US Army Corps of Engineers

U.S. Army Corps of Engineers
Walla Walla District

Lower Snake River Programmatic Sediment Management Plan, Final Environmental Impact Statement
Appendix K - Endangered Species Act Consultation

August 2014

Contents

Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement

Appendix K

Endangered Species Act Consultation

Section 1. Letters Requesting Review and Formal Consulatio

USACE, Walla Walla District to USFWS, December 12, 2012

USACE, Walla Walla District to NMFS, December 17, 2012

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

REPLY TO
ATTENTION OF:

December 17, 2012

Planning, Programs, and Project
Management Division

SUBJECT: 2013-2014 Lower Snake River Navigation Channel Maintenance Biological Assessment, PM-EC-2007-0001

Mr. Russ MacRae, Field Supervisor
U.S. Fish and Wildlife Service
11103 East Montgomery, Suite 2
Spokane, Washington 99206

Dear Mr. MacRae:

Pursuant to Section 7(c) of the Endangered Species Act, we request your review and formal consultation on the proposed navigation channel maintenance dredging and in-water disposal of dredged material in the Lower Snake River. The in-water disposal will be designed to create shallow water habitat, beneficial to juvenile salmon.

We have determined that the proposed action *"may affect, and is likely to adversely affect"* bull trout. The project would adversely affect their designated critical habitat. Further, we conclude the project would have "*no effect*" on Ute ladies'-tresses, Canada lynx, Spalding's silene and pygmy rabbit.

Enclosed is our biological assessment for the project. The biological assessment includes determinations for species listed by the National Marine Fisheries Service. Also enclosed is a compact disk with the draft environmental impact statement for the project. If you have any questions about the project or would like additional information, please contact Mr. Ben Tice of my staff at 509-527-7267 or Ben.J.Tice@usace.army.mil.

Sincerely,

Michael S. Francis
Chief, Environmental Compliance Section

2 Enclosures

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

REPLY TO
ATTENTION OF:

December 17, 2012

Planning, Programs, and Project
Management Division

SUBJECT: 2013-2014 Lower Snake River Navigation Channel Maintenance Biological Assessment, PM-EC-2007-0001

Mr. Steve Landino
National Marine Fisheries Service
510 Desmond Drive Suite 103
Lacey, Washington 98503

Dear Mr. Landino:

Pursuant to Section 7(c) of the Endangered Species Act, we request your review and formal consultation on the proposed navigation channel maintenance dredging and in-water disposal of dredged material in the Lower Snake River. The in-water disposal will be designed to create shallow water habitat, beneficial to juvenile salmon.

We have determined that the proposed project *"may affect, and is likely to adversely affect"* Snake River spring/summer Chinook, fall Chinook, and steelhead. The project is "*not likely to adversely affect*" Snake River sockeye. The project would also adversely affect designated critical habitat for these species. Likewise, the project would adversely affect Essential Fish Habitat.

Enclosed is our biological assessment for the project. The biological assessment includes determinations for species listed by the U.S. Fish and Wildlife Service. Also enclosed is a compact disk with the draft environmental impact statement for the project. If you have any questions about the project or would like additional information, please contact Mr. Ben Tice of my staff at 509-527-7267 or Ben.J.Tice@usace.army.mil.

Sincerely,

Michael S. Francis
Chief, Environmental Compliance Section

2 Enclosures

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Endangered Species Act Consultation

Section 2. Snake River Channel Maintenance 2013/2014 Lower Snake River, PM EC-2007-0001 Biological Assessment

U.S. Army Corps of Engineers
Walla Walla District

December 2012

SNAKE RIVER CHANNEL MAINTENANCE 2013/2014

LOWER SNAKE RIVER

PM-EC-2007-0001

Biological Assessment

U.S. Army Corps of Engineers
Walla Walla District
Environmental Compliance Section

12 December 2012

If additional information regarding this document is required, please contact Benjamin Tice, Biologist in the Environmental Compliance Section of the U.S. Army Corps of Engineers, Walla Walla District, at (509) 527-7267, or by email at ben.j.tice@usace.army.mil. Other correspondence can be mailed to:

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U.S. Army Corps of Engineers
Walla Walla District
Environmental Compliance Section

Index of Figures

Index of Tables

Glossary

BMP	Best Management Practice
CFR	Code of Federal Regulations
CH	Critical Habitat
cfs	Cubic feet per second
Corps	U.S. Army Corps of Engineers
cy	Cubic Yards
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act of 1973, as amended
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FPC	Fish Passage Center
HUC	Hydrologic Unit Code
ICBTRT	Interior Columbia Basin Technical Recovery Team
IDFG	Idaho Department of Fish and Game
MCR	Middle Columbia River
MPG	Major Population Group
MOP	Minimum Operating Pool
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act of 1969, as amended
NMFS	National Marine Fisheries Service
NTU	Nephelometric Turbidity Units
PCE	Primary Constituent Element
PFMC	Pacific Fishery Management Council
PIT	Passive Integrated Transponder
Rkm	River Kilometer
ROD	Record of Decision
SR	Snake River
SRB	Snake River Basin (steelhead)
SRF	Snake River Fall (Chinook)
SRSS	Snake River Spring/Summer (Chinook)
UCR	Upper Columbia River
USFWS	U.S. Fish and Wildlife Service
WADOE	Washington Department of Ecology

I. Endangered Species Act of 1973: Biological Assessment

1. Introduction

The U.S. Army Corps of Engineers (Corps) proposes to perform maintenance dredging in 2013/2014 to meet the immediate need of providing a 14-foot navigation channel depth as measured at minimum operating pool (MOP) at four locations in the lower Snake River and lower Clearwater River in Washington and Idaho (Figure 1). The 14-foot minimum depth is the depth required to safely pass large boats and barges. The Corps is authorized by the Flood Control Act of 1952 (Public Law 87-874) to maintain a 14 foot deep channel.

One proposed dredging site is the downstream navigation lock approach for Ice Harbor Dam [Snake River river mile (RM) 9.5], while the other three sites are located at the confluence of the Snake and Clearwater rivers in Lower Granite reservoir. The three sites in Lower Granite are the Federal channel (Snake RM 138 to Clearwater RM 2) and the berthing areas for the Port of Lewiston (Clearwater RM 1-1.5) and Port of Clarkston (Snake RM 137.9 and 139). The Corps identified a suitable, mid-depth location in the Lower Granite reservoir, Snake River Mile (RM) 116 just upstream of Knoxway Canyon, as the in-water discharge site of the dredged materials. The Corps proposes to use the dredged material in a beneficial manner to create additional shallow water habitat for juvenile salmonids.

Channel maintenance by dredging has occurred periodically since 1961 (see Table 1) and was an anticipated action necessary to keep the channel operating for its designated navigational uses. Navigation channel maintenance has not occurred since 2005/2006. Shoaling in the channel and port berthing areas has become critical in these locations. Sediment (mostly sand) has been depositing in these areas in the Snake/Clearwater confluence primarily during spring runoff periods. Bathometric survey results from August 2011 show that the area of the Federal navigation channel shallower than 14 feet (as measured at minimum operating pool (MOP) in the Snake/Clearwater river confluence area) has risen from approximately 38 acres in 2010 to about 50 acres in 2011, an increase of 31 percent. It is likely that additional sediment has been deposited in 2012 and will be in 2013, further increasing the area which does not meet the authorized channel depth. Water depths in the Federal navigation channel at the confluence are now as shallow as 7 feet while the berthing areas at the Port of Clarkston and Port of Lewiston are now as shallow as 7 feet and 9 feet, respectively, based on a MOP water surface elevation. Navigation channel depths less than 14 feet substantially impact access to port facilities.

Shoaling in the Ice Harbor navigation lock approach is interfering with the ability of barge traffic to safely maneuver when entering or exiting the navigation lock. Spill flows at the dam have scoured rock from the base of the four rock-filled coffer cells bordering the lock approach and have pushed material from the edge of the lock approach into the channel, narrowing the room available for barges to maneuver between the coffer cells and the north shore (see figure 7 on page 9). In addition, at least one of the coffer cells has been losing rockfill through the exposed base and this may be contributing to the material encroaching in the lock approach. This material has created a shoal that encroaches across the south half of the lock approach for about 480 feet, reducing the depth to about 9 feet. Temporary repairs to the coffer cell were attempted in 2012.

This biological assessment (BA) documents potential effects to Endangered Species Act (ESA) listed species that may occur as a result of the Corps proposed navigation channel maintenance activities on the lower Snake and Clearwater rivers. In addition, the action area is designated as Essential Fish Habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996, 16 United States Code (U.S.C.) 1855, for Chinook salmon (*Oncorhynchus tshawytscha*) and coho salmon (*O. kisutch*). This BA will be used to facilitate ESA Section 7 formal consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS).

2. Background / History

2.1. Project History

2.1.1. Documentation of Relevant Correspondence

The Corps sent NMFS and USFWS a BA in 2003 analyzing the effects of a proposed 2004/2005 dredging action. NMFS issued a Biological Opinion (BiOp) on March 15, 2004 (NMFS Tracking No. 2003/01293) that concluded implementation of the proposed action was not likely to jeopardize the continued existence of any of the ESA listed species or result in the destruction or modification of designated critical habitat. The dredging was not conducted in 2004/2005. Later the Corps changed the project description slightly. On June 1, 2005, NMFS sent a letter stating they agree with the Corps that the changes to the proposed action would not affect ESA-listed species beyond the effects anticipated by, and considered in, the March 2004 BiOp, and agreed the Corps had satisfied its responsibilities for ESA and MSA consultation.

Similarly, the USFWS issued a BiOp for the 2004/2005 proposed dredging action on October 18, 2004 concluding the action was not likely to jeopardize the continued existence of bull trout or bald eagles. As with the NMFS consultation, the USFWS sent a letter dated July 3, 2005 when the Corps changed the year the action would occur and the proposed action slightly, stating the modifications to the proposed action did not change the analysis of effects in the 2004 BiOp and that it still applied to the modified proposed action.

The Corps signed a Record of Decision (ROD), completing the Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA) in July 2005 on the 2005-06 dredging effort. The ROD selected the Maintenance Dredging with Beneficial Use of Dredged Material alternative.

March 23, 2012 to May 29, 2012 – Email correspondence between the Corps (Ben Tice) and the Services (Dale Bambrick, NMFS; Michelle Eames, USFWS) concluding a programmatic consultation is not feasible unless specific actions can be identified for construction. Consultation on specific actions is appropriate.

August 9, 2012 - A pre-consultation conference call and net meeting was held between NMFS, USFWS and the Corps. The Corps (Sandy Shelin) used a PowerPoint to present background information and the Corps' preliminary proposed plan. A programmatic vs. a case by case, site specific consultation was discussed. It was determined it would be very difficult to do a programmatic consultation in time for implementation of a 2013 action. A more detailed summary of the meeting can be provided by Ben Tice (509-527-7267).

2.1.2. Supplemental Information

Programmatic Sediment Management Plan Draft EIS. December 2012. Walla Walla District, Corps of Engineers.

Lower Snake River Navigation Maintenance, Lower Snake and Clearwater Rivers, Washington and Idaho, Environmental Impact Statement. June 2005. Walla Wall District. Corps of Engineers.

Lower Snake River Channel Maintenance Endangered Species Act Consultation for Anadromous Fish Species. Biological Assessment. Walla Walla District. Corps of Engineers

2004/2005 Routine Maintenance Dredging in the Lower Snake River Reservoirs, Snake River Basin, Asotin, Garfield, Walla Walla, and Whitman Counties, Washington and Nez Perce County, Idaho. Biological Opinion. National Marine Fisheries Service. Seattle, Washington.

Winter 2004/2005 Maintenance Dredging, Lower Snake River. Biological Opinion. U.S. Fish and Wildlife Service. Spokane, Washington.

Dixon Marine Services. 2006. Water Quality Final Report- FY 06, Lower Snake River Dredging Project Snake and Clearwater Rivers, Washington. Iverness, CA. (Available on request)

Corps of Engineers, Walla Walla District 2012a. Lower Snake River Programmatic Sediment Management Plan, 2013/2014 Navigation Maintenance – Draft Monitoring Plan. Walla Walla, WA. August 2012. (Available on request)

Corps of Engineers, Walla Walla District 2012b. Lower Snake and Clearwater Rivers - Draft Sediment Evaluation Report for Proposed 2013/2014 Channel Maintenance. Walla Walla, WA. September 2012. (Available on request)

2.1.3. Federal Action History

The Federal navigation channel in the Snake River refers to that portion of the Snake River inland navigation waterway maintained by the Corps. It begins at the Columbia/Snake River confluence and includes the Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Locks and Dams and associated reservoirs (Lake Wallula, Lake Sacajawea, Lake West, Lake Bryan, and Lower Granite Lake, respectively) on the lower Snake River and ends on the Clearwater River about a mile upstream of the Snake/Clearwater River confluence. The Corps maintains a 14-foot-deep, 250-foot-wide navigation channel through these reservoirs. The Corps is authorized by the Flood Control Act of 1952 (Public Law 87-874) to maintain the channel to these dimensions. There are several main areas of sedimentation problems in the Federal navigation channel: the Snake-Clearwater River confluence in the vicinity of Lewiston, Idaho, and Clarkston, Washington, and the navigation lock approaches below each of the dams.

The confluence of the lower Snake River and Clearwater Rivers occurs at the approximate point of the river-to-reservoir interface for the Lower Granite reservoir. The confluence is bounded by Lewiston, Idaho, and Clarkston, Washington. The Snake River interface with the Lower Granite reservoir begins approximately two miles upriver from this confluence. Gravels and large sands are generally deposited above the confluence. At the confluence, the river's suspended sediment load is primarily smaller sands, silts, clays, and other fine particles. Sampling has shown that sand is the dominant material. The Clearwater River interface with the Lower Granite reservoir begins almost at the confluence. The combination of river-to-reservoir interface and the confluence of the two rivers cause both rivers to lose energy. The result is an ongoing deposition of sediment within the confluence area. The Lower Granite reservoir is estimated to trap approximately 85 percent of the sediment entering the reservoir, with approximately 50 percent of the total sediment load entering the reservoir settling out in the area of the confluence between Lewiston and RM 120. The Federal navigation channel from just downstream of the Port of Clarkston upriver to the Port of Lewiston and the non-Federal navigation areas of the two ports periodically lack adequate water depth for navigation.

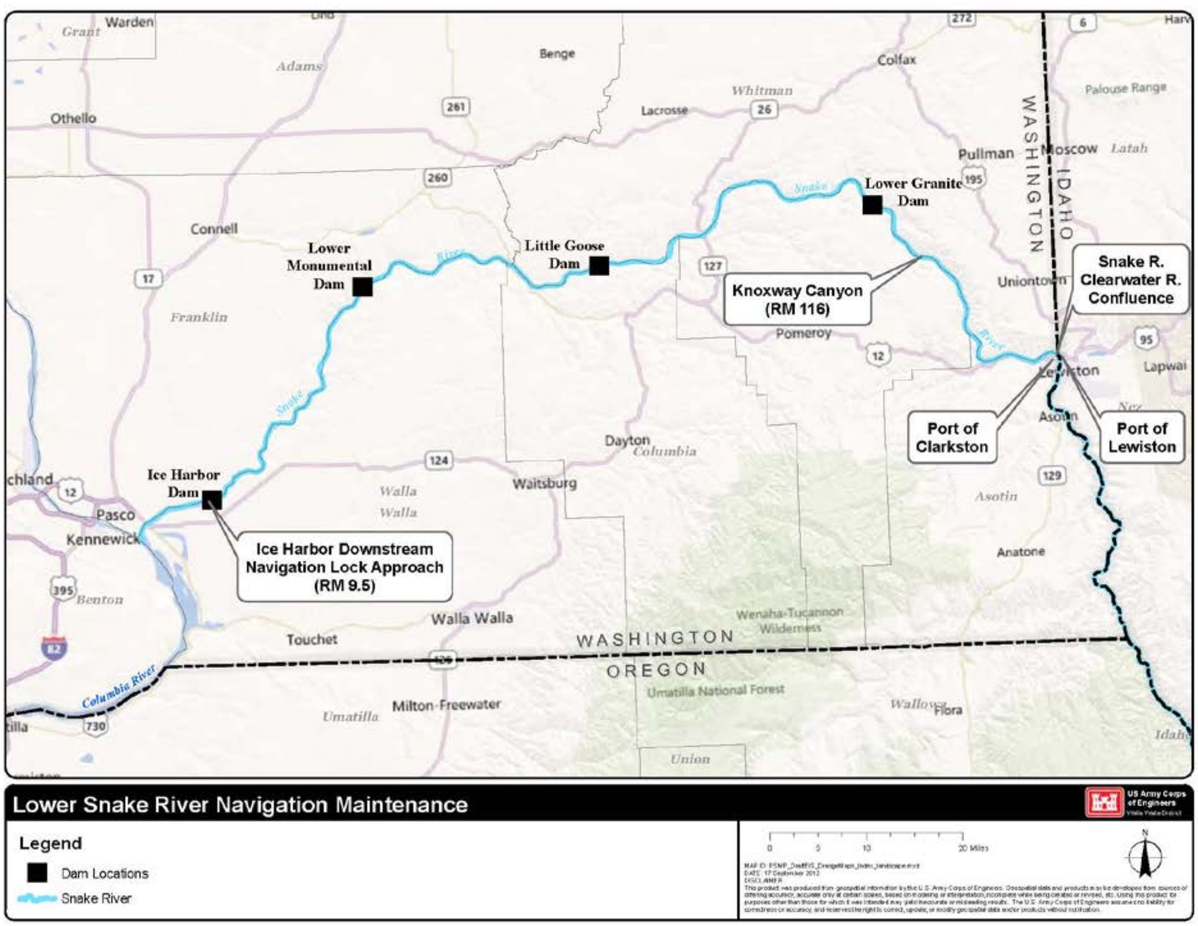

Figure 1 Project action area map of the lower Snake River hydrosystem and navigation system

There are ongoing problems with sedimentation that occur at the downriver approaches to the navigation locks. Each of the four lower Snake River projects is authorized to provide navigation facilities, including locks with dimensions 86 feet wide and over 665 feet long to allow passage of a tug with the four-barge tow commonly used in river navigation. Construction of these dams created a series of slackwater reservoirs on the Snake River, adding an additional 140 miles to the Columbia/Snake River shallow-draft (14-foot) inland navigation system. Areas in the Federal navigation channel within approximately 0.25 to 0.5 miles below the navigation locks at Ice Harbor, Little Goose, Lower Monumental, and Lower Granite Dams periodically experience an excess of sediment materials. The materials are cobble and gravel, similar to the riverbed materials in adjacent areas outside the navigation channel and just below the dams. The cobble and gravel are too large to be readily suspended and are not likely to be bedload, as bedload is unlikely to pass through the locks or over the dam. The source of these unwanted sediment deposits are believed to be a redistribution of local riverbed material caused by flow passing through the spillways during high flows and the sloughing from steep slopes of the channel through hydraulic actions of barge guidance into the lock and initiation of passage through the locks. Discharge through the spillways has been increased in the past decade to aid downriver juvenile salmonids passage through each dam.

Non-Federal navigation areas include commercial ports and berths operated by local port districts or private companies. Most of these non-Federal navigation areas consist of side channels leading from the main Federal navigation channel to the port or berth as well as those areas at the port or berth used for loading, unloading, mooring, or turning around. These facilities are typically designed to accommodate river tugs with up to four barges in tow. Some facilities also accommodate river tour boats carrying recreational passengers.

A history of Walla Walla District dredging in the lower Snake and Clearwater Rivers is shown in Table 1.

Since 2001, NMFS and other agencies have determined the potential negative impacts on listed species that could occur in the project area during the established in-water work window may be more significant than the similar actions that occurred prior to 1999. As a result, the effects from dredging actions on ESA-listed salmonid Evolutionarily Significant Units (ESUs) and Distinct Population Segments (DPSs) have required ESA Section 7 formal consultation. These species primarily include juvenile Snake River Fall (SRF) Chinook salmon and Snake River Basin (SRB) steelhead. In previous consultations the Services have determined the action would not jeopardize the continued existence of the (listed) species or destroy or cause adverse modification to designated critical habitats.

