US Army Corps of Engineers ®
Walla Walla District
BUILDING STRONG®

STILLING BASIN SEDIMENT REMOVAL

Lower Granite Lock and Dam
Little Goose Lock and Dam
Lower Monument Lock and Dam

Columbia, Franklin, Garfield, Walla Walla, and Whitman Counties Washington

ENVIRONMENTAL ASSESSMENT

TIERED FROM THE *LOWER SNAKE RIVER PROGRAMMATIC SEDIMENT MANGEMENT PLAN FINAL ENVIRONMENTAL IMPACT STATEMENT* DATED AUGUST 2014

In compliance with the
National Environmental Policy Act of 1970

ADMINISTRATIVE RECORD – DO NOT DESTROY

PROJECT FILE NUMBER: PPL-C-2022-0024

March 2024

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Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
BA	Biological Assessment
BMP	Best Management Practice
CFR	Code of Federal Regulations
Corps	U.S. Army, Corps of Engineers, Walla Walla District
CWA	Clean Water Act
cy	cubic yards
DPS	Distinct Population Segment
EA	Environmental Assessment
EM	Engineer Manual
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
FONSI	Finding of No Significant Impact
FWCA	Fish and Wildlife Coordination Act
LSR	Lower Snake River
LSRP	Lower Snake River Projects
MBTA	Migratory Bird Treaty Act
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Units
NWP	Nationwide Permit
PSMP	Programmatic Sediment Management Plan
RM	River Mile
SHPO	State Historic Preservation Officer
SPCC	Spill Prevention, Control, and Countermeasures
TCP	Traditional Cultural Property
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
Ecology	Washington State Department of Ecology
WOTUS	Waters of the United States

1 Introduction

1.1 Proposed Action, Authority, and Purpose of and Need for Action

1.1.1 Proposed Action

The U.S. Army Corps of Engineers, Walla Walla District (USACE) proposes to remove accumulated debris and sediment ("clean out"), dispose of the removed debris, and survey the stilling basins at Lower Granite, Little Goose, and Lower Monumental dams (Projects). This environmental assessment (EA) identifies, considers, and describes potential environmental effects associated with the proposed actions of removing sediment build up within the stilling basins and disposing of the removed sediment in order to inspect the current state of stilling basins these Projects.

In compliance with the National Environmental Policy Act (NEPA), this EA identifies, considers, and analyzes the potential environmental effects associated with the proposed Action and at least the No Action alternative. This EA was prepared in accordance with the Council on Environmental Quality *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA)* (Title 40 of the CFR Parts 1500-1508) and 33 CFR 230, *Procedures for Implementing NEPA*. USACEs objective in preparing this EA is to determine the potential environmental effects of the proposed dredging and disposal action and any reasonable alternatives. If such environmental effects are determined to be relatively minor, a Finding of No Significant Impact (FONSI) would be issued, and USACE would proceed with the dredging and disposal action, subject to availability of funding. If any environmental effects are determined to be significant according to USACE analysis, either mitigation would be employed to ensure effects are reduced below significant levels, or an Environmental Impact Statement (EIS) would be prepared before a decision is reached regarding implementation of the proposed action.

This EA is tiered from the August 2014 Programmatic Sediment Management Plan (PSMP) Final Environmental Impact Statement (FEIS) which is incorporated herein in its entirety by reference. A copy of the PSMP FEIS can be viewed at: https://www.nww.usace.army.mil/Missions/Projects/Programmatic-Sediment-Management-Plan/. The clean out of the stilling basins qualifies as an immediate need dredging action under the PSMP, as the debris and accumulated sediment is interfering USACE's ability to appropriately monitor the structural integrity of the stilling basins for authorized project purposes (e.g., navigation), identify any needed change in operations, and/or accomplish any necessary maintenance.

1.1.2 Authority and Background Information

USACE authority to construct, operate, and maintain the Lower Snake River Projects (LSRP) was first established in Section 2 of the River and Harbor Act (Public Law (PL) 79-14) and approved March 2, 1945, in accordance with House Document 704, 75th Congress, 3rd Session. The Projects are covered under the River and Harbor Act and the Flood Control Act of 1944 (PL 78-534), both Acts grant USACE authority to construct, operate, and maintain.

Spillways can be found at dam sites and the function is to control the release of water downstream of a dam or levee. The water is released from the spillway and falls to the stilling basin, which is a means to absorb and dissipate the energy from the spillway release. Water discharged through the dam spillways contains an enormous amount of energy. The stilling basins are designed to protect the riverbed and the foundations of dams at the outlet of the spillway from scour and erosion by directing this energy away from the riverbed and dissipating it. Without the protection of properly functioning and structurally intact stilling basins, the riverbed and dam foundations would be vulnerable to scour, erosion, and undermining, resulting directly from normal spillway operations. The ultimate result of a sufficient loss of riverbed material due to such scour, erosion, and undermining is a loss of stability of the spillway section of the dam.

Spill operations and the existence of spill deflectors at Lower Monumental, Little Goose, and Lower Granite create hydraulic conditions that allow recruitment of debris into the spillway stilling basins. Large vertical rollers paired with strong lateral eddies create currents within the dam tailraces capable of pulling large rock and cobble into the basin. The tailraces at the subject dams have geometries allowing for the debris to enter their respective basins. The presence of strong hydraulic currents and debris within the basins elevates the risk of abrasion and erosion of the concrete apron. The subject tailraces currently possess significant sediment that is capable of movement during spill operation.

Historical operations and configurations of the dams allowed for the end spillbays to operate during high spill events. These end bay operations, paired with a non-deflector configuration, allowed for any accumulated debris within basins to be flushed downstream on a routine yearly basis. The addition of end bay deflectors and the increased spill duration and volume for fish passage has prevented the spillway from clearing debris and allowed for sediment accumulation.

The condition of the stilling basin concrete for the three operating dam projects remains unknown since the addition of end bay spillway deflectors and the implementation of voluntary spill for downstream fish passage. Routine multibeam surveys are conducted on a 5-year interval as part of the Dam Safety program to determine if a change in condition occurs within the stilling basins. These surveys have continually demonstrated the accumulation of debris within the basins but are unable to establish the condition of the concrete due to the presence of the debris. However, there are some areas with visible reinforcement bars. The presence of these bars (Figure 1-1) indicates the concrete has eroded significantly in some areas.

Figure 1-1. Exposed Rebar in the Lower Monumental Dam Stilling Basin

The stilling basin at Lower Granite was last cleaned out in 1992 and divers preformed hydrographic inspections in 2006. The inspections completed in 2006 did not provide USACE with a substantiated damage report due to the amount of accumulated sediment on the stilling basin. The Little Goose stilling basin has only been inspected by dives and hydrographic surveys, which again were unable to provide USACE with a, accurate damage report due to the amount of debris in the stilling basin. An initial survey using an underwater Remoted Operated Vehicle (ROV) was conducted and while the footage was unable to survey the stilling basins, it did illustrate the amount of large cobble accumulated in the stilling basins and discovered exposed rebar. The exposed rebar suggests that the stilling basins have been significantly eroded but the churn of cobble in the basin and therefore not able to provide the service of absorbing and dissipated the energy from the water falling from the spillway.

1.1.3 Purpose of and Need for Action

USACE proposes to remove accumulated debris and sediment, dispose of the removed debris, and survey the stilling basins at Lower Granite, Little Goose, and Lower Monumental dams. An action is needed large cobble is drawn into the stilling basins, where is circulates in strong, spill-driven eddies. The cobble both damages and obscures the spillway aprons, creating unknown, but potentially hazardous conditions.

Without periodic inspection and completed of appropriate repairs, the spillways could erode the base of the Projects.

The purpose of the action is to identify existing and prevent further damage to the stilling basins at the Projects. The selected alternative should clear cobbles and sediment from the stilling basins to expose the basins for inspection. Removal of cobbles would also prevent further damage to the basins, at least in the short-term.

1.2 Location of the Proposed Action

The proposed actions would take place in Columbia, Franklin, Garfield, Walla Walla, and Whitman counties, Washington.

Lower Granite Dam is located approximately 27 miles northeast of Pomeroy, Washington, and southwest of Pullman, Washington at River Mile (RM) 107.5 on the Snake River (Figure 1-2). This dam is about 32 miles downstream from the Snake/Clearwater River confluence. The dam straddles Garfield and Whitman Counties, Washington and the reservoir impoundment, Granite Lake, extends up the Snake River into Asotin County, Washington, and up the Clearwater River into Nez Perce County, Idaho.

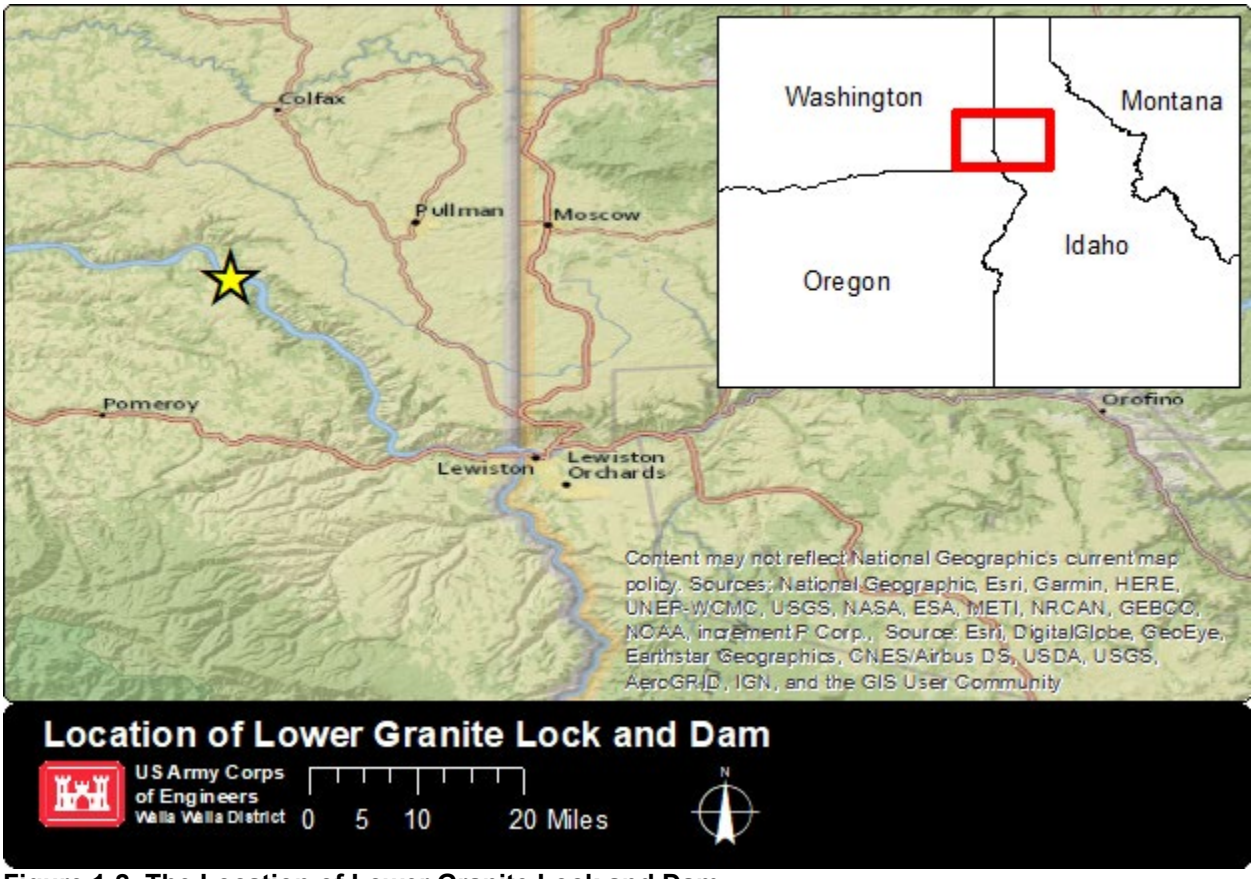

Figure 1-2. The Location of Lower Granite Lock and Dam

Little Goose Lock and Dam is located on the Snake River, at RM 70.3 (Figure 1-3). The dam and reservoir lie in southeastern Washington, with the right abutment of the dam in Whitman County and the left abutment in Columbia County. The reservoir impoundment

of the Snake River, called Lake Bryan, extends 37.2 miles east to the base of Lower Granite Lock and Dam near Pomeroy, Washington at approximately RM 107.5.

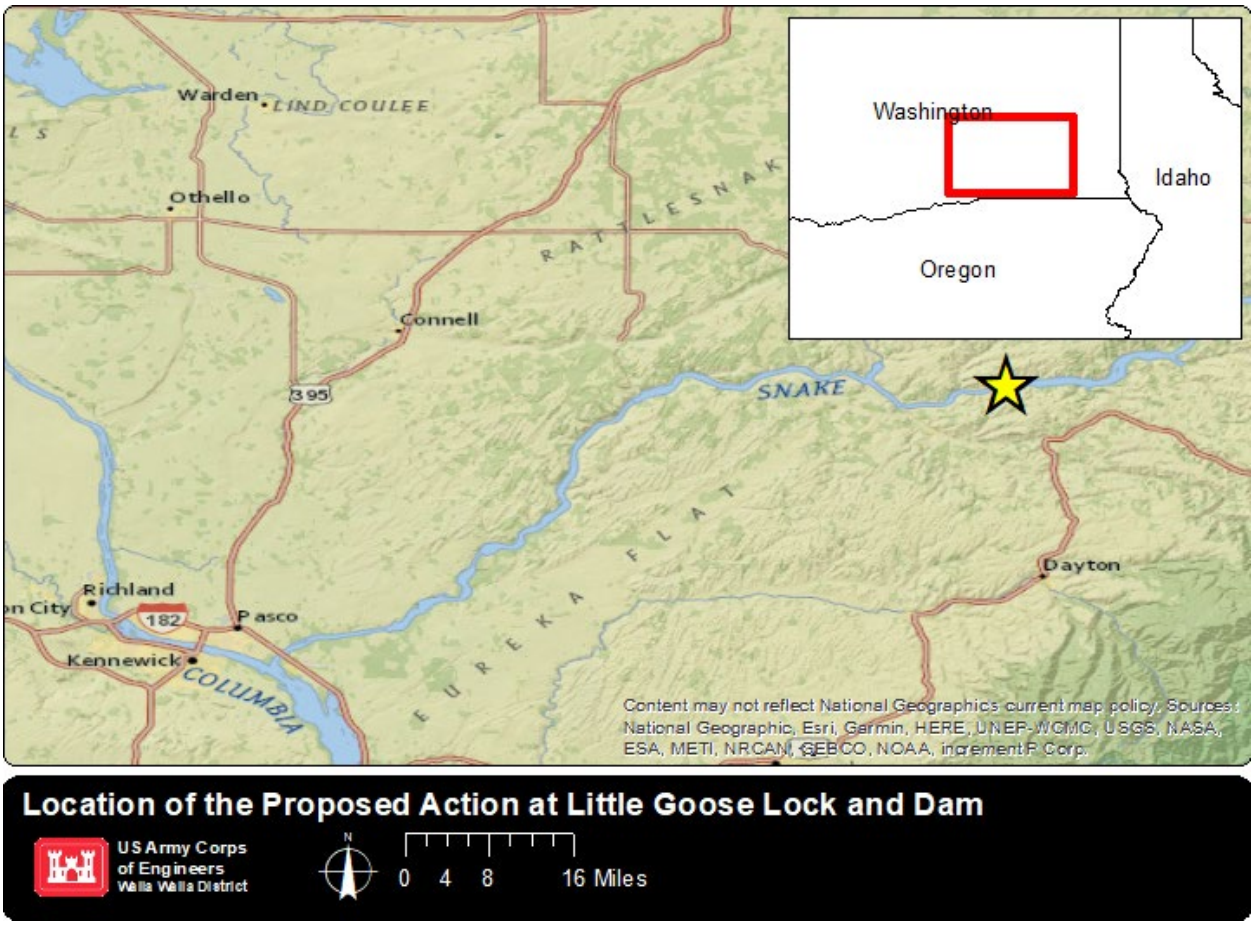

Figure 1-3. The Location of Little Goose Lock and Dam

Lower Monumental Lock and Dam is located on the Snake River, at RM 41.6 (Figure 1-4). The dam and reservoir lie in southeastern Washington, with the right abutment of the dam in Franklin County and the left abutment in Walla Walla County Washington. The reservoir impoundment of the Snake River, called Lake Herbert G. West, extends 28 miles east to the base of Little Goose Lock and Dam near Starbuck, Washington at approximately RM 70.3.

