed from vessel strikes. All lifestages of listed anadromous fish in the Snake River are capable of avoiding vessel strikes since they have high burst speeds and they have a tendency to avoid residing near the surface of the deeper water that barges use to navigate the channel.

When barges are moored at ports, they create the effect of a floating island that blocks sunlight underneath and alters currents near the surface. Subyearling Chinook salmon and other species swimming near the shore may encounter predatory fish that hide in the shadow of moored vessels. A variety of studies have found that predatory fish gain an advantage over their prey by hiding near overhead cover that creates low light conditions. As light levels decrease, predation on juvenile salmonids by piscivorous fishes may increase due to a diminished ability for the juvenile salmonids to detect predators (Rondorf *et al* 2010). The most significant piscivores in the action area that prey on salmon and steelhead are northern pikeminow and smallmouth bass, and to a lesser extent, walleye (Rieman *et al*. 1991). Northern pikeminow and smallmouth bass may sometimes use shade to avoid detection by their prey (Chapman 2007). Smallmouth bass in particular have a strong affinity to in-water structures such as docks and piers and they are common predators of subyearling salmonids in the Columbia River drainage (Carrasquero 2001). However, barges lack the physical habitat complexity that provides hiding places found among the pilings that often support in-water structures so the effects of moored barges may not be comparable to effects of structures such as piers and docks.

Although predatory fish may use overhead cover from barges to prey on listed fish, moored barges in the action area are unlikely to offer much advantage to predators for several reasons: the sporadic mooring of vessels would not provide a consistent or predictable environment that would enable predatory fish to congregate at the ports; salmon smolts tend to avoid shaded areas and shorelines (Kemp *et al* 2005); and by the time subyearling Chinook salmon and all other smolts reach Lower Granite reservoir, the fish favor deep, mid-channel areas (Rondorf *et al*. 2010; Chapman 2007). Given the above circumstances, moored barges are unlikely to meaningfully increase risks of predation on juvenile salmon or steelhead.

2.4.4 Summary of Effects on Listed Species.

Relevance of Effects on Individual Fish to Salmonid Population Viability

NMFS assesses the importance of habitat effects in the action area (on individual fish) to their ESUs or DPSs by examining the relevance of those effects to the characteristics of VSPs. The characteristics of VSPs are abundance, population growth rate (productivity), spatial structure, and diversity. While these characteristics are described as unique components of population dynamics, each characteristic exerts significant influence on the others. For example, declining abundance can reduce spatial structure of a population; and when habitats are less varied, then diversity among the population declines.

Abundance. An action adversely affects abundance of a population when it causes losses of individuals through injuries or death, or through emigration to areas outside the population area when individuals are forced to move to avoid direct effects of an action. The proposed action is likely to reduce the local abundance of listed fish in the immediate vicinity of the dredging and fill sites when the dredging and filling activities are underway, and increase the abundance of fish near the periphery of the work sites. These changes would be temporary effects of avoidance behavior, and abundance is likely to return to normal soon after the work is completed at each site. Only a small percentage of listed fish in the action area are likely to encounter effects of the action. Significant changes in abundance due to mortality are unlikely since direct effects of the action are likely to be largely non-lethal; and the risk of losses to predators is not likely to change significantly since fish need only to move a short distance to avoid effects of the action; and dredging and filling will occur in areas where few juveniles or adults are likely to be present at the times the activities will occur. The large size of the river also provides ample opportunity for listed fish to avoid machinery and plumes of turbidity by moving a short distance laterally; consequently, salmon and steelhead would not be driven out of the action area. Since the action is unlikely to kill fish and would not cause fish to emigrate, abundance of listed fish affected by the proposed action would not appreciably change.

Productivity. Productivity is an indicator of population growth over the entire life cycle. Productivity of anadromous fish is adversely affected by any action that reduces the reproductive rate or increases the mortality rate. Changes in productivity may occur when a fish or habitat are affected in a manner that reduces the success of spawning or incubation, reduces the growth or survival of juvenile fish; or results in losses of adults The timing and location of the activities avoid impacts that affect productivity. With the possible exception of the dredging site at the Ice Harbor Dam lock, the proposed action does not occur in locations used for spawning, and the dredging and filling actions will occur at a time when very few fish, juveniles or adults, are likely to be in the disturbed areas. In addition, the majority of adverse effects of the action are likely to be non-lethal, and the proposed activities do not disrupt adult behavior in a manner that would affect their survival or spawning success. At the Ice Harbor Dam site where dredging will occur in an area that could potentially be used by SRF Chinook salmon for spawning, the action is unlikely to affect productivity because fish are not known to spawn in that particular location, and the action includes extra measures to survey the area for redds and to curtail any activities that would affect a redd if one or more were found.

The action will increase nearshore rearing habitat (11.4 acres or 5.25% increase over existing) for subyearling Chinook salmon and possibly juvenile steelhead, which could potentially increase productivity of these species. However, any positive effect on productivity is likely to be relatively minor since the shallow habitat created by the action is a single location that would have only local effects.

Spatial Structure. Spatial structure refers to the arrangement of the locations where fish are found throughout their range. The spatial arrangement of a species and its various populations affects key processes such as immigration, emigration, and genetic exchange through interbreeding. An action adversely affects spatial structure through effects such as: causing a drainage or stream to become unusable or inaccessible; extirpating a fish population associated with a particular area; or by interfering with adult migration in a manner that reduces the likelihood that adults will return to their natal streams.

The proposed action occurs in the central migratory corridor used by all anadromous fish in the Snake River basin; consequently; the migratory functions of the action area are essential for maintaining spatial structure throughout the range of all Snake River salmon and steelhead population segments. The proposed action causes only localized habitat effects near dredging and fill sites, and several hundred feet downstream. The potential uses of the dredge sites by anadromous fish would change slightly since deepening the channel makes the habitat at the sites more suitable for migrating smolts and adults and less suitable for subyearling SRF Chinook salmon. None of the dredging sites have unique habitat characteristics, and areas with similar features (pre- and post-project) can be found throughout the entire action area. The physical alterations of the action area will have no effect on migratory movements.