Table 1 History of Channel Maintenance in the Lower Snake and Clearwater Rivers

Dredging Location	Year	Purpose	Amount Dredged [cubic yards (cy)]	Disposal
Excavation of Navigation Channel, Ice Harbor, Part I and II, Channel Construction	1961	Navigation	3,309,500	Upland and in-Water
Navigation Channel, Ice Harbor Part III, Channel Construction	1962	Navigation	120,000	Upland and in-Water
Downstream Navigation Channel, Ice Harbor Lock and Dam	1972	Navigation	80,000	Upland and in-Water
Downstream Approach Navigation Channel, Lower Monumental Lock and Dam	1972	Navigation	25,000	Upland
Navigation Channel Downstream of Ice Harbor Lock and Dam	1973	Navigation	185,000	Upland and in-Water
Downstream Approach Channel Construction, Lower Monumental Lock	1973	Navigation	10,000	Upland
Downstream Approach Channel Construction, Ice Harbor Lock	1978	Navigation	110,000	Upland and in-water
Downstream Approach Channel Construction, Ice Harbor Lock	1978 1981/82	Navigation	816,814	Upland and in-water
Various Boat Basins, Swallows Swim Beach, Lower Granite Reservoir (Corps)	1975-1998	Recreation	20,000	Upland sites
Port of Lewiston – Lower Granite Reservoir (Corps)	1982	Navigation/Maintain Flow Conveyance Capacity	256,175	Upland sites
Port of Clarkston – Lower Granite Reservoir (Corps)	1982	Navigation	5,000	Upland sites
Downstream Approach Channel Construction, Ice Harbor Lock	1985	Navigation	98,826	In-water
Confluence of Clearwater and Snake Rivers (Corps)	1985	Maintain Flow Conveyance Capacity	771,002	Upland site
Port of Lewiston – Lower Granite Reservoir (Corps)	1986	Navigation/Maintain Flow Conveyance Capacity	378,000	Upland sites
Confluence of Clearwater and Snake Rivers (Corps)	1988	Maintain Flow Conveyance Capacity	915,970	In-water
Confluence of Clearwater and Snake Rivers (Corps)	1989	Maintain Flow Conveyance Capacity	993,445	In-water
Schultz Bar – Little Goose (Corps)	1991	Navigation	27,335	Upland site
Confluence of Clearwater and Snake Rivers (Corps)	1992	Maintain Flow Conveyance Capacity	520,695	In-water
Barge Approach Lane, Juvenile Fish Facilities, Lower Monumental	1992	Navigation	10,800	Upland site
Ports of Lewiston (Lower Granite Reservoir), Almota and Walla Walla	1991/92	Navigation	90,741	Upland and in-water
Schultz Bar – Little Goose (Corps)	1995	Navigation	14,100	In-water
Confluence of Clearwater and Snake Rivers (Corps)	1996/97	Navigation	68,701	In-water
Confluence of Clearwater and Snake Rivers (Corps)	1997/98	Navigation	215,205	In-water
Greenbelt Boat Basin, Clarkston – Lower Granite Reservoir	1997/98	Recreation	5,601	In-water
Port of Lewiston – Lower Granite Reservoir (Port)	1997/98	Navigation	3,687	In-water
Port of Clarkston – Lower Granite Reservoir (Port)	1997/98	Navigation	12,154	In-water
Lower Granite Navigation Lock Approach	1997/98	Navigation	2,805	In-water
Lower Monumental Navigation Lock Approach	1998/99	Navigation	5,483	In-water

Dredging Location	Year	Purpose	Amount Dredged [cubic yards (cy)]	Disposal
Lower Monumental Navigation Lock Approach	2005/06	Navigation	4,583	In-water
Lower Granite Navigation Lock Approach	2005/06	Navigation	342	In-water
Port of Lewiston	2005/06	Navigation	7,744	In-water
Port of Clarkston	2005/06	Navigation	19,896	In-water
Confluence of Clearwater and Snake Rivers (Corps)	2005/06	Navigation	538,052	In-water

3. Project Description

3.1. Authority

The Corps was authorized by Congress to maintain a 14-foot-depth for navigation in the Flood Control Act of 1962 (Public Law 87-874)]. The Corps is working to develop methods to maintain navigation, while avoiding or minimizing negative impacts to the environment and adverse effects to ESA-listed species.

3.2. Project Area and Action Area

3.2.1. Action Area

The area directly affected by the proposed action begins near Lewiston, Idaho and Clarkston, Washington at the confluence of the Snake and Clearwater Rivers (approximately RM 139 on the Snake River), and extends downstream to the downstream navigation lock approach at Ice Harbor Dam (approximately Snake RM 10). The action area also extends upstream from the confluence of the Clearwater and Snake Rivers to around RM 1.2 on the Clearwater River. Both adult and juvenile life stages of ESA-listed Snake River spring/summer (SRSS), SRF Chinook, Snake River Basin (SRB) steelhead and Snake River (SR) sockeye salmon, as well as adult Columbia Basin bull trout use the action area as a migration corridor. The action area also provides spawning and rearing habitat for SRF Chinook salmon, although very little SRF Chinook salmon spawning occurs in the mainstem of the lower Snake River below the Snake and Clearwater Rivers confluence. Some adult SRB steelhead and juvenile SRSS Chinook salmon also overwinter in the action area.

Table 2 lists the sites proposed for dredging in 2013 and 2014 and the estimated quantities of material to be removed from each site. Sediment is expected to continue to accumulate at these locations while this action is being planned, therefore the amount of material to be removed at the time of the dredging will likely be greater than what is shown in Table 2. The Corps anticipates the quantity of material needing to be dredged will range from 422,000 cubic yards (cy) to a maximum of 500,000 cy.

Table 2 Sites Proposed for Immediate Maintenance Dredging

Site to be Dredged	Quantity to be Dredged (cy)[1]
Federal navigation channel at confluence of Snake and Clearwater Rivers (Snake RM 138 to Clearwater RM 2)	406,595
Port of Clarkston (Snake RM 137 and 139)	10,220
Port of Lewiston (Clearwater RM 1-1.5)	3,000
Ice Harbor Navigation Lock Approach (Snake RM 9.5)	1,950
Total	**421,765**

Note: [1] Based on removal to 16 feet below MOP using survey data from November 2011.

Confluence of Snake and Clearwater Rivers (Federal navigation channel). About 406,600 cy of material will be removed from the Federal navigation channel at the confluence of the Snake and Clearwater Rivers (Figures 2 and 3).

Currently at locations in front of port berthing areas, the Federal navigation channel is expanded up to a maximum total width of 950 feet. This widening is provided to allow for maneuvering of barge tows in accordance with navigation practice described in 33 U.S.C. § 562, "Channel dimensions specified shall be understood to admit of such increase at the entrances, bends, sidings, and turning places as may be necessary to allow for the free movement of boats."

Sediment samples were collected in August 2011 from the main navigation channel in the confluence area. The average percent sand and fines (i.e., small particles of sediment, generally silts and clays) from the 2011 samples was 100 percent and 0 percent, respectively.

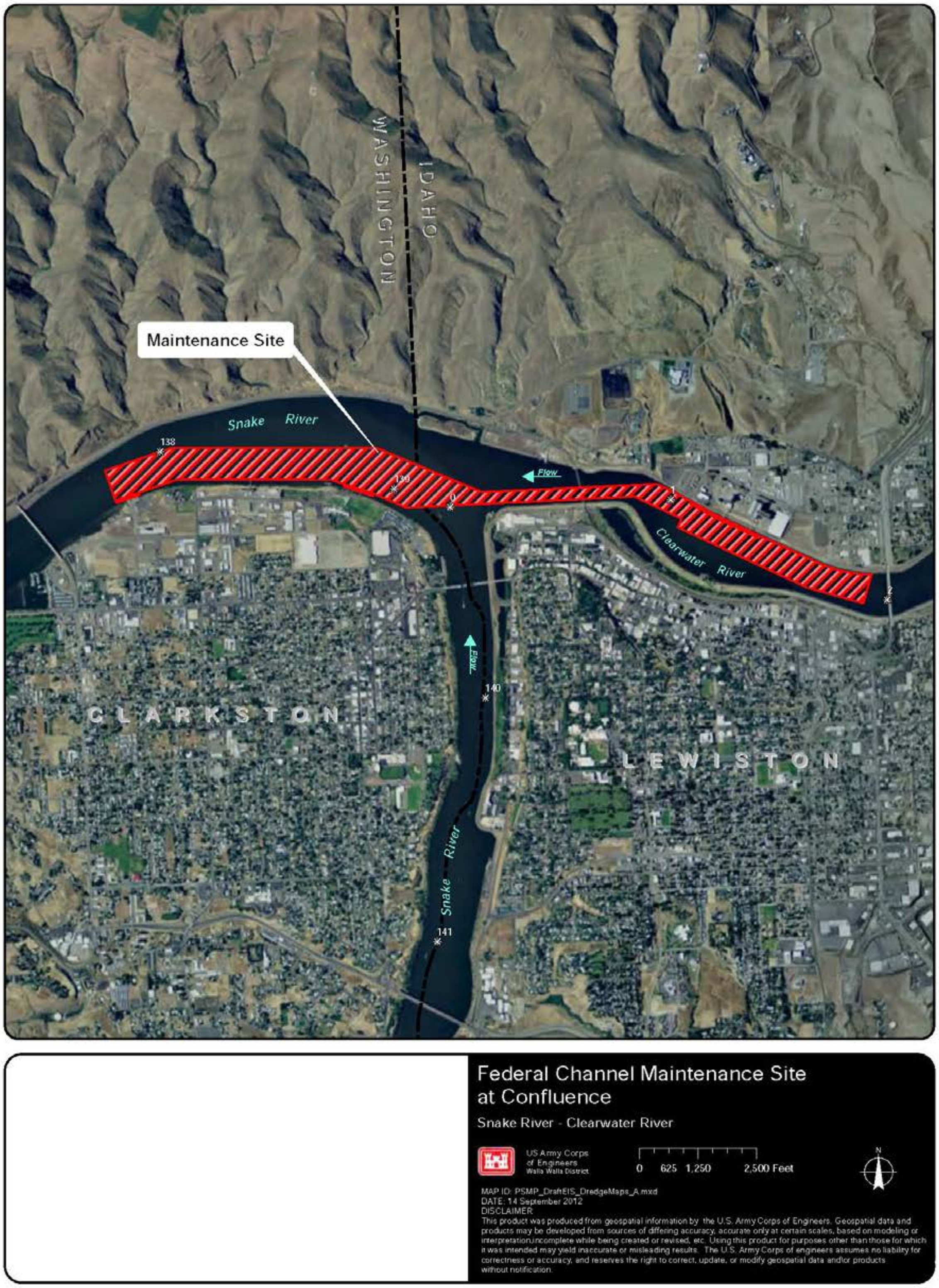

Figure 2 Federal Navigation Channel near Clarkston, WA and Lewiston, ID.

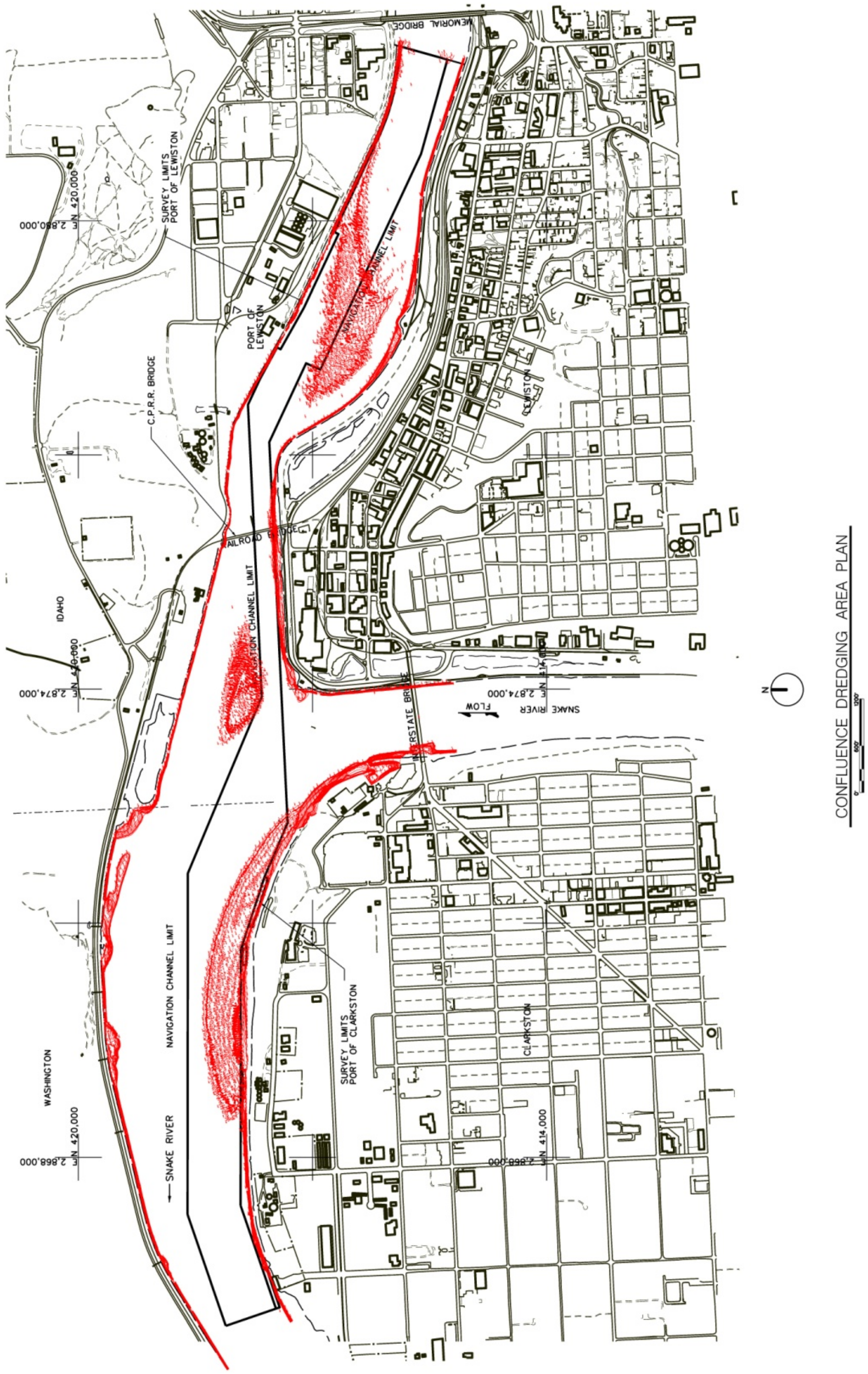

Figure 3 Shallow areas (less than 14 feet at MOP) within the Federal navigation channel and port berthing areas.

Port of Clarkston. About 10,200 cy of material will be removed from two berthing areas at the Port of Clarkston, the crane dock at the downstream end of the Port property and the tour boat dock at the upstream end (Figure 4). The berthing area is defined as a zone extending 50 feet out into the river from the port facilities and running the length of the port facilities. Maintenance in this area is the port's responsibility, and the Port of Clarkston will provide funding to the Corps for this portion of the work. Most of the area was last dredged in 2005/2006. Sediment surveys in 2011 showed that sediment composition was primarily of 86- to 99-percent sand and 1- to 14-percent fines.

Figure 4 Port of Clarkston dredging areas.

Port of Lewiston. About 3,000 cy of material will be removed from the berthing area at the Port of Lewiston (Figure 5). The berthing area is defined as a zone extending 50 feet out into the river from the port facilities and running the length of the port facilities. Maintenance in this area is the port's responsibility, and the Port of Lewiston will provide funding to the Corps for this portion of the work. The area was last dredged in 2005/2006. Sediment surveys in 2011 showed that sediment composition was similar to that found at the Port of Clarkston.

Figure 5 Port of Lewiston dredging area.

Ice Harbor Lock Approach. About 1,950 cy of material will be removed from the Ice Harbor lock approach (figures 6 and 7). Dredging has not occurred in this area since the 1970's. Sediment sampling showed that sediment composition was large rock substrate and cobbles greater than or equal to 2-6 inches.

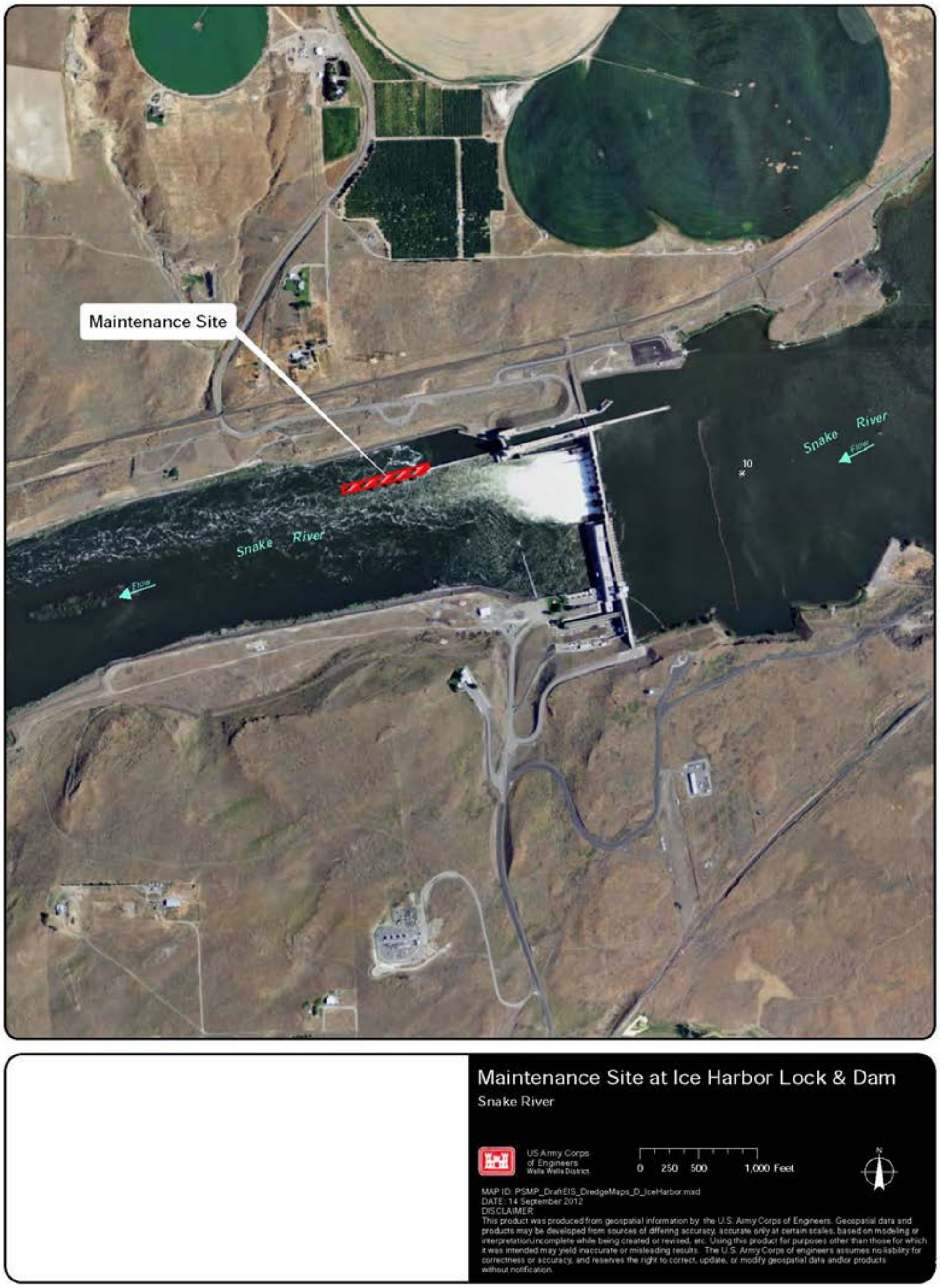

Figure 6 Dredging location at Ice Harbor navigation lock approach.

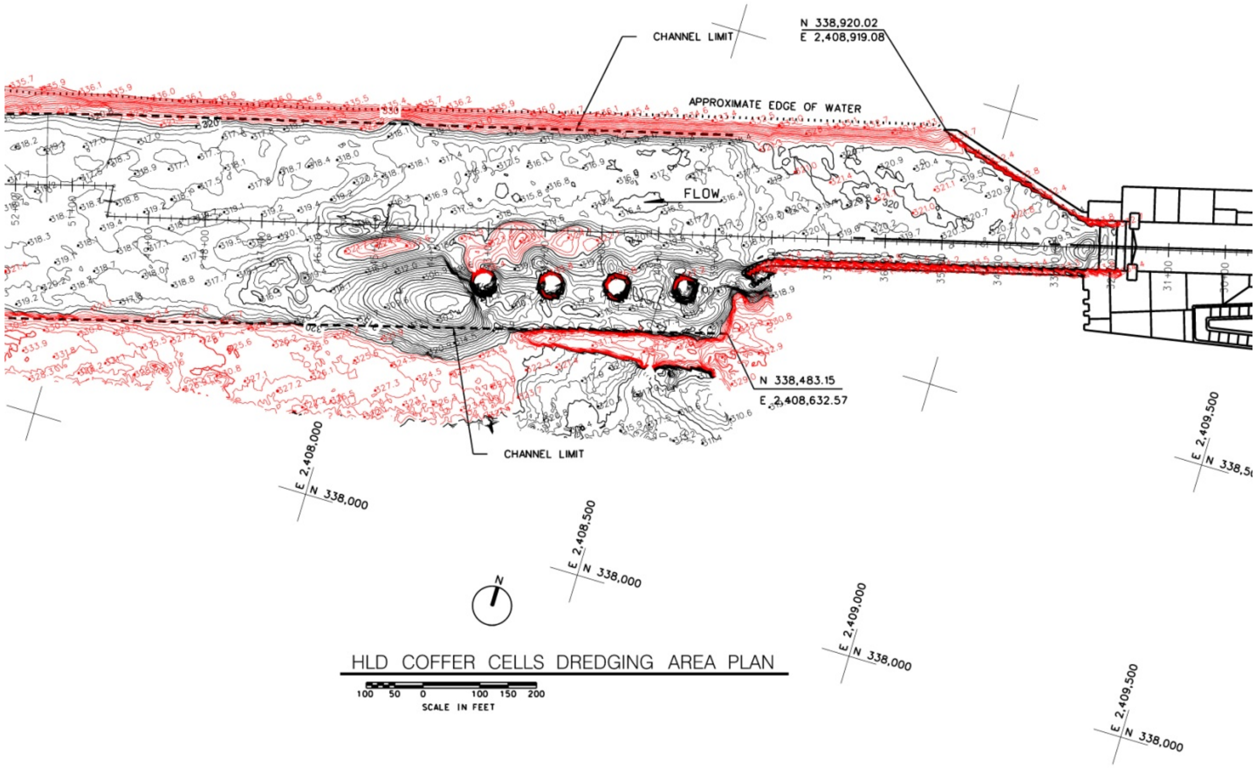

Figure 7 Shoaling at Ice Harbor navigation lock approach. Areas less than 14 feet deep at MOP are in red.

3.2.2. HUC, Township, Range, Section

USGS Hydrological Unit Codes (HUC) for this action include the Clearwater (17060306), the Lower Snake-Tucannon (17060107) and Lower Snake River (17060110) which are all designated as current essential fish habitat (EFH) for Chinook and currently accessible, but unutilized historic habitat for coho and the Lower Snake-Asotin (17060103) which is designated as currently accessible, but unutilized historic habitat for both Chinook and coho salmon.