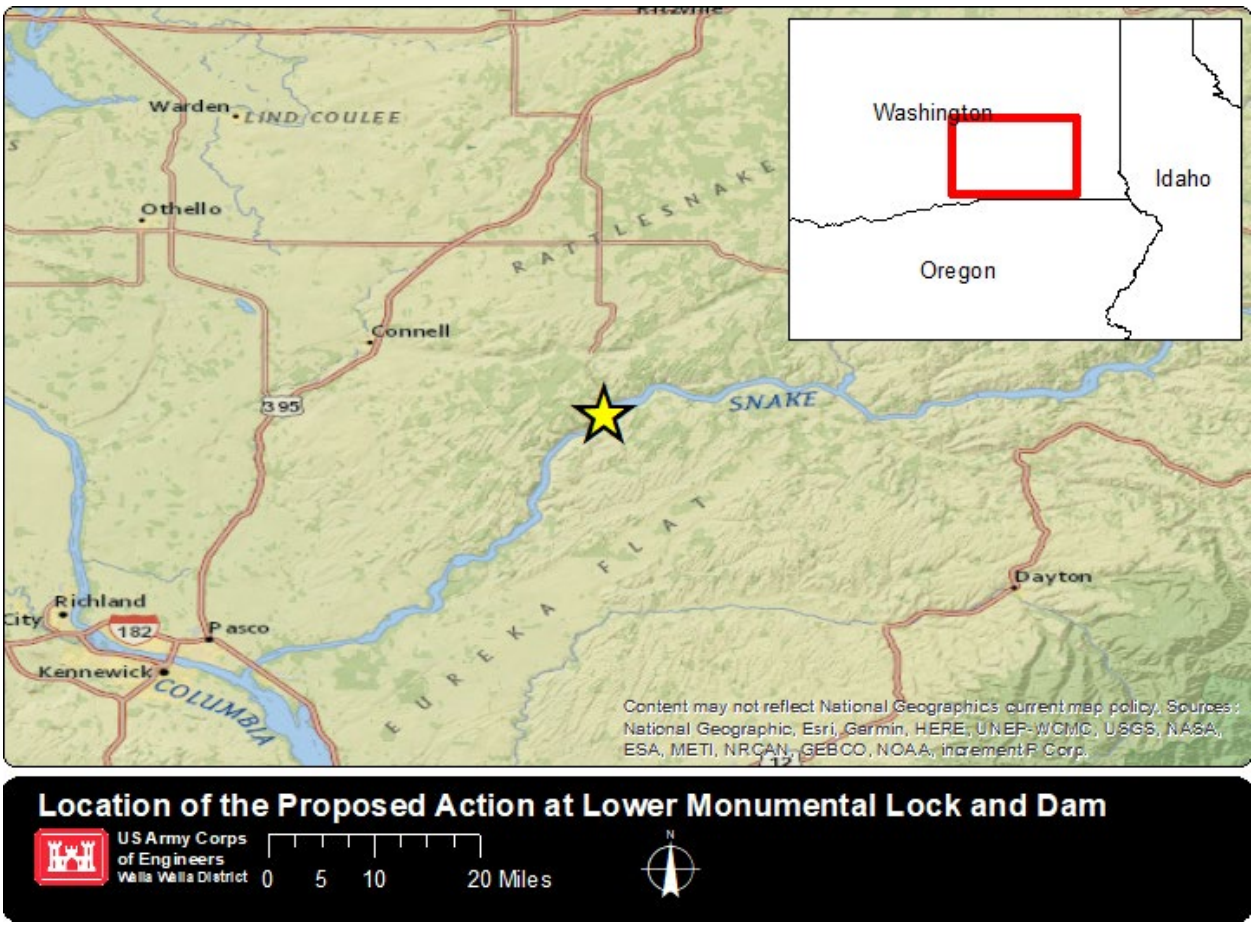

Figure 1-4. The Location of Lower Monumental Lock and Dam

NEPA requires federal agencies to consider a reasonable range of alternatives for most proposed actions. Alternatives considered under NEPA must include, at least, the proposed action and the “No Action” Alternative, which provides a baseline from which to compare other alternatives. In the case of an ongoing program, the

The PSMP FEIS (Corps 2014) identified and evaluated a wide range of measures and alternatives to accomplish the purpose of maintaining authorized project purposes for the lower Snake River Projects (LSRP). The PSMP (Appendix A to the EIS) provides a decision-making process to manage and, if possible, prevent sediment accumulation. Section 3.3.4.2 of the PSMP states, “Given the immediate need measures identified in the PSMP, the NEPA review process for immediate need actions will generally include only the “No Action” and Proposed Action Alternative (i.e., dredging), with alternative dredged material disposal options...” Therefore, in tiering from the PSMP FEIS, two alternatives are evaluated in this EA: 1) the No Action Alternative, and 2) Immediate Need Dredging-disposal. This EA does not evaluate alternative option of removing debris/sediment, as the PSMP identified only one alternative that can effectively remove accumulated sediment – i.e., dredging. This alternatives analysis is, therefore, focused on identifying the most cost efficient, technically feasible and environmentally acceptable disposal option – e.g., Table A-3 and Sections 2.4.1 and 3.3.3 – and the disposal option analysis in the PSMP EIS.

Three alternatives are evaluated in this EA: 1) No Action Alternative, 2) Dredging with In-Water Disposal, 3) Dredging with Upland Disposal. As outlined above, the alternatives analysis is focused on evaluating the disposal options (in-water and upland), as outlined in the PSMP and EIS, as dredging has been identified in the PSMP/EIS as the only option available to remove accumulated problem sediment.

2.1 Alternative 1: No Action

The No Action alternative is included to compare to other alternatives. Under this alternative, the stilling basins would not be cleaned out and sediment would continue to accumulate potentially causing damage to the stilling basins. USACE would continue to operate and maintain the Project sites with no changes. USACE would not survey the condition of the stilling basins nor their cleanouts. This alternative would contribute to an elevated likelihood of the basins sustaining damage and prevent USACE from making any informed decisions related to the continued operation of the spillways at each dam.

This alternative would not meet the purpose and need for the action but is carried forward for analysis as a baseline for comparison.

2.2 Alternative 2: Dredging with In-water Disposal

Alternative 2 would include a bathymetric survey to determine the quantity and location of debris and sediments that need to be removed. Accumulated sediment would then be removed with a clamshell dredge utilizing in-water disposal methods. A hydraulic

suction dredge would be used to remove sediment that cannot be removed with the clamshell. Diver assisted suction dredging would follow, performing detailed sediment removal so that a thorough condition survey of the spillway aprons and stilling basins can be accomplished and documented. Once clear of sediments and debris, the aprons and stilling basins would be post-surveyed with multibeam sonar technology and supplemented with diver collected data to perform a detailed survey of problem areas identified.t.

The alternative would begin by temporarily removing the avian deterrent wires from the project spillways, then documenting the existing conditions with a pre-dredge condition bathymetric survey. Following the acceptance of the pre-dredge survey, accumulated sediments will be removed with a clamshell dredge utilizing in-water disposal downstream of the work site. To remove the sediments (cobble and large debris), the c a barge mounted clamshell dredge bucket would be used to remove material from the spillway aprons and stilling basins. Removal of lighter and finer materials with the dredge plant requires a slower and more targeted approach to dredging than standard production dredging. A hydraulic suction dredge would be used to remove sediment from tight areas between structures such as the baffle blocks at the downstream end of the stilling basins.

Not all the sediment can be removed by the clamshell or hydraulic dredge. Sediments that are inaccessible by the clamshell or hydraulic dredge (possibly between the baffle blocks, such as those at Little Goose; in damaged areas of the concrete; in corners, etc.) would be removed by divers utilizing hand operated equipment. A diver-operated suction dredge will be used to assist the divers in removing the sediment from around the baffle blocks and similar areas that cannot be accessed by the other dredging methods.

All dredged material will be disposed of in the river at one of two disposal sites (Figure 1-4): near Swift Bar HMU (below Lower Granite Dam) at river mile (RM) 96 for the sediment from Lower Monumental stilling basin and Lower Granite stilling basin, and near Joso HMU (below Little Goose Dam) at RM 57 for the Little Goose stilling basin material. Disposed material will be placed in a manner to minimize piling of the material that could create predatory fish habitat. The final grade of the material is expected to create a gentle slope with no dramatic contours. The material would also not be placed within the deepest parts of the river near the disposal areas which will protect cold-water refugia for fish.

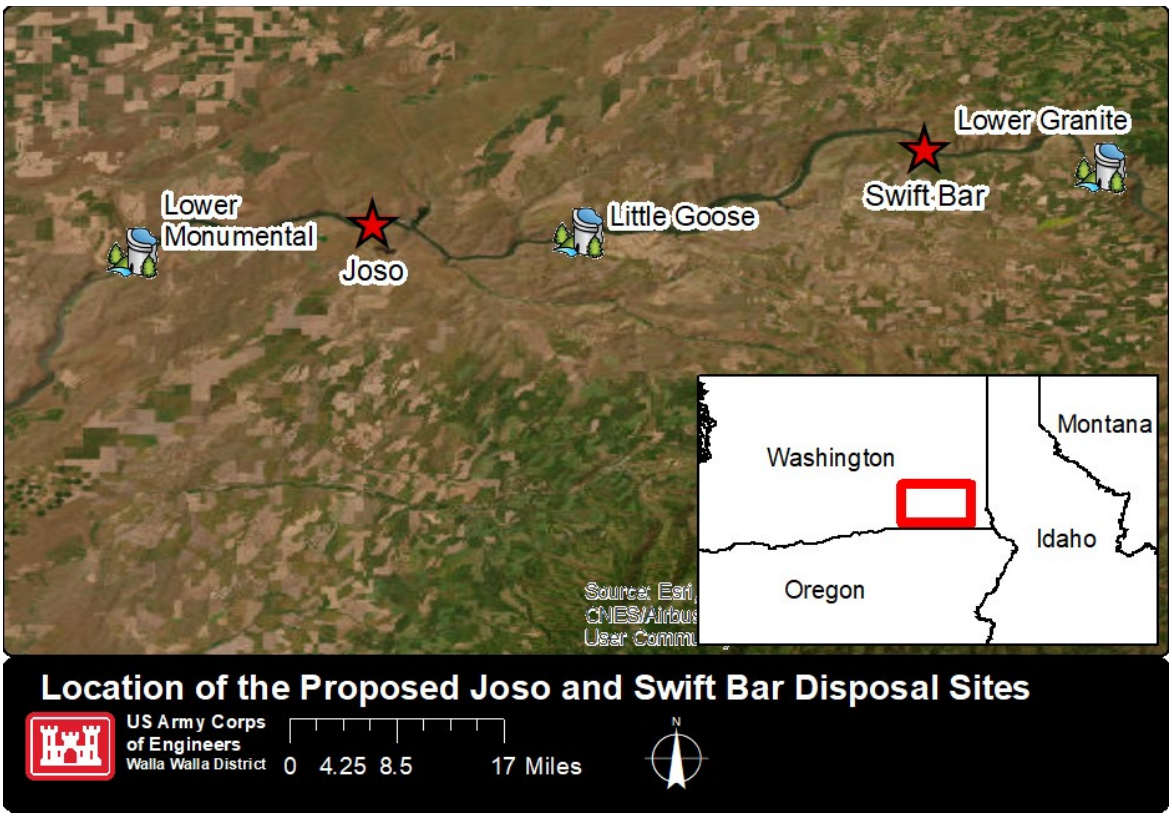

Figure 1-4 Location of the Proposed Joso and Swift Bar Disposal Sites

Approximately 36,150 cubic yards (cy) of cobble and sediment would be removed and disposed of; 8,000 cy from Lower Granite, 28,000 cy from Little Goose, and 150 cy from Lower Monumental (Table 1-1).

Table 1-1. Approximate Quantities of Accumulated Sediment to be Removed from three Lower Snake River Dam Stilling Basins Measured in Cubic Yards (CY)

Dam	River Mile	Approximate Quantity to be Removed (CY)
Lower Granite	107.5	8,000
Little Goose	70.3	28,000
Lower Monumental	41.6	150

Under Alternative 2 all dredging and disposal actions would occur during the in-water work window from December 15 to March 1. This in-water work window was established through coordination with state and Federal resource agencies, as the in-water work window selected would have the least impact to Endangered Species Act listed (ESA) salmonid stocks. The work would require two in-water work windows (one for Lower Monumental and Lower Granite, and one for Little Goose) in consecutive years. Dredge plants (any type of industrial equipment, including mobile equipment) would operate 24 hours per day to complete the scope of work within the in-water work window from December 15 to March 1. The proposed schedule for the stilling basin sediment removal would be spaced out with Lower Granite and Lower Monumental to be cleaned out first from December 2024 to March 2025 followed by the clean out of Little Goose

which would be completed from December 2025 to March 2026. No flow through the spillways can occur during the proposed dredging work.

The following conservation measures would be incorporated as part of Alternative 2. Conservation measures are intended to minimize or avoid environmental impacts to listed species or critical habitats. Conservation measures are incorporated into design as a proactive means for avoiding or minimizing adverse impacts associated with construction activities. The conservation recommendations listed below are consistent with obligations to ESA compliance for dredging and disposal operations as well as for the survival and recovery of ESA-listed Snake River salmonid ESUs and DPS. Therefore, the conservation measures listed below would be implemented by USACE to avoid or minimize adverse effects to the survival and recovery of Snake River sockeye salmon, Snake River fall Chinook salmon, Snake River spring and summer Chinook salmon, Snake River basin steelhead, and bull trout, including adverse effects on designated critical habitat for these species:

1. Conduct work during the winter in-water work window of December 15 to March 1 when relatively few anadromous fish species are present. The work window could be further restricted to start January 1 when the fish ladders are taken out of service for annual maintenance.
2. Place dredged material far enough downstream that it doesn't reenter the stilling basin.
3. Place dredged material in such a manner that it does not create steep mounds that could attract predatory fish species.
4. Avoid placing the material in the deepest parts of the river near the disposal areas.