Instream work activities in general could have potential to interfere with adult migration if migrating fish significantly change their behavior in response to the disruptions caused by noise, dredging equipment, or plumes of sediment. Plumes of suspended sediment could theoretically affect spatial structure by blocking or delaying adult salmon or steelhead from returning to their natal streams, but this will not occur since the sediment plumes will not span the entire river. Turbidity measurements taken at a distance of 300 feet laterally from the dredge in 2005/2006 were less than 5 NTU above background 85% of the time. In 2005/2006, the maximum width of the sediment plume was reported by the COE to be 450 feet. The river in the vicinity of the dredge and fill sites is at least two times wider than 450 feet width of the sediment plume. Migrating fish will be capable of swimming around the work sites in water that is unaffected by the proposed action since a large portion of the stream width is likely to remain free of turbidity from the dredging and filling.

The Ice Harbor Dam lock entrance includes potential spawning areas for SRF Chinook salmon, but the contribution of this particular spawning area to the spatial structure of the SRF Chinook salmon ESU is nil since the site does not appear to be used for spawning. In addition, if redds are present at the Ice Harbor Dam dredge site, dredging would not proceed until a time when dredging could be done without causing adverse effects to redds.

Diversity. Diversity refers to the array of physical and behavioral traits found in a population, which enable various individuals to flourish under a wide range of environmental conditions. An action can adversely affect diversity from effects such as: causing an appreciable and persistent environmental alteration of an area with unique habitat characteristics; or systematically reducing the abundance, survival, or reproduction of a unique genotype or phenotype. The proposed action creates temporary habitat effects in locations that have common features that are found throughout the action area. A temporary increase in depth of the channel at the dredge sites is not a type of change that would affect diversity since no unique habitat characteristics would be changed.
To a small extent the increase in shallow-water rearing habitat at the Knoxway disposal site would help to maintain diversity of SRF Chinook salmon by improving conditions experienced by subyearling SRF Chinook salmon as they migrate on to the ocean or overwinter in the Snake River. The “reservoir-type” of life history where Chinook overwinter in the Snake River is a relatively new behavior pattern in that has apparently developed in response to alterations in water temperature and flows caused by dams in the Snake and Clearwater River drainages. This new life history pattern illustrates how phenotypic diversity within a population allows fish to rapidly adapt to changing conditions.

2.4.5 Summary of Critical Habitat Effects

The specific attributes of designated critical habitat affected by the proposed action are substrate, water quality, forage, and safe passage.

Dredging will disturb approximately 118 acres of river bottom and sediment disposal will disturb approximately 27 acres. However, the dredging will not substantially change the substrate size composition since the size of sediments after dredging will be similar to the size of materials that existed before dredging. Thus effects to substrate consist of temporary disturbances during dredge and fill operations, with minor physical changes thereafter. The physical changes to substrate do not alter the suitability of affected areas for spawning, migration, rearing, or adult holding.

Dredging and sediment disposal will create plumes of suspended sediment throughout the entire 77-day work window, possibly up to 24-hours per day, affecting water quality and utilization of areas subjected to sediment plumes. Sediment plumes with turbidity up to 5 NTUs above background will extend downstream from each work area for a distance of 900 feet, and lower concentrations slightly above background may continue even further downstream. Suspended sediment concentrations are likely to be high near the source and sharply taper off in the first 300 feet downstream. Compliance with the state of Washington turbidity criteria, use of mechanical dredge equipment, and constant turbidity monitoring ensure that suspended sediment concentrations would not significantly exceed background concentrations beyond a distance of 900 feet downstream. The width of the river affected by sediment is expected to be less than half the river width at any given location. The effects of suspended sediment are temporary and would cease in less than 1 day after the work is completed.

Critical habitat within the plume would be affected while elevated levels of suspended sediment are present. Suspended sediment would likely discourage most fish from using areas within the plume and any fish moving through the area would likely avoid the plumes. Fish movement through the action area might be delayed as fish are forced to move laterally to avoid suspended sediment. However, the action area would be passable at all times since the plumes would not span the entire channel, thus safe passage will still be available in the action area even while the plume is present. In areas with lower suspended sediment concentrations, there is a possibility that the sediment plumes might be used by fish as cover. Feeding areas within the sediment plumes would be unusable in areas of high suspended sediment, while areas with low levels of turbidity might remain usable. In general, foraging opportunities in the vicinity of areas affected by sediment plumes would be reduced as long as the plumes are present. Some losses of benthic invertebrates prey would also occur where the river bottom is disturbed by dredging or filling; however, benthic invertebrates are not an important food source for salmon and steelhead in winter. Effects to water quality would be temporary, as turbidity levels would quickly return to background after work stops.

Dredging may facilitate barge traffic that can cause brief episodes of increased turbidity near the shore from wakes generated by moving vessels. Turbidity caused by wakes would be limited to near-shore areas that have deposits of fine sediment. The duration and frequency of turbidity increases from barge wakes is unlikely to rise to a level that would diminish the value of the habitat as cover from predators or as a foraging area used by juvenile salmon and steelhead.

In addition to suspended sediment effects, the water quality attribute of critical habitat might also be affected by re-suspension of potentially toxic chemicals in the sediment. All dredge sites have been sampled for toxic chemicals and the potential toxicity has been evaluated. None of the chemicals found in the sediment samples are present in concentrations that might cause effects more severe than avoidance.

2.5 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Cumulative effects, when combined with baseline effects and effects of the action, may increase the likelihood that the proposed action will result in jeopardy to a listed species, or in destruction or adverse modification of designated critical habitat.

In a large river such as the lower Snake River, habitat conditions in the action area are influenced by countless activities that have the potential to affect streamflows or water quality in the action area, but occur upstream, outside the action area. Effects of future urban growth, forestry activities, sediment caused by agricultural practices, and flow reductions from water withdrawals are among the most significant activities that are likely to affect fish and critical habitat in the action area. These activities will continue to affect listed fish and critical habitat in the action area in a similar manner as described previously in the environmental baseline.

Within the action area, there is a significant demand within the state of Washington to begin appropriating water directly from the Snake River and from local aquifers that may be hydraulically connected to the Snake River. Furthermore, the state reopened the mainstem Columbia and Snake Rivers for further appropriation in 2002, after withdrawing the water from further appropriation in 1995. It is difficult to predict long-term trends in water quantity and quality, but impacts from water withdrawals are reasonably certain to continue.