The project footprint follows the Snake and Clearwater Rivers from Section 31 of Township 36 North, Range 5 West to Section 24 of Township 9 North, Range 31 East.

3.2.3. Quantification of Area Potentially Affected

Dredging will be aimed at restoring the navigation channel to the authorized depth by dredging to a depth of no more than 16 feet as measured at MOP. The overdepth dredging (i.e., to 16 feet) is standard procedure as outlined in Engineer Regulation 1130-2-520, *Project Operations – Navigation and Dredging Operations and Maintenance Policies* (USACE 1996). Overdepth allowance helps minimize the need for more frequent and intermittent dredging of high spots. A 16-foot depth is used as the maximum dredging depth in the Federal navigation channel in order to maintain a consistent 14-foot depth. Of the additional 2 feet, 1 foot is considered advance maintenance, which is the additional depth or width specified to be dredged beyond the project channel dimensions for the purpose of reducing overall maintenance costs and impacts by decreasing the frequency of dredging. The other foot is considered allowable overdepth, which is the additional depth below the required section specified in a dredging contract, and is permitted because of inaccuracies in the dredging process (USACE 1996).

The specific areas to be dredged were previously discussed (above). A total area of more than 50 acres of river bottom will be affected by the dredging. Another 26 acres will be directly affected at the disposal site. Some sand and silt will be carried a short distance downstream of these disturbed areas. The work will be distributed over 130 miles of river (from just below Ice Harbor Dam to Lewiston, ID with most of the work occurring from Snake RM 116 to 139.

3.3. Project Purpose and Objectives

The purpose of the routine channel maintenance is to provide a 14-foot depth throughout the designated Federal navigation channel in the project area and to restore access to selected port berthing areas. Sediment deposition can affect uses of the lower Snake River by building up on the existing bottom, thus reducing the water depth. Sediment deposits that create shallow-water areas are called shoals. Because routine channel maintenance has not occurred since 2005/2006, shoaling in the channel has become critical in some locations. There is a safety hazard if the water depth over the shoal is less than that shown on navigation charts, as vessels striking the shoal may become grounded and be damaged.

Groundings could result in the leakage or loss of cargo into the river, possibly presenting serious environmental consequences or concerns since petroleum products and fertilizer are among the top five commodities carried on the Snake and Columbia Rivers.

3.4.Project Description

3.4.1. Project Activities

The Corps proposes to perform maintenance dredging in 2013/2014 to meet the immediate need of providing a 14-foot water depth as measured at MOP at four locations in the lower Snake River and lower Clearwater River. The Corps identified a location in the Lower Granite reservoir, RM 116 just upstream of Knoxway Canyon, as the in-water discharge site of the dredged materials. The Corps proposes to use the dredged material to create additional shallow water habitat for juvenile salmonids. The material at the Ice Harbor navigation lock approach will be removed first. It will be placed on the bottom of the disposal area then the equipment will move up to the Clarkston/Lewiston sites.

Sediment Removal Methods

Dredging will be accomplished by a contractor using mechanical methods, such as a clamshell, dragline, or shovel/scoop. Based on previous dredging activities, the method to be used will likely be a clamshell. Material will be dredged from the river bottom and loaded onto barges for transport to the disposal site (see figure 8). Clamshell dredges with a capacity of approximately 15 cy and barges with capacity of up to 3,000 cy and maximum drafts of 14 feet will be used. It will take about 6 to 8 hours to fill a barge. The expected rate of dredging is 3,000 to 5,000 cy per 8-hour shift. The contractor could be expected to work up to 24 hours per day and 7 days per week if needed. Material will be scooped from the river bottom and loaded onto a barge, most likely a bottom-dump barge. While the barge is being loaded, the contractor will be allowed to overspill excess water from the barge, to be discharged a minimum of 2 feet below the river surface. Water quality monitoring will take place upstream (for background) and downstream of the dredge (as described in a monitoring plan for this project). The data will be collected near real-time so that timely measures can be taken to avoid exceeding both Washington and Idaho state water quality standards. These are the same procedures used during the previous dredging action in 2005/2006.

Disposal Site

Once the barge is full, a tugboat will push it to the disposal site. No material or water will be discharged from the barge while in transit. For in-water disposal, when the barge arrives at the disposal site and is properly positioned, the bottom will be opened to dump the material all at once. Once unloaded, the barge will be returned to the dredging site for additional loads.

The proposed in-water discharge/habitat development site is located in the Lower Granite reservoir at Snake RM 116 (Knoxway Canyon site). This site is an approximately 120-acre, mid-depth bench on the left bank of the Snake River about 0.5 river miles upriver of Knoxway Canyon. The Knoxway Canyon site was historically an old homestead orchard and pasture located several hundred feet upland of the historic river shoreline. The beneficial use site is located in a low velocity area that has been accumulating sediment at an estimated rate of 2 inches per year since the filling of Lower Granite reservoir. The substrate at this site was visually inspected in 1992 during the reservoir drawdown test and was observed to be primarily silt. The upstream end of the site was used as the in-water disposal site for the 2005/2006 navigation maintenance dredging. Approximately 420,000 cubic yards of sand and silt was deposited on the upriver end of the Knoxway bench. An estimated 3.7-acre shallow water habitat shelf was created for summer rearing juvenile fall Chinook salmon (Figure 8). The upper surface of this material is sand that was reshaped to gently slope towards the river.

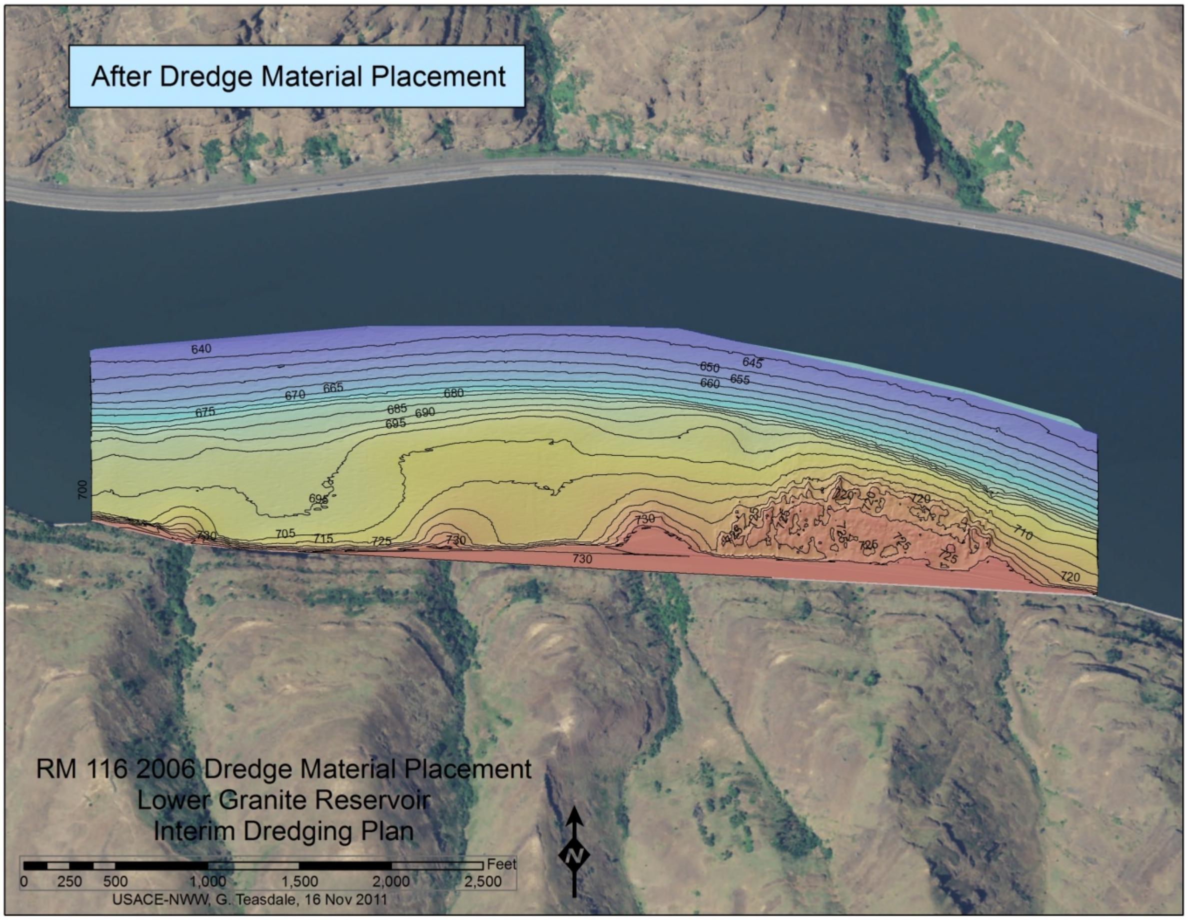

Figure 8 Contour map of RM 116 disposal site at Knoxway Canyon.

The material from the proposed 2013/2014 dredging will be deposited adjacent to and downstream of the material deposited in 2005/2006 (Figure 9). The new material will occupy a 26-acre footprint and will form a uniform, gently sloping shallow-water bench along about 3,500 linear feet of shoreline. The top of the bench will have a 2% slope and will provide about 7.36 acres of additional aquatic habitat up to 6 feet deep at MOP with features optimized for resting/rearing of outmigrating juvenile salmonids, particularly for SRF Chinook salmon (Figure 10). The Corps anticipates there will be about 18 acres of lesser-quality shallow water habitat at depths of 6 to 20 feet on the slope of the bench.

The overall plan is to place the dredged material in the below-water portion of the bench extending downriver from the material deposited in 2006 and riverward of the existing shoreline. However, rather than place the material in a block as was done in 2006, the Corps will place the material in a “ribbon” along the shoreline. This placement approach is based on results of recent biological surveys (Tiffan and Conner 2012, Artzen et al. 2012; Tiffan and Hatten 2012). These results indicate that a more useful design for the shallow water habitat will be to place the sand and silt material into a narrow band with a width of about 50 feet and a surface plane depth of 6 feet at MOP elevation 733 feet that parallels the shoreline. Placement of cobbles, rock, silt, and silt/sand mixture will occur in a manner that will extend the shore riverward along the proposed disposal site to enhance the rearing suitability of the mid-depth habitat bench, by creating a low horizontal slope across the newly created shallow-water rearing habitat. Final grading or reshaping to achieve the target slope will occur, if necessary, once disposal of all dredge material is complete.

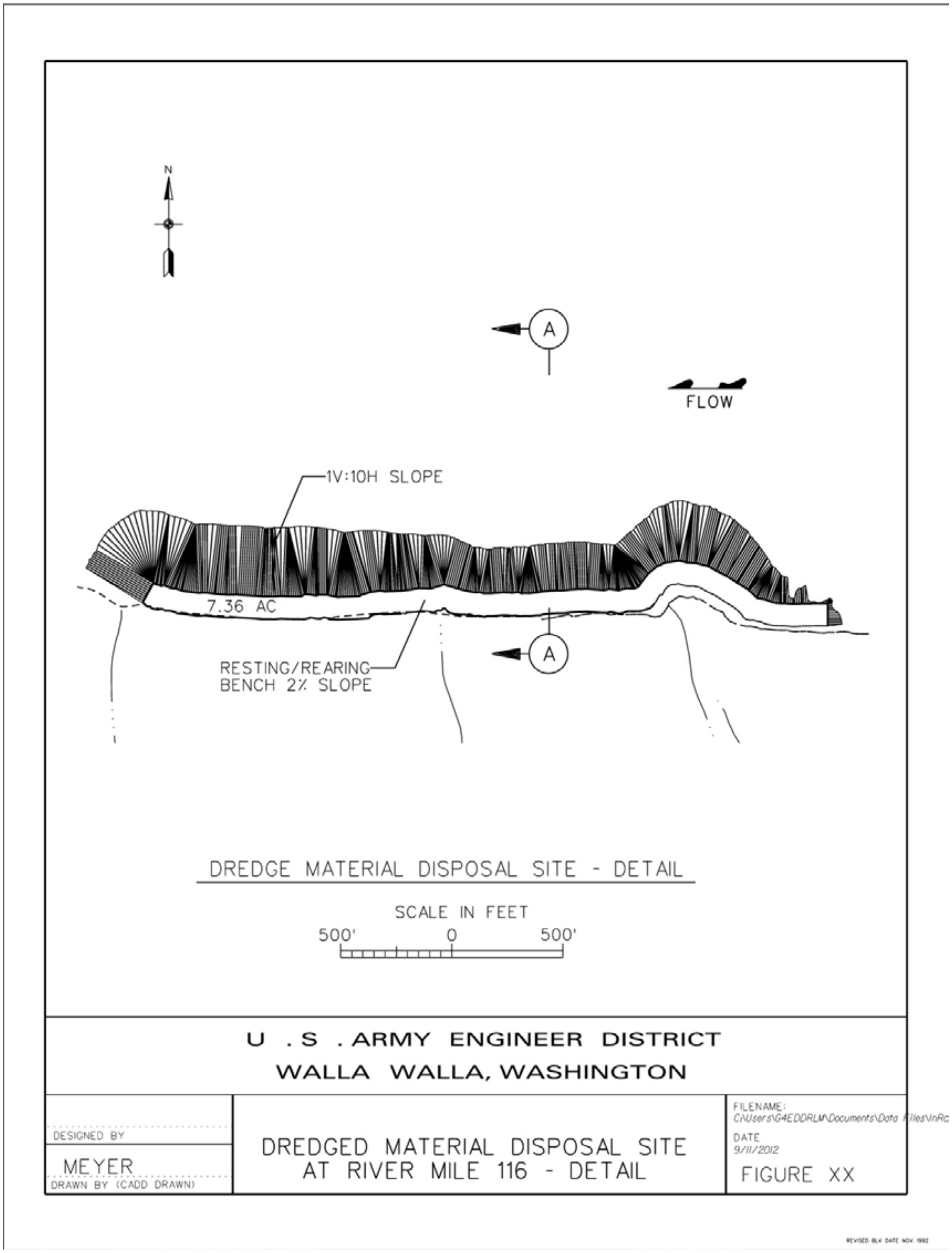

Figure 9 Site plan for disposal at RM 116.

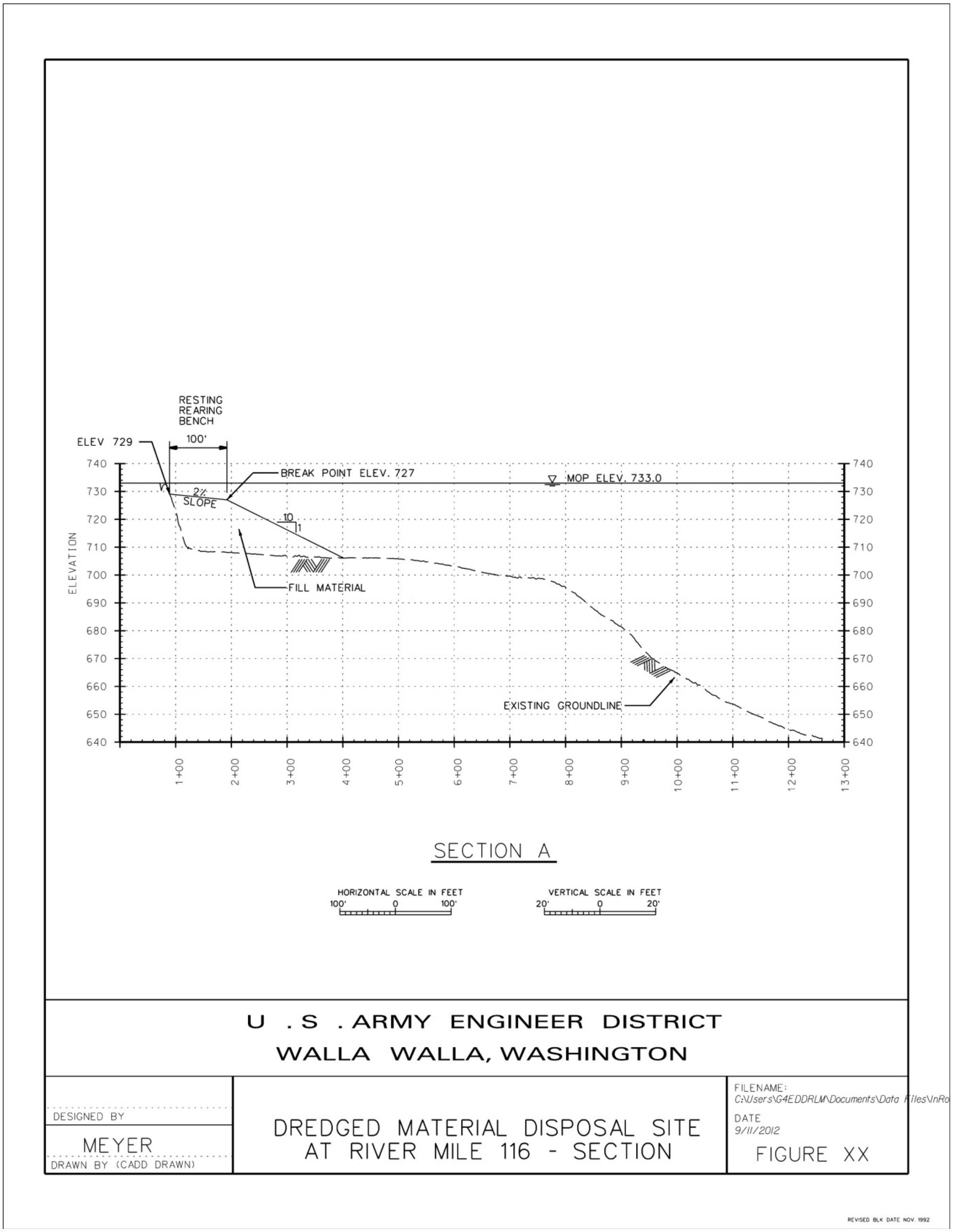

Figure 10 Cross section of disposal at RM 116.

During the 2005/2006 dredging project several water quality parameters were monitored in near real-time. Turbidity was the principal parameter that was influenced by the dredging activity in the Snake River. Turbidity values measured in the field were compared to background values and action levels were defined by the states' established criteria. The Port of Lewiston monitoring station did not report any turbidity values (hourly averages) above the State of Idaho water quality criteria of 50 Nephelometric Turbidity Units (NTU) units above background. For the remaining sites located in the State of Washington, there were some readings which exceeded the background reading average by 5 NTU units, the State of Washington Ecology Department water quality criteria.

The Corps proposes to monitor water quality, biological effects and structural stability of the disposed material in associations with the navigation channel maintenance dredging at four locations in the lower Snake River and lower Clearwater River in Washington and Idaho. This plan includes water quality monitoring that has been historically required for maintenance dredging projects in the lower Snake River as well as addressing concerns raised in previous ESA consultations. These concerns include viability of fish habitat and stability of the disposal embankment. Additional monitoring requirements may be identified in the Section 401 Water Quality Certification the Corps is requesting from Washington Department of Ecology or the short term activity exemption the Corps is requesting from Idaho Department of Environmental Quality. The Corps intends to issue one or more reports presenting the results of the monitoring. All the Corps' monitoring activities described in this plan may be conducted either by the Corps or its contractors, based on the availability of funds.

Monitoring will be conducted pre-dredging, during dredging and disposal and post-dredging and disposal. Pre-dredging includes redd surveys within the Ice Harbor navigation lock approach. Based on multiple years of surveys since 1993, no redds have ever been found within the navigation lock approaches of any of the lower Snake River dams (Mueller and Coleman 2007, Mueller and Coleman 2008). Since potential spawning habitat exists within the footprint of the proposed dredging area of the Ice Harbor Dam tailrace, the proposed action may have the potential to disturb or harm eggs and alevins in redds if found to be present immediately prior to or during the proposed dredging activities. In an effort to avoid disturbing or harming fall Chinook redds, the Corps will conduct underwater surveys of the proposed dredging site at the Ice Harbor navigation lock in November and the first 2 weeks of December in 2013 prior to commencing dredging. Techniques similar to those used by Battelle from 1993 to 2008 (Dauble et al. 1994-1997; Mueller and Coleman 2007, 2008) will be employed. This technique has used a combination of a boat mounted underwater video camera tracking system to look at the bottom of the river to identify redds. Results of the surveys will be transferred to the Corps within 2 days of the survey dates in order for compilation prior to December 15, at which time the Corps can communicate results to NMFS for appropriate action. If no redds are located, then the Corps will proceed with proposed dredging within the boundaries of the surveyed template. If one or more redds are located within the proposed dredging template and such redds are verified with video, then the Corps will coordinate with NMFS to determine what the appropriate avoidance and protection actions should be prior to dredging the affected location.

Pre-dredging also includes rearing habitat and site use surveys. The Corps has conducted multiple years of biological surveys within the lower Snake River including at the proposed RM 116 disposal site to determine current usage by juvenile salmonids, potential usage as rearing habitat by fall Chinook, and the efficacy of in-water disposal of dredged material for creating juvenile fall Chinook resting and rearing habitat in the lower Snake River reservoirs. The results of this research have shown that the use of dredged material to create shallow-water habitat has not adversely affected salmonid species and after stabilization provides suitable salmonid rearing and shallow habitat functions (Gottfried et el. 2011). These newly built shallow water areas were found to be at least as productive for invertebrates as compared to reference sites, provide beneficial shallow water habitat for natural subyearlings during the spring and summer (i.e., rearing fall Chinook), minimized the presence of predators at that site, and in general made the reservoir environment more hospitable for the Chinook salmon using it (Artzen et al. 2012; Gottfried et al. 2011; Tiffan and Conner 2012).

During the dredging and disposal activities, the Corps will monitor water quality to ensure state criteria are not being exceeded. The Corps will monitor depth, turbidity, pH, temperature, dissolved oxygen, and conductivity. Water quality monitoring will be performed before, during, and after all in-river work at each active dredging site and at the disposal site. The equipment will have the capability to transmit the data via satellite or radio relay rather than having to be downloaded at each station in the field.