This alternative meets the Purpose and Need for the action.

2.3 Alternative 3: Dredging with Upland Disposal

Alternative 3 would include the same dredging operations as Alternative 2 but would dispose of dredged materials in upland locations instead of in-water. As outlined in the PSMP and Section 2 of the EIS, sediments would be transferred from the dredge barge to a "dump scow" – a large boat used to transport material to the shore. Cobble and sediments would be temporarily stockpiled near each dam and allowed to drain and dry. The material would then be loaded into dump trucks using an excavator and hauled to an appropriate and legal upland disposal area.

The schedule for Alternative 3 would be the same as that for Alternative 2.

Alternative 3, Dredging with Upland Disposal would meet the outlined Purpose and need.

2.4 Alternatives Carried Forward for Analysis

- Alternative 1: No Action Alternative (No Change to Current Practice)
- Alternative 2: Dredging with In Water Disposal
- Alternative 3: Dredging with Upland Disposal

Alternative 1, No Action, will be carried forward to Chapter 3, Affected Environment and Environmental Effects, as required by NEPA, providing a basis for comparison with other alternatives. Under this alternative, the stilling basins would not be cleaned out for assessment and sediment would continue to accumulate and cause damage to the stilling basins. USACE would continue to operate and maintain the dams but would not survey the condition of the stilling basins nor their cleanouts. This alternative would contribute to an elevated likelihood of the stilling basins at the Project sites to fail by accepting the unknown condition of the stilling basins and prevents USACE form making any informed decisions related to the continued operation of the spillways at each dam.

Alternative 2, Dredging with In-Water Disposal, would meet all the conditions of the outlined purpose and need of the proposed action and will be carried forward to Chapter 3, as Action Alternative 2, the Proposed Action Alternative.

Alternative 3. Dredging with Upland Disposal would meet all of the conditions of the outlined purpose and need of the proposed action and will be carried forward to Chapter 3, as Action Alternative 3.

3 Affected Environment and Environmental Consequences

This section describes the existing affected environment (existing condition of resources) and evaluates potential environmental effects (consequences) on those resources for each alternative. Alternative 1 (No Action), Alternative 2, and Alternative 3 were carried forward for analysis. This EA focuses on the existing resources that may be potentially impacted by the alternatives carried forward for analysis.

The following descriptors are used in the body of this chapter for consistency in describing impact intensity in relation to significance:

- No or Negligible Impact: The action would result in no effect, or the effect would not change the resource condition in a perceptible way. Negligible is defined as of such little consequences as to not require additional consideration or evaluation.
- Minor Impact: The effect to the resource would be perceptible; however, the effect would not be major and unlikely to result in an overall change in resource character.
- Moderate Impact: The effect to the resource would be perceptible and may result in an overall change in resource character. Moderate impacts are not significant due to their limited context (the geographic, biophysical, and social context in which the effects would occur) or intensity (the severity of the impact, in whatever context it occurs).
- Significant Impact: The effect to the resource would be perceptible and may be severe. The effect would likely result in an overall change in resource character. The determination of significant impact to any resource would require the completion of an Environmental Impact Statement.

3.1 Environmental Evaluation by Resource

Although only relevant resources are specifically evaluated for impacts, USACE did consider all resources in the proposed project area and decided on which ones to evaluate. The following resource areas were evaluated: Sediment, Water Quality, Aquatic Resources (including threatened and endangered species), Recreation, Terrestrial Resources (including threatened and endangered species), Historic and Cultural Resources, Socioeconomics and Environmental Justice, and Climate Change. It was determined that it was not necessary to evaluate, Noise, Land Use, Aesthetics/Visual Quality, or Air Quality as implementation of the proposed action would have no or negligible impacts to these resources (Table 3-1).

Table 3-1. Environmental Resources not evaluated further.

Environmental Component	Explanation
Noise	The proposed action is located within rural areas with relatively few noise sources. Sources may include boat and barge operation along the Snake River and trains, aircraft, and vehicle use. Noise levels would be negligibly affected by the proposed action.
Land Use	The proposed action would not change or alter the current land uses surrounding the Lower Snake River.
Aesthetics and Visual Quality	Proposed dredging would take place underwater and would not be visible. Dredging equipment on the on the water would be temporary and not significantly alter the aesthetics or visual quality of the landscape. Upland sediment disposal would be in previously disturbed areas and would not significantly alter the aesthetics or visual quality of the landscape.
Air Quality	The proposed action area meets Washington State's ambient air quality standards and is in "attainment." No Statement of Conformity is needed in attainment areas, such as Whitman, Garfield, Columbia, Franklin, and Walla Walla Counties, Washington. Air quality would not be affected by the proposed action.

3.2 Sediment

3.2.1 Affected Environment

Sediment Transport

Sediment transport is limited at the proposed action areas. Varying spill patterns at the dams creates large eddies in the spillway, generating strong currents that carry cobbles and other coarse sediments upstream and into the stilling basin. Fine sediments generally settle out of the water column in the low energy forebay of the dams and neither spill nor power generation transports notable quantities of fine sediment.

Sediment Quality

The sediment in the stilling basins consists of gravel, cobble, and boulders with no fine-grained material. The rock is very clean and does not contain contaminants.

3.2.2 Environmental Consequences

Alternative 1: No Action Alternative

Under the No Action Alternative, sediment would not be cleaned from the stilling basins and the basins could not be inspected. The dams would continue to function under current management, large-sized sediment particles would continue to circulate around the stilling basin and cause damage to the stilling basin floors. Uncontrolled damaged and erosion to the stilling basin floors may ultimately lead to the damage of the stilling basin. Damage to the stilling basins would impact multiple authorized project purposes including navigation and fish passage. The No Action Alternative would have no effects to sediment.

Alternative 2: Dredging with In-water Disposal

Under Alternative 2, accumulated sediments would be dredged from the stilling basins and disposed at in-water locations. The large-sized particles that have accumulated in the stilling basins would be removed. Removal of the large sediment would be done by dredging and divers manually removing smaller sediment once dredges get close to the stilling basin floor. Following clean up, cobble and coarse sediment would likely continue to accumulate in the stilling basins. The sediment removed would then be transferred via barge to the disposal sites, Joso or Swift Bar, for placement. Deposition of the clean sediments would create very little turbidity. The two disposal sites were selected due to their depths, and they possess the same sediment types that would be disposed of. Alternative 2 would have negligible effects on sediment, both at the stilling basin sites and the disposal sites.

Alternative 3: Dredging with Upland Disposal

Under Alternative 3 the large-sized particles that have accumulated in the spillways would be removed in the same manner as Alternative 2, and disposed upland. Upland disposal would have no effect to sediment. Alternative 3 would have negligible effects to sediment.

3.3 Water Quality

3.3.1 Affected Environment

Water quality in the Snake River Basin is affected by many past and present influences, including human population growth and associated pollutants, water withdrawal for irrigation, dam structures and operations, and land use practices including mining, domesticated livestock, agriculture, industry, logging, and recreation.

The state of Washington has designated the LSR and its tributaries to be protected for the following uses: salmon spawning, rearing, and migration; primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values (Washington Administrative Code 173-210A-600).

The Washington State Department of Ecology (WADOE, Ecology) has placed reaches of the LSR in the proposed action area on the Section 303(d) list due to impairment by temperature, dissolved oxygen, and total chlordane. Temperature is generally high in the summer months, though it is somewhat moderated by cold water releases from Dworshak Dam. Summer releases from Dworshak Dam are used to reduce water temperatures downstream in the LSR (Lower Granite, Little Goose, and Lower Monumental reservoirs) where temperatures historically exceeded the current state of Washington standard of 68°F (20°C). The cooling effect in the LSR diminishes at each successive downstream reservoir and the frequency of exceedances above the standard increases.

One important characteristic of an aquatic system affecting dissolved oxygen levels is water temperature. The solubility of oxygen decreases as water temperature increases, so colder water can hold more dissolved oxygen than warmer water. In winter and early spring, when the water temperature is low, the dissolved oxygen concentration is higher. In summer and fall, when the water temperature is high, the dissolved-oxygen concentration is low.

Until EPA banned its use, chlordane (or chloridan), a human-made chlorinated organic compound, was used as a pesticide for the treatment of eradication of insects on crops and home gardens since 1948. In 1983 it was banned from all uses except in the control of termites, and five years later it was completely banned for usage in the U.S. in 1988. Since chlordane is mostly insoluble in water, when introduced to a waterway, it typically sticks to the sediment and soil particles found naturally in the water source. Chemical contamination can become high in waterbodies due to agricultural runoff. Once this compound has been deposited into the soils, directly or indirectly, it remains for a long time. Rain, snow, flood waters, erosion, decomposition, and the reassigning of land purpose (prior exposed cropland being disturbed due to ground moving activities) can assist the movement of chlordane into the river system. Due to the size of the sediment USACE is not expecting to disturb areas of chlordane.

Turbidity is a measurement of the clarity of water and is determined by the type of river bottom, presence of pollutants, and the flora and fauna present in the system. Turbidity is often linked to total suspended solids (TSS) because water with high TSS levels typically look murkier and has a higher turbidity measurement. Some common suspended solids that may influence turbidity levels are clay, silt, and sand form soils, phytoplankton, decaying vegetation, industrial wastes and sewage, and other non-direct inhibitors that get washed into the system by rain, snow, floods, and runoff. The ROV survey demonstrated the sediment to be removed is large cobblestone sitting atop the concrete stilling basins.

3.3.2 Environmental Consequences

Alternative 1: No Action Alternative

Under the No Action Alternative, sediment would not be cleaned from the stilling basins and the basins could not be inspected. The dams would continue to function under current management, large-sized sediment particles would continue to circulate around the stilling basin and cause damage to the stilling basin floors. Uncontrolled damaged

and erosion to the stilling basin floors may ultimately lead to damage of the stilling basin. Damage to the stilling basins would impact multiple authorized project purposes including navigation and fish passage. The No Action Alternative would have no effects to water quality.

Alternative 2: Dredging with In-water Disposal

Under Alternative 2, there may be minor adverse effects to water quality. Accumulated sediments would be dredged from the stilling basins and disposed at in-water locations. At dredging sites, there may be short term adverse effects to water quality from the suspension of fine sediments during dredging. However, sediments at the proposed action areas are composed primarily on large cobble and other coarse sediments that would not suspend.

At disposal sites, there may be limited short-term adverse effects from turbidity generated by disposal of the sediments. The dredged materials and the disposal sites are both composed of coarse cobble and other small rock, not fine sediments. As such, little turbidity would be expected.

The use of mechanized equipment in the river would increase the potential for a spill or release of hazardous materials such as oil, grease, fuels, or hydraulic fluids into the aquatic environment. Certain chemicals may have serious toxic effects on water quality and aquatic organisms. Avoidance and minimization measures would be implemented to prevent spills and releases. Spills would be controlled by measures outlined in the Spill Prevention, Control, and Countermeasures (SPCC) Plan. The use of mechanical equipment may cause minor effects to water quality should a spill occur.

Alternative 3: Dredging with Upland Disposal

Alternative 3 would have similar minor effects as those described in Alternative 2 to water quality from dredging and operation of equipment over water. Dredged material would be dewatered along the shoreline but given the composition of the sediments this would likely have negligible effects to water quality. There would be no effects to water quality from upland disposal of dredged material.

3.4 Aquatic Resources

3.4.1 Affected Environment

This section provides an overview of the aquatic resources present in the proposed action area. Aquatic resources include plankton, benthic species (which occur on the bottom of a water body), aquatic plants, and fish. The following discussions present general descriptions of the key aquatic species that may be affected by the proposed action. Although most of the research on aquatic resources has focused on Lower Granite Reservoir, this information is also applicable to the other two reservoirs within the project area. This section includes information on threatened and endangered aquatic species. Plankton, benthic invertebrates, aquatic plants, and fish are described in Section 3.1 (Aquatic Resources) of the PSMP/EIS (USACE 2014).

3.4.1.1 Fish

Anadromous salmonids are seasonally present within the proposed action area, with juveniles of some stocks present year-round. Such species include Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), and steelhead trout (*O. mykiss*). Coho salmon and Pacific lamprey are not listed under the ESA but are considered a culturally significant resource to local tribes.

Coho salmon were historically abundant in the LSR Basin but were declared extinct in 1986 (Cichosz et al. 2001 and HSRG 2009). In 1995, in cooperation with the U.S. Fish and Wildlife Service (USFWS), the Nez Perce Tribe initiated a coho salmon reintroduction program in the Clearwater subbasin. Reintroduction efforts from this program have been met with marginal success in portions of the watershed. Coho salmon reintroduced in the Clearwater subbasin are considered out-of-Evolutionarily Significant Unit (ESU) and are not listed as threatened or endangered (HSRG 2009).

Anadromous Pacific lamprey (*Entosphenus tridentatus*) are also present in the proposed action area. Pacific lamprey pass upstream through the proposed action area as adults when returning to spawn in tributaries and downstream as juveniles when migrating to the ocean. Pacific lamprey enter freshwater to spawn (Kan 1975) between April and June and migrate to spawning areas by September (Close et al. 1995). Peak upstream dam passage typically occurs from July through September (Corps 1980-2000).

3.4.1.2 Threatened and Endangered Aquatic Species

Four anadromous species populations and one trout population present in the in the proposed action area are listed as threatened or endangered under the ESA (Table 3-2). These include, Snake River Sockeye, Snake River spring/summer-run Chinook, Snake River fall-run Chinook, Snake River Basin steelhead, and Columbia River Basin bull trout. Table 4 below lists the populations within the proposed action area as either threatened or endangered. Descriptions of the life histories and use of within the proposed action area are provided below.

Table 3-2. Endangered Species Act-Listed Fishes

Population	Designation
Snake River Spring/Summer-run Chinook Salmon	Threatened
Snake River fall-run Chinook Salmon	Threatened
Snake River Sockeye Salmon	Endangered
Snake River Basin Steelhead	Threatened
Columbia River Basin Bull Trout	Threatened

Snake River Spring/Summer-Run Chinook Salmon

Snake River spring/summer Chinook salmon were listed as threatened on April 22, 1992, and include all natural-origin populations in the Tucannon, Grande Ronde, Imnaha, Salmon, and mainstem Snake Rivers. Adult and juvenile spring/summer Chinook salmon generally only migrate through the proposed action area. Spring-run

adult upstream migration begins in March and ends in May, while summer-run adult Chinook salmon migration starts a little later in June through July (Figure 4-1). Juvenile outmigration for both runs occurs from mid-April through mid-June. Spring- and summer-run Chinook salmon spawn in July and August mostly in tributaries to the Snake River but can use shallow water habitat mainstem river channel.