Salmon recovery efforts in the action area have assisted with numerous projects to improve habitat for listed species. Ongoing studies and habitat enhancement projects conducted by the Snake River Salmon Recovery Board and Washington State Department of Fish and Wildlife Department to implement watershed plans and recovery plans are expected to continue.

Washington, Oregon, and Idaho have all developed total maximum daily load restrictions for various water quality components, turbidity, temperature, pesticides, heavy metals and others in the Snake River and some of its tributaries. As these plans are carried out water quality may improve.

The Snake River basin is one of many areas in the state of Washington that is experiencing ongoing wind power developments and expansion of transportation infrastructure. Recent national economic developments have slowed population growth in the last few years but non-agriculture employment has increased and that trend is likely to continue. Population changes and economic diversification is likely to result in greater overall and localized demands for electricity, water, and buildable land in the action area; affect water quality directly and indirectly; and increase the need for transportation, communication, and other infrastructure. These economic and population demands will probably affect habitat features such as water quality and quantity, which are important to the survival and recovery of the listed species. Unless planning includes measures to avoid, minimize, and effectively mitigate the potential effects to listed species, the effect of continued growth and economic diversification will likely be negative.

Sediment-producing actions such as on-going agriculture and forestry activities described in the baseline, are likely to continue. Actions to reduce erosion from roads and agricultural lands are likely to occur at the same time actions that increase erosion are undertaken. No distinct trend in future sediment-producing activities can be predicted. An analysis of sediment sources in the Northern Rocky Mountains by Goode *et al*. (2012) and Clark *et al*. (2013) shows that any likely effect of new non-Federal actions that increase or decrease sediment production will be vastly overwhelmed by agricultural inputs and natural sediment-producing events such as debris flows and wildfires. The average annual sediment yield in the Snake River at the upstream end of the Lower Granite reservoir is estimated to be 2.3 million cubic yards, from a contributing area of 27,000 square miles (Clark *et al*. 2013). With the majority of the contributing watershed area being composed of forests where wildfires are a natural event and a major source of sediment in the lower Snake River, high sediment loads are likely to continue well into the foreseeable future.

2.6 Integration and Synthesis

Low abundance and productivity are a recurring factor that keep most populations of SRSS Chinook salmon, SR sockeye salmon, SR steelhead and SRF Chinook salmon from attaining their desired status as described in the draft recovery plans. The ICTRT (2005) and the most recent 5-year status review (Ford 2011) noted a high viability risk for all SRSS Chinook and SR sockeye populations, and a moderate viability risk for SRF Chinook salmon. Little is known about the individual SRB steelhead populations, but with the exception of the Joseph Creek population (rated highly viable) remaining steelhead populations are thought to be have a moderate or high viability risk.

Almost all of the populations of SRSS Chinook, SRF Chinook, SR sockeye and SRB steelhead considered in this Opinion must pass over eight mainstem dams to reach spawning areas or migrate downstream. Exceptions are the populations of SRSS Chinook and SRB steelhead that use the Tucannon River, where they only have to pass over six mainstem dams. There are 28 populations of SRSS Chinook, five populations of SR sockeye (four have been extirpated), one extant population of SRF Chinook, and 24 populations of SRB steelhead that pass through or use the action area as adults and/or as juvenile outmigrants. None of the listed Chinook or steelhead MPGs affected by the project currently reach desired status in the draft recovery plan. There is a significant lack of information for most of the steelhead populations and the sockeye population is still in danger of extinction.

The proposed dredging and in-water sediment disposal activities create five types of potentially adverse effects: exposure to elevated concentrations of suspended sediment; burial by deposited sediment; exposure to toxic chemicals by suspending contaminated sediment; traumatic injuries from dredge equipment; and destruction of fall Chinook redds.

Suspended sediment concentrations likely to occur from the proposed dredging and filling can potentially harm or kill fish when the duration of exposure to the sediment lasts more than 1 or 2 days. When salmonids initially encounter elevated levels of suspended sediment, they typically move away from the sediment if cleaner water is available. Consequently, most fish in the action area are likely to avoid adverse effects of suspended sediment by moving away from the sediment. Sediment plumes created by the dredging and filling would not span the entire channel, and fish may move laterally (or a longer distance downstream) to avoid suspended sediment. Although the majority of are expected to move out of sediment plumes to avoid adverse effect, some individuals may remain in areas with elevated suspended sediment for an extended period of time.

Fish that occupy sediment plumes may experience a reduction in feeding while they remain in the plume; although salmonids might also use areas of low turbidity as cover from predators and increase rates of feeding. Since suspended sediment concentrations are very high near the source and sharply taper off in the first 300 feet downstream, only those fish in the first 300 feet are likely to encounter suspended sediment concentrations with potential to harm or kill fish. Noise from the dredge machinery is likely to startle fish and further reduce the likelihood that fish will remain in the 300-foot zone. Compliance with the state of Washington turbidity criteria (5 NTU above background), use of mechanical dredge equipment, and constant turbidity monitoring ensure that listed fish will not be harmed by suspended sediment beyond a distance of 300 feet downstream from work areas. Within the 300-foot zone, fish are generally unlikely to be harmed or killed, but a small percentage of fish may behave differently from the norm and remain in the sediment plume long enough to be harmed by exposure to suspended sediment.

Burial by sediment during in-water disposal activities is a remote possibility that is unlikely but cannot be discounted. Few juvenile fish, if any, are likely to be buried. Juvenile SRF Chinook salmon, SRSS Chinook salmon, and steelhead might be present in the vicinity of the disposal site when sediment is released from barges. Generally, these fish are expected to be in deeper water where they would not risk burial, but some individuals might be present at the disposal site. Fish that are in the immediate vicinity of the barge might not have sufficient time to escape the falling sediment if they are immediately below the barge or if dunes or other physical obstructions block their escape path. This situation is likely to be uncommon since fish are unlikely to occupy shallow benches in winter.

Fish are likely to be exposed to low levels of contaminants that have been found in sediments at some of the dredge sites. All dredge sites have been sampled for toxic chemicals and the potential toxicity has been evaluated based on the contaminant concentrations and toxic effects thresholds reported in scientific literature. None of the chemicals are present in concentrations that might cause effects more severe than avoidance.