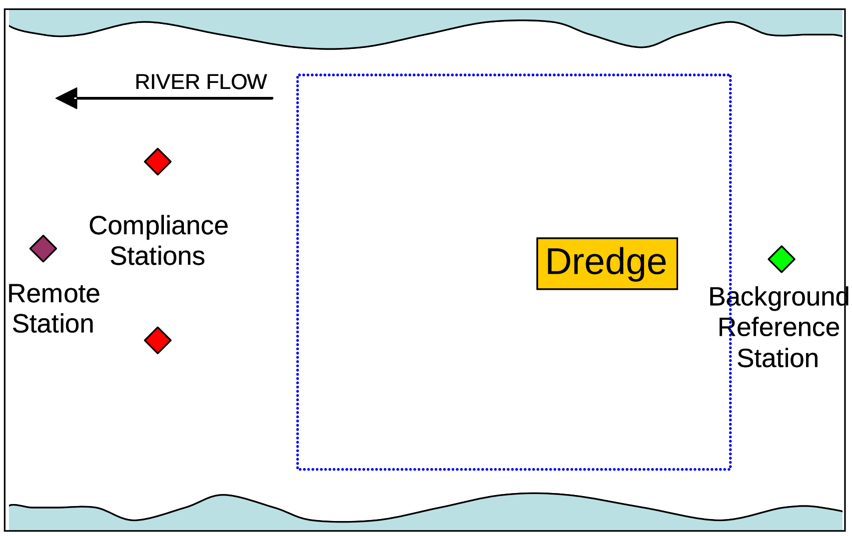

Figure 11 Schematic of water quality monitoring locations.

Biological monitoring includes fish monitoring. The Corps' contractor will monitor for sick, injured, or dead fish. They will visually monitor the waters surrounding the dredging and disposal activities as well as observing the content of each clamshell bucket as it discharges in the barges. If a sick, injured, or dead specimen is encountered, it will be placed in a container of cold river water until it could be determined if it was a species listed under the ESA. If it is a listed species, the contractor will notify the Corps and the Corps will then contact the appropriate Service as soon as possible for further instructions. If a healthy fish gets entrained by the dredging operations, the Corps will make every reasonable attempt to return the specimen safely back to the river.

Post-dredging and disposal will include hydrographic surveys to ensure the disposal site is constructed as planned. The Corps will perform follow up surveys after the first spring runoff following disposal.

Additional biological monitoring will be conducted post-dredging. Use by juvenile salmonids of the newly created habitat at the disposal site will be conducted. The Corps will collect fish use monitoring 2 years and 10 years after the project is complete (subject to the availability of funding).

Monitoring embankment stability will be accomplished by taking soundings soon after disposal is complete. Soundings will again be taken in the summer after high flows in order to determine if the embankment slumped or moved. This information will be used to make adjustments in the percentage of silt allowable for potential future dredged material placement, and to determine whether or not a berm should be constructed around the toe of the embankment to prevent movement. Monitoring of the biological use of the embankment will be accomplished by sampling fish species presence and abundance in the area post-construction.

3.4.2. Project Elements

The project includes the following main elements.

1. Mobilization of equipment to the Ice Harbor navigation lock approach.
2. Dredging of the approach.
3. Movement of equipment and dredged material up to the Knoxway Canyon disposal site.
4. Placement of the dredged rock at the disposal site.
5. Movement of equipment to the Clarkston/Lewiston dredging sites.
6. Dredging in the Federal navigation channel, the Port of Lewiston and the Port of Clarkston.
7. Transfer of dredged material to the disposal site at Knoxway Canyon.
8. Water quality monitoring at the dredging and disposal sites.
9. Redistribution of material at the disposal site to create a “ribbon” of shallow water habitat along the shoreline.
10. Surveying of the dredging and disposal sites to ensure required depths are met.
11. Demobilization of equipment when all dredging and disposal is complete.
12. Monitoring embankment stability
13. Fish use monitoring

3.5. Project Timeline

Under the proposed action all dredging and disposal action will 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 time period in which in-water work could be performed with the least impact to ESA-listed salmonid stocks.

3.6. Project Sequence

Dredging will begin at the Ice Harbor site then move upriver to the Clarkston/Lewiston sites. Material will be dredged from the river bottom and loaded onto barges for transport to the disposal site. It will take about 6 to 8 hours to fill a barge. The expected rate of dredging is 3,000 to 5,000 cy per 8-hour shift. The contractor could be expected to work up to 24 hours per day and 7 days per week in order to ensure all work is completed during the in-water work period. While the barge was being loaded, the contractor will be allowed to overspill excess water from the barge, to be discharged a minimum of 2 feet below the river surface.

Once the barge is full, a tug will push it to the disposal site. Once unloaded, the barge will be returned to the dredging site for additional loads. All dredging will be performed within the established in-water work window (December 15 through March 1). Multiple-shift dredging workdays will be used when necessary to ensure that dredging was completed within this window.

At the disposal site, the dredged material will be placed in steps. The first step will be to place the cobbles from the Ice Harbor lock approach either on the surface of the disposal site or along the outer edge of the planned footprint to form a berm. This will be followed by placing a mixture of the silt (less than 0.0024 inch in diameter), sand, and gravel/cobble, to fill the mid-depth portion of a site and form a base embankment. The dredged material will be transported by barge to the disposal area, where the material will be placed within the designated footprint. This footprint will be close to the shoreline, so that the river bottom could be raised to create an underwater shelf about 10 feet below the desired final grade. Because the barges may not be able to dump in the shallow depths, additional equipment will likely be needed to place or reshape the material to bring it up to the desired finished grade and slope. This may be accomplished by using hydraulic placement of material, which involves pumping the material from the barge through a pipe or hose to the surface of the disposal site and guiding the pipe so the material is placed where needed. It may also be accomplished by using equipment such as a clamshell bucket to move the material to meet the desired configuration.

The final step will be to place sand on top of the sand/silt embankment. An area of sand will be reserved as the final area to be dredged during the dredging activity. Sand will be placed on top of the base embankment in sufficient quantity to ensure that a layer of sand at least 10 feet thick covers the embankment once the final step of the process was completed. As described above, the sand could be placed using hydraulic placement or mechanical equipment. The final step includes placement or re-handling of the material to form a gently-sloping (3 to 5 percent) shallow area bench with water-ward edge depths down to 6 feet, finished on top of a stable base slope down to 20 feet deep, both measured at MOP. The sand cap layer will be created with a minimum thickness of 10 feet to ensure that the most desirable substrate (sand with limited fine-grained or silt material) was provided for salmonid-rearing habitat.

Monitoring embankment stability will be accomplished by performing hydrographic surveys soon after disposal was complete and periodically in the future to determine if the embankment slumped or moved.

3.7. Operational Characteristics of the Proposed Action

The proposed action will not change any operations of hydrosystem facilities that underwent the formal consultation process in the 2008 Federal Columbia River Power System (FCRPS) BiOp and 2010 Supplemental BiOp. The relevant operational characteristics of the proposed action will be decreased water velocity through the dredged sediment removal site in the confluence and relatively no change in water velocity through the new rearing habitat at the Knoxway Canyon disposal site. No other operational changes to the system are expected.

3.8. Proposed Conservation Measures

The Corps proposes the following conservation measures as part of the proposed action. Conservation measures are intended to minimize or avoid environmental impacts to listed species or critical habitat. Conservation measures are incorporated into the initial Project design as a proactive means for avoiding or minimizing adverse impacts associated with Project 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 will be implemented by the Corps to avoid or minimize adverse effects to the survival and recovery of Snake River sockeye salmon, SRF Chinook salmon, SRSS Chinook salmon, SRB steelhead, and bull trout, including adverse effects on designated critical habitat for these species.

- The Corps will, encourage other Federal agencies with applicable authorities or programs to reduce sedimentation in the Snake River Basin.

- The Corps will further investigate and pursue opportunities to enhance shallow-water rearing habitat.

3.8.1. Impact Minimization Measures

The following impact minimization measures will be implemented by the Corps:

1) Dredging activities may commence no earlier than December 15 and conclude not later than March 1.
2) Equipment will be inspected for leaks and cleaned prior to working. Any detected leaks will be repaired before the work begins.
3) A spill prevention and control plan will be developed and discussed to equipment operating personnel prior work.
4) A survey for redds will occur below the Ice Harbor navigation lock prior to dredging. If SRF Chinook salmon redds are discovered, the Corps will notify NMFS. The two agencies will jointly determine the appropriate course of action.
5) Water quality monitoring will be conducted at the dredging and disposal sites in near real-time so that operational changes can occur rapidly if water quality standards are exceeded.

6) Dredging activities will be concluded in a single in-water work period.

3.8.2. Best Management Practices

Typical types of best management practices will depend on site-specific conditions, but will generally include the following.

1) The Corps will minimize take from dredging and disposal operations by monitoring pre-, during, and post-dredging and disposal.
2) In-water disposal will only occur at the Knoxway Canyon site. Sediment will be disposed in a manner that will maximize its suitability as rearing habitat.
3) Sediment that contains concentrations of contaminants in excess of regulatory thresholds (none found) will be disposed of at an appropriate upland location.
4) The Corps will continue to evaluate the benefits of newly constructed habitat/in-water disposal sites. Specifically, the Corps will determine if new habitat locations function as rearing habitat for juvenile fall Chinook salmon, and will report the results of this evaluation to NMFS.
5) If the Corps or its contractor observes that a threatened or endangered species has been entrained by dredging operations, every reasonable attempt will be made to return the specimen safely back to the river. If a sick, injured, or dead specimen of a threatened or endangered species is observed, the finder must notify the Corps Contracting Officer or representative immediately. The Corps will then contact NMFS or USFWS.

3.9. Mitigation

3.9.1. Mitigation Required Under Other Permits

There is no mitigation required under other permits at this time.

3.10. Interdependent and Interrelated Actions

Interdependent actions are those that have no independent utility apart from the proposed action. Interrelated actions are part of a larger action and depend on the larger action for their justification.

Commercial barging has an interrelated and interdependent effect on ESA-listed species. Barges can leak petroleum products and possibly cargo into the river, which reduces water quality. When shallow water is encountered, barges can ground, or stir up sediments from the river bottom, also affecting water quality.

As part of meeting requirements of the 2008/2010 FCRPS BiOp, the Corps collects and transports juvenile salmonids arriving at certain lower Snake River, including Lower Granite Dam, through up to eight FCRPS dams for release below Bonneville Dam. The current barging system is dependent on a functioning transportation system to meet this FCRPS BiOp requirement. The 2008/2010 FCRPS BiOp contains a requirement to operate the dams at MOP. If the navigation channel is shallower than 14 feet the water level is increased to maintain commercial navigation. This, in turn, increases the travel time for juvenile salmon to migrate through Lower Granite Reservoir. Commercial industries which make up the cargo barges carry, such as timber and agricultural products are not dependent on barging (or dredging), as these products could be hauled by truck or rail.

4. Status of Species and Critical Habitat

4.1. Species Lists from NMFS and USFWS

On 25 September 2012 the Corps reviewed the current list of threatened and endangered species that pertain to the proposed project area under the jurisdiction of NMFS and USFWS for the following counties. Table 3 lists the species which may be in the counties where work could occur.

- Nez Perce County, ID
- Asotin County, WA
- Columbia County, WA
- Franklin County, WA
- Garfield County, WA
- Walla Walla County, WA
- Whitman County, WA

4.2. Identification of Listed Species and Critical Habitat

Table 3 Federal Register notices for final rules that list threatened and endangered species, designate critical habitats, or apply protective regulations to listed species considered in this consultation. Listing status: 'T' means listed as threatened under the ESA; 'E' means listed as endangered; "P" means proposed for listing or designation.

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon (*Oncorhynchus tshawytscha*)			
Snake River spring/summer run	T 6/28/05; 70 FR 37160	10/25/99; 64 FR 57399	6/28/05; 70 FR 37160
Snake River fall-run	T 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
sockeye salmon (*O. nerka*)			
Snake River	E 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	ESA section 9 applies
steelhead (*O. mykiss*)			
Snake River Basin	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
bull trout (*Salvelinus confluentus*)			
Columbia River DPS	T 6/10/98; 63 FR 31647 31674	9/02/05; 70 FR 56211 56311: 10/18/10; 75 FR 63898	
pygmy rabbit (*Brachylagus idahoensis*)			
Columbia Basin DPS	E 11/30/01; 66 FR 59769 59771	None designated	
Canada lynx (*Lynx canadensis*)			
Contiguous U.S. DPS	T 3/24/00; 63 FR 16051 16086	2/25/09; 74 FR 8615 8702	
Ute ladies'-tresses (*Spiranthes diluvialis*)			
Contiguous U.S. DPS	T 1/17/92; 57 FR 2048 205	None designated	
Spalding's catchfly (*Silene spaldingii*)			
	T 10/10/01; 66 FR 51597 51606	None designated	

4.3.Identification of Designated Critical Habitat

Critical habitat has been designated for all of the fish species as well as Canada lynx.

4.4. Status of Species

4.4.1. Snake River Spring/Summer Chinook

4.4.1.1. Listing History

The Snake River SSChinook salmon ESU, listed as threatened on April 22, 1992, (67 FR 14653), includes all natural-origin populations in the Tucannon, Grande Ronde, Imnaha, and Salmon Rivers. Fish returning to several of the hatchery programs are also listed, including those returning to the Tucannon River, Imnaha, and Grande Ronde River hatcheries, and to the Sawtooth, Pahsimeroi, and McCall hatcheries on the Salmon River. Critical habitat was designated for SRSS Chinook salmon on December 28, 1993 (58 FR 68543), and was revised on October 25, 1999 (64 FR 57399).

4.4.1.2. Life History/Biological Requirements

In the Snake River, spring and summer Chinook share key life history traits. Both are stream-type fish, with juveniles that migrate swiftly to sea as yearling smolts. Depending primarily on location within the basin (and not on run-type), adults tend to return after either 2 or 3 years in the ocean. Both spawn and rear in small, high elevation streams (Chapman et al. 1991), although where the two forms co-exist, spring-run Chinook spawn earlier and at higher elevations than summer-run Chinook.

Spring/summer Chinook salmon use smaller, higher elevation tributary systems for spawning and juvenile rearing compared to fall run fish which spawn in mainstems of larger rivers. Spring/summer Chinook salmon normally spawn in late July–September using gravel bars in smaller river and tributary streams. As with most salmon, adults die after spawning providing a large nutrient source for juvenile fish. Juvenile spring/summer Chinook salmon behave differently than fall Chinook in that they remain in headwater streams for a year and out–migrate the following spring. Optimal water temperatures range from 14–19°C (57–66°F) with temperatures exceeding 21°C (70°F) being lethal (Wydoski and Whitney 2003). Juvenile Chinook salmon feed on small aquatic invertebrates in both fresh and salt water, primarily insects in freshwater and crustaceans in marine environments. As they grow in saltwater, they quickly change to a fish diet (IDFG 2005).

4.4.1.3. Distribution

Based on genetic and geographic considerations, the ICBTRT (2003) established five major population groups in this ESU: the Lower Snake River Tributaries, the Grande Ronde and Imnaha Rivers, the South Fork Salmon River, the Middle Fork Salmon River, and the upper Salmon River. The ICBTRT further subdivided these groupings into a total of 31 extant, demographically independent populations. However, Chinook salmon have been extirpated from the Snake River and its tributaries above Hells Canyon Dam, an area that encompassed about 50 percent of the pre-European spawning areas in the Snake River Basin. In 1927, major subbasins in the Clearwater River Basin were blocked to Chinook salmon by the construction of Lewiston Dam. Figure 12 shows the distribution of Chinook salmon in the Columbia River basin.

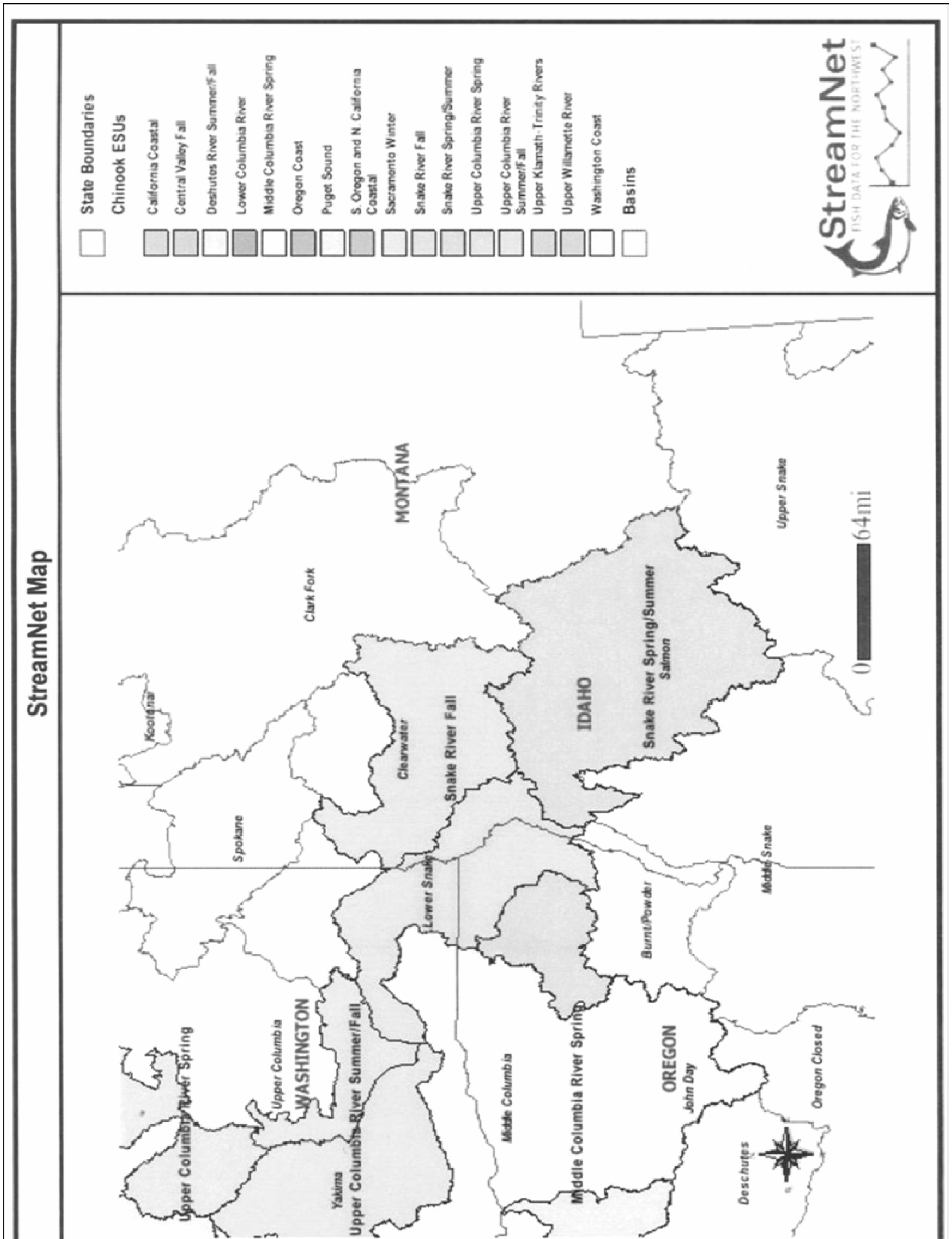

Figure 12 Columbia River basin Chinook salmon distribution.

4.4.1.4. Factors for Decline

4.4.1.4.1. Historical Pressures on the Species

Even before mainstem Snake River dams were built, habitat was lost or severely damaged in small tributaries by construction and operation of irrigation dams and diversions, inundation of spawning areas by impoundments and siltation and pollution from sewage, farming, logging and mining.

In 1927 major subbasins in the Clearwater River Basin were blocked to Chinook salmon by the construction of Lewiston Dam, which has now been removed. Tributary streams upstream of the Salmon River were completely blocked by the 1960's by construction of the Hells Canyon Complex. The lower Snake River dams have also impacted a portion of the remaining population. By the mid-1900s, the abundance of adult spring and summer Chinook salmon had greatly declined. As evidenced by adult counts at dams, however, spring and summer Chinook salmon have declined considerably since the 1960s though there has been an increase in recent years (FPC 2012).

4.4.1.4.2. Current Pressures on the Species

Factors such as injury while passing through dams, predation and high water temperatures continue to impact Snake River Chinook salmon. During the 2004 Status Review, NMFS evaluated whether conservation efforts (e.g., the extensive artificial propagation program) reduced or eliminated the risk to Snake River SS Chinook salmon. They concluded the artificial propagation programs did provide benefits in terms of abundance, spatial structure and diversity, but the programs had neutral or uncertain effects in terms of overall productivity. As a result, NMFS did not believe that the artificial propagation programs were sufficient to substantially reduce the long-term extinction risk. Actions under the FCRPS Biological Opinions and improvements in hatchery practices are addressing some factors for decline of this ESU.

4.4.1.4.3. Limiting Factors for Recovery

The limited amount of high quality habitat available is likely the main factor limiting recovery of SRSS Chinook salmon.

4.4.1.5. Local Empirical Information

4.4.1.5.1. Current Local Population Information

Juvenile spring Chinook salmon have been documented as using the backwater areas of Lake Wallula for rearing. Limited sampling has occurred in the lower Snake River demonstrating that individuals of SRSS Chinook salmon may show very limited use of shallow water areas of lower Snake River reservoirs for periods of rearing during the spring outmigration period or overwintering between July and March (Tiffan and Connor 2012; Artzen et al. 2012). Because this ESU is an upriver stock, no spawning habitat is present in the lower Snake River.