Snake River Fall Chinook Salmon

Snake River fall-run Chinook salmon were listed as threatened on June 28, 2005, and reaffirmed on April 14, 2014 (79 Federal Register 20802). Historically, the lower and middle Snake River populations formed the two major population groups, however, the construction of Hells Canyon Dam eradicated the middle Snake River population. Spawning populations presently occur in the mainstem Snake River below Hells Canyon Dam, Lower Granite Dam, and in the lower reaches of the Clearwater, Grande Ronde, Tucannon, Salmon, and Imnaha Rivers between October and December. Fall-run Chinook salmon mostly migrate through the proposed action area. Adult fall-run Chinook salmon migrate through the proposed action area between August and October, while Juveniles out-migrate from mid-May through mid-July.

Snake River Sockeye Salmon

Snake River sockeye salmon were listed as endangered on November 20, 1991. Adult sockeye generally only migrate through the proposed action area between September and October but adults have been known to hold up below Lower Granite Dam in the summer when high water temperature impedes migration. Spawning occurs in September and October, but not in the mainstem Snake River.

Snake River Steelhead

Snake River steelhead were listed as threatened on August 18, 1997, and protective regulations were issued under Section 4(d) of the ESA on July 10, 2000. Their threatened status was reaffirmed on January 5, 2006, and again on April 14, 2014. This Distinct Population Segment (DPS) includes populations below natural and manmade impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho. Adult steelhead typically only migrate through the proposed action area between June and August Steelhead spawning occurs between March and June, but not in the mainstem Snake River.

Bull Trout

USFWS issued a final rule listing the Columbia River Basin population of bull trout (*Salvelinus confluentus*) as a threatened species on June 10, 1998. Bull trout are currently listed throughout their range in the western United States as a threatened species. Historically, bull trout were found in about 60 percent of the Columbia River Basin. They now occur in less than half of their historic range. Populations remain in portions of Oregon, Washington, Idaho, Montana, and Nevada (USFWS 2014). Lower Monumental Dam fish passage is necessary for migratory bull trout from core areas in the Walla Walla River and Tucannon River subbasins to interact with migratory bull trout from core areas in the Asotin Creek, Grande Ronde River, or Imnaha River

subbasins. The Tucannon River is the most likely origin of many of the bull trout observed at Lower Monumental Dam because of its relatively healthy migratory population and proximity (Barrows et al. 2016). Bull trout occur in the LSR, but distribution is limited due in part to their need for very cold-water habitats.

3.4.2 Environmental Consequences

Effects on Fish (Including Threatened and Endangered Species)

Alternative 1: No Action Alternative

Under the No Action Alternative, sediment would not be cleaned from the stilling basins and the basins could not be inspected. The dams would continue to function under current management, large-sized sediment particles would continue to circulate around the stilling basin and cause damage to the stilling basin floors. Uncontrolled damaged and erosion to the stilling basin floors may ultimately lead to the damage of the stilling basin. Damage to the stilling basins would impact multiple authorized project purposes including navigation and fish passage. The No Action Alternative would have moderate adverse to aquatic resources.

Alternative 2: Dredging with In-water Disposal (Proposed Alternative)

Under Alternative 2, there may be minor adverse effects to aquatic resources. Accumulated sediments would be dredged from the stilling basins and disposed at in-water locations. At dredging sites, there may be short term adverse effects to aquatic resources and fish in particular. Dredging effects on fish are generally localized and include possible entrainment, increased turbidity, noise, and changes to habitat such as substrate and depth.

Most anticipated navigation dredging activities would use a barge-mounted clamshell bucket to excavate and remove sediment. Clamshell buckets have a low potential to entrain fish in comparison to other dredging methods (Corps 2002a). The clamshell bucket descends to the substrate in an open position. During the descent, the bucket cannot trap or contain a mobile organism because it is open on top and bottom. The force generated by the descent drives the jaws of the bucket into the substrate, which “bites” the sediment upon retrieval, thus filling the empty bucket with sediment. The bucket bottom then closes as it is retracted from the dredged area. Clamshell dredging operations would proceed slowly and would present reasonable opportunity for fish, including adult and juvenile salmonids, to escape from a dredge area prior to commencement of the actual dredging operation.

In addition to the type of equipment used for dredging, the time of year would also reduce the possibility of affecting ESA-listed fish. Juvenile an adult coho, spring and summer Chinook, steelhead, and sockeye salmon are likely to be at the lowest densities during the winter in-water work period than other times of the year.

Dredging and in-water dredged material placement would not affect water temperature or dissolved oxygen because activity would typically take place in cold weather during the in-water work window. Dredging activities are temporary and would cause short-

term and localized impacts by increasing turbidity and suspended solids, which could adversely affect fish.

Disposal of dredged material (that is, deep-water dumping of dredged material as opposed to beneficial use) would cause temporary localized increases in turbidity and suspended solids, as well as noise disturbance. These factors can affect fish in the immediate area, but their mobility would allow them to temporarily escape the disturbance and return later after the effects of the dredged material placement have dissipated. Both resident and anadromous fish could use the area upstream and downstream of the sites for refuge when dredging and placement activities would occur. The in-water dredged material placement activities would not be a continuous activity confined to a single location and fish would return to the activity areas shortly after completion of the disposal. Potential effects of the dredged material placement operation on downstream migrating salmonids would be expected to vary depending on the timing of the downstream migrations, the amount of time the migrants spend in the affected areas, and their use of the affected areas. Both adults and juveniles of other salmon species would most likely be present within the LSR reservoirs at low densities during the in-water work window and therefore would not be affected by the temporary increases in turbidity, suspended solids, and noise from in-water disposal of dredged material.

Bull trout adults only intermittently inhabit areas of the lower mainstem of the Snake River where dredging would occur. These fish may enter the LSRP during migrations from the tributaries that they inhabit during the remainder of the year (Faler et al. 2008). These are pelagic adult fish that can actively avoid the dredging operations when noise and other disturbances associated with dredging operations occur. Spawning and juvenile rearing occurs in the upstream reaches of tributaries; therefore, dredging in the mainstem of the Snake River would not affect these life stages for bull trout.

Alternative 3: Dredging with Upland Disposal

Alternative 3 would have similar minor effects as those described in Alternative 2 to aquatic resources from dredging and operation of equipment over water. There would be no effects to aquatic resources from upland disposal of dredged material..

3.5 Recreation

3.5.1 Affected Environment

Recreation around and within the LSR provide opportunities such as picnicking, camping, boating, swimming, hiking, wildlife viewing, fishing, hunting, and overall aesthetic value. Nearly the entire length of the proposed action area is designated as part of the Northwest Discovery Water Trail, which is a 367-mile recreational boating route on the region’s defining waterways. It begins at Canoe Camp on the Clearwater River in Idaho, follows the Snake River down to the Columbia River, and ends at Bonneville Dam in the Columbia River Gorge. The trail connects nearly 150 sites to launch boats, picnic, or camp along these rivers when traveling via means of water.

Recreation activities take place throughout the year, with the most use occurring during the late spring, summer, and early autumn when fair weather is typical. Most recreation is related to the water resources provided by the Snake River and boating is the primary activity for many visitors. Much of the boating is related to fishing; however, waterskiing, tubing, wake boarding, jet skiing, sailing, kayaking, paddleboarding, and canoeing are also important boating activities. Additionally, boating provides an efficient means of transportation and allows hunters to gain access to more remote wildlife habitat areas.

The stilling basins are located in the spillway of the Projects and are a boast restricted zone. There are no recreational opportunities at the dredge sites. Fishing and boating opportunities are present at the disposal sites, though similar opportunities can be found throughout the reservoirs.

3.5.2 Environmental Consequences

Alternative 1: No Action Alternative

Under the No Action Alternative, sediment would not be cleaned from the stilling basins and the basins could not be inspected. The dams would continue to function under current management, large-sized sediment particles would continue to circulate around the stilling basin and cause damage to the stilling basin floors. Uncontrolled damaged and erosion to the stilling basin floors may ultimately lead to the failure of the stilling basin. Damage to the stilling basins would impact multiple authorized project purposes including navigation and fish passage. The No Action Alternative would have minor adverse effects to recreation if navigation were impaired.

Alternative 2: Dredging with In-Water Disposal

Under Alternative 2, there may be minor adverse effects to recreation. Accumulated sediments would be dredged from the stilling basins and disposed at in-water locations. Recreational users of park and recreation facilities along the LSP could see temporary minor adverse effects to recreational navigation during disposal activities. Dredging and placement of dredged material would occur during the approved winter in-water work period (December 15 through March 1) when recreation use is generally low, which would also minimize any effects on recreation.

In-water placement of dredged material would have temporary Minor Impacts on any recreational activities that may be occurring in the vicinity of the dredged material placement while large equipment is in place.

Alternative 3: Dredging with Upland Disposal

Under Alternative 3, effects to recreation from dredging of material from the stilling basins would be the same as those discussed for Alternative 2. There would be no effects from in-water disposal, but USACE would have to find an upland disposal site for the dredged material removed from the stilling basins. The impacts to recreation around the upland location chosen could cause temporary minor adverse effects to recreation. The disposal site would need to be located, prepared, and cleaned after the disposal. Depending on the disposal site, there is the possibility of temporary noise and limited

access to recreational areas. If there were existing recreation value at the upland disposal sites, these values would be permanently impaired by the disposal.

3.6 Terrestrial Resources

3.6.1 Affected Environment

3.6.1.1 Wildlife

Habitats associated with the river generally support trees/shrub or dense hydrophytic emergent grass-forb cover, which provide more structurally complex habitat and more abundant forage resources than adjacent uplands. Habitats associated with water, e.g., riparian and wetland areas, support higher population densities and species numbers than dry grassland and shrub community habitat.

Land adjacent to the proposed action area provides habitat for numerous birds, mammals, amphibians, and reptiles. Much of the wildlife in the proposed action areas is dependent on tree-shrub riparian habitat associated with the river system (Lewke and Buss 1977). The LSR provides food, water, and cover for numerous wildlife species and are especially important in a region where moisture is extremely limited.

3.6.1.3 Threatened and Endangered Terrestrial Species

Table 3-4 lists both species designated as threatened under the ESA that could occur on lands surrounding the proposed action area. The yellow-billed cuckoo (*Coccyzus americanus*) is a bird and Spalding's catchfly (*Silene spaldingii*) is a perennial plant. Descriptions of the life histories and use of lands surrounding the proposed action area are provided below; however, it is unlikely either of these species would be present near the project area.

Table 3-3. Endangered Species Act-Listed Terrestrial Species

Population	Designation
Western, Yellow-billed Cuckoo	Threatened
Spalding's Catchfly	Threatened

Western Yellow-billed Cuckoo

The western distinct population segment (west of the continental divide) of the yellow-billed cuckoo was listed as threatened under the ESA on October 3, 2014. Critical habitat has been proposed; however, Washington is not included in the critical habitat designation.

These birds prefer open woodlands with clearings with a dense shrub layer. They are often found in woodlands near streams, rivers, or lakes, but yellow-billed cuckoos occur most frequently and consistently in cottonwood forests with thick willow understory (Taylor 2000). They typically require an understory of 75 percent cover over a minimum of 10 acres. In winter, yellow-billed cuckoos migrate to tropical habitats with similar structure, such as scrub forest and mangroves. Individuals may be on breeding grounds between May and August. In the Pacific Northwest, the species was formerly common in willow bottoms along the Willamette and Columbia Rivers in Oregon, and in the Puget

Sound lowlands and along the lower Columbia River in Washington. The species was rare east of the Cascade Mountains. It may now be extirpated from Washington (USFWS 2008).

Lands surrounding the proposed action area lack the required plant cover density to support yellow-billed cuckoos and no yellow-billed cuckoos have been documented in the around proposed action area; given the lack of required habitat, none are expected to be in the area.

Spalding's Catchfly

Spalding's catchfly was listed as threatened in 2001. It is an herbaceous perennial in the pink family (*Caryophyllacea*). All green portions of the plant (foliage, stem, and flower bracts) are covered in dense sticky hairs that frequently trap dust and insects, giving this species the common name 'catchfly'. Plants emerge in mid to late May. Flowering typically occurs from mid-July through August but may occasionally continue into October. Above-ground vegetation dies back at the end of the growing season and plants either emerge in the spring or remain dormant below ground for one to several consecutive years. Spalding's catchfly reproduces solely by seed.

The species is endemic to the Palouse region of southeast Washington and adjacent Oregon and Idaho, and is disjunct in northwestern Montana and British Columbia, Canada. This species is found predominantly in the Pacific Northwest bunchgrass grasslands and sagebrush-steppe, and occasionally in open-canopy pine stands. The plant is found at elevations ranging from 420 to 1,555 meters (1,380 to 5,100 feet), usually in deep, productive soils. Plants are generally found in swales or on north or east facing slopes where soil moisture is relatively higher (USFWS 2005). Spalding's catchfly occurs in Asotin, Whitman, Garfield Counties, which include Greenbelt, Swallows, Nisqually John, Blyton Landing, and Wawawai Landing boast basins within Little Goose and Lower Granite Projects, though this plant has not been found on USACE-managed property.

3.6.2 Environmental Consequences

Alternative 1: No Action Alternative

Under the No Action Alternative, sediment would not be cleaned from the stilling basins and the basins could not be inspected. The dams would continue to function under current management, large-sized sediment particles would continue to circulate around the stilling basin and cause damage to the stilling basin floors. The No Action Alternative would have no effects to terrestrial resources.

Alternative 2: Dredging with In-Water Disposal

Under Alternative 2, there would be negligible effects to terrestrial resources. Dredging would result in intermittent and temporary disturbance or displacement of wildlife species from the operation of construction equipment. These activities are not expected to prevent wildlife from obtaining food or otherwise using the areas adjacent to the dredging. Riparian forest and shrub habitat for raptors and other birds would not be

affected. Waterfowl, birds, aquatic furbearers, and other wildlife could be temporarily disturbed or displaced by activities; however, they would likely use areas upstream and downstream of the sites where dredging activities occur. Dredging and disposal of sediment would be performed in deeper water away from any terrestrial habitat. There would be negligible effects to terrestrial habitat.

As discussed in Terrestrial Resources, federally listed or other protected wildlife species have the potential to be present near the Project sites. However, given the proposed activities would occur within the river, the measures are not expected to cause any appreciable impact to ESA-listed or other protected terrestrial wildlife species or plants. This alternative could cause temporary displacement of individuals on the water; however, species are expected to leave the area of impact as there are multiple alternate places for species to relocate. Alternative 2 would have negligible effects to terrestrial wildlife.

Alternative 3: Dredging with Upland Disposal

Under Alternative 3, effects to terrestrial from dredging of material from the stilling basins would be the same as those discussed for Alternative 2.There is potential for effects to listed species from upland disposal of sediment. However, it is expected that disposal sites would be already heavily disturbed areas and effects should be minimal. Further analysis would be needed for site-specific proposed action areas to determine effects as disposal sites are identified.

Selection and further development of any measure would be subject to site-specific tiered environmental review and requirements, including the ESA-listed species. Alternative 3 would have minor adverse effects to terrestrial resources.