Traumatic injuries can occur from dredging by entraining fish with hydraulic dredge equipment. The proposed action avoids this potential effect by restricting dredge equipment to mechanical means, such as a clamshell or dragline, which do not create hydraulic forces that can draw fish into the dredge equipment.

The proposed action facilitates some incremental amount of barge usage that might not be possible without the proposed dredging. The general ways that barges might harm or kill fish are through creation of wakes, direct strikes, and shaded areas under moored barges, which can change the behavior of fish that prey on listed salmonids. A review of scientific literature indicates that barges do not have drafts that are deep enough to cause substantial wakes, and that injuries from strikes are unlikely due to inherent avoidance behavior when salmon and steelhead encounter noise and vibrations from moving vessels. Increased predation on listed fish in the vicinity of moored barges is unlikely since research on predators that use overhead cover such as piers and docks indicates that overhead cover does not offer much advantage to predatory fish in river systems as large as the lower Clearwater and Snake Rivers. Barges also lack the pilings and underwater structural complexity that provide much of the advantage to predators that is observed at docks and piers. In addition, the temporary and sporadic presence of barges at any particular location also discourages predators from lingering near mooring sites.

Habitat that is marginally-suited for fall Chinook salmon spawning occurs in the vicinity of the dredging site at the Ice Harbor Dam locks. Dredging in a spawning area could destroy redds and kill all of the incubating eggs if no efforts are made to locate and avoid redds. Damage to redds is unlikely under the proposed action since the dredging does not occur in an area that is likely to be used for spawning, and the dredge site will be surveyed to determine if any redds are present. If redds are found, dredging would not proceed at the site if the redds would be adversely affected by the dredging.

The primary role of critical habitat in the action area is to serve as a migratory corridor for all of the listed salmon and steelhead in the Snake River basin, and secondarily as a rearing area for reservoir-type SRF Chinook salmon. The proposed action does not affect the value of the action area as a migratory corridor since it does not affect the ability of fish to move through the area during the dredging and filling, or after the project is completed. The dredging and filling will cause a temporary decline in water quality in the vicinity of each disturbed area. NMFS expects these short-term effects to be minor and brief, and will not result in any long-term negative effects to critical habitat. NMFS expects water quality in the disturbed areas to recover within hours of disturbance while forage and prey species will begin to recolonize the dredged and filled substrate within days or a few weeks at most.

Temporary adverse effects to PCEs will occur from changes in water quality (turbidity and pollutants), alteration of physical habitat by deepening some areas and filling others. Beneficial effects include increased shallow water habitat available to rearing juveniles in Lower Granite Reservoir. The COE will create 11.4 acres of shallow water habitat (less than 6 feet in depth) and 16 acres of moderate depth (6 to 20 feet) habitat. The action's negative effects on PCEs consist of increased levels of suspended sediment throughout the 77-day work window, and suspension of low amounts of contaminants at several dredge sites. Overall, PCES are affected only during the 77-day work window and when the action is completed, PCEs in the action will be largely unchanged except for the small increase in shallow rearing habitat and increased depth at dredging sites.

In summary, suspended sediment is the only effect of the proposed action that is likely to result in take of listed fish, although burial by sediment at the disposal sites could also occur. As discussed above, most fish will avoid harm from suspended sediment by avoiding the turbidity plume. A few fish may stay in the plume for a length of time that would result in sub-lethal adverse effects. As described in the *Summary of Effects on Listed Species*, these effects are not expected to affect the VSP characteristics of any of the affected populations, or in turn, any of the affected ESUs or DPS, because they are not expected to kill fish but are instead expected to be temporary and non-lethal in nature. The proposed action is not expected to have any long-term effects that would influence population viability. As described earlier, the action will modify the water depth at the affected sites but given the small area affected this will not in turn affect salmonid populations that use the action area. Thus, when effects of the action are added to the baseline, and anticipated cumulative effects are also considered, NMFS does not find an appreciable change in any of the populations' viability parameters. Similarly, the habitat related effects of the proposed action are anticipated to be insufficient to meaningfully decrease the function or alter the conservation potential in the action area.

2.7 Conclusion

After reviewing the current status of SRSS Chinook salmon, SRF Chinook salmon, SR sockeye, and SRB steelhead, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS' Opinion that the proposed action is not likely to jeopardize the continued existence of SRSS Chinook salmon, SRF Chinook salmon, SR sockeye, and SRB steelhead. Similarly, the proposed action's negative effects to PCEs will not measurably diminish conservation value, so NMFS concludes that the project will not destroy or adversely modify designated critical habitat for any of the subject species.

2.8 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

2.8.1. Amount or Extent of Take

In the Opinion, NMFS determined that incidental take would occur as follows: Juvenile SRF Chinook salmon, juvenile SRSS Chinook and juveniles SRB steelhead within 300 feet downstream from dredge sites and 1,200 feet downstream from the disposal site may be harmed by exposure to turbidity if they fail to move out of the turbidity plumes, and may be harmed or killed by burial if fish are directly beneath a barge when it releases material and there is insufficient time for fish to move. As described in effects analysis, most fish exposed to turbidity from the proposed action are likely to avoid harm since the typical response to high levels of turbidity or suspended sediment is to move away from the sediment source. Similarly, few fish are likely to be present at the disposal site when materials are dumped from the barge since they prefer deeper water in winter and the first barge pass is likely to clear most fish from the area. Juvenile steelhead and juvenile spring/summer Chinook salmon are not expected to be present during the designated work window, but exceptions may occur and a small number of these individuals may be present. No incidental take of adult steelhead or any life stages of sockeye salmon is anticipated.

As described previously, using fish densities from Tiffan and Connor (2012) and the extent of sediment plumes observed in previous dredging and disposal efforts, the number of fish likely to encounter suspended sediment in potentially-harmful concentrations is estimated to be 2,006 subyearling fall Chinook salmon and insignificant numbers of juvenile and adult steelhead and juvenile spring/summer Chinook salmon. The number of fish actually harmed by the exposure is likely to be a small percentage of the fish exposed to the sediment.