Juvenile SRSS Chinook salmon generally migrate through the Snake River during March through July. Most adult SRSS Chinook salmon migrate through the lower Snake River between April and mid-August.

There has been a general increase in the number of adult and jack SRSS Chinook passing over Ice Harbor Dam in recent years, though the latest years' data hasn't reached the peak of the number counted in 2001 (191,866). The latest 10 year average (2002- 2011) was 91,937. The previous 10 year average was 41,130 (FPC 2012).

4.4.1.5.2. Ongoing Monitoring

Passage of adult and juvenile Chinook salmon is monitored at the Snake River dams. There are also several other monitoring programs by other Federal, state and tribal organizations throughout the watershed.

4.4.2. Snake River Fall Chinook

4.4.2.1. Listing History

NMFS listed SRF Chinook salmon as threatened on April 22, 1992 (57 CFR 14653) and their threatened status was reaffirmed on June 28, 2005 (70 CFR 37160).

4.4.2.2. Life History/Biological Requirements

Detailed life history data (age at spawning, sex ratios, etc.) are plentiful for hatchery populations, but limited and inconsistent for wild populations. More data are also available for some subbasins and streams than others, and different types of data are available for different streams at different times. Age at spawning and associated fecundity differ between the adults returning to the Middle Fork and main Salmon Rivers and all other areas where information is available. In these two areas, 3-ocean adults (especially females) with higher fecundity predominate, whereas 2-ocean adults with lower fecundity predominate in other areas. This is in spite of the fact that spring- and summer-run Chinook salmon inhabit parts of both areas. This suggests that geography or other environmental factors are more influential in determining age at return than run-timing (Mathews and Waples 1991).

The generalized life history of Pacific salmon involves incubation, hatching, and emergence in freshwater, migration to the ocean, and subsequent initiation of maturation and return to freshwater for completion of maturation and spawning. Juvenile rearing in freshwater can be minimal or extended. Additionally, some male Chinook salmon mature in freshwater, thereby foregoing emigration to the ocean. The timing and duration of each of these stages is related to genetic and environmental determinants and their interactions to varying degrees. Salmon exhibit a high degree of variability in life-history traits; however, there is considerable debate as to what degree this variability is the result of local adaptation or the general plasticity of the salmonid genome (Ricker 1972, Healey 1991, Taylor 1991).

Juveniles emerge from the gravels in March and April of the following year, moving downstream from natal spawning and early rearing areas from June through early fall. Juvenile fall-run Chinook salmon move seaward slowly as subyearlings, typically within several weeks of emergence (Waples et al. 1991).

Adults return to the Snake River at ages 2 through 5, with age 4 most common at spawning (Waples et al. 1991). Adult SRF Chinook salmon enter the Columbia River in July and August and reach the mouth of the Snake River from the middle of August through October. Spawning occurs in the main stem and in the lower reaches of large tributaries in October and November.

4.4.2.3. Distribution

SRF Chinook salmon spawning and rearing occurs only in larger, mainstem rivers such as the Salmon, Snake, and Clearwater Rivers. Historically, the primary fall-run Chinook salmon spawning areas were located on the upper mainstem Snake River (Connor et al. 2005). A series of Snake River mainstem dams block access to the upper Snake River, which has significantly reduced spawning and rearing habitat for SRF Chinook salmon. The vast majority of spawning today occurs upstream from Lower Granite Dam, with the largest concentration of spawning sites in the Clearwater River, downstream from Lolo Creek. Currently, natural spawning is limited to the Snake River from the upper end of Lower Granite Reservoir to Hells Canyon Dam, the lower reaches of the Imnaha, Grande Ronde, Clearwater, Salmon, and Tucannon Rivers, and small areas in the tailraces of the lower Snake River hydroelectric dams (Good et al. 2005; Mueller and Coleman 2007). The tailrace of Ice Harbor Dam has been surveyed for fall Chinook redds during six years from 1993-2008 with one redd located below Ice Harbor Dam in 1996 and two in 2007 with none in the vicinity of the navigation lock approach. The area downstream of the navigation lock approach has a low suitability as fall Chinook spawning habitat (Mueller and Coleman 2007).

As a consequence of losing access to historic spawning and rearing sites in the upper Snake River, fall Chinook salmon now reside in waters that are generally cooler than the majority of historic spawning areas. In addition, alteration of the lower Snake River by hydroelectric dams has created a series of low-velocity pools in the Snake River that did not exist historically. Both of these habitat alterations have created obstacles to fall Chinook survival. Prior to alteration of the Snake River Basin by dams, fall Chinook salmon exhibited a largely ocean-type life history, where they migrated downstream and reared in the mainstem Snake River during their first year. Today, fall Chinook salmon in the basin exhibit one of two life histories that Connor et al. (2005) have called ocean-type and reservoir-type. The reservoir-type life history is one where juveniles overwinter in the pools created by the dams, prior to migrating out of the Snake River. The reservoir-type life history is likely a response to early development in cooler temperatures, which prevents juveniles from reaching a suitable size to migrate out of the Snake River.

While most SRF Chinook salmon spawn above the confluence and navigation lock approach area targeted for dredging, a few have been documented periodically (1993 and 1994 in the tailwaters of the lower Snake River dams) spawning within suitable areas of the tailwater environment outside the navigation lock approaches (Bennett et al. 1983, 1992; Dauble et al. 1994, 1995).

4.4.2.4. Factors for Decline

4.4.2.4.1. Historical Pressures on the Species

SRF Chinook salmon are believed to have once lived and spawned in the mainstem Snake River from its confluence with the Columbia River upstream to Shoshone Falls (RM 615). The spawning grounds between Huntington, Oregon (RM 328) and Auger Falls in Idaho (RM 607) were historically the most important for this species; and only limited spawning activity occurred downstream of RM 273 (Waples et al. 1991), about one mile below Oxbow Dam. However, development of irrigation and hydropower projects on the mainstem Snake River have inundated or blocked access to most of this area in the past century.

Construction of Swan Falls Dam (RM 458) in 1901 eliminated access to many miles (about 25 percent) of potential habitat, leaving only 458 miles of useable habitat. Construction of the Hells Canyon Dam complex (from 1958-1967) cut off anadromous fish access to 211 miles (or 46 percent) of the remaining historical fall Chinook salmon habitat upstream of RM 247. The lower Snake River Dams allow access to upriver areas, but have further changed the character of the remaining habitat.

4.4.2.4.2. Current Pressures on the Species

SRF Chinook salmon now have access to approximately 100 miles of mainstem Snake River habitat, which is roughly 22 percent of the 458 miles of historic habitat available prior to completion of the Hells Canyon Complex and the four lower Snake River dams. The limited amount of habitat limits the salmon population. These fish are also affected by passage through dams, high water temperatures, predation and poor estuary conditions.

The Snake River system has contained hatchery-reared fall Chinook salmon since 1981 (Busack 1991). The hatchery contribution to Snake River Basin escapement has been estimated at greater than 47% (Myers et al. 1998). Artificial propagation is relatively recent, so cumulative genetic changes associated with it may be limited. Wild fish are incorporated into the brood stock each year, which should reduce divergence from the wild population. Release of subyearling fish may also help minimize the differences in mortality patterns between hatchery and wild populations that can lead to genetic change.

4.4.2.4.3. Limiting Factors for Recovery

Approximately 80 percent of historical spawning habitat was lost with the construction of a series of dams on the mainstem Snake River. The loss of spawning habitat restricted the ESU to a single naturally spawning population and increased its vulnerability to environmental variability and catastrophic events. The diversity associated with populations that once resided above the Snake River dams has been lost and the impact of hatchery fish and fish from other areas straying to the spawning grounds has the potential to further compromise the genetic diversity of the ESU. Although recent improvements in the marking of hatchery fish and the removal of some of them at Lower Granite Dam have reduced the impact of many of these strays, introgression below Lower Granite Dam remains a concern. The Biological Review Team found moderately high risk for all viable salmon population categories and therefore felt that this ESU was at some level of risk despite the recent positive signs.

4.4.2.5. Local Empirical Information

4.4.2.5.1. Current Local Population Information

Adult SRF Chinook numbers passing over Ice Harbor Dam have increased in the last several years. The latest 10 year average (2002 – 2011) is 35,137. The previous 10 year average was 8,403 (FPC 2012).

Wild juvenile fall Chinook salmon typically pass through the Lower Snake River from mid-June through September, with double peaks in mid-July and some lingering portion of the annual migration lasting until December. Many of the juvenile fall Chinook salmon outmigrating from the Clearwater and Snake Rivers spend time in shoreline areas (less than 3 meters [9.8 feet] in depth) in the Lower Granite reservoir and less time in downriver reservoirs, where they prefer sand-substrate areas (Bennett et al. 1997). Tiffan and Connor (2012) similarly reported low gradient shoreline areas less than 2 meters deep were highly used by naturally produced juvenile fall Chinook salmon. When water temperatures reach about 21.1°C (70°F), these fish appear to have achieved adequate growth and fitness due to the warming conditions of these shallow-water habitat areas. They leave the shoreline areas to either continue rearing or begin their migration in the cooler pelagic zone of the reservoirs (Bennett et al. 1997).

Though most juvenile Chinook salmon migrate to the ocean as sub-yearlings, passive integrated transponder (PIT) tag detections from 1993 to 1995 brood year juvenile fall Chinook salmon from the Clearwater River were recorded in the spring of 1994 to 1996 at some lower Snake River dams. More PIT-tagged fall Chinook salmon outmigrants were detected in the spring of 1994 and 1995 than in the previous year, while the trend was reversed with the 1995 brood year. It is apparent from these detections that some Clearwater River fall Chinook salmon migrate to the ocean as yearlings, rather than as subyearlings.

The Snake River upper reach, Snake River lower reach, Grande Ronde River, and Clearwater River are recognized as the four major spawning aggregates of Snake River Basin natural fall Chinook salmon upstream of Lower Granite Reservoir (ICBTRT 2007). Though treated as one population, temperature during incubation and early rearing fosters life history diversity among the juveniles of the spawning aggregates (Connor et al. 2002, 2003a). Natural fall Chinook salmon in the Snake River upper reach typically emerge and enter Lower Granite Reservoir as subyearlings earliest followed in overlapping order by natural fall Chinook salmon subyearlings (hereafter, natural subyearlings) from the Snake River lower reach, Grande Ronde River, and finally the Clearwater River subbasin. Passage of natural subyearlings from the four spawning aggregates through the lower Snake River reservoirs is a protracted event (Connor et al. 2002) based on data collected on fish implanted with passive integrated transponder (PIT) tags (Prentice et al. 1990). Thus, there is large potential for natural subyearlings to use shallow water habitat complexes throughout the spring and summer.

Natural subyearlings most likely enter Lower Granite Reservoir as both newly emergent fry and as parr after they have reared upstream in natal riverine habitat. Those fish that enter the reservoir as fry probably locate nearshore areas and reside there as they grow to into parr. Fry abundance likely decreases over time due to mortality, recruitment to parr, and as fish move downstream. Natural subyearlings that remain in natal riverine rearing areas upstream of Lower Granite Reservoir are believed to progress through four migrational phases including: discontinuous downstream dispersal along the shorelines of the free-flowing river; abrupt and mostly continuous downstream dispersal offshore in the free-flowing river; passive, discontinuous downstream dispersal offshore in Lower Granite Reservoir; and, active and mostly continuous seaward migration (Connor et al. 2003b). Thus, the potential for use of shallow water habitat by natural fall Chinook salmon subyearlings is regulated by the dispersal of fry and parr as well as the survival and behavior of fish passing through these two life stages.

Some of the natural and hatchery subyearlings discontinue active migration before or after entering the reservoirs in mid-summer (Arnsberg and Statler 1995). These "reservoir-type" juveniles are primarily natural fall Chinook salmon (Connor et al. 2005) and they feed and grow as they move downstream offshore in reservoirs during fall and winter and into spring when they become yearlings (Tiffan et al. 2012). Winter is a critical season that can greatly influence the survival and behavior of juvenile anadromous salmonids. Fish in small streams limit their winter movement and energy expenditure by seeking nearshore cover and holding (review by Brown et al. 2011). Shallow water habitat in the lower Snake River reservoirs would also be important to overwinter survival of reservoir-type juveniles if they exhibited the behavior of their counterparts that inhabit small streams. However, Tiffan et al. (2012) hypothesized that the need for cover, protection from predators, and energy conservation are met in reservoirs in ways that allow fish more unrestricted movement at lower energetic costs than observed in small streams. Further, the same authors deduced from angling catch data that reservoir-type juveniles are largely pelagic. Furthermore, sampling data, including radio-telemetry efforts, suggests that use of shallow water habitat during the fall and winter by juvenile fall Chinook is limited and that while juveniles passed shallow water habitat sites, relatively few entered them. Radio-tagged fish located during mobile tracking in the winter of 2010 were pelagically oriented, and generally not found over shallow water or close to shore (Tiffan and Connor 2012).

Cold-water releases from Dworshak Dam, aimed at augmenting flows for adult migration, may cause stunted growth rates in juveniles in the late summer and early fall, causing these fish to overwinter. Overwintering and early rearing of fall Chinook salmon in Lake Wallula backwater areas has been documented and it will be logical to assume that the potential for overwintering and rearing exists in the lower Snake River as well.

Redd surveys have been performed in the lower Snake River since at least 1993 (Mueller 2009). For example, seven redds were found downstream of Lower Monumental Dam in 2008 by the Pacific Northwest National Laboratory (Mueller 2009). The redds were located approximately 30 meters (m) (100 ft) downstream of the fish bypass pipe and adjacent to the fish loading dock on the north side of the river in water depths of 4 to 5.5m (13 to 18 ft) with near bottom water velocities of 0.37 to 0.46 m/sec (1.2 to 1.5 feet per second (ft/s)). This was the first time that redds were found at this location (Arnsberg et al. 2009). At Ice Harbor Dam, redd surveys have been performed in multiple years (Table 4), with only 1 redd found downriver of the powerhouse near the outfall pipe in 1996 and 2 redds found in 2007 390 feet downstream of the bypass pipe in 22-23 feet of water (Mueller and Coleman 2008; Mueller 2009).

The low velocity and relatively fine substrate along a high percentage of the reservoir shorelines of the Lower Snake River reservoirs preclude spawning in these areas. The limited spawning that does occur is in the tailrace areas below all of the lower Snake River dams, where water velocity is high and substrate size is relatively large (Mueller and Coleman 2007, 2008). No redds have been located in other regions of the reservoirs, including shoreline areas that could be potentially affected by site development. As shown in Figure 13, although a large percentage of the areas examined downstream of Ice Harbor dam for potential fall Chinook spawning habitat contains suitable substrate, low water velocities are likely a key variable precluding suitable spawning conditions and therefore result in low quality spawning habitat (Mueller and Coleman 2007).

Since there is potential to encounter fall Chinook redds during the proposed action at Ice Harbor, Fall Chinook redd surveys will be conducted below Ice Harbor Dam in November and December 2013, prior to the proposed dredging action.

Table 4 Fall Chinook redd counts from deepwater video surveys conducted in the tailrace sections of lower Snake River dams, 1993–2008 (Mueller 2009).

	Lower Snake River Dam			
Survey Year	Lower Granite	Little Goose	Lower Monumental	Ice Harbor
1993	14	4	0	0
1994	5	4	0	0
1995	0	4	n/s[(a)]	n/s
1996	0	1	0	1
1997	0	n/s	n/s	n/s
1998	n/s	n/s	n/s	n/s
1999	n/s	n/s	n/s	n/s
2000	n/s	n/s	n/s	n/s
2001	n/s	n/s	n/s	n/s
2002	0[(b)]	n/s	0[(b)]	n/s
2003	n/s	n/s	n/s	n/s
2004	1[(b)]	n/s	0[(b)]	n/s
2005	0[(b)]	n/s	0[(b)]	n/s
2006	1	2	0	0
2007	4	0	0	2
2008	8	0	7	0

(a) No survey.
(b) Partial survey.

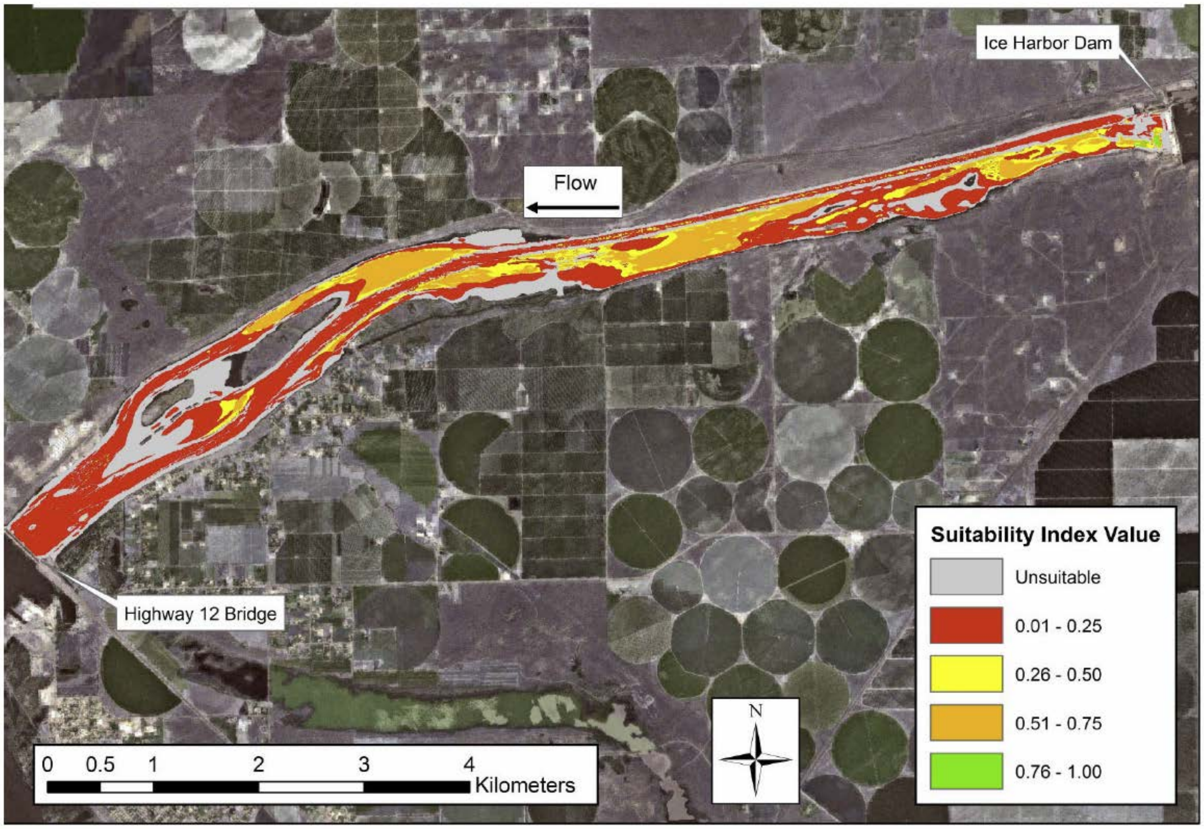

Figure 13 Fall Chinook Salmon Spawning Habitat Suitability Downstream from Ice Harbor Dam. Habitat suitability assessment is based on a 50% exceedence discharge (21.7 kcfs) during a normal water year, with the McNary Dam forebay at normal pool elevation. Suitability index values indicate a range of potential habitat from unsuitable (0.0) to high quality (1.0). (Mueller 2009).

4.4.2.5.2. Ongoing Monitoring

Passage of adult and juvenile Chinook salmon is monitored at the Snake River dams. There are also several other monitoring programs by other Federal, state and tribal organizations throughout the watershed. Fish numbers are posted on the fish passage center's website (FPC 2012). The past three years (2009 - 2011) saw significantly higher numbers of fall Chinook since prior to 1975. Use of shallow water habitat by juvenile fall Chinook has been ongoing for several years as part assessing placement of dredge materials for creation of shallow water habitat (Gottfried et al. 2011, Artzen et al 2012; Tiffan and Connor 2012). Based on recent monitoring by Tiffan and Hatten (2012) estimating subyearling fall Chinook habitat in Lower Granite Reservoir, suggests that deposition of dredge spoils at RM 116 will increase the amount of available rearing habitat in the lower Snake River. As part of the proposed action, monitoring will continue in the future to assess whether juvenile fall Chinook utilize the disposal site as expected.

4.4.3. Snake River Sockeye

4.4.3.1. Listing History

NMFS listed Snake River sockeye salmon as endangered on April 22, 1992 (57 FR 14653) and their endangered status was reaffirmed on June 28, 2005 (70 FR 37160). The Snake River sockeye salmon species includes all anadromous and residual sockeye salmon from the Snake River basin, Idaho, as well as artificially propagated sockeye salmon from the Redfish Lake captive brood stock program (NMFS 2005a).

4.4.3.2. Life History/Biological Requirements

Overall age of maturity in sockeye salmon ranges from 3 to 8 years. Male sockeye salmon are capable of maturing at any of 22 different combinations of freshwater and ocean ages, while female sockeye salmon may mature at any of 14 different age compositions (Healey 1986, 1987). For a given fish size, female sockeye salmon have the highest fecundity and the smallest egg size among the Pacific salmon (Burgner 1991). Average fecundity across the range of sockeye salmon is from 2,000 to 5,200 (Burgner 1991, Manzer and Miki 1985). Emerging fry possess heritable rheotactic and directional responses that allow fry from outlet tributaries to move upstream and fry from inlet tributaries to move downstream, in order to reach the nursery lake habitat (Raleigh 1967, Brannon 1972, Burgner 1991). Adult body size may also be affected by variations in stock abundance. Based on fishery catch data, which tends to select for larger fish than are present in the total run, Columbia River sockeye salmon average about 1.58 kg (3.5 lb) after two winters at sea (Gustafson et al. 1997).