3.7 Historic and Cultural Resources

3.7.1 Affected Environment

Cultural resources are usually identified as the remnants of past human lifeways, such as archaeological sites, artifacts, graves, historic buildings, trails, and other inanimate objects or areas. However, cultural resources also include areas of ongoing importance and use by Tribes and the public.

Early archaeological surveys conducted under the auspices of the Smithsonian Institution’s River Basin Survey Program, as part of pre-inundation salvage efforts, and as result of ongoing management of archaeological resources by USACE, have resulted in the identification of numerous archaeological sites within the LSRP. Sites include those that are on lands adjacent to the rivers, as well as a number of sites that were subsequently inundated after construction of the LSRP. Dredging and disposal activities carried out near shorelines, confluences, alluvial fans, islands or channel bars, and in the area of recorded archaeological sites have the potential for ground disturbance that can bury, damage or destroy archaeological sites.

Archaeological Resources

There is ample evidence that the Nez Perce and Palus people lived along the Snake River area for thousands of years. Their ongoing presence is indicated through oral history provided by descendants of the Native American inhabitants, allotment and homestead records, ethnographic study by tribal and non-tribal researchers, museum collections, and from archaeological site investigations. The archaeological sites found around the proposed action area and throughout the region represent a full range of lifeways, including plant, animal, and tool stone procurement, food processing and storage, rock imagery, ceremonial aspects, and habitation sites ranging from small camps to large villages. These areas not only represent long ago activities, but they are also still of living importance today to multiple Tribes, including the Confederated Tribes of the Colville Reservation, and the Nez Perce Tribe.

Traditional Cultural Properties

Traditional Cultural Properties (TCP), which include Historic Properties of Religious and Cultural Significance to Indian Tribes, are areas tied to beliefs, customs, and practices of a living community. TCPs have been identified in the proposed action area by the Confederated Tribes of the Colville Reservation, and the Nez Perce Tribe. One joint National Register of Historic Preservation (NRHP) nomination has been prepared by USACE, with contributions from the tribes for the Palus Village/Canyon TCP.

Historic Properties

As part of ongoing work, USACE has a responsibility to document and evaluate archaeological sites, historic building, structures, objects, and districts for listing on the National Register of Historic Places (NRHP). Historic built resources, including buildings, structures, and objects, have been documented to a very limited extent within the proposed action area. Most structures were removed prior to or during dam construction, but additional historic built resources may be present, and could be identified during future surveys.

Little Goose Lock and Dam is now 50 years of age and has been found eligible for listing on the NRHP. Lower Monumental Lock and Dam is now 50 years of age and has been found eligible for listing on the NRHP. Other structures, including a Bonneville Power Administration substation, the Joso Trestle, an Inland Power transmission line, and the Snake River Bridge/Lyons Ferry Bridge have also been documented, but these four resources are not owned by USACE and are maintained by other entities. Two objects, including a monument at Lyons Ferry Park and the Lyons Ferry, are located on USACE land. Lower Monumental has one site and one district listed on the NRHP. These sites are the Marmes Rockshelter, listed as a National Historic Landmark, and the Palouse Canyon Archaeological District which encompasses numerous archaeological sites.

Lower Granite Lock and Dam is now 50 years of age and has been found eligible for listing on the NRHP. Other structures including Hasotino, Hatwai, and Interior Grain Tramway, have been listed on the National Register of Historic Places NRHP. Additionally, two buildings at Chief Timothy Park have been documented that are over

50 years old and have been recommended not eligible for the NRHP. USACE needs to complete concurrence determinations with the Washington State Historic Preservation Officer (SHPO) before formally determining their eligibility status.

3.7.2 Environmental Consequences

Alternative 1: No Action

Under the No Action Alternative, sediment would not be cleaned from the stilling basins and the basins could not be inspected. The dams would continue to function under current management, large-sized sediment particles would continue to circulate around the stilling basin and cause damage to the stilling basin floors. Damage to the stilling basins would impact multiple authorized project purposes including navigation and fish passage. The No Action Alternative would have minor adverse effects to historical resources as the Projects themselves would be permanently damaged.

Alternative 2: Dredging with In-Water Disposal

Under Alternative 2, there would be negligible effects to historic and cultural resources. Accumulated sediments would be dredged from the stilling basins and disposed at in-water locations. The dredged material is accumulated cobbles and coarse sediments in a previously disturbed location. There would be no historic or cultural properties in the dredged material. In-water disposal of the dredged material would also have negligible effects to historic and cultural resources. In is uncertain if such properties exist at the disposal sites, but disposal of the dredged materials would not adversely affect any buried materials at the deep water disposal. Rather it would only bury them further.

Alternative 3: Dredging with Upland Disposal

Under Alternative 3, effects to historical and cultural resources from dredging of material from the stilling basins would be the same as those discussed for Alternative 2. Upland disposal of the dredged material could have effects on such resources depending on the location and character of the disposal sites. Further cultural review would be required prior to selecting upland disposal locations.

3.8 Socioeconomics and Environmental Justice

The proposed project spans the LSR and will occur in five separate counties in southeastern Washington, those counties are Whitman, Columbia, Garfield, Franklin, and Walla Walla counties.

3.8.1 Affected Environment

Population and Demographics

As of July 1, 2022, Whitman County, Washington has an estimated population of 47,619 residents. Columbia County, Washington has an estimated population of 4,042. Of the project area, Garfield County, Washington has the smallest population of 2,2800 while Franklin County, Washington has the largest estimated population at 98,678 residents.

The largest city is Pasco, which is part of the Tri-Cities area, which includes Kennewick and Richland. Walla Walla County, Washington has an estimated population of 62,584 residents with Walla Walla being the largest city in the county. See the table (Table 3-4) below that illustrates some demographics for the counties compared to the state and national averages.

Table 3-4. Education and Income for the Five Counties of Proposed Action Area Compared to the State of Washington and National Averages (U.S. Census Bureau 2021 Data)

Demographic	Whitman County, WA	Columbia County, WA	Garfield County, WA	Franklin County, WA	Walla Walla County, WA	State of WA	National
Persons under 18	15.3%	17.3%	26.3%	39.6%	26%	21.7%	22.2%
Persons Over 65	11.7%	29.1%	15.5%	9.9%	19.1%	16.2%	16.8%
High School Graduates	95.8%	89.9%	90.3%	75.9%	88.4%	91.9%	88.9%
Four-Year Degree or Higher	50.9%	26.6%	32.1%	19.8%	38.4%	37.3%	33.7%
Percent in Labor Force	60.2%	57.4%	61.7%	66.1%	56.8%	63.7%	63.1%
Median Household Income	$49,345	$68,825	$76,612	$72,452	$63,686	$82,400	$69,021

Environmental Justice

As outlined in Executive Order 12898, federal agencies must evaluate environmental justice issues related to any action proposed for implementation. This evaluation includes identification of minority and low-income populations, identification of any negative impacts that would disproportionately affect these minority or low-income groups, and proposed mitigation to offset the projected negative impacts. The evaluation of environmental justice issues includes identification of minority and low-income populations in the project areas.

Section 160 of the Water Resources Development Act (WRDA) of 2020 directs the Secretary to define the term “economically disadvantaged community” for the purpose of the Act and the amendments made by the Act. An economically disadvantaged community is defined as meeting one or more of the following:

- Low per capital income – The area per capita income of 80% or less of the national average.
- Unemployment rate above national average – The area has an unemployment rate that is, for the most recent 24-month period for which data are available, at least 1% greater than the national average unemployment rate.

- Indian country as defined in 18 U.S.C. 1151 or in the proximity of an Alaska Native Village.
- U.S. Territories, or
- Communities identified as disadvantaged by the Council on Environmental Quality's Climate and Economic Justice Screening Tool. (https://screeningtool.geoplatform.gov)

According to the Climate and Economic Justice Screening Tool (CEJST), accessed on December 18, 2023, of the five counties within the project scope, only one tract in Walla Walla County, associated with the Lower Monument Dam and the Joso disposal site, is considered at a disadvantage because it meets one or more burden threshold and the associated socioeconomical threshold. This tract is considered burdened as it falls within the burden category of Formerly Used Defense Sites and also exceeds these thresholds for the associated socioeconomic threshold of low household income. The Formerly Used Defensive Sites in the tract are three former outlying airstrips associated with the former Pasco Naval Air Station. All three are near the confluence of the Snake and Columbia Rivers, far from the proposed action area. The census tract in question is very large and spans the entire northern third of Walla Walla County.

3.8.2 Environmental Consequences

Alternative 1: No Action

Under the No Action Alternative, sediment would not be cleaned from the stilling basins and the basins could not be inspected. The dams would continue to function under current management, large-sized sediment particles would continue to circulate around the stilling basin and cause damage to the stilling basin floors. Uncontrolled damaged and erosion to the stilling basin floors may ultimately lead to the failure of the stilling basin. Damage to the stilling basins would impact multiple authorized project purposes including navigation and fish passage. The No Action Alternative would have minor adverse effects to socioeconomics as damage to the stilling basins may render the projects unable to fully provide navigation or hydropower benefits which would increase agricultural expenses and electricity costs in the region.

Alternative 2: Dredging with In-Water Disposal

Under Alternative 2, there would be negligible effects to socioeconomics. Accumulated sediments would be dredged from the stilling basins and disposed at in-water locations. There would be a brief increase in local services utilization and contracted workers would need meals and lodging in the action area, this effect would be negligible in the broader economic context of the region. There would be no effect to formerly used defensive sites, household income, or environmental justice.

Alternative 3: Dredging with Upland Disposal

Under Alternative 3, effects to socioeconomics and environmental justice would be the same as those discussed for Alternative 2. Upland disposal of the dredged material could have effects on such resources depending on the location and character of the

disposal sites. Further review would be required if upland disposal locations were located near burdened tracts or communities.

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3.8 Climate Change

The Proposed Action area includes a variety of resources that could be affected by climate change. Within the Inland Northwest, the climate is trending towards warmer temperatures and drier conditions.

3.8.3 Affected Environment

Predicted changes in temperature and precipitation would continue to decrease snowpack and would affect water flow and quality throughout the Inland Northwest region. Warmer temperatures would result in more winter precipitation falling as rain rather than snow throughout much of the Inland Northwest, particularly in mid-elevation basins such as this area, where average winter temperatures are currently near freezing. The predicted changes would result in:

- Less winter snow accumulation
- Higher winter streamflows
- Earlier spring snowmelt
- Earlier peak spring streamflow and lower summer streamflows in rivers that depend on snowmelt (most rivers in the Inland Northwest).

The decline of the region's snowpack is predicted to be greatest at low to middle elevations due to increases in air temperature and less precipitation falling as snow. The average decline in snowpack in the Pacific Northwest was about 25% of the last 40 to 70 years, with most of the decline due to the 2.5 degrees F° increase in cool season air temperatures over that period. As a result, seasonal stream flow timing would likely shift significantly in sensitive watersheds (Littell et al., 2009).

3.8.4 Environmental Consequences

Alternative 1: No Action

Under the No Action Alternative, sediment would not be cleaned from the stilling basins and the basins could not be inspected. The dams would continue to function under current management, large-sized sediment particles would continue to circulate around the stilling basin and cause damage to the stilling basin floors. Damage to the stilling basins would impact multiple authorized project purposes including navigation and fish passage. The No Action Alternative would not induce climate change.

Climate change would have no effects to the No Action Alternative.

Alternative 2: Dredging with In-Water Disposal

Under Alternative 2, there would be negligible effects to climate change. Accumulated sediments would be dredged from the stilling basins and disposed at in-water locations. Dredging equipment must be portable and capable of operating independently of external power sources. This makes diesel fuel the primary choice for powering such machinery. The burning of diesel fuel emits pollutants into the atmosphere. These emissions can affect air quality and contribute to broader concerns about global climate change. Carbon emission equivalents (CO_2e) have been estimated for dredging operations to range from 6.4 kg CO_2e to 11.73 kg CO_2e per ton of material dredged and disposed (Aumônier et al. 2010, Anderson and Barkdoll 2009). Conservatively estimating emissions at the higher figure, dredging and disposal of 36,150 cy of coarse material (49,164 metric tons), Alternative 2 would generate as much as 576, 693 kg of CO_2e or approximately 576 metric tons.

Climate change would have no effects to Alternative 2.

Alternative 3: Dredging with Upland Disposal

Under Alternative 3, effects to climate change would be the same as those discussed for Alternative 2. Upland disposal of the dredged material could have less emissions if the upland disposal sites are located significantly closer to the dredge sites than in Alternative 2, but this would not make a meaningful difference in the overall effect level.

Climate change would have no effects to Alternative 2.

3.9 Cumulative Effects

The National Environmental Policy Act and the Council on Environmental Quality regulations implementing the Act require federal agencies to consider the cumulative impacts of their actions. Cumulative effects are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (470 CFR § 1508.7).

The primary goal of a cumulative effects analysis is to determine the magnitude and significance of the environmental consequences of the proposed action in the context of the cumulative effects of other past, present, and reasonably foreseeable future actions.

3.9.1 Resources Considered

USACE used the technical analysis in conducted in this EA to identify and focus on cumulative effects that may be “truly meaningful” in terms of local and regional importance. While this EA addresses the effects of alternatives on the range of resources representative of the human and natural environment, not all of those resources need to be included in the cumulative effects analysis – just those that are

relevant to the decision to be made on the proposed action. USACE has identified Sediment, Water Quality, Aquatic Resources (including threatened and endangered species), Recreation, Terrestrial Resources (including threatened and endangered species), Historic and Cultural Resources, and Climate Change. as notable for their importance to the areas and potential for cumulative effects.

There would be no cumulative effects to other resources from implementation of the Action Alternatives in combination with past, present, and reasonably foreseeable future actions.

Resources are discussed in terms of their cumulative effect boundary (spatial and temporal), the historic condition and impacts to the resources, present condition and impacts to the resources, reasonably foreseeable future actions that may affect the resources, and the effects to the resources.

This section evaluates the cumulative effects of actions that could potentially affect the same environmental resources as those discussed earlier in this EA. The scope of this analysis extends beyond the Still Basin Sediment Removal Project to other areas that sustain the resources of concern. A resource may be differentially impacted in both time and space. The implication of those impacts depends on the characteristics of the resource, the magnitude, and scale of the action's impacts, and the environmental setting (EPA 1999).

3.9.2 Geographic and Temporal Scope of Cumulative Effects Analysis

Guidance for setting appropriate boundaries for a cumulative effect analysis is available from CEQ (1997) and EPA (1999). Generally, the scope of cumulative effects analysis should be broader than the scope of analysis used in assessing direct or indirect effects. "Geographic boundaries and time periods used in cumulative impact analysis should be based on all resources of concern and all of the actions that may contribute, along with the project effects, to cumulative impacts" (EPA 1999). The analysis should delineate appropriate geographic areas including natural ecological boundaries, whenever possible, and should evaluate the time period of the project's effects.