The number of fish harmed by the action cannot be measured or estimated since the number of fish in the vicinity of areas affected by sediment will vary continuously as fish move in and out of work areas throughout the period of operation, and only a portion of those fish occupying areas affected by sediment plumes or sediment dumped from barges are likely to be harmed. Furthermore, if fish are harmed, they are unlikely to exhibit any outwardly visible signs of harm since it would occur primarily from physiological stress or reduced feeding rates; therefore, take cannot be quantified directly. In situations where the amount of take cannot be quantified, NMFS develops an ecological surrogate. Turbidity is used as a surrogate for this action since it is the primary mechanism of incidental take, and the area affected by turbidity also encompasses locations where take might occur from burial by sediment disposal.

The linear extent of the worst-case turbidity levels based on modeling by Schroeder (2014) and monitoring of previous dredging by Dixon Marine Services (2006), and the lateral extent where turbidity might cause avoidance behavior (based on reviews by Anderson *et al*. (1996) and Newcombe and Jenson (1996) represents the extent of take exempted in this Incidental Take Statement (ITS) as follows:

1. Maximum turbidity concentrations over background (2-hour average) at the 300-foot monitoring stations will not exceed 300 NTU below the disposal site, or 50 NTU below dredge sites. These parameters represent the most effective results that are likely to be achievable with mechanical dredging and in-water disposal.

2. The turbidity plume at each of the dredging sites and the disposal will not exceed 50% of the total river width.

2.8.2 Effect of Take

In Section 2.7, NMFS determined that the level of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.8.3 Reasonable and Prudent Measures and Terms and Conditions

Reasonable and prudent measures are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02).

The COE will:

1. Ensure that dredging will not occur in locations where SR fall chinook salmon redds might be damaged by mechanical disturbance of the riverbed or by suspended sediment.

2. Minimize turbidity during fill and bench construction actions.

3. Monitor turbidity to ensure that the minimization measures are meeting the objective of minimizing take and that incidental take exempted by this ITS is not exceeded.

2.8.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the COE or any applicant must comply with them in order to implement the reasonable and prudent measures (50 CFR 402.14) The COE or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. To implement reasonable and prudent measure number 1 (SR fall Chinook salmon redds), the COE will:

    a. The COE will conduct underwater surveys of the proposed dredging site at the Ice Harbor navigation lock once in November and once during the first 2 weeks of December prior to commencing dredging.

    b. If redds are located, the COE will contact NMFS immediately with the approximate location relative to the proposed dredging. The COE will not dredge in this location until NMFS has been contacted and determined if any activity can be done without harming the redds.

2. To implement reasonable and prudent measure number 2 (minimize turbidity), the COE will:

    a. Require barges to drop dredged material at Knoxway Bench in a manner that minimizes turbidity.

    b. Pause sediment-producing activities when turbidity levels measured 900 feet downstream from the dredge or disposal site exceeds 5 NTU above background when background levels are 50 NTU or less, or when turbidity levels exceed 10% over background when background levels exceed 50 NTUs

3. To implement reasonable and prudent measure number 3 (monitor turbidity), the COE will :

   a. Develop and implement a water quality monitoring program to determine compliance with State of Washington turbidity criteria and thresholds for incidental take.

      i. Turbidity will be measured at stations located 300 and 900 feet downstream from the work zone at the dredging or disposal site, and at background stations.

      ii. The COE will visually monitor the turbidity plume twice daily during the first 3 days of operations at each of the dredging sites and the disposal site to confirm the plume does not exceed 50% of the total river width.

   b. The COE will complete a final monitoring report after all activities are completed and submit it to NMFS within six months after project completion. All reports will be sent to National Marine Fisheries Service, Snake Basin Office, Attention Snake Basin Director, 800 Park Boulevard, Suite 220, Boise, Idaho 83712-7743.

NOTICE: If a sick, injured or dead specimen of a threatened or endangered species is found in the action area, the finder must notify NMFS Law Enforcement at (206) 526-6133 or (800) 853-1964, through the contact person identified in the transmittal letter for this Opinion, or through NMFS Snake Basin Office. The finder must take care in handling sick or injured specimens to ensure effective treatment, and in handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder should carry out instructions provided by Law Enforcement to ensure evidence intrinsic to the specimen is not disturbed unnecessarily.

2.9 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02). NMFS is recommending that the COE look for opportunities to partner with other land management agencies to reduce the input of sediments to the Snake or Clearwater Rivers or their tributaries so as to reduce the frequency of the need for dredging.

In addition, because only 2.2% of Lower Granite Reservoir at 143,000 cfs (less at lower flows) is juvenile rearing habitat but 44% of the reservoir is predator habitat (riprapped banks), NMFS recommends that the COE investigate and adopt techniques to cover large areas of riprap with organic material that can support riparian vegetation and provide juvenile shallow water rearing habitat.

2.10 Reinitiation of Consultation

As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) The amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action on listed species or designated critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat not considered in this Opinion; or 4) a new species is listed or critical habitat designated that may be affected by the action.

2.11 "Not Likely To Adversely Affect" Determinations

The COE determined that the proposed action is not likely to adversely affect MCR Steelhead, UCR steelhead, and Upper Columbia spring-run Chinook salmon, or their critical habitat. NMFS concurs with these determinations. The range of these species and their critical habitat are entirely outside the action area. However, since the action area is near the confluence of the Snake and Columbia Rivers, these species may wander into the action area as adults.

Upper Columbia spring-run Chinook salmon would not be adversely affected by the proposed action because adults are the only life stage that occurs in the Snake River, and they do not occur in the action area from December 15 through March 1. The earliest returns of Chinook salmon to the Ice Harbor Dam occur in the month of April. Juvenile Upper Columbia spring-run Chinook salmon do not occur in the action area since smolts are the only juvenile life stage likely to be in the vicinity of the mouth of the Snake River, and Upper Columbia spring-run Chinook salmon smolts migrating downstream in the Columbia River system would not swim upstream into the Snake River.

Adult MCR and UCR steelhead might stray into the action area during the December 15 to March 1 work window. Out-of-basin strays entering the Snake River may continue upstream and spawn anywhere that SRB steelhead might spawn, or they may only occupy the Snake River briefly and move back downstream. The proposed action is unlikely to have more than an insignificant effect on adult steelhead migrating through or holding in the action area since adults tend to occupy deeper water where neither dredging nor in-water disposal would occur, and they are capable of avoiding plumes of suspended sediment by moving to cleaner water. Sediment plumes are not expected to span the entire width of the river, and at least a few hundred feet of the river width would be clear of suspended sediments created by the proposed action.