4.4.3.3. Distribution

Anadromous sockeye were once abundant in a variety of lakes throughout the Snake River Basin, including Alturas, Pettit, Redfish, Stanley, and Yellowbelly Lakes in the Sawtooth Valley; as well as Wallowa, Payette, and Warm Lakes. However, the only remaining population resides in Redfish Lake.

Federally-listed Snake River sockeye salmon are known to occur in the project area. The lower Snake River corridor is designated as critical habitat for migration of wild SR sockeye salmon. Critical habitat for rearing or overwintering for Snake River sockeye salmon is not present in the lower Snake River corridor. The components of the migration corridor and run timing of designated critical habitat for juvenile and adult migration passage are present between mid-March and mid-June. No spawning habitat for sockeye salmon is present in the project area.

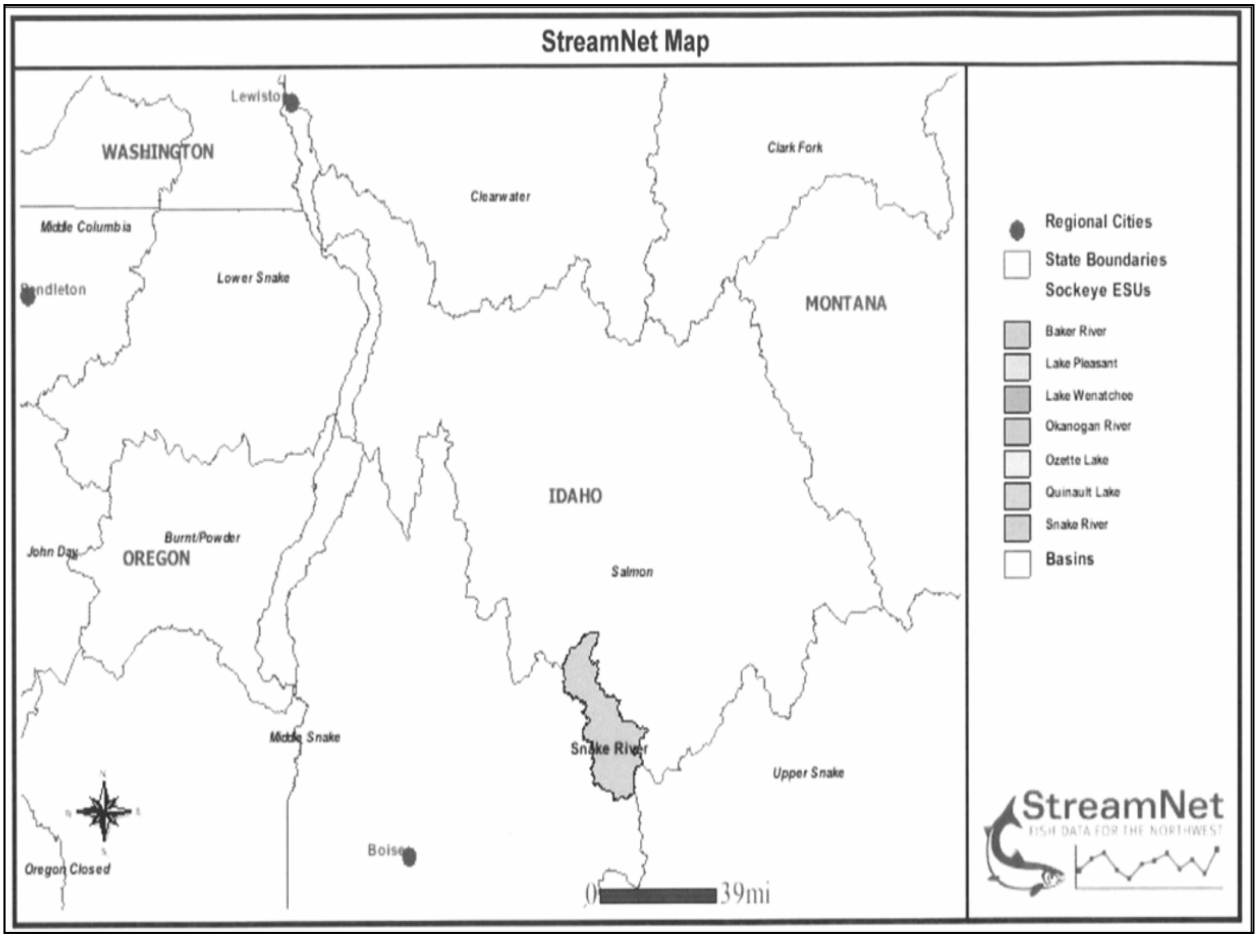

Figure 14 Snake River sockeye distribution.

4.4.3.4. Factors for Decline

4.4.3.4.1. Historical Pressures on the Species

Snake River sockeye salmon have been impacted by a wide range of factors in the past. At one time, Snake River sockeye salmon were subject to eradication programs as a means to replace them with a more desirable rainbow trout fishery. Construction of dams, roads, railroads and levees/shoreline protection, as well as irrigation withdrawals has altered the migratory habitat of juveniles and adults. Increased predation on juvenile salmonids due to the habitat changes is also a contributor to the declining salmonid population.

4.4.3.4.2. Current Pressures on the Species

Current pressures on Snake River sockeye include partial passage barriers, degraded habitat and a very low population.

4.4.3.4.3. Limiting Factors for Recovery

Though there have been increases in the past few years, the extremely low population and limited amount of suitable habitat combine to limit the potential for recovery of Snake River sockeye salmon.

4.4.3.5. Local Empirical Information

Snake River sockeye adults and juveniles can be found in the Columbia, Snake and Salmon Rivers. Adult and juvenile wild Snake River sockeye salmon are not expected to be present in the mainstem Snake or Clearwater Rivers between mid-December and February. Wild Snake River juvenile sockeye salmon generally migrate downriver during April and May, and wild adult sockeye salmon are not typically counted at Ice Harbor Dam before June or after October (Corps Annual Fish Passage Reports, 1980-2011). During sampling in May and June 2002, Bennett et al. (2003) found 21 and 14 juvenile sockeye salmon rearing along shallow-water shorelines in the Lower Granite and Little Goose reservoirs, respectively. Similarly, Artzen et al. (2012) found up to 22 juvenile sockeye at shallow water sample sites in Little Goose and Lower Granite reservoirs from April to July 2011.

4.4.3.5.1. Current Local Population Information

The Snake River sockeye salmon ESU currently consists of Redfish Lake stock in the captive broodstock program at Eagle and Beef Creek hatcheries, and the hatchery fish released from this program into Redfish Lake, Pettit Lake, Pettit Creek and Redfish Lake Creek; wild residual sockeye in Redfish Lake and their out-migrating progeny; any naturally-spawned progeny of broodstock adults released into Redfish Lake; and any adults returning to Redfish or Pettit Lake.

The population of Snake River sockeye salmon is extremely low, but has shown a substantial increase recently. Since 1962, the highest count of adults at Ice Harbor dam was 1,302 in 2010. Zero adults were counted at Ice Harbor dam in 1994 (this may be somewhat misleading since in 1994, six were counted at Lower Monumental, 44 at Little Goose and 5 at Lower Granite, all of which are located upstream from Ice Harbor). The latest 10-year average (2002-2011) is 415. The previous 10-year (1992-2001) average was 34. In 2011- 1,141 sockeye salmon were counted passing Ice Harbor Dam (FPC 2012).

4.4.3.5.2. Ongoing Monitoring

Snake River sockeye salmon are counted at the Corps' Snake River dams. Adults are counted as they move up through the ladders. Juveniles are sampled from the juvenile bypass systems and abundance estimates are made. Additional monitoring takes place in and near the lakes where sockeye spawn and rear.

4.4.4. Snake River Basin Steelhead

4.4.4.1. Listing History

Snake River Basin steelhead were listed as threatened on August 18, 1997 (62 FR 43937) and protective regulations were issued under section 4(d) of the ESA on July 10, 2000 (65 FR 42422). Their threatened status was reaffirmed on June 28, 2005 (70 FR 37160). The DPS includes all naturally spawned steelhead populations below natural and manmade impassable barriers in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho, as well as six artificial propagation programs: the Tucannon River, Dworshak National Fish Hatchery, Lolo Creek, North Fork Clearwater River, East Fork Salmon River, and the Little Sheep Creek/Imnaha River Hatchery steelhead hatchery programs.

4.4.4.2. Life History/Biological Requirements

The Interior Columbia Basin Technical Recovery Team (ICBTRT 2003) identified six major population groups in the DPS: (1) The Grande Ronde River system; (2) the Imnaha River drainage; (3) the Clearwater River drainage; (4) the Salmon River; (5) Hells Canyon; and (6) the lower Snake. The Snake River historically supported more than 55% of total natural-origin production of steelhead in the Columbia River Basin. It now has approximately 63% of the basin's natural production potential.

Snake River Basin steelhead migrate a substantial distance from the ocean (up to 940 miles) and use high elevation tributaries (up to 6,562 feet above sea level) for spawning and juvenile rearing. SRB steelhead occupy habitat that is considerably warmer and drier (on an annual basis) than other steelhead DPSs. Managers classify up-river summer steelhead runs into two groups based primarily on ocean age and adult size upon return to the Columbia River. A-run steelhead are predominately age-1-ocean fish while B-run steelhead are larger, predominated by age-2-ocean fish. SRB steelhead are generally classified as summer run, based on their adult run timing pattern. SRB steelhead enter fresh water from June to October and, after holding over the winter, spawn during the following spring from March to May. Steelhead usually smolt as 2- or 3-year-olds. Outmigration occurs during the spring and early summer periods, coinciding with snowmelt in the upper drainages. Median and 90% passage dates at Lower Granite Dam for PIT tagged groups from the Imnaha River were: wild steelhead trout - May 2 and May 9; and hatchery steelhead trout - May 31 and June 16. Hatchery steelhead trout displayed small peaks in arrival timing at Lower Granite and Little Goose Dams in mid-May to mid-June; however, the general trend at each dam was a long protracted emigration (Blenden et al. 1996).

Steelhead adult migration preferred temperatures are between approximately 4°C and 9°C (39-48^{o}F) (Bell 1990). Steelhead preferred temperatures fall between 10 °C and 13°C (50-55.5^{o}F), while the upper lethal limit for steelhead is 23.9 °C (75^{o}F) (Spence et al. 1996).

With one exception (the Tucannon River production area), the tributary habitat used by Snake River steelhead DPS is above Lower Granite Dam. Annual return estimates are limited to counts of the aggregate return over Lower Granite Dam. Returns to Lower Granite Dam fluctuated widely in the 1980s and remained at relatively low levels through the 1990s. The 2001 run size at Lower Granite Dam was substantially higher relative to the 1990s. The 2002 through 2005 return years declined annually but continued to remain higher than the 1990s return years. Counts of wild steelhead passing over Lower Granite Dam, which began in 1994, show a marked increase in 2001, then a decreasing trend through 2006, followed by a small increase since that time reaching a peak of 76,161 in 2009 (FPC 2012).

4.4.4.3. Distribution

The SRB steelhead DPS is distributed throughout the Snake River drainage system, including tributaries in southwest Washington, eastern Oregon and north/central Idaho (Good et al. 2005). SRB steelhead no longer occur above Dworshak Dam. The ICBTRT (2007) identified 26 populations in the following six major population groups (MPGs) for this species: Clearwater River, Grande Ronde River, Hells Canyon, Imnaha River, Lower Snake River, and Salmon River. The North Fork population in the Clearwater River is extirpated. The ICBTRT noted that SRB steelhead remain spatially well distributed in each of the six major geographic areas in the basin (Good et al. 2005). Environmental conditions are generally drier and warmer in these areas than in areas occupied by other steelhead species in the Pacific Northwest. SRB steelhead were blocked from portions of the upper Snake River beginning in the late 1800s and culminating with the construction of Hells Canyon Dam in the 1960s.

A-run populations are found in the tributaries to the lower Clearwater River, the upper Salmon River and its tributaries, the lower Salmon River and its tributaries, the Grand Ronde River, Imnaha River, and possibly the Snake River’s mainstem tributaries below Hells Canyon Dam. B-run steelhead occupy four major subbasins, including two on the Clearwater River (Lochsa and Selway) and two on the Salmon River (Middle Fork and South Fork Salmon); areas that are for the most part not occupied by A-run steelhead. Some natural B-run steelhead are also produced in parts of the mainstem Clearwater and its major tributaries.

SRB steelhead are not known to spawn in the impounded reaches of the Snake River, but it is possible that some juveniles overwinter or rear there for short periods. Adult steelhead hold in the mainstem Snake and Columbia Rivers for extended periods (months) prior to spawning and some are likely to be in the action area during the proposed work window (Bjornn et al. 2000).

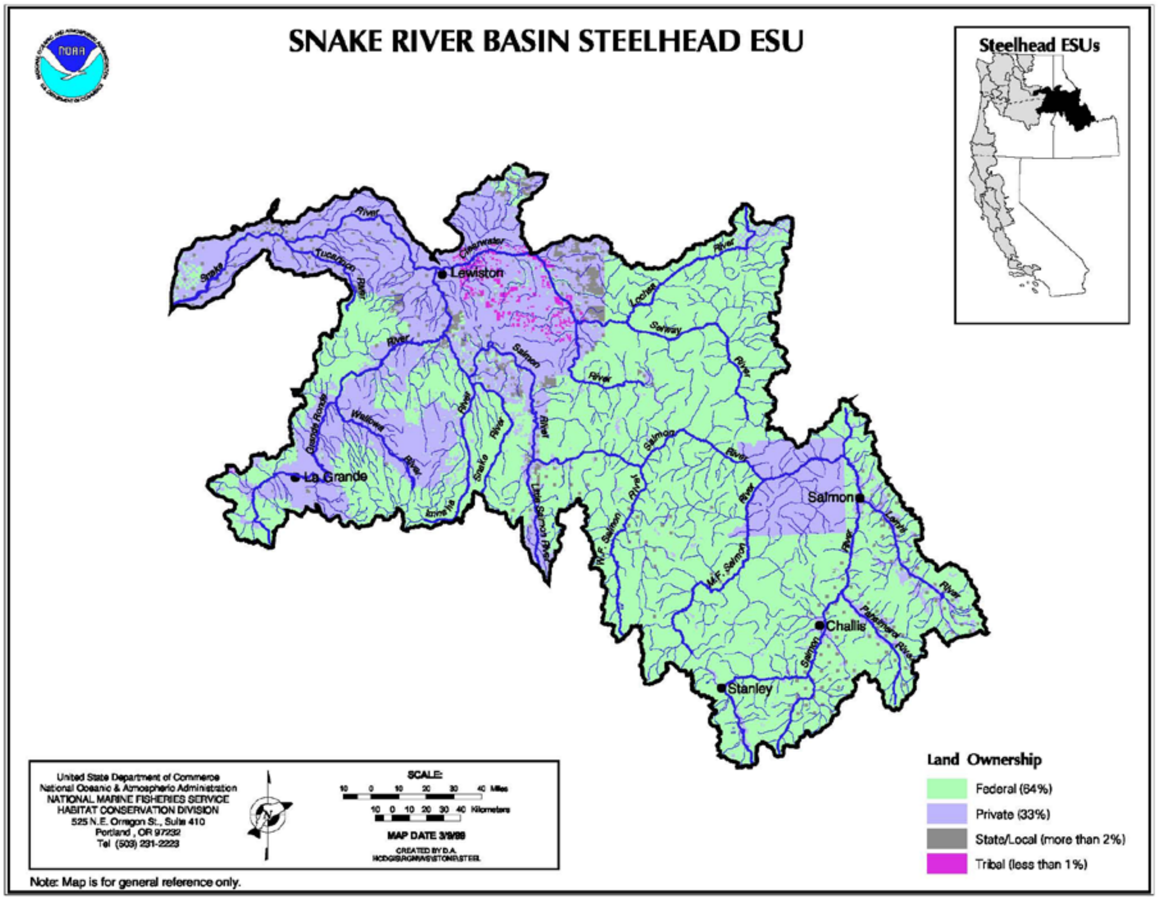

Figure 15 Snake River Basin Steelhead Distribution.

4.4.4.4. Factors for Decline

4.4.4.4.1. Historical Pressures on the Species

Historic fishing pressure began the decline of salmonid populations over 100 years ago. Construction of dams, roads, railroads, and levees/shoreline protection, as well as irrigation withdrawals has altered the rearing habitat of juvenile salmonids and the migratory habitat of juveniles and adults. Increased predation on juvenile salmonids due to the habitat changes is also a contributor to the declining salmonid population. Prior to the construction of the mainstem dams, a large percentage of the shoreline consisted of shallow water with a small particle size substrate. Today, much of the shoreline consists of deeper water bordered by riprap. This change in habitat type is likely a factor in the decline of the Columbia Basin salmonid populations.

4.4.4.4.2. Current Pressures on the Species

Hydrosystem projects create substantial habitat blockages in this ESU; the major ones are the Hells Canyon Dam complex (mainstem Snake River) and Dworshak Dam (North Fork

Clearwater River). Minor blockages are common throughout the region. Habitat in the SRB is warmer and drier and often more eroded than elsewhere in the Columbia River Basin or in coastal areas.

4.4.4.4.3. Limiting Factors for Recovery

The reduced amount of suitable habitat may be the main factor limiting steelhead recovery.

4.4.4.5. Local Empirical Information

Very little information is documented on nearshore habitat use by juvenile steelhead in the mainstem Columbia and Snake Rivers. Juvenile steelhead are thought to utilize the deeper, higher velocity areas away from the shoreline to migrate. They could potentially use the shoreline area during winter and spring for rearing.

4.4.4.5.1. Current Local Population Information

Most wild adult steelhead typically migrate through the reach between June and August for the A-run and between late August and November for the B-run. Adults from this stock may be migrating in deeper water or individuals may be holding in mid-channel areas prior to moving upriver into tributaries for spawning in early spring. Adult wild steelhead numbers passing over Ice Harbor Dam have generally increased over the last 15 years. The latest 10 year average is 45,812. The previous 7 year average (data isn't available for a 10 year average) was 19,066 (FPC 2012).

Wild juvenile SRB steelhead generally migrate downstream through the lower Snake River, mainly between late March and the end of August. Some rearing or overwintering may occur in the reservoirs.

4.4.4.5.2. Ongoing Monitoring

Passage of adult and juvenile steelhead is monitored at the Snake River dams. There are also several other monitoring programs by other Federal, state and tribal organizations throughout the watershed.

4.4.5. Bull Trout

4.4.5.1. Listing History

The USFWS issued a final rule listing the Columbia River population of bull trout as a threatened species on June 10, 1998 (63 FR 31647). Bull trout are currently listed throughout their range in the coterminous United States as a threatened species. Bull trout critical habitat was designated in September 2005. The designation was revised in October 2010. The revised designation includes the mainstem Columbia and Snake Rivers.

4.4.5.2. Life History/Biological Requirements

Individual bull trout may exhibit resident or migratory life history strategies. Resident bull trout carry out their entire life cycle in the stream in which they spawn and rear. Migratory bull trout spawn in tributary streams, but eventually travel to larger streams (or lakes) where they mature. Habitat components that appear to influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrates and migratory corridors (with resting habitat). All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders and deep pools.

Bull trout normally reach maturity in four to seven years and may live as long as twelve years. They generally spawn from August to November during periods of decreasing water temperatures. Migratory bull trout may travel over one hundred miles to their spawning grounds. Egg incubation is normally 100 to 145 days and fry remain in the substrate for several months.

Bull trout are opportunistic feeders. Their diet requirements vary depending on their size and life history strategy. Resident and juvenile bull trout prey on insects, zooplankton and small fish. Adult migratory bull trout mainly eat other fish.

4.4.5.3. Distribution

In the Columbia River Basin, bull trout historically were found in about 60% of the basin. They now occur in less than half of their historic range. Populations remain in portions of Oregon, Washington, Idaho, Montana, and Nevada. Bull trout are distributed throughout most of the large rivers and associated tributary systems within the Columbia River Recovery Unit. Wydoski and Whitney (2003) indicate that all four life history types of bull trout (anadromous, adfluvial, fluvial, and resident) require water temperatures below 15^{o}C (59° F). They also note bull trout are occasionally collected in the tailraces of Priest Rapids and Wanapum Dams on the mainstem Columbia River. In Idaho, bull trout were found at elevations from 2,000 to 3,800 feet in elevation with gradients ranging from 1.9 to 8.3% (Wydoski and Whitney 2003).