A temporal or time boundary is the duration that impacts from the proposed project or other actions affecting the resources would last. The boundary can vary per resource. Predicting the effects of future actions can be difficult and highly speculative. USACE identified the temporal boundary as 73 years as the time frame for analysis of cumulative effects (based on completion of the first of the three Projects in 1961, 68 years ago, and an additional five years into the future). Only reasonably foreseeable future actions are included. To be reasonably foreseeable, there must be a strong indication that an action/even will occur or be conducted. Strong indication means the action is planned, or budgeted, or has NEPA coverage completed.

The geographic boundary for the cumulative effects analysis includes actions taking place along the LSR Columbia River starting at Lower Granite Dam at RM 107.5 and continuing west until RM 0 where LSR empties into the Columbia River at RM 325.

Discussed below are the past, present, and reasonably foreseeable future actions that were considered for the cumulative effects analysis, the effects of the actions of the resources assessed, and a summary of the cumulative effects of the alternatives.

3.9.3 Past, Present, and Reasonably Foreseeable Future Actions and Implications for Resources

The following sections present summaries of past, present, and reasonably foreseeable future actions considered in this cumulative impact analysis, and the effects of those actions on the resources considered.

Past Actions

Commercial navigation began on the LSR in 1861, after the discovery of gold in the Clearwater basin of Idaho. In the 1930s farmers demanded competitive rates for shipping their wheat to Portland or Seattle, at the time nearby railroads were charging $5 per ton. The undammed LSR had rapids and whitewater and deterred barges from using the river for navigation. With the Northwest's growing economy the need for energy increased and in 1945, Under the Rivers and Harbors Act (RHA), Congress authorized the LSR dams as multiple-purpose Projects for hydropower and making barge traffic possible. In return, damming would provide pools for irrigation on farmlands along the river. However, the U.S. Department of the Interior proposed a 10-year moratorium for building dams a couple of years later. While salmon and steelhead appeared to be successfully navigating the fish ladders constructed at the Bonneville Dam near Portland, fisheries biologists became concerned about cumulative impacts of fish in a series of dams.

The last sediment cleanout of the Lower Granite stilling basins was in 1992. Dive and hydrographic inspections were completed in 2006, however divers were not able to substantiate damage shown on the surveys, which led to questions regarding the accuracy of the hydrographic survey data. Since 1980, Little Goose has only been observed by dives and hydrographic surveys and Lower Monumental has had a stilling basin repair.

All three Projects have individual Master Plans, which are required to be updated every 20 years. Master Plans guide and articulate USACE responsibilities pursuant to Federal laws to preserve, conserve, restore, maintain, manage, and develop the land, water, and associated resources for the Projects.

- The Lower Granite Master Plan was first approved in 1974. There have been six supplemental changes since that time, but no formal revisions until 2018.
- The Lower Monumental Master Plan was first approved in 1966 and there was one supplemental change, signed in 1969, but no formal revisions until 2020.
- The Little Goose Master Plan was first approved in 1969and there has been one supplemental change since then, but no formal revisions until 2020.

Effects of Past Actions on Resources

Several fish species being Federally listed on the Threatened/Endangered Species list. Snake River spring/summer Chinook salmon were listed as threated in 1992, Snake River fall-run Chinook salmon were listed as threaded in 2005 and reaffirmed in 2014, Snake River sockeye salmon were listed as endangered in 1991, Snake River steelhead were listed as threatened in 1997 and affirmed in 2006 and 2014, and the Columbian River Basin population of bull trout as threatened in 1998. In 1995 USACE initiated an EIS as a result of the listing of the LSR dams to evaluate the feasibility and impact of four alternatives for improving migration for salmon.

Since the Projects construction the western yellow-billed cuckoo was Federally listed as threatened in 2014. The Projects areas naturally lack the required plant cover density to support the species. The Spalding's catchfly was also federally listed in 2001, however it has never been documented in the Project areas.

The construction of the three Projects changed the course and function of the LSR and changed the topography of the region. Reservoir's that are created by the blockage of water trap sediment and organisms, can bury rocky riverbeds, and prohibit the passage of gravel, logs, and other important sediments that may be a source of food and/or habitat features that would otherwise have been transported in a natural system. There are both upstream and downstream impacts of dams when compared to a free-flowing river. Some of the upstream impacts are but not limited to water quality, changes to temperature of water, buildup of sediment, and limits fish and other aquatic organism's passage (both upstream and downstream). Some of the downstream impacts are but not limited to riverbed elevation, limits passage upstream, altered flow, and altered temperatures which can lead to water quality impairments.

Adding the three Project dams to the LSR did add recreational opportunities to areas otherwise remote. The LSR reservoirs provide opportunities such as picnicking, camping, boating, swimming, hiking, wildlife viewing, fishing, hunting, and overall aesthetic value. Nearly the entire length of the proposed action area is designated as part of the Northwest Discovery Water Trail, which is a 367-mile recreational boating route on the region's defining waterways. It begins at Canoe Camp on the Clearwater River in Idaho, follows the Snake River down to the Columbia River, and ends at Bonneville Dam in the Columbia River Gorge. The trail connects nearly 150 sites to launch boats, picnic, or camp along these rivers when traveling via means of water.

Early archaeological surveys conducted under the auspices of the Smithsonian Institution's River Basin Survey Program, as part of pre-inundation salvage efforts, and as result of ongoing management of archaeological resources by USACE, have resulted in the identification of numerous archaeological sites within the LSRP. Sites include those that are on lands adjacent to the rivers, as well as a number of sites that were subsequently inundated after construction of the LSRP. Dredging and disposal activities carried out near shorelines, confluences, alluvial fans, islands or channel bars, and in the area of recorded archaeological sites have the potential for ground disturbance that can bury, damage or destroy archaeological sites.

Present Actions

Present actions include regular operation and maintenance activities at the three Project sites. This includes maintenance and care for recreational areas and the operation of the dams to allow for hydropower and navigation. All maintenance projects proposed for the Projects are individually evaluated for environmental compliance through the NEPA process.

Effects of Present Actions on Resources

Management of the Projects will be in ordinance of the recently revised Master Plans. Increased levels of recreation within the Project areas have been trending and this ensures that USACE will continue to provide recreational opportunities year-round.

Reasonably Foreseeable Future Actions

As human population increases so will the need for energy and the movement of commerce through navigation, thus ensuring the three Projects are able to provide and maintain proper function will be necessary. A few future actions proposed, including the Stilling basins clean out for Lower Granite, Lower Monumental, and Little Goose are but not limited to tainter valves replacement at all 3 Projects, bridge repair and rockfall project at Lower Granite, navigation lock concrete culvert repair at Little Goose, turbine maintenance platform storage at Little Goose, installation of cables on the Lewiston Memorial bridge at Lower Granite, and a transformer line upgrade at Lower Monumental.

*Effects of Reasonably Foreseeable Future Action*s

As discussed throughout this EA there are beneficial and nonbeneficial effects for the maintenance required for the Projects to function properly to providing the region with hydroelectric power, navigation, and recreation opportunities for all. As climate change continues to progress, the use of heavy equipment will continue to add to the greenhouse gas effect. The projects for maintenance of the Projects listed above will ensure the safety and function of the dams.

The Action Alternatives would have no significant effects, either individually or cumulatively.

4 Preferred Alternative

USACE has selected Alternative 2, Dredging with in-water disposal at locations near Swift bar HMU and Joso HMU as the preferred alternative for the proposed project. This alternative best meets the purpose and need for the action by avoiding impacts associated with upland disposal.

5 Compliance with Applicable Treaties, Laws, and Executive Orders

5.1 Treaties

Treaties are legally binding contracts between sovereign nations that establish those nations' political and property relations. Treaties between Native American Tribes and the United States confirm each nation's rights and privileges. In most of these treaties, the Tribes ceded title to vast amounts of land to the United States but reserved certain lands (reservations) and rights for themselves and their future generations. It is important to be clear that "the rights of sovereign Indian Tribes pre-existed their treaties; they were not granted them by treaties or by the United States government. Rather, the treaties gave their rights legal recognition" (Hunn et al. 2015:58). Like other treaty obligations of the United States, Indian treaties are "the supreme law of the land," and they are the foundation upon which Federal Indian law and the Federal Indian trust relationship is based.

Treaties are legally binding contracts between sovereign nations that establish those nations' political and property relations. Treaties between Native American Tribes and the United States confirm each nation's rights and privileges. In most of these treaties, the Tribes ceded title to vast amounts of land to the United States but reserved certain lands (reservations) and rights for themselves and their future generations. Like other treaty obligations of the United States, Indian treaties are "the supreme law of the land," and they are the foundation upon which Federal Indian law and the Federal Indian trust relationship is based.

Treaty negotiations with area Tribes were conducted quickly by Isaac Stevens, Governor of Washington Territory. Treaties with area Tribes (e.g., Treaty of June 9, 1855, Walla Walla, Cayuse, Etc., 12 Stat. 945 [1859]) explicitly reserved unto the Tribes certain rights, including the exclusive right to take fish in streams running through or bordering reservations, the right to take fish at all usual and accustomed places in common with citizens of the territory, and the right 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 identified geographical areas. The proposed action would not affect reserved treaty rights or resources or otherwise conflict with any Treaty between a Native American Tribe and the United States.

5.2 Federal Laws, Regulations, and Executive Orders

5.2.1 National Environmental Policy Act

NEPA requires federal agencies to use a systematic interdisciplinary approach to evaluate the environmental effects of a proposed federal action prior to implementing that action. This is usually accomplished through preparation of a statement, either an Environmental Impact Statement (EIS) if the action is a major federal action significantly affecting the quality of the human environment, or an Environmental Assessment (EA) if the federal agency has not yet determined the significance of the effects.

This EA was prepared pursuant to regulations implementing NEPA, (42 United States Code [U.S.C.] 4321 et seq. and 87 FR 23453) and identifies and considers the potential environmental effects of the proposed dredging and disposal action in the LSR. The draft Finding of No Significant Impact (FONSI), this EA and all supporting appendices were made available to other federal and state agencies, Tribes, and the public for a 30-day review and comment period from March 8, 2024 to April 8, 2024. While preparing the EA and in the public review period, USACE did not identify any impacts that would significantly affect the quality of the human environment. Therefore, compliance with NEPA would be achieved upon the signing of the FONSI. If significant impacts had been identified during public review, a Supplemental EIS (tiered to the PSMP EIS) would have been required. Completion of a Supplemental EIS and the signing of a Record of Decision would then achieve compliance with NEPA.

5.2.2 Clean Water Act

The Federal Water Pollution Control Act (33 U.S.C. §1251 et seq., as amended) is more commonly referred to as the Clean Water Act (CWA). This act is the primary legislative vehicle for federal water pollution control programs and the basic structure for regulating discharges of pollutants into waters of the United States (WOTUS). The act was established to “restore and maintain the chemical, physical, and biological integrity of the nation’s waters.” The CWA sets goals to eliminate discharges of pollutants into navigable water, protect fish and wildlife, and prohibit the discharge of toxic pollutants in quantities that could adversely affect the environment.

Section 404 of the CWA established a program to regulate the discharge of dredged or fill material into WOTUS and Section 401 requires that any federal activity that may result in a discharge to WOTUS must first receive a water quality certification from the state in which the activity would occur.

The proposed action would place approximately 36,150 cubic yards of fill below the ordinary high water mark for the in-water disposal of the dredged material. The proposed action does not qualify for a Nationwide Permit (NWP). Therefore, the proposed action requires the associated Section 404 compliance, and the USACE prepared a CWA Section 404(b)(1) Evaluation, attached to this EA as Appendix B.

For Section 401 compliance, USACE began coordination with the certifying authority, the Washington State Department of Ecology (Ecology), and the USACE request for Section 401 water quality certification (WQC) was deemed complete on October 10, 2023. The Section 404(b)(1) evaluation is attached as Appendix B. Compliance with the CWA will be considered complete when Section 401 water quality certification is received from Ecology.

5.2.3 Rivers and Harbors Act

The Rivers and Harbors Act (RHA) refers to a conglomeration of many pieces of legislation and appropriations passed by Congress since the first such legislation in 1824. The Rivers and Harbors Act of 1899 was the first federal water pollution act in the U.S. It focuses on protecting navigation, protecting waters from pollution, and acted as a precursor to the CWA. Section 10 of the RHA of 1899 regulates alteration of and prohibits unauthorized obstruction of navigable waters of the U.S.

Because the Corps prepared a Section 404(b)(1) evaluation and because it issued a Public Notice that provided an opportunity for interested parties to review and comment on the proposed action, the Corps met the requirements of the River and Harbor Act (RHA) Section 10. Additionally, the four lower Snake River dam and reservoir projects were originally authorized under the RHA of 1945 (PL 79-14) and, therefore, do not require a separate Section 10 permit for operation and maintenance actions.

5.2.4 Endangered Species Act of 1973, as Amended (ESA)

The ESA established a national program for the conservation of threatened and endangered fish, wildlife, and plants and the habitat upon which they depend. Section 7(a)(2) of the ESA requires federal agencies to consult with the USFWS and the NMFS, as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their critical habitats. Section 7(c) of the ESA and the federal regulations on endangered species coordination (50 CFR §402.12) require that federal agencies prepare biological assessments of the potential effects of major actions on listed species and critical habitat.

USACE has determined that the Proposed Action may affect and is likely to adversely affect ESA-listed fish species under NMFS jurisdiction. NMFS determined that the proposed action is covered by the 2020 Columbia River System Operation Biological Opinion and that coordination with the Fish Passage Operation and Maintenance workgroup should be conducted. That coordination was completed on May 11, 2023. USACE also believes the proposed dredging-disposal action is covered by the November 14, 2014, NMFS Biological Opinion for the PSMP, which is an appendix to the PSMP EIS. This EA is tiered to the PSMP EIS, as identified in Section 1 above.

USACE determined the proposed project would be likely to affect, but not adversely affect bull trout and their Critical Habitat. USFWS also determined that the proposed action is covered by the 2020 Columbia River System Operation Biological Opinion and that coordination with the Fish Passage Operation and Maintenance workgroup should be conducted. That coordination was completed on May 11, 2023. USACE also believes the proposed dredging-disposal action is covered by the November 14, 2014, USFWS Biological Opinion for the PSMP, which is an appendix to the PSMP EIS. This EA is tiered to the PSMP EIS, as identified in Section 1 above.

5.2.5 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act prohibits the taking or possession of and commerce in bald and golden eagles, with limited exceptions, primarily for Native American Tribes. Take under this Act includes both direct taking of individuals and take due to disturbance.

Bald and golden eagles are known to nest throughout USACE managed lands in the Walla Walla District. While all nest sites have not been documented, locations of some

are known. None are known to occur in or near the proposed action area, therefore, there would be no effect or take (to include disturbance) of either bald or golden eagles.

5.2.6 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) (16 U.S.C. §§ 703-712, as amended) prohibits the taking of and commerce in migratory birds (live or dead), any parts of migratory birds, their feathers, or nests. Take is defined in the MBTA to include by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing, or transporting any migratory bird, nest, egg, or part thereof.

Some of the existing bird wires will be temporarily removed to facilitate the work, but there would be no impact on nesting birds, nests, or nestlings. Bird wires are intended to deter the presence of avian fish predators in the spillway. However, their removal during dredging operations would not cause migratory birds to nest within the proposed action area. No change to vegetation will occur due to the proposed action. There would be no effect to birds under the MBTA.