Critical habitat for Upper Columbia spring-run Chinook salmon, UCR steelhead, and MCR Steelhead would not be affected because there is no critical habitat for these species in the action area.

3 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The consultation requirement of section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the COE and descriptions of EFH for Pacific coast salmon contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce (PFMC 1999).

3.1 Essential Fish Habitat Affected by the Project

The proposed action and action area are described in the BA and this letter. The project area includes habitat which has been designated as EFH for various life stages of Chinook salmon (*O. tshawytscha*) and coho salmon (*O. kisutch*).

3.2 Adverse Effects to Essential Fish Habitat

Based on information provided in the BA and the analysis of effects presented in the ESA portion of this document, NMFS concludes that proposed action will adversely affect EFH designated for Chinook salmon and coho salmon because it will have negative effects on water quality and benthic communities. The proposed project will alter a total of 118.3 acres of river bottom altering benthic habitat and macroinvertebrate production in the short-term. The action will also temporarily impair water quality near the dredging equipment and Knoxway Bench. In addition, this action will create a total of 27.4 acres of new shallow water habitat, thereby permanently increasing the amount of a limited habitat type important to juveniles in the mainstem Snake River. These changes to EFH are long-lasting effects. NMFS believes the construction of permanent shallow water habitat ameliorates much of the temporary negative effects.

Specifically, NMFS has determined that the action will adversely affect EFH as follows:

1. Temporary degradation of water quality (turbidity, contaminants) from construction activities.

2. The alteration of current substrate and benthic forage by dredge and fill actions.

3. Maintenance of the channel will require continued, periodic dredging of certain areas of the Snake and Clearwater Rivers

3.3 Essential Fish Habitat Conservation Recommendations

NMFS believes that the following conservation measures are necessary to avoid, mitigate, or offset the impact of the proposed action on EFH.

1. The COE will initiate or continue studies on the availability and fish use of shallow water habitat in Lower Granite Reservoir and in downstream reservoirs. Information of the distribution, connectivity and patch size of existing shallow water areas relative to seasonal flows and fish use will help determine if there are additional areas where shallow water habitat can be created and have the greatest benefit to salmonids.

NMFS expects that full implementation of this EFH Conservation Recommendation would protect designated EFH for Pacific coast salmon, by avoiding, minimizing or offsetting the adverse effects described in Section 3.2.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Federal agency must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation from NMFS. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations, unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many Conservation Recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of Conservation Recommendations accepted.

3.5 Supplemental Consultation

The COE must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (DQ A) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the Opinion addresses these DQA components, documents compliance with the DQA, and certifies that this Opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users.

The intended users of this Opinion are the COE. Other interested users could include the Nez Perce Tribe, citizens of cities of Clarkston, Washington and Lewiston, Idaho; Walla Walla Garfield, Columbia, Whitman and Asotin Counties in Washington; Nez Perce County in Idaho and others interested in the conservation of SRSS Chinook salmon, SR sockeye, SRF Chinook salmon, and SRB steelhead. Individual copies of this Opinion were provided to the COE. This Opinion will be posted on NMFS Northwest Region web site (http://www.nwr.noaa.gov). The format and naming adheres to conventional standards for style.

4.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including NMFS ESA Consultation Handbook, ESA Regulations, 50 CFR 402.01, et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.920(j).

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the Literature Cited section. The analyses in this Opinion/EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with Northwest Region ESA quality control and assurance processes.

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Clean Water Act Water Quality Certification

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

August 29, 2014

Ms Sandra Shelin
US Army Corps of Engineers
Walla Walla District,
201 N. 3rd Avenue
Walla Walla, WA 99362-1876

RE: Water Quality Certification - Order #10764 Corps reference #CENWW-PM-PD-EC 13-01, Maintenance dredging of the Lower Snake and Clearwater Rivers and dredge material disposal, Asotin, Franklin, Garfield, and Whitman counties, Washington.

Dear Ms Shelin:

The above-referenced public notice for proposed work in waters of the state has been reviewed in accordance with all pertinent rules and regulations. On behalf of the State of Washington, we certify that the work proposed in the public notice complies with applicable provisions of Sections 301, 302, 303, 306 and 307 of the Clean Water Act, as amended, and other appropriate requirements of State law. This certification is subject to the conditions contained in the enclosed Order and may be appealed by following the procedures described in the Order.

If you have any questions concerning the content of this letter, please contact Laura Inouye at (360) 407-6165.

Sincerely,

Brenden McFarland, Section Manager
Environmental Review and Transportation Section
Shorelands and Environmental Assistance Program

by Certified Mail 7009 0820 0001 9056 0052

Order# 10764
Corp Ref# CENWW-PM-PD-EC 13-01
August 29, 2014

Enclosures

cc: Sandy Shelin, Corps
Thomas Schirm, WDFW
Donald Olmstead, DNR
Arthur Swannack, Whitman County Board of Commissioners District 1
Bill Elliot, Air, Water and Aquatic Research Program, Rocky Mountain Research Station
Cary Newman
Matt Van Vleet, Clearwater Paper Corporation
Dean Kinzer, Whitman County Commissioner District 2
Steve Mashuda, Earth Justice
Nat Rich
Marlene Trumbo, Nez Perce
Kirsten Meira, Pacific Northwest Waterways Association
Noel Sanders, Port of Walla Walla
Rich Schwartz, Department of Natural REsources
Steve Pauley
Carol Bua, Tidewater
Rob Rich, V.P. Marine Services

ecc: Loree' Randall, Ecology (HQ-SEA)
Laura Inouye, Ecology (HQ-SEA)
Brendan Dowling, Ecology (ERO-TCP)
Mike Maher (ERO-SEA)
Patrick McGuire (ERO WQ)
ecyrefedpermits@ecy.wa.gov

IN THE MATTER OF GRANTING A	)	**ORDER #10764**
WATER QUALITY	)	**Corps Reference No. CENWW-PM-PD-EC**
CERTIFICATION TO	)	**13-01**
US Army Corps of Engineers	)	Lower Snake and Clearwater Rivers maintenance
in accordance with 33 U.S.C. 1341	)	dredging and dredge material disposal, in Asotin,
(FWPCA § 401), RCW 90.48.120, RCW	)	Franklin, Garfield, and Whitman Counties,
90.48.260 and Chapter 173-201A WAC	)	Washington

TO: Ms Sandra Shelin
US Army Corps of Engineers
Walla Walla District,
201 N. 3rd Avenue
Walla Walla, WA 99362-1876

On April 28, 2014 the US Army Corps of Engineers (Corps) submitted a Joint Aquatic Resources Permit Application (JARPA) to the Department of Ecology (Ecology) requesting a Section 401 Water Quality Certification. A public notice regarding the request was distributed by Ecology for the above-referenced project pursuant to the provisions of Chapter 173-225 WAC on May 2, 2014.