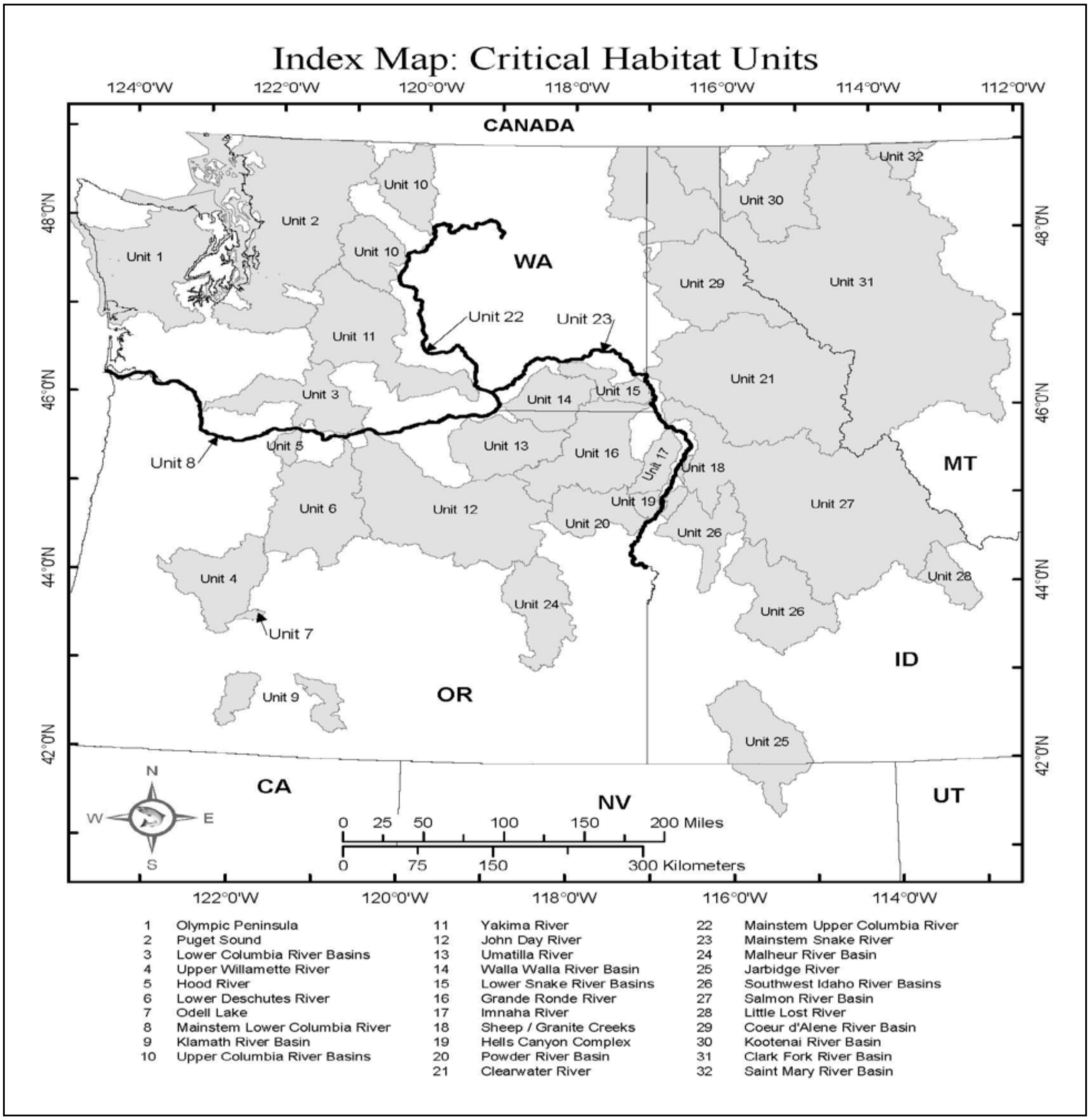

Figure 16 Bull trout approximate distribution in the Columbia Basin.

Fish passage at all of the Corps dams is monitored. Any bull trout observations are recorded, though only a few, if any, are generally seen in any year. Most of the bull trout observed are seen passing Lower Monumental and Little Goose Dams. Fish counting at the dams is not conducted during winter when bull trout are typically most apt to be in the larger rivers. For example tables 5, 6 and 7 show adult bull trout observations in 2009 at the Columbia and Snake River Corps dams.

Table 5 Adult bull trout observed at Lower Monumental in 2009.

Lower Monumental				
Date	**Time**	**Length**	**C or NC**	**Condition**
12-May-09	13.25	12		
22-May-09	1440	12	unclipped	
22-May-09	1610	10	unclipped	
3-Jun-09	1320	12 - 14	clipped	
3-Jun-09	1335	12	clipped	
4-Jun-09	803	12-13"	unclipped	small but good looking -North shore ladder
20-Jun-09	913	10	unclipped	small-North shore ladder
22-Jun-09	844	12	unclipped	north shore

Table 6 Adult bull trout observed at Little Goose in 2009.

Little Goose				
Date	**Time**	**Length**	**C or NC**	**Condition**
24-Apr-09	1808	12	unclip	good upstream
25-Apr-09	1414	12	unclip	good upstream
28-Apr-09	1340	12	unclip	good upstream
29-Apr-09	1633	15	unclip	good upstream
9-May-09	pm	15		
19-May-09	1910	13	unclip	good upstream "w" shaped body
25-May-09	1223	8	unclip	good
25-May-09	1045	15	unclip	good
27-May-09	948	13	unclip	good
8-Jun-09	430	18-20	unclip	good
11-Jun-09	1648	13	unclip	good
14-Jun-09	801	13	nonclipped	good
14-Jun-09	1908	14	nonclipped	good
15-Jun-09	921	13	unclip	good
15-Jun-09	944	15	unclip	good
15-Jun-09	953	8	unclip	good
16-Jun-09	903	12	unclip	good
17-Jun-09	811	14	unclip	good
20-Jun-09	1929	14	unclip	good
23-Jun-09	1421	14	unclip	good
24-Jun-09	1748	10	unclip	good
24-Jun-09	1831	14	unclip	good
25-Jun-09	925	12	unclip	good
25-Jun-09	1415	14	unclip	good
26-Jun-09	930	14	unclip	good
27-Jun-09	740	12	unclip	good
29-Jun-09	735	15	unclip	good
1-Jul-09	840	15	unclip	good
2-Jul-09	712	12	unclip	good
2-Jul-09	945	14	unclip	
4-Jul-09	705	18	unclip	good
7-Jul-09	1414	12	unclip	good
8-Jul-09	1241	14	unclip	good

Table 7 Adult bull trout observed at Lower Granite in 2009.

Lower Granite				
Date	**Time**	**Length**	**C or NC**	**Condition**
30-May-09	1203	14	non clipped	good
19-Jun-09	1434	12	non clipped	good
28-Jun-09	521	12	non clipped	good
30-Jun-09	1822	12	non clipped	good
6-Jul-09	1151	10	non clipped	good
8-Jul-09	1310	15	non clipped	good

Anglin et al. (2010) estimated a total of 192 bull trout emigrated from the Walla Walla Basin to the Columbia River from November 2007 through December 2009. They estimated that 36 PIT tagged bull trout entered the Columbia from the Walla Walla in 2009. However, over the duration of their 2009 study, only one bull trout was detected, in June, returning to the Walla Walla River from the Columbia River. Four Walla Walla Basin bull trout were detected at mainstem Columbia River dams over the duration of the study. Detections at the juvenile facilities at John Day and McNary dams indicated two of these bull trout were moving downstream. Detections in the adult ladders at McNary and Priest Rapids dams indicated two of these bull trout were moving upstream (Anglin et al. 2010). Two additional bull trout were detected returning to the Walla Walla from the Columbia River in mid-April 2010.

Anglin et al. (2010) also indicate bull trout dispersed into the mainstem Columbia River from the Walla Walla Basin, and at times, this dispersal included a relatively long migration. One bull trout moved 130 river kilometers (rkm) upstream and was detected at Priest Rapids Dam, and another moved 162 rkm downstream to John Day Dam (Anglin et al. 2010).

The timing of migratory bull trout movement from the Walla Walla River to the Columbia River varies from year to year, but generally occurs between October and May, peaking between December and February (Anglin et al. 2010). Adult bull trout migrating from the Columbia River might initiate upstream movement in April (R. Koch, personal communication, August 30, 2010).

Faler et al. (2008) report that bull trout in the Tucannon River, upstream of Lower Monumental Dam, migrated upstream in spring and early summer to the spawning areas in upper portions of the Tucannon River watershed. The fish in their study quickly moved off the spawning areas in the fall, and either held or continued a slower migration downstream until March or April. By June 1, most bull trout had ascended the Tucannon River. During late fall and winter, bull trout were distributed in the lower half of the Tucannon River basin, down to and including the mainstem Snake River below Little Goose Dam.

They observed bull trout migrations into the Lower Monumental reservoir area influenced by the lower Tucannon River and/or the Snake River for 6 individuals. Two of the fish never returned to the Tucannon River. One individual made multiple movements to and from the reservoir near the mouth of the Tucannon, but it spent much of the winter within the reservoir influence area of the Tucannon River (Faler 2008).

Two Tucannon PIT tags have also been detected outside of the reservoir. One by NMFS personnel conducting Avian Predation Study efforts on a Columbia River island in 2002, and the other in the Catherine Creek (tributary to the Grande Ronde River) acclimation pond in 2003 (Faler 2008).

Based on the Anglin et al. studies (ongoing), and the Faler et al. studies, it is clear that some individual bull trout migrate out of their natal streams and into the mainstem Columbia and Snake Rivers. Clearly actual abundance and amount of usage by bull trout during migration and overwintering is not yet known in reservoirs behind Corps operated dams, but given the evidence, the number of migratory bull trout using the action area is extremely low relative to other salmonids.

There have been several observations of adult bull trout passing Lower Monumental and Little Goose dams. From 1994 to 1996, 27 bull trout passed the adult fish counting station (mainly in April and May) at Little Goose. At least six bull trout passed counters at Lower Monumental and Little Goose in 1990 and 1992 (Kleist 1993). Kleist also observed one bull trout in 1993 just downstream of the count window at Lower Monumental. One bull trout was captured in the Palouse River below Palouse Falls in 1998. These were likely migratory fish from the Tucannon River; however, one bull trout was observed at Lower Granite in 1998 that may indicate fluvial fish are migrating to other upstream populations. Incidental collection of bull trout at lower Snake River dams in juvenile bypass facilities, observations of bull trout within adult fish ladders (Battelle 2004, Bretz 2011), and radio telemetry and PIT tag studies (Faler et al. 2003, 2004, 2005, 2006, 2007; Bretz 2008, 2009) have shown that migratory adults from the Tucannon River utilize the mainstem Snake River as overwintering habitat and as a migratory corridor (Bretz 2011; DeHaan and Bretz 2012). Although bull trout have been observed at these dams, the extent to which Federal Columbia River Power System (FCRPS) operations alter the migratory patterns of bull trout or impede passage and the origins of the fish observed at the Snake River dams are relatively unknown. The results of DeHaan and Bretz (2012) suggest that migratory bull trout originating from the tributaries such as the Tucannon and Imnaha Rivers are utilizing the fish facilities at Little Goose Dam).

During recent sampling of shallow water habitats in the Lower Snake River Reservoirs, single bull trout have been collected some years at a sampling site in the Lower Tucannon River (Seybold and Bennett 2010, Artzen et al. 2012). Researchers speculated this sampling was probably not indicative of widespread bull trout use of the Lower Snake River Reservoirs; instead, it is potentially indicative of an adfluvial life history strategy (Seybold and Bennett 2010). During sampling and tracking of bull trout in the lower Tucannon River between the fall of 2005 and spring of 2009, Bretz (2010) estimated a minimum proportion of 6-29% of PIT-tagged bull trout migrated between the Tucannon River and the mainstem Snake River within a single migratory year. Evaluation of PIT-tag passage data in the Tucannon River by Bretz (2010) indicates bull trout are in the reservoir influence zone during October, November and December with juvenile and adult outmigrating occurring between October and February; which supports the time frame of outmigration established by Faler et al. (2008) who observed the distribution of bull trout in the lower Tucannon River and the mainstem Snake River during the late fall and winter months. The detections within the months of March through June are adults returning to the Tucannon River to spawn. A single bull trout was detected leaving the Tucannon River in May 2010 and subsequently detected at Little Goose Dam, both in the Full Flow Bypass and the Adult Fish Return (Bretz 2011).

4.4.5.4. Factors for Decline

4.4.5.4.1. Historical Pressures on the Species

Bull trout are estimated to have occupied about 60 percent of the Columbia Basin and presently occur in only about 45 percent of their historic range. The decline of bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices and the introduction of non-native species. Declining salmon and steelhead populations could also negatively impact bull trout populations by reducing the number of juvenile salmon and steelhead that bull trout might prey on.

4.4.5.4.2. Current Pressures on the Species

Bull trout habitat is sensitive to stream channel changes. Altered flow regimes, sedimentation rates, bank erosion and reduced channel complexity all reduce the quality of bull trout habitat.

4.4.5.4.3. Limiting Factors for Recovery

Barriers between isolated populations are a limiting factor for most of the bull trout subpopulations in the Columbia Basin.

4.4.5.5. Local Empirical Information

4.4.5.5.1. Current Local Population Information

The few remaining bull trout strongholds in the Columbia River basin tend to be found in large areas of contiguous habitats in the Snake River basin of the central Idaho mountains, upper Clark Fork and Flathead Rivers in Montana, and several streams in the Blue Mountains in Washington and Oregon. Populations also exist in the Yakima River watershed. Very little is known about the number of bull trout within the mainstem, lower Snake River. The number is presumed to be very low. Table 8 shows the number of bull trout seen at various dams in the past few years.

Table 8 Bull trout fish ladder counts for Corps dams in Snake and Columbia rivers in the action area.

Ladder	Totals (number of individuals)			
	2011	2010	2009	2008
McNary Oregon shore fish ladder at McNary Dam	0	0	0	0
McNary Washington shore fish ladder at McNary Dam	0	0	0	0
Ice Harbor South fish ladder at Ice Harbor Dam	3	0	0	0
Ice Harbor North fish ladder at Ice Harbor Dam	0	0	0	0
Lower Monumental South fish ladder at Lower Monumental Dam	0	0	0	0
Lower Monumental North fish ladder at Lower Monumental Dam	47	12	5	2
Little Goose Dam (one fish ladder)	161	73	37	27
Lower Granite Dam (one fish ladder)	1	8	6	8

4.4.5.5.2. Ongoing Monitoring

Fish passage, including bull trout, at the lower Snake River dams is monitored. Any bull trout observations are recorded, though only a few, if any, are generally seen in any year. However, fish counting does not occur during winter when bull trout are most likely to be present. The USFWS operates a PIT tag detector on the lower Walla Walla River which has detected some bull trout leaving and returning to the Walla Walla River. They also operate a smolt trap on the Walla Walla River in conjunction with the Confederated Tribes of the Umatilla Indian Reservation.

4.4.6. Pygmy Rabbit

4.4.6.1. Listing History

The Columbia Basin pygmy rabbit DPS was listed as an endangered species by USFWS under an emergency regulation in 2001. The species was confirmed listed as endangered in 2003, without designation of critical habitat. The recovery priority number for the Columbia Basin pygmy rabbit is 3, on a scale from 1C (highest) to 18 (lowest). The Washington Department of Fish and Wildlife began a captive breeding program for the Columbia Basin pygmy rabbit in 2001. The Columbia Basin pygmy rabbit was considered to be extirpated from the wild in mid-2004. On March 13, 2007, 20 captive-bred animals were reintroduced to habitats historically occupied by the species in the Columbia Basin of central Washington. These captive-bred animals experienced a high level of predation over the first several weeks following their release, and as of May 15, 2007, five of them remained alive. Just prior to the release effort there were 86 individuals included in a captive breeding program, 3 of which were purebred Columbia Basin animals. At least one wild-born, and likely captive-bred kit (approximately 1-month old), has been documented at the release site. The remaining captive-bred female was also seen displaying nesting behavior. The balance of the captive population and those recently released to the wild consist of intercross progeny from controlled matings between Columbia Basin pygmy rabbits and pygmy rabbits of the same taxonomic classification from a discrete population in Idaho. Intercross breeding has helped facilitate genetic restoration of the Columbia Basin pygmy rabbit and is considered essential for recovery efforts. Currently, proposed measures to recover the Columbia Basin pygmy rabbit in the wild include additional releases of captive-bred progeny with at least 75 percent Columbia Basin ancestry (USFWS 2007).

4.4.6.2. Life History/Biological Requirements

Pygmy rabbits occur in the semiarid shrub steppe biome of the Great Basin and adjacent intermountain regions of the western United States. Within this broad biome, pygmy rabbits are typically found in habitat types that include tall, dense stands of sagebrush (*Artemesia* spp.), upon which they are highly dependent on for food and shelter throughout the year. The pygmy rabbit is one of only two rabbit species in North America that digs its own burrows and, therefore, is most often found in areas that also include relatively deep, loose soils that allow burrowing (USFWS 2007).

4.4.6.3. Distribution

There are no known pygmy rabbit populations along the lower Snake River. The historic and current Washington distribution can be seen in Figure 17. Pygmy rabbit's historic range may have included northern Benton and Franklin Counties, Washington, but they are no longer found there. Currently, pygmy rabbits are known to survive in five isolated fragments of suitable habitat in Douglas County. The pygmy rabbit historical range includes portions of the following states: California, Oregon, Nevada, Idaho, Montana, Wyoming, Utah, and Washington.

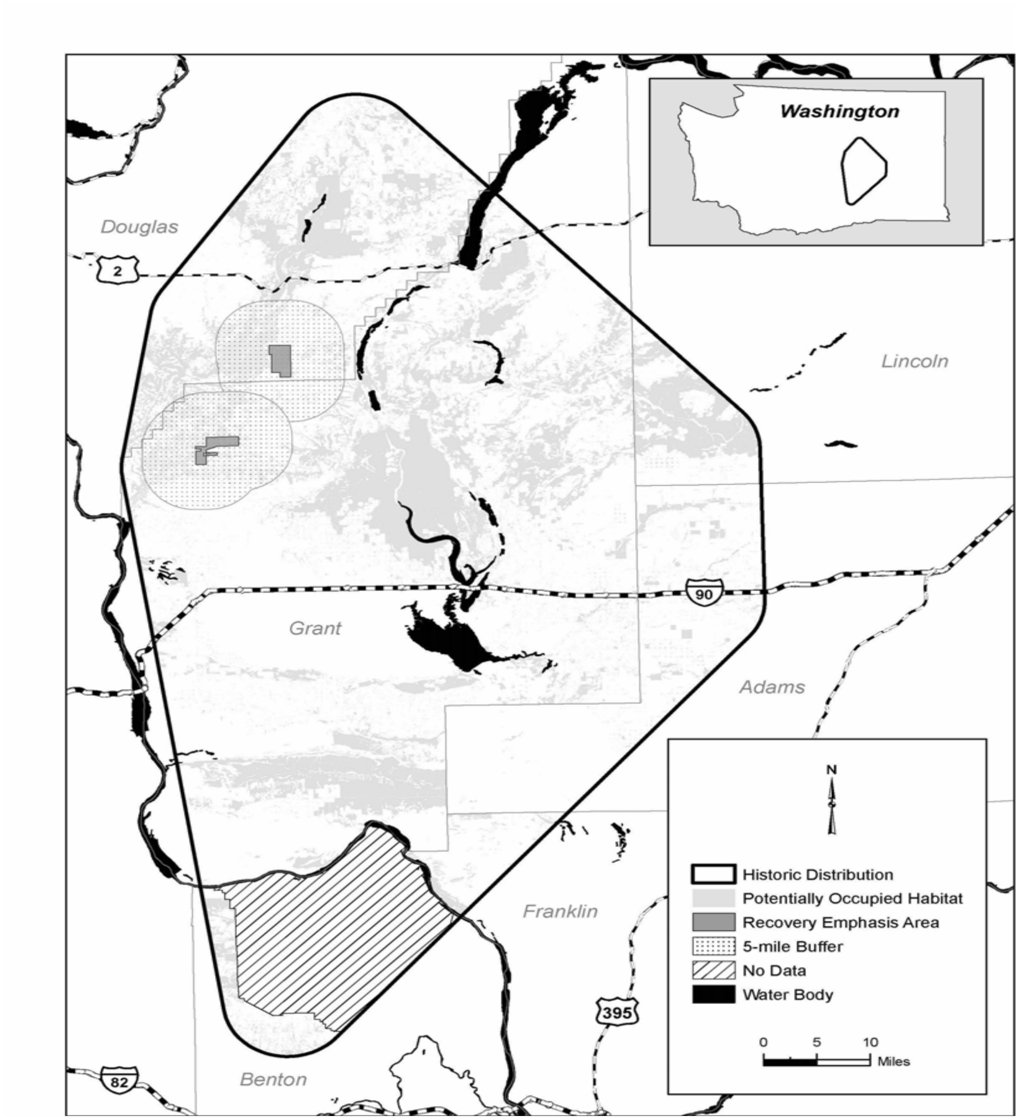

Figure 17 Historic distribution of the Columbia Basin pygmy rabbit, potentially occupied habitat, and recovery emphasis areas with 5-mile buffers.

4.4.6.4. Factors for Decline

4.4.6.4.1. Historical Pressures on the Species

The loss of shrub-steppe habitat to agricultural and other development has been a major factor affecting the continued survival of pygmy rabbits.

4.4.6.4.2. Current Pressures on the Species

There are several threats to the Columbia Basin pygmy rabbit population including disease and habituation in captivity and the potential for outbreeding depression in the wild. In addition, the present or threatened destruction, modification, or curtailment of its habitat or range reduces this species' chances of survival.

4.4.6.4.3. Limiting Factors for Recovery

The extremely low population of Columbia Basin pygmy rabbits combined with habitat loss and the effects of predators limit recovery of this species.

4.4.6.5. Local Empirical Information

Pygmy rabbits are not found near the action area or Snake River. The proposed project will have no effect on pygmy rabbits.

4.4.6.5.1. Current Local Population Information

There are no local populations of pygmy rabbits along the lower Snake River or near any lands around the proposed action.

4.4.6.5.2. Ongoing Monitoring

Researchers at Washington State University (Sayler et al. 2007), through coordination with the USFWS and the Washington Department of Fish and Wildlife, have developed a reintroduction plan that identifies specific procedures for release and monitoring of captive-bred Columbia Basin pygmy rabbits (USFWS 2007).

4.4.7. Canada Lynx

4.4.7.1.Listing History

The Canada lynx was listed as a threatened species in 2000. In 2003, in response to a court-order to reconsider the listing, USFWS clarified their final listing decision. Lynx are known to inhabit areas in Washington and Idaho, but due to a lack of data, the historic and current status of resident lynx populations in Oregon is uncertain.

4.4.7.2. Life History/Biological Requirements

Canada lynx are medium-sized cats, generally measuring 75-90 centimeters long (30-35 inches) and weighing 8-10.5 kilograms (18-23 pounds). Canada lynx are smaller than the European lynx with a shorter tail and longer hind legs. They have large feet adapted to walking on snow, long legs, tufts on the ears, and black-tipped tails. They are highly adapted for hunting snowshoe hare, the primary prey, in the snows of the boreal forest.