5.2.7 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) of 1934, as amended (16 USC 661 et seq.) requires consultation with USFWS when any water body is impounded, diverted, controlled, or modified for any purpose. The USFWS and state agencies charged with administering wildlife resources are to conduct surveys and investigations to determine the potential damage to wildlife and the mitigation measures that should be taken. The USFWS incorporates the concerns and findings of the state agencies and other federal agencies, including the NMFS, into a report that addresses fish and wildlife factors and provides recommendations for mitigating or enhancing impacts to fish and wildlife affected by a federal project.

This proposed action is maintenance of an existing structure and no modification of a waterway, the FWCA would not apply to the proposed action.

5.2.8 Fishery Conservation Management Act of 1976

The Fishery Conservation and Management Act of 1976 (16 USC 1801-1882; 90 Stat. 331; as amended), also known as the Magnuson-Stevens Fishery Conservation and Management Act, established a 200-mile fishery conservation zone, effective March 1, 1977, and established the Regional Fishery Management Councils consisting of federal and state officials, including the USFWS. The fishery conservation zone was subsequently dropped by amendment and the geographical area of coverage was changed to the Exclusive Economic Zone, with the inner boundary being the seaward boundary of the coastal states. Columbia River salmon and steelhead are found in this zone.

Columbia River salmon and steelhead are found in this zone. Therefore, the potential effects of the alternatives on the fisheries in this zone have been examined in Section 3.4 (Aquatic Resources) of this EA. The BA documents the essential fish habitat effects of the proposed action.

5.2.9 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires agencies to consider the potential effect of their actions on properties that are listed, or are eligible for listing, on the National Register of Historic Places (NRHP). The NHPA implementing regulations, 36 CFR Part 800, requires that the federal agency consult with the State Historic Preservation Officer (SHPO), Tribes and interested parties to ensure that all historic properties are adequately identified, evaluated, and considered in planning for proposed undertakings.

Pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, USACE analyzed the potential effects of the alternatives on cultural resources in the proposed action area in the EA and prepared a Cultural Resources Review that was sent to the Washington State Historic Preservation Officers (SHPO) and five area Tribes on January 22, 2024 for a 30-day review. USACE determined that the proposed action would not have an adverse effect on any historic properties, including any of traditional or cultural importance to area Native American Tribes. The proposed work is only maintenance of an existing facility and would not result in any changes to the use of that facility that might adversely affect historic properties.

USACE received concurrence with the Determination of No Adverse Effect to Historic Properties from the SHPO on March 4, 2024. No Tribe objected to that determination within the 30-day review period.

5.2.10 Executive Order 11988, Floodplain Management

This Executive Order outlines the responsibilities of federal agencies in the role of floodplain management. Each agency must evaluate the potential effects of actions on floodplains and avoid undertaking actions that directly or indirectly induce development in the floodplain or adversely affect natural floodplain values.

There is no land use change associated with the proposed action. Dredging and disposal would occur in water. The proposed action would not interfere with floodplain function or lead to floodplain development.

6.1 Tribal and Agency Consultation and Coordination

Tribal Consultation and National Historic Preservation Act Section 106 Coordination:

Tribal leadership for the Confederated Tribes and Bands of the Yakama Nation, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Colville Reservation, and the Nez Perce Tribe were formally offered government to government consultation regarding the proposed dredging and disposal action in a letter that also announced the start of the public review and comment period, dated March 15, 2024. The Wanapum Band also received a notification letter specific to the start of the public review and comment period but were not offered government to government consultation.

Pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, USACE analyzed the potential effects of the alternatives on cultural resources in the proposed action area in the EA and prepared a Cultural Resources Review that was sent to the Washington and Idaho State Historic Preservation Officers (SHPO) and five area Tribes on June 22, 2024 for a 30-day review. USACE determined that the proposed action would not have an adverse effect on any historic properties, including any of traditional or cultural importance to area Native American Tribes. The proposed work is only maintenance of an existing facility and would not result in any changes to the use of that facility that might adversely affect historic properties.

Endangered Species Act Consultation:

Pursuant to Section 7 of the Endangered Species Act of 1973, as amended, USACE determined that the preferred alternative may affect and is likely to adversely affect ESA-listed fish species. Formal consultation with the USFWS and NMFS was not required as they determined that the proposed action was within the scope of the 2020 Columbia River System Operation Biological Opinion (BiOp). USACE also believes immediate need dredging (i.e., for sediment and debris that have already accumulated and are interfering with authorized project purposes) is covered under the PSMP BiOps received by the USFWS and NMFS on November 14, 2014.

Clean Water Act Compliance and Coordination:

Section 401 (state water quality standards) requires a pre-filing meeting request for to the certifying authority at least 30 days prior to the submission of a Section 401 Water Quality Certification request. USACE began coordination with the certifying authority, the Washington State Department of Ecology (Ecology), and submitted a pre-filing meeting request form to Ecology on August 21, 2023. After the 30-day waiting period, no meeting request was received by USACE from Ecology and therefore requested Section 401 water quality certification (WQC) on October 10, 2023. Compliance with the CWA will be considered complete when Section 401 water quality certification is received from Ecology.

Rivers and Harbors Act:

The Rivers and Harbors Act (RHA) refers to a conglomeration of many pieces of legislation and appropriations passed by Congress since the first such legislation in 1824. The Rivers and Harbors Act of 1899 was the first federal water pollution act in the U.S. It focuses on protecting navigation, protecting waters from pollution, and acted as a precursor to the CWA. Section 10 of the RHA of 1899 regulates alteration of and prohibits unauthorized obstruction of navigable waters of the U.S. Original construction of the federal navigation channels was authorized under the RHA, and nationwide, USACE maintenance dredging maintains the navigability of the channels in accordance with their authorized dimensions.

Because the Corps prepared a Section 404(b)(1) evaluation and because it issued a Public Notice that provided an opportunity for interested parties to review and comment on the proposed action, the Corps met the requirements of the River and Harbor Act (RHA) Section 10. Additionally, the four lower Snake River dam and reservoir projects were originally authorized under the RHA of 1945 (PL 79-14) and, therefore, do not require a separate Section 10 permit for operation and maintenance actions.

6.2 Public Involvement

Public Review – Draft Finding of No Significant Impact and Environmental Assessment

In compliance with NEPA, the draft Finding of No Significant Impact (FONSI), EA, and all supporting appendices were made available for a 15-day review and comment period beginning on March 30, 2024 and concluding on April 15, 2024.

In compliance with and to complete the NEPA process, USACE will sign the FONSI and proceed with the proposed action beginning in April 2024. This EA and the final FONSI and all supporting appendices are available on the Walla Walla District Corps of Engineers website at www.nww.usace.army.mil/Missions/Environmental-Compliance.

If significant environmental effects resulting from implementing the proposed action had been identified during the review period, USACE would proceed to write a Supplemental Environmental Impact Statement and the proposed action would be delayed until USACE completed the NEPA process with the signing of a Record of Decision.

7 References

Anatek Labs. 1997. Lower Snake River Feasibility Study: Sediment Quality Study Analytical Results, Moscow, Idaho.

Anders, P.J. and L.G. Beckman. 1993 Location and timing of white sturgeon spawning in three Columbia River impoundments. In: Status and Habitat Requirements of White Sturgeon Populations in the Columbia River Downstream of McNary Dam, Volume 1, Final Report (Contract DEAI79-86BP63584) to Bonneville Power Administration. R.C. Beamesderfer and A.A. Nigro, ed.

Anderson, J. J. (2020). Decadal climate cycles and declining Columbia River salmon. In Sustainable Fisheries Management (pp. 467-484). CRC Press.

Anderson, M.J. and Barkdoll B. D. 2009. Environmental Aspects of Dredging: What About Air Quality? World Environmental and Water Resources Congress. 11 pages.

Arntzen E.V., K.J. Klett, B.L. Miller, R.P. Mueller, R.A. Harnish, M.A. Nabelek, D.D. Dauble, B. Ben James, A.T. Scholz, M.C. Paluch, D. Sontag, and G. Lester. 2012. Habitat Quality and Fish Species Composition/Abundance at Selected Shallow-Water Locations in the Lower Snake River Reservoirs, 2010-2011 - Final Report. PNWD-4325, Battelle--Pacific Northwest Division, Richland, Washington.

Aumônier, Hartlin. and Peirce. 2010. 'Carbon footprint of marine aggregate extraction'. Prepared Environmental Resources Management Limited (ERM) The Crown Estate, 17 pages

Bajkov, A.D. 1951 Migration of white sturgeon (Acipenser transmontanus) in the Columbia River. Oregon Fish Comm. Res. Briefs 3(2): 8-21.

Barrows, M.G., D.R. Anglin, P. M. Sankovich, J. M. Hudson, R. C. Koch, J. J. Skalicky, D. A. Wills and B. P. Silver. 2016. Use of the Mainstem Columbia and Lower Snake Rivers by Migratory Bull Trout. Data Synthesis and Analyses. Final Report. U.S. Fish and Wildlife Service, Columbia River Fisheries Program Office, Vancouver, WA.

Bennett, D.H., and F.C. Shrier. 1986. Effects of Sediment Dredging and In-Water Disposal on Fishes in Lower Granite Reservoir, ID-WA. Annual Report to the U.S. Army Corps of Engineers, Walla Walla District. College of Forestry, Wildlife, and Range Sciences, University of Idaho, Moscow.

Bennett, D.H., L.K. Dunsmoor, and J.A. Chandler. 1988. Fish and benthic community abundance at proposed in-water disposal sites, Lower Granite Reservoir. Completion Report. U.S. Army Corps of Engineers. Walla Walla, Washington.

Bennett, D.H., L.K. Dunsmoor, and J.A. Chandler. 1990. Lower Granite Reservoir in-water disposal test: Results of the fishery, benthic and habitat monitoring program-Year 1 (1988). Completion Report. U. S. Army Corps of Engineers, Walla Walla, Washington.

Bennett, D.H., P. Bratovich, W. Knox, D. Palmer, and H. Hansel. 1983 Status of the warmwater fishery and the potential of improving warmwater fish habitat in the lower Snake River reservoirs. Report to the U.S. Army Corps of Engineers, Walla Walla District prepared by University of Idaho, Department of Fish and Wildlife Resources. Walla Walla: U.S. Army Corps of Engineers.

Bennett, D.H., T.J. Dresser, Jr., and M.A. Madsen. 1994 Effects of Pool Operations at Minimum Pool and Regulated Inflows of Low Temperature Water on Resident Fishes in Lower Granite Reservoir, Idaho-Washington. Completion Report to the

U.S. Army Corps of Engineers, Walla Walla District. College of Forestry, Wildlife, and Range Sciences, University of Idaho, Moscow.
Bennett, D. H., M. Madsen, T.J. Dresser, Jr., and T.S. Curet. 1995a Monitoring Fish Community Activity at Disposal and Reference Sites in Lower Granite Reservoir, Idaho- Washington Year 5 (1992). Report to the U.S. Army Corps of Engineers, Walla Walla District. College Forestry, Wildlife, and Range Sciences, University of Idaho, Moscow.
Bennett, D.H., T.J. Dresser, Jr., S. Chipps, and M. Madsen. 1995b Monitoring Fish Community Activity at Disposal and Reference Sites in Lower Granite Reservoir, Idaho- Washington Year 6 (1993). Report to the U.S. Army Corps of Engineers, Walla Walla District. College of Forestry, Wildlife, and Range Sciences, University of Idaho, Moscow.
Bruton, M.N. 1985. The effects of suspendoids on fish. Hydrobiologia. 125: 221-241.
CH2M Hill. 1997. Sediment Sampling Particle Size Sampling Task, Lower Snake River Juvenile Salmon Migration Feasibility Study. Contract DACW68-94-D-0006. U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington.
1999. 1999 Ambient Sediment Monitoring Program Report. Prepared for Potlatch Corporation, Idaho Pulp and Paperboard Division, Lewiston, Idaho. Portland, Oregon: CH2M Hill.
2000. 2000 Ambient Sediment Monitoring Program Report. Prepared for Potlatch Corporation, Idaho Pulp and Paperboard Division, Lewiston, Idaho. Portland, Oregon: CH2M Hill.
Chapman, D., C. Peven, A. Giorgi, T. Hillman, and F. Utter. 1995. Status of spring Chinook salmon in the mid-Columbia region. Don Chapman Consultants, Inc. Boise, Idaho. 401 pp. plus appendices.
Cichosz, T., D. Saul, A. Davidson, W. Warren, D. Rollins, J. Willey, T. Tate, T. Papanicolaou, S. Juul. 2001. Draft Clearwater Subbasin Summary. Prepared for the Northwest Power Planning Council.
Clark, J. E. 1979. “Fresh water wetlands: Habitats for aquatic invertebrates, amphibians, reptiles, and fish,” Wetland functions and values: The state of our understanding. Proceedings of the National Symposium on Wetlands, P.E. Greeson, J.R. Clark, and J.E. Clark, ed., American Water Resources Association, Minneapolis, MN, 330-343.
Close, D., M. Fitzpatrick, H. Li, B. Parker, D. Hatch, and G. James. 1995. Status report of the Pacific lamprey (*Lampetra tridentata*) in the Columbia River Basin. Prepared for U.S. Department of Energy. Bonneville Power Administration. Portland, Oregon. July 1995.
Cochnauer, T.G. 1981 Survey status of white sturgeon populations in the Snake River, Bliss Dam to C. J. Strike Dam. Idaho Department of Fish and Game, River and Stream Investigations, Job Performance Rep., Project F-73-R-2, Job I-b, Boise. 25 pp.
Columbia Basin Research. 2020. DART Adult Passage Basin Summary for All Projects and Species. School of Aquatic & Fishery Sciences. University of Washington http://www.cbr.washington.edu/dart/query/adult_basin_sum. Accessed on November 27, 2020.
Council on Environmental Quality (CEQ). 1997. Considering Cumulative Effects Under the National Environmental Policy Act. January 1997. Crecelius, E.A., and O.A. Cotter.

Crecelius, E. H., and J. M. Gurtisen. 1985. Sediment Quality of Proposed 1986 Dredge Sites, Clarkston, Washington. Report Number PNL-5552 UC-11. Prepared for U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington. Sequim, Washington: Battelle Marine Sciences Laboratory.

Curet, T.D. 1994 Habitat use, food habits and the influence of predation on subyearling Chinook salmon in Lower Granite and Little Goose pools, Washington. Master's thesis. University of Idaho, Moscow.

Daly, E. A., and R. D. Brodeur. 2015. "Warming Ocean Conditions Relate to Increased Trophic Requirements of Threatened and Endangered Salmon." Public Library of Science one 10(12): e0144066.

Environmental Protection Agency (EPA). 1999 Consideration of Cumulative Impacts in EPA Review of NEPA Documents. U.S. Environmental Protection Agency, Office of Federal Activities. May 1999.

Faler, M.P., G. Mendel, and C. Fulton. 2008. Evaluation of Bull Trout Movements in the Tucannon and Lower Snake Rivers. Project Completion Summary (2002 through 2006). USFWS 2002-006-00.