This federal navigational dredging project includes approximately 458,500 cubic yards of material from the federal navigational channel at the confluence of the Snake and Clearwater Rivers, and approximately 2,500 cubic yards of material from the Ice Harbor Lock approach.

This project also includes dredge material disposal at RM116 (left bank) in Garfield County. This disposal location is being considered beneficial reuse of dredge material resulting in shallow water habitat for juvenile salmonids.

AUTHORITIES:

In exercising authority under 33 U.S.C. § 1341, RCW 90.48.120, and RCW 90.48.260, Ecology has examined this application pursuant to the following:

1. Conformance with applicable water quality-based, technology-based, and toxic or pretreatment effluent limitations as provided under 33 U.S.C. §1311, 1312, 1313, 1316, and 1317 (FWPCA § 301, 302, 303, 306 and 307);

2. Conformance with the state water quality standards contained in Chapter 173-201A WAC and authorized by 33 U.S.C. §1313 and by Chapter 90.48 RCW, and with other applicable state laws; and

3. Conformance with the provision of using all known, available and reasonable methods to prevent and control pollution of state waters as required by RCW 90.48.010.

WATER QUALITY CERTIFICATION CONDITIONS:

Through issuance of this Order, Ecology certifies that it has reasonable assurance that the activity as proposed and conditioned will be conducted in a manner that will meet the applicable water quality standards and other appropriate requirements of state law. In view of the foregoing and in accordance with 33 U.S.C. § 1341, RCW 90.48.120, RCW 90.48.260, Chapter 173-200 WAC and Chapter 173-200A WAC, water quality certification is granted to the Applicant subject to the conditions within this Order.

Certification of this proposal does not authorize the Applicant to exceed applicable state water quality standards (Chapter 173-200A WAC), ground water standards (Chapter 173-200 WAC) or sediment quality standards (Chapter 173-204 WAC). Furthermore, nothing in this certification shall absolve the Applicant from liability for contamination and any subsequent cleanup of surface waters, ground waters or sediments occurring as a result of project construction or operations.

A. General Conditions:

1. For purposes of this Order, the term "Applicant" shall mean the US Army Corps of Engineers and its agents, assignees and contractors.

2. For purposes of this Order, all submittals required by its conditions shall be sent to Ecology's Headquarters Office, Attn: 401/CZM Federal permit coordinator, P.O. Box 47600 Olympia, WA 98504-7600 and/or lino461@ecy.wa.gov. Any submittals shall reference Order #10764 and Corps Reference # CENWW-PM-PD-EC 13-01

3. Work authorized by this Order is limited to the work described in the Joint Aquatic Resources Permit Application (JARPA) received by Ecology on April 28, 2014. The Applicant will be out of compliance with this Order and must submit an updated JARPA if the information contained in the JARPA is voided by subsequent changes to the project not authorized by this Order.

4. Within 30 days of receipt of an updated JARPA, Ecology will determine if the revised project requires a new water quality certification and public notice or if a modification to this Order is required.

5. Copies of this Order shall be kept on the job site and readily available for reference by Ecology personnel, the construction superintendent, construction managers and lead workers, and state and local government inspectors.

6. The Applicant shall provide access to the project site upon request by Ecology personnel for site inspections, monitoring, necessary data collection, and/or to ensure that conditions of this Order are being met.

7. Nothing in this Order waives Ecology's authority to issue additional orders if Ecology determines that further actions are necessary to implement the water quality laws of the state. Furthermore, Ecology retains continuing jurisdiction to make modifications hereto through supplemental order, if additional impacts due to project construction or operation are identified or if additional conditions are necessary to further protect water quality.

8. The Applicant shall ensure that all appropriate project engineers and contractors at the project site have read and understand relevant conditions of this Order and all permits, approvals, and documents referenced in this Order. The Applicant shall provide Ecology a signed statement (see Attachment A for an example) from each project engineer and contractor that they have read and understand the conditions of this Order and the above-referenced permits, plans, documents and approvals. These statements shall be provided to Ecology before construction begins at the project.

9. This Order does not authorize direct, indirect, permanent, or temporary impacts to waters of the state or related aquatic resources, except as specifically provided for in conditions of this Order.

10. Failure of any person or entity to comply with this Order may result in the issuance of civil penalties or other actions, whether administrative or judicial, to enforce its terms.

B. Water Quality Conditions

1. This order does not authorize temporary exceedances of water quality standards beyond the limits established in WAC 173-201A-200, except as modified by this Order.

    - The point of compliance established for this project is 900 ft downstream of the in-water work zone. Turbidity occurring outside that zone that is more than 5 nephelometric turbidity units (NTU) over background when the background is 50 NTU or less, or a 10% increase in turbidity when the background turbidity is more than 50 NTU is a violation of the turbidity water quality standard.

    - Visible turbidity anywhere at 900 ft point of compliance from the work zone and/or the disposal zone shall be considered to be an exceedance of the standard.

C. Water Quality Monitoring

1. The Applicant shall follow the water quality monitoring plan approved by Ecology on July 28, 2014. Any changes in this plan shall be approved by Ecology prior to any in-water work. **A final WQMP from the contractor must be submitted and reviewed for consistency with the approved plan one week prior to the pre-dredge meeting (Condition D8).**

2. Turbidity monitoring reports shall be sent weekly to the 401/CZM Federal permit coordinator (Condition A2). The permit coordinator shall be contacted within 24 hours if an exceedance occurs.