Lynx in the contiguous United States are at the southern margins of a widely-distributed range across Canada and Alaska. The center of the North American range is in north-central Canada. Lynx occur in mesic coniferous forests that have cold, snowy winters and provide a prey base of snowshoe hare (Ruggiero et al. 2000). These forests are generally described as boreal forests. In North America, the distribution of lynx is nearly coincident with that of snowshoe hares. Lynx survivorship, productivity, and population dynamics are closely related to snowshoe hare density in all parts of its range. A minimum density of snowshoe hares (greater than 0.5 hare per hectare (1.2 hares per acre)) distributed across a large landscape is necessary to support survival of lynx kittens and recruitment into and maintenance of a lynx population.

The southernmost extent of the boreal forest that supports lynx occurs in the contiguous United States in the Northeast, western Great Lakes, northern and southern Rockies, and northern Cascades. Here the boreal forest transitions into other vegetation communities and becomes more patchily distributed. As a result, the southern boreal forests generally support lower snowshoe hare densities, hare populations do not appear to be as highly cyclic as snowshoe hares further north, and lynx densities are lower compared to the northern boreal forest. Individual lynx maintain large home ranges (reported as generally ranging from 31 to 216 $kilometers^2$ (km^2), or 12-83 $miles^2$ (mi^2). Thus, a lynx population can only persist in a large boreal forested landscape that contains appropriate forest types, snow depths, and high snowshoe hare densities.

4.4.7.3. Distribution

Recent observations of lynx are primarily from the Cascade Range and the Blue Mountains. Canada lynx likely have never been as abundant in the lower 48 States as they were in northern Canada and Alaska because there is less lynx and snowshoe hare habitat at the southern part of the range.

In western states, most lynx occurrences (83%) were associated with Rocky Mountain Conifer Forest, and most (77%) were within the 1,500-2,000 m (4,920-6,560 ft) elevation zone (McKelvey et al. 1999). Primary vegetation that contributes to lynx habitat is lodgepole pine, subalpine fir, and Engelmann spruce (Aubry et al. 2000). In extreme northern Idaho, northeastern Washington, and northwestern Montana, cedar-hemlock habitat types may also be considered primary vegetation. In central Idaho, Douglas-fir on moist sites at higher elevations may also be considered primary vegetation. Secondary vegetation when interspersed within subalpine forests, may also contribute to lynx habitat. These vegetation types include cool, moist Douglas-fir, grand fir, western larch, and aspen forests. Dry forest types (e.g., ponderosa pine, climax lodgepole pine) do not provide lynx habitat (USACE 2006).

4.4.7.4. Factors for Decline

4.4.7.4.1. Historical Pressures on the Species

Lynx populations in the Northwest U.S. have likely never been high. However, lynx were hunted and trapped along with bobcat until just prior to their listing under the ESA. Roads, timber harvest, and human development have further reduced lynx populations.

4.4.7.4.2. Current Pressures on the Species

The same factors historically affecting lynx continue to affect lynx today, though take from hunting and trapping is likely lower than historical levels.

4.4.7.4.3. Limiting Factors for Recovery

While the lynx population in the U.S. was likely never very high, the low population size and limited amount of quality habitat in the U.S. limit the recovery of lynx populations.

4.4.7.5. Local Empirical Information

4.4.7.5.1. Current Local Population Information

There are no known local populations or individuals of Canada lynx near the action area or the lower Snake River. The proposed project will have no effect on Canada lynx.

4.4.7.5.2. Ongoing Monitoring

The Idaho Department of Fish and Game (IDFG) has used 12 remote camera stations and live traps conducted surveys for furbearers and carnivores throughout Dworshak Reservoir in 2000 and 2001. Eleven species of furbearers and carnivores were documented. No lynx were observed within the study area. However, lynx have been documented in 2 locations north of Breakfast Creek, one on the Floodwood Road in 1997 and once at Stocking Meadows Ridge in 1998 (USACE 2006).

4.4.8. Ute ladies'-tresses

4.4.8.1. Listing History

Ute ladies'-tresses was listed as threatened in 1992 in its entire range. Within the area covered by this listing, this species is known to occur in Colorado, Idaho, Montana, Nebraska, Utah, Washington, and Wyoming. In 2004, USFWS contracted for a comprehensive status review of this species. A draft of this report became available in February 2005. A final draft of the status review was completed in October 2005. USFWS has determined a petition to remove the Ute ladies'-tresses orchid from Federal protection under the ESA provides substantial biological information to indicate that removal may be warranted.

4.4.8.2.Life History/Biological Requirements

Ute-ladies'-tresses is a perennial, terrestrial orchid with 7 to 32-inch stems arising from tuberously thickened roots. The flowering stalk consists of few to many small white or ivory flowers clustered into a spiraling spike arrangement at the top of the stem. The species is characterized by whitish, stout flowers. It blooms, generally, from late July through August. The orchid occurs along riparian edges, gravel bars, old oxbows, high flow channels, and moist to wet meadows along perennial streams. It typically occurs in stable wetland and seepy areas associated with old landscape features within historical floodplains of major rivers, as well as in wetlands and seeps near freshwater lakes or springs. Ute ladies'-tresses ranges in elevation from 720 to 1,830 ft in Washington to 7,000 ft in northern Utah. Nearly all occupied sites have a high water table (usually within 5 to 18 inches) of the surface augmented by seasonal flooding, snowmelt, runoff, and irrigation.

Since 1992, at least 26 new populations of Ute ladies'-tresses have been documented from perennial stream, river, lakeshore, and spring sites directly associated with human-developed dams, levees, reservoirs, irrigation ditches, reclaimed gravel quarries, roadside barrow pits, and irrigated meadows. In all, 33 of 61 documented populations (54%) occur in sites in which natural hydrology has been influenced by dams, reservoirs, or supplemental irrigation. Even sites with undisturbed hydrology, however, have been influenced by human agricultural practices, urban development, or road and dam construction (Fertig et al. 2005).

4.4.8.3.Distribution

Distribution of Ute ladies'-tresses is shown in Figure 18. It does not appear to occur on Corps managed lands in the District.

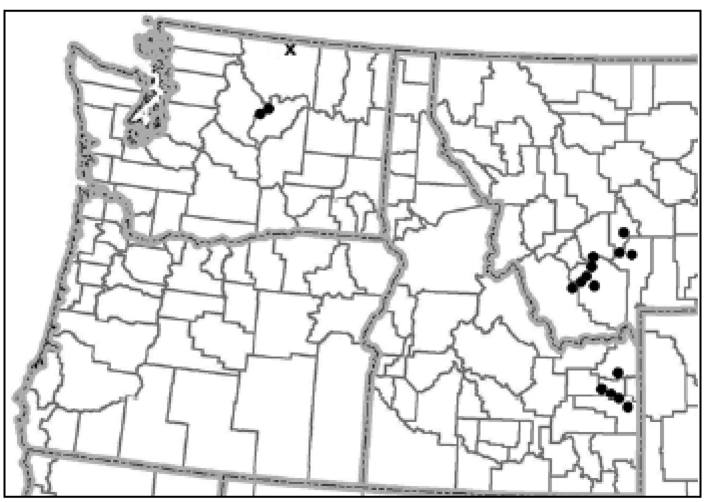

Figure 18 Known distribution of Ute-ladies'-tresses in western North America circa July 2005. Extant populations are indicated by black circles, while extirpated populations are marked by an "x". Excerpted from Fertig et al. 2005.

Idaho

Ute ladies'- tresses was first discovered in Idaho by Mabel Jones in 1996 along the South Fork of the Snake River (Moseley 1997). The species is now known from Bonneville, Fremont, Jefferson, and Madison counties along the Snake River and from wetland sites along the Henry's Fork River (Mancuso 2004, Moseley 1998a, 1998b, 1999a, Murphy 2004). Idaho populations occur in the Idaho Falls, Palisades, and Lower Henrys watersheds within the Columbia Plateau and Utah-Wyoming Rocky Mountains ecoregions (Fertig et al. 2005).

Washington

Ute ladies'-tresses was first discovered in Washington at Wannacut Lake in Okanogan County (also in the Okanogan watershed and ecoregion) in 1997 (Bjork 1997). In 2000, the species was also found along a reservoir bordering the Columbia River near Chelan in Chelan County (Chief Joseph watershed) within the Columbia Plateau ecoregion (Fertig et al. 2005).

4.4.8.4.Factors for Decline

4.4.8.4.1. Historical Pressures on the Species

The historic population size of Ute ladies'-tresses is unknown. It is likely construction of roads, levees along streams, other development and livestock grazing have decreased numbers of this plant in some areas.

4.4.8.4.2. Current Pressures on the Species

The same factors which historically affected this species continue to affect the plant today. The USFWS received a petition to delist Ute ladies'-tresses in 2004. The USFWS concluded there was substantial information to warrant a status review to determine if delisting was warranted. The outcome of the status review is unknown.

4.4.8.4.3. Limiting Factors for Recovery

Since Ute ladies'-tresses was listed it has been found in many previously unknown locations. While this does not indicate the plant has recovered, it seemingly reduces the urgency of its need for protection under the ESA.

4.4.8.5.Local Empirical Information

4.4.8.5.1. Current Local Population Information

There are no known local populations of Ute ladies'-tresses near the lower Snake River. No Ute ladies'-tresses were found in any of the HMUs on Corps lands between Lyon's Ferry (RM 59) upstream to Asotin Slough (RM 147), and upstream of the confluence of the Snake and Clearwater Rivers to RM 8.2 on the Clearwater during a 2008 vascular plant survey on Corps lands in the upper Snake River (Bailey 2008a, 2008b).

The proposed action will have no effect on Ute ladies'-tresses.

4.4.8.5.2. Ongoing Monitoring

Local monitoring on Corps lands within the action area may occur where suitable habitat is present. There is no ongoing, District-wide monitoring for Ute ladies'-tresses at this time.

4.4.9. Spalding's Catchfly

4.4.9.1.1. Listing History

Spalding's catchfly was listed as a threatened species on October 10, 2001. Spalding's catchfly is native to portions of Idaho, Montana, Oregon, Washington, and British Columbia, Canada. Fifty-eight percent of Spalding's catchfly populations occur either entirely or partially on private land; the remaining populations occur on Federal lands (U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Refuges, National Park Service, and Department of Defense), and state and tribal lands.

4.4.9.2. Life History/Biological Requirements

Spalding's catchfly is an herbaceous perennial plant in the pink family (*Caryophyllacea*). Spalding's catchfly produce one to several vegetative or flowering stems arising from a simple or branched persistent underground stem (caudex), which surmounts a long, narrow taproot. Plants range from 20 to 40 cm in height. Each stem typically bears 4 to 7 pairs of simple, opposite leaves that are 5 to 8 cm in length and 2 to 4 cm in width. Reproductive individuals produce 3 to 20 cream to pink or light green flowers borne in a branched, terminal inflorescence. All green portions of the plant (foliage, stem, and flower bracts) are covered in dense sticky hairs that frequently trap dust and arthropods, giving this species the common name 'catchfly'. Plants (both vegetative and reproductive) emerge in mid-to late May. Flowering typically occurs from mid-July through August, but may occasionally continue into October.

Rosettes are formed the first and possibly the second year, followed by the formation of vegetative stems. 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. Spalding's catchfly was listed as threatened in 2001 and a final recovery plan for this plant was released October 15, 2007.

4.4.9.3. Distribution

The species is endemic to the Palouse region of south-east 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. Occupied habitat includes five physiographic (physical geographic) regions: 1) the Palouse Grasslands in west-central Idaho and southeastern Washington; 2) the Channeled Scablands in east-central Washington; 3) the Blue Mountain

Basins in northeastern Oregon; 4) the Canyon Grasslands along major river systems in Idaho, Oregon, and Washington; and 5) the Intermontane Valleys of northwestern Montana and British Columbia, Canada.

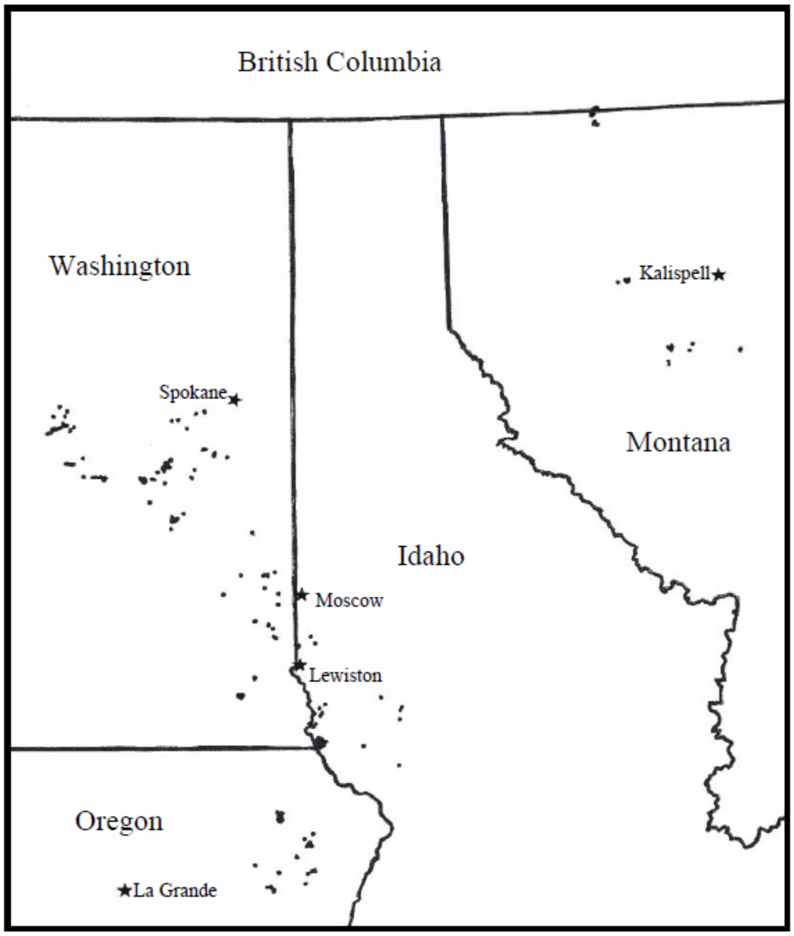

Figure 19 Rangewide distribution of Spalding's catchfly (*Silene spaldingii*) (Gray and Lichthardt 2004).

4.4.9.4.Local Empirical Information

4.4.9.4.1. Current Local Population Information

There are no known local populations of Spalding's catchfly in the action area. This species was not found in any of the HMUs on Corps lands between Lyon's Ferry (RM 59) upstream to Asotin Slough (RM 147), and upstream of the confluence of the Snake and Clearwater Rivers to RM 8.2 on the Clearwater during a 2008 vascular plant survey on Corps lands in the upper Snake River (Bailey 2008a, 2008b).

The proposed project will have no effect on Spalding's catchfly.

4.4.9.4.2. Ongoing Monitoring

Currently there is no monitoring for Spalding's catchfly on Corps lands.

4.5.Status of Critical Habitat

4.5.1. Snake River Spring/Summer Chinook

4.5.1.1. Geographical Extent of Designated Critical Habitat

NMFS designated critical habitat for SRSS Chinook to include the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to Hells Canyon Dam.

Critical habitat also includes river reaches presently or historically accessible (except reaches above impassable natural falls (including Napias Creek Falls) and Dworshak and Hells Canyon Dams) to SRSS Chinook salmon in the following hydrologic units: Hells Canyon, Imnaha, Lemhi, Little Salmon, Lower Grande Ronde, Lower Middle Fork Salmon, Lower Salmon, Lower Snake-Asotin, Lower Snake-Tucannon, Middle Salmon-Chamberlain, Middle Salmon-Panther, Pahsimeroi, South Fork Salmon, Upper Middle Fork Salmon, Upper Grande Ronde, Upper Salmon, Wallowa. Critical habitat borders on or passes through the following counties in Oregon: Baker, Clatsop, Columbia, Gillium, Hood River, Morrow, Multnomah, Sherman, Umatilla, Union, Wallowa, Wasco; the following counties in Washington: Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Klickitat, Pacific, Skamania, Wahkiakum, Walla Walla, Whitman; and the following counties in Idaho: Adams, Blaine, Custer, Idaho, Lemhi, Lewis, Nez Perce, Valley.

4.5.1.2. Essential Elements of Designated Critical Habitat

Table 9 lists the PCEs for Snake River salmon.

Table 9 Primary constituent elements (PCEs) of critical habitats designated for SRSS Chinook salmon, SRF Chinook salmon, and SR sockeye salmon, and corresponding species life history events.

Primary Constituent Elements		Species Life
Site	**Site Attribute**	**History Event**
Spawning and juvenile rearing areas	Access (sockeye) Cover/shelter Food (juvenile rearing) Riparian vegetation Space (Chinook) Spawning gravel Water quality Water temperature (sockeye) Water quantity	Adult spawning Embryo incubation Alevin development Fry emergence Fry/parr growth and development Fry/parr smoltification Smolt growth and development
Juvenile migration corridors	Cover/shelter Food Riparian vegetation Safe passage Space Substrate Water quality Water quantity Water temperature Water velocity	Fry/parr seaward migration Smolt growth and development Smolt seaward migration
Areas for growth and development to adulthood	Ocean areas – not identified	Adult growth and development Adult sexual maturation Fry/parr smoltification Smolt/adult transition
Adult migration corridors	Cover/shelter Riparian vegetation Safe passage Space Substrate Water quality Water quantity Water temperature Water velocity	Adult sexual maturation Adult “reverse smoltification” Adult upstream migration Kelt (steelhead) seaward migration

4.5.2. Snake River Fall Chinook

4.5.2.1. Geographical Extent of Designated Critical Habitat

The proposed dredging will occur within designated critical habitat for SRF Chinook salmon. Freshwater critical habitat can include all Columbia River Basin waterways, substrates, and adjacent riparian areas below longstanding, natural impassable barriers (e.g., natural waterfalls in existence for at least several hundred years) and dams that block access to former habitat.

NMFS designated CH for SRF Chinook to include the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; the Snake River, all river reaches from the confluence of the Columbia River, upstream to Hells Canyon Dam; the Palouse River from its confluence with the Snake River upstream to Palouse Falls; the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam. Critical habitat also includes river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to SRF Chinook salmon in the following hydrologic units; Clearwater, Hells Canyon, Imnaha, Lower Grande Ronde, Lower North Fork Clearwater, Lower Salmon, Lower Snake, Lower Snake-Asotin, Lower Snake-Tucannon, and Palouse. Critical habitat borders on or passes through the following counties in Oregon: Baker, Clatsop, Columbia, Gillium, Hood River, Morrow, Multnomah, Sherman, Umatilla, Wallowa, Wasco; the following counties in Washington: Adams, Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Klickitat, Lincoln, Pacific, Skamania, Spokane, Wahkiakum, Walla Walla, Whitman; and the following counties in Idaho: Adams, Benewah, Clearwater, Idaho, Latah, Lewis, Nez Perce, Shoshone, Valley.

4.5.2.2. Essential Elements of Designated Critical Habitat

Refer to Table 9.

4.5.3. Snake River Sockeye

4.5.3.1. Geographical Extent of Designated Critical Habitat

The proposed dredging will occur within designated critical habitat for Snake River sockeye salmon. Freshwater critical habitat includes all Columbia River Basin waterways, substrates, and adjacent riparian areas below longstanding, natural impassable barriers (e.g., natural waterfalls in existence for at least several hundred years) and dams that block access to former habitat.

NMFS designated critical habitat for Snake River sockeye to include the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to the confluence of the Salmon River; all Salmon River reaches from the confluence of the Snake River upstream to Alturas Lake Creek; Stanley, Redfish, Yellow Belly, Pettit, and Alturas Lakes (including their inlet and outlet creeks); Alturas Lake Creek, and that portion of Valley Creek between Stanley Lake Creek and the Salmon River. Critical habitat is comprised of all river lakes and reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River sockeye salmon in the following hydrologic units: Lower Salmon, Lower Snake, Lower Snake-Asotin, Lower Snake-Tucannon, Middle Salmon-Chamberlain, Middle Salmon-Panther, and Upper Salmon. Critical habitat borders on or passes through the following counties in Oregon: Clatsop, Columbia, Gillium, Hood River, Morrow, Multnomah, Sherman, Umatilla, Wallowa, Wasco; the following counties in Washington: Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Klickitat, Pacific, Skamania, Wahkiakum, Walla Walla, Whitman; and the following counties in Idaho: Blaine, Custer, Idaho, Lemhi, Lewis, Nez Perce.

4.5.3.2. Essential Elements of Designated Critical Habitat

Refer to Table 9.

4.5.4. SRB Steelhead

4.5.4.1. Geographical Extent of Designated Critical Habitat

The proposed dredging will occur within proposed CH for Snake River steelhead. NMFS designated CH for Snake River steelhead in the Hells Canyon, Imnaha River, Lower Snake/Asotin, Upper Grande Ronde River, Wallowa River, Lower Grande Ronde, Lower Snake/Tucannon, Upper Salmon, Pahsimeroi, Middle Salmon-Panther, Lemhi, Upper Middle Fork Salmon, Lower Middle Fork Salmon, Middle Salmon-Chamberlain, South Fork Salmon, Lower Salmon, Little Salmon, Upper Selway, Lower Selway, Lochsa, Middle Fork Clearwater, South Fork Clearwater, and Clearwater subbasins, and the Lower Snake/Columbia River migration corridor (NMFS 2005b). There are 289 watersheds within the range of this DPS. Fourteen watersheds received a low conservation value rating, 44 received a medium conservation value rating, and 231 received a high conservation value rating. The lower Snake/Columbia River rearing/migration corridor downstream of the spawning range is considered to have a high conservation value and is the only portion designated in 15 of the high value watersheds. Of the 8,225 miles of habitat areas eligible for designation, 8,049 miles of stream and 4 square miles of