Franklin, J.F. and C.T. Dyrness. 1973. Natural vegetation of Oregon and Washington. USDA Forest Service General Tech. Rept. PNW-8, 417 p. Fulton, L.A.

Fulton, L.A., 1968. Spawning areas and abundance of Chinook salmon (Oncorhynchus tshawytscha) in the Columbia River Basin: past and present (p. 26). US Department of the Interior, US Fish and Wildlife Service, Bureau of Commercial Fisheries.

Gravity Consulting L.L.C. 2013. Sediment Analysis Data Report: Port of Clarkston Crane Dock Sediment Characterization. Prepared for Port of Clarkston. January 2013.

Gregory, R.S. and C.D. Levings. 1998. Turbidity reduces predation on migrating juvenile Pacific salmon. Transactions of the American Fisheries Society. 127: 275-285.

Gregory, R.S., and T.S. Northcote. 1993. Surface, planktonic, and benthic foraging by juvenile Chinook salmon (*Oncorhynchus tshawytscha*) in turbid laboratory conditions. Can. J. Fish. Aquat. Sci. 50: 223-240.

Hastings, M.C. and A.N. Popper. 2005. Effects of sound on fish. Prepared for California Department of Transportation, Contract No. 43A0139, Task Order 1.

Hatchery Scientific Review Group (HSRG). 2009. Review and Recommendations Clearwater River Coho Population and Related Hatchery Programs. Appendix E of Columbia River Hatchery Reform System-Wide Report.

HDR. 1998. Sediment Sampling Lower Snake River and McNary Pool: Field Documentation and Particle Size Data. Prepared for U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington.

Heaton, R. D., and S. T. J. Juul. 2003. Physical and Chemical Characterization of the Sediments in the Lower Snake River Proposed for 2003/2004 Dredging. U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, Washington.

Historical Research Associates, Inc. 2015. A Systemwide Research Design for the Study of Historic Properties in the Federal Columbia River Power System. Prepared for the Federal Columbia River Power System, Cultural Resource Program. Available at: https://www.bpa.gov/efw/CulturalResources/FCRPSCulturalResources/Pages/Program-Documents.aspx. Accessed on November 27, 2020.

Hunn, E.S., E.T. Morning Owl, P.E. Cash Cash, and J. Karson Engum. 2015. Ĉáw Pawá Láakni, They Are not Forgotten, Sahaptian Place Names Atlas of the Cayuse, Umatilla, and Walla Walla. University of Washington Press, Seattle, Washington.

Kan, T. 1975. Systematics, variation, distribution, and biology of lampreys of the Genus Lampetra in Oregon. Doctoral Dissertation. Oregon State University. Corvallis, Oregon. 194 pp.

Lepla, K.B. 1994 White sturgeon abundance and associated habitat in Lower Granite Reservoir, Washington. Master's Thesis. University of Idaho, Moscow.

Lewke, R.E., and I.O. Buss. 1977. Impacts of impoundment to vertebrate animals and their habitats in the Snake River Canyon, Washington. Northwest Sci. 51:219-270.

Luzier, C.W., H.A. Schaller, J.K. Brostrom, C. Cook-Tabor, D.H. Goodman, R.D. Nelle, K. Ostrand and B. Streif. 2011. Pacific Lamprey (*Entosphenus tridentatus*) Assessment and Template for Conservation Measures. U.S. Fish and Wildlife Service, Portland, Oregon.

Mackay, R.J. 1992. Colonization by lotic macroinvertebrates: a review of processes and patterns. Can. J. Aquat. Sci. 49: 617-628.

Matthews, G.M., and R.S. Waples. 1991. Status review for Snake River spring and summer Chinook salmon. U.S. Department of Commerce, NOAA Technical Memo. National Marine Fisheries Service F/NWC-200. 75 pp.

McCabe, G.T., Jr., and C.A. Tracy. 1993 Spawning characteristics and early life history of white sturgeon (*Acipenser transmontanus*) in the Lower Columbia River. Pages 19-49 in R. C. Beamesderfer and A. A. Nigro, editors. Status and habitat requirements of the white sturgeon populations in the Columbia River downstream from McNary Dam. Vol. I. Final Report to Bonneville Power Administration, Portland, Oregon.

McCabe, G. T., Jr., R.L. Emmett, and S.A. Hinton. 1992a Feeding ecology of juvenile white sturgeon (*Acipenser transmontanus*) in the lower Columbia River In: R. C. Beamesderfer and A. A. Nigro, editors. Status and habitat requirements of white sturgeon populations in the Columbia River downstream from McNary Dam. Vol. II. Final Report (Contract DE-AI79-86BP63584) to Bonneville Power Administration, Portland, Oregon.

1992b. Distribution, abundance, and community structure of benthic invertebrates in the lower Columbia River. In: R. C. Beamesderfer and A. A. Nigro, editors. Status and habitat requirements of white sturgeon populations in the Columbia River downstream from McNary Dam. Vol. II. Final Report (Contract DE-AI79-86BP63584) to Bonneville Power Administration, Portland, Oregon.

Moseley, R.K., and C. Groves. 1990 Rare, threatened, and endangered plants and animals of Idaho. Natural Heritage Section. Idaho Department of Fish and Game. Boise, Idaho.

Muir, W.D., R.L. Emmett, and R.J. McConnell. 1988 Diet of Juvenile and Subadult White Sturgeon in the Lower Columbia River and its Estuary. California Fish and Game 74(1): pp 49-54.

National Marine Fisheries Service (NMFS). 2004. Consultation on remand for operation of the Columbia River power system and 19 Bureau of Reclamation projects in the Columbia Basin. (Called the 2004 FCRPS BiOp.) Revised and reissued

pursuant to court order NWF v. NMFS, Civ. No. CV-01-640-RE (D. Oregon). Seattle: NOAA Fisheries, Northwest Region.
2015. ESA Recovery Plan: Snake River Sockeye Salmon. NOAA West Coast Region. https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/snake-river-sockeye-salmon. Accessed on November 24, 2020.
2017a. ESA Recovery Plan for Snake River Spring/Summer Chinook Salmon (Oncorhynchus tshawytscha) and Snake River Basin Steelhead (Oncorhynchus mykiss). NMFS, West Coast Region, Portland, OR. November 2017. https://www.fisheries.noaa.gov/resource/document/recovery-plan-snake-river-spring-summer-chinook-salmon-and-snake-river-basin. Accessed November 24, 2020.
2017b. ESA Recovery Plan for Snake River Fall Chinook salmon. NMFS West Coast Region. Available at: https://www.fisheries.noaa.gov/resource/document/recovery-plan-snake-river-fall-chinook-salmon. Accessed November 24, 2020.
2017c. 2017 Supplemental Recovery Plan Module for Snake River Salmon and Steelhead Mainstem Columbia River Hydropower Projects. NMFS, West Coast Region, Portland, OR. September 2017. https://archive.fisheries.noaa.gov/wcr/publications/recovery_planning/salmon_steelhead/domains/interior_columbia/snake/2017_hydro_supplemental_recovery_plan_module.pdf. Accessed November 24, 2020.
2020a. Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Continued Operation and Maintenance of the Columbia River System. National Marine Fisheries Service. West Coast Region.
2020b. Memorandum of Understanding. Agreement no. NMFS-2020-OHC-074.
Nelle, R.D. 1999 Smallmouth Bass Predation on Juvenile Fall Chinook Salmon in the Hells Canyon Reach of the Snake River, Idaho. Master's Thesis. University of Idaho, Moscow, Idaho. 89 pp.
Oregon Department of Fish and Wildlife and Washington Department of Fish and Wildlife (ODFW and WDFW). 1998 Status Report Columbia River Fish Runs and Fisheries, 1938-1997. 299 pp.
Parr, W., S.J. Clarke, P. vanDijk, and N. Morgan. 1998. Turbidity in English and Welsh waters. Report prepared for English Nature, Report no. Co 4301/1., 116 pp. Marlow: Water Research Centre.
Petersen, J., C. Barfoot, S. Sauter, D. Gadomski, P. Connolly, and T. Poe. 1999 Predicting the effects of dam breaching in the lower Snake River on predators of juvenile salmon. Report prepared for the Army Corps of Engineers, Walla Walla, Washington. Pletcher, F. T.
Pinza, M. R., J. A. Word, L. F. Lefkovitz, and H. L. Mayhew. 1992a. Sediment Sampling of Proposed Dredge Sites in the Confluence of the Snake and Clearwater Rivers. Report Number PNL-7958 UC-000. Sequim, Washington: Battelle Marine Sciences Laboratory.
Pinza, M. R., J. Q. Ward, E. S. Barrows, H. L. Mayhew, and D. R. Clark. 1992b. Snake and Columbia Rivers Sediment Sampling Project. Report PNL-8479 UC-000. Sequim, Washington: Battelle Marine Sciences Laboratory.
Pratt, K.L., M. Kozel, J. Mauser, L. Mauser, and R. Scarpella. 2001. Chronology of activities influencing the region of the Snake River between Shoshone Falls and

Hells Canyon. Special Appendix A to Technical Report Appendix E.3.1-2, Feasibility of reintroduction of anadromous fish above or within the Hells Canyon Complex. Boise, Idaho: Idaho Power Company.
Reid, K. C. 1995. An Overview of Cultural Resources in the Snake River Basin: Prehistory and Paleoenvironments (1st Update). Prepared for the U.S. Army Corps of Engineers by Rainshadow Research, Inc., Pullman, Washington.
Science and Engineering for the Environment, LLC, Dalton, Olmsted and Fuglevand, Inc, and Resource Management Group Inc. (SEE, OMF, and RMG). 2014. 2013 Data Report Lower Snake/Clearwater River Sediment Sampling.
Seybold, W.F., and D.H. Bennett. 2010. Inventory and Impact/Benefit Analyses of Sediment Disposal for Salmonid Fishes at Selected Sites in the Lower Snake River Reservoirs, Washington Final Report.
Sprague, C.R., and L.G. Beckman. 1993. Prey selection by juvenile white sturgeon in reservoirs of the Columbia River. Pages 229-244.
Taylor, D. 2000. Status of the Yellow-Billed Cuckoo in Idaho. Western Birds 31:252-254.
Tiffan, K.F. and Connor. 2012. W. P. 2012. Seasonal Use of Shallow Water Habitat in the Lower Snake River Reservoirs by Juvenile Fall Chinook Salmon; 2010-2011 Final Report of Research. U.S. Geological Survey, Cook, WA and U.S. Fish and Wildlife Service, Ahsahka, Idaho.
University of Washington. 2005. Columbia River DART (Data Acquisition in Real Time). Seattle: University of Washington, School of Aquatic and Fishery Sciences, Columbia Basin Research.
U.S. Army Corps of Engineers (USACE or Corps). 1980 – 2000 Annual Fish Passage Report, Columbia and Snake Rivers. U.S. Army Corps of Engineers Portland and Walla Walla Districts.
1987. Beneficial Uses of Dredged Material, EM 1110-2-5026.
1988. Lower Granite Final Environmental Impact Statement Supplement 1- Interim Navigation and Flood Protection Dredging. U.S. Army Corps of Engineers Walla Walla District.
1999. Lower Snake River Juvenile Salmon Migration Feasibility Study- Water Quality appendix, final draft. Completed by Normandeau Associates in association with Foster Wheeler Environmental Company, Washington State University, and the University of Idaho for the U.S. Army Corps of Engineers Walla Walla District. Delivery Order 011, Contract #DAC2W68-96-D-0003. Walla Walla: U.S. Army Corps of Engineers.
1992. Evaluating Environmental Effects of Dredged Material Management Alternatives – A Technical Framework. U.S. EPA, Office of Water (4504F) and Department of the Army, U.S. Army Corps of Engineers. EPA842-B-92-008, Revised May 2004.
2002a. Dredged Material Management Plan and Environmental Impact Statement, McNary Reservoir and Lower Snake River Reservoirs. U.S. Army Corps of Engineers Walla Walla District. Final. July 2002.
2002b. Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement. U.S. Army Corps of Engineers Walla Walla District, February 2002.
2005. Lower Snake River Navigation Maintenance Environmental Impact Statement (EIS). Lower Snake and Clearwater Rivers, Washington and Idaho. 2006 Risk Analysis for Flood Damage Reduction Studies. ER1105-2-101, January 2006.

2007. Summary of Available Guidance and Best Practices for Determining Suitability of Dredged Material for Beneficial Uses. Dredging Operations and Environmental Research Program. ERDC/EL TR-07-27 November 2007. Project File Number: PM-EC-2016-0007.
2013. Dredged Material Evaluation and Disposal Procedures Users' Manual. U.S. Army Corps of Engineers Seattle District, July 2013. Prepared in cooperation with Region 10 of the U.S. Environmental Protection Agency, the Washington Department of Ecology, and the Washington Department of Natural Resources.
2014. Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement. U.S. Army Corps of Engineers Walla Walla District.
2017. Pest Management Program Implementation Instructions. U.S. Army Corps of Engineers Walla Walla District. August 2017.
2022. Section 106 Determination of Effect for the Proposed Snake River Navigation Channel Maintenance Dredging. U.S. Army Corps of Engineers. Walla Walla, Washington.
U.S. Fish and Wildlife Service (USFWS). 2003. Agreement between the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers for Conducting Fish and Wildlife Coordination Act Activities.
2005. Draft Recovery Plan for Silene spaldingii (Spalding's Catchfly). U.S. Fish and Wildlife Service, Portland, Oregon. 121 pp.
2008. Species Assessment and Listing Priority Assignment Form: Coccyzus americanus.
2010. Best Management Practices to Minimize Adverse Effects to Pacific Lamprey (Entosphenus tridentatus). Compiled by J.K. Brostrum and C.W. Luzier (USFWS) and K. Thompson (U.S. Forest Service).
2014. Bull trout critical habitat units – index map (Washington, Oregon, Idaho, Montana, Nevada). Available from: https://www.fws.gov/pacific/bulltrout/finalcrithab/FR_Maps_CHUs.jpg.
U.S. Commission of Fish and Fisheries. 1878. Report of the Commissioner for 1875-1876: Inquiry into the decrease of the food-fishes. Washington, D.C.: Government Printing Office, Washington, D.C.
U.S. Forest Service (USFS) 2015. USDA Forest Service Strategic Plan: FY 2015-2020. June 2015.
Van Winkle, W. 1914. Quality of the surface waters of Washington. Geological Survey Water Supply Paper 339. Washington, D.C.: Government Printing Office.
Wydoski, R., and R. Whitney. 2003. Inland fishes of Washington. University of Washington Press. Seattle, Washington. 220 pp.
Zimmerman, M.P. 1999 Food habits of smallmouth bass, walleyes, and northern pikeminnow in the lower Columbia River Basin during outmigration of juvenile anadromous salmonids. *Transactions of the American Fisheries Society* 128:1036-1054.

8 Appendices

Appendix A: Programmatic Sediment Management Plan (PSMP) Final Environmental Impact Statement, August 2014
Appendix B: CWA Section 404(b)(1) Evaluation