D. Dredging and Disposal:

1. All dredging is to be done using a mechanical dredge (e.g. clamshell). **Use of any other type of dredge will require prior approval from Ecology.**

2. All dredged material will be transported to the dredge material disposal at RM116 (left bank) in Garfield County using a bottom dump barge. **Use of any other method or location of disposal will require prior approval from Ecology.**

3. Debris (larger than 2 feet in any dimension) shall be removed from the dredged sediment prior to disposal. Similar sized debris found floating in the dredging or disposal area shall also be removed.

4. Dredging and disposal site reshaping operations shall be conducted in a manner that minimizes the disturbance or siltation of adjacent waters and prevents the accidental discharge of petroleum products, chemicals or other toxic or deleterious substances into waters of the State.

5. Dredged material shall not be stockpiled on a temporary or permanent basis below the ordinary high water line at the dredging locations.

6. During dredging and disposal, the Applicant shall have a boat available on site at all times to retrieve debris from the water.

7. Dredging and disposal shall be sequenced such that the material from the Clarkston area shall be dredged first and placed first at the disposal site.

8. A pre-dredge meeting or conference call is required to be convened at least one week prior to the start of dredging. A **Dredging Plan, Disposal Plan, and Spill Prevention and Containment Plan** is required and shall be submitted to Ecology to the 401/CZM Federal permit coordinator at the address shown in Condition A2 for review and approval one week prior to the pre-dredge meeting.

E. Timing Requirements:

1. All in-water work shall be completed between December 15 and March 1 of a given year.

2. This Order shall remain in effect for a period of 5 years from date of issuance. Continuing this project beyond the 5 year term of this Order will require separate certifications every 5 years.

F. Notification Requirements:

1. The Applicant shall provide notice to Ecology's 401/CZM Federal permit coordinator at least 7 days prior to the start of dredging each dredging season and within 14 days after completion of dredging each season. Notification should be made using all the information required in Condition A2.

G. Emergency/Contingency Measures:

1. The Applicant shall develop a spill prevention and containment plan for this project, and shall have spill cleanup materials and an emergency call list available on site.
2. Any work that is out of compliance with the provisions of this Order, or conditions causing distressed or dying fish, or any discharge of oil, fuel, or chemicals into state waters, or onto land with a potential for entry into state waters, is prohibited. If these occur, the Applicant or operator shall immediately take the following actions:
   a. Cease operations that are causing the compliance problem.
   b. Assess the cause of the water quality problem and take appropriate measures to correct the problem and/or prevent further environmental damage.
   c. In the event of finding distressed or dying fish, the applicant shall collect fish specimens and water samples in the affected area within the first hour of the event. These samples shall be held in refrigeration or on ice until the applicant is instructed by Ecology on what to do with them. Ecology may require analyses of these samples before allowing the work to resume.
   d. In the event of a discharge of oil, fuel, or chemicals into state waters, or onto land with a potential for entry into state waters, containment and cleanup efforts shall begin immediately and be completed as soon as possible, taking precedence over normal work. Cleanup shall include proper disposal of any spilled material and used cleanup materials.
   e. Immediately notify Ecology's 24-Hour Spill Response Team at 1-800-258-5990, **and** within 24 hours of spills or other events Ecology's 401/CZM Federal permit coordinator at (360) 407-6076.
   f. Submit a detailed written report to Ecology within five (5) days that describes the nature of the event, corrective action taken and/or planned, steps to be taken to prevent a recurrence, results of any samples taken, and any other pertinent information.
3. Fuel hoses, oil drums, oil or fuel transfer valves and fittings, etc., shall be checked regularly for drips or leaks, and shall be maintained and stored properly to prevent spills into state waters, including wetlands.
4. If at any time during work the proponent finds buried chemical containers, such as drums, or any unusual conditions indicating disposal of chemicals, the proponent shall immediately notify Ecology using the above phone numbers.

YOUR RIGHT TO APPEAL

You have a right to appeal this Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001 (2).

To appeal you must do all of the following within 30 days of the date of receipt of this Order:

- File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this Order on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel RD SW STE 301 Tumwater, WA 98501	**Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

CONTACT INFORMATION

Please direct all questions about this Order to:

Laura Inouye
Department of Ecology
P.O. Box 47600
Olympia, WA 98503-7600

360-407-6165
lino461@ecy.wa.gov

MORE INFORMATION

- **Pollution Control Hearings Board Website**
  www.eho.wa.gov/Boards_PCHB.aspx
- **Chapter 43.21B RCW - Environmental and Land Use Hearings Office – Pollution Control Hearings Board**
  http://apps.leg.wa.gov/RCW/default.aspx?cite=43.21B
- **Chapter 371-08 WAC – Practice And Procedure**
  http://apps.leg.wa.gov/WAC/default.aspx?cite=371-08
- **Chapter 34.05 RCW – Administrative Procedure Act**
  http://apps.leg.wa.gov/RCW/default.aspx?cite=34.05
- **Chapter 90.48 RCW – Water Pollution Control**
  http://apps.leg.wa.gov/RCW/default.aspx?cite=90.48
- **Chapter 173.204 Washington Administrative Code (WAC) Sediment Management Standards**
  http://www.ecy.wa.gov/biblio/wac173204.html
- **Chapter 173-200 WAC Water Quality Standards for Ground Waters of the State of Washington**
  http://www.ecy.wa.gov/biblio/wac173200.html
- **Chapter 173-201A WAC Water Quality Standards for Surface Waters of the State of Washington**
  http://www.ecy.wa.gov/biblio/wac173201A.html

SIGNATURE

Dated this August 29, 2014 at the Department of Ecology, Lacey Washington

Brenden McFarland, Section Manager
Environmental Review and Transportation
Shorelands and Environmental Assistance Program
Headquarters

ATTACHMENT A

Lower Snake and Clearwater Rivers
Maintenance Dredge and Dredge Material Disposal
Water Quality Certification Order #10764

Statement of Understanding of
Water Quality Certification Conditions

I have read and understand the conditions of Order #10764 Section 401 Water Quality Certification for the Lower Snake and Clearwater Rivers Maintenance Dredge and Disposal. I have also read and understand all permits, plans, documents, and approvals associated with the project referenced in this order.

______________________ ______________
Signature Date

____
Print Name

____
Company

____
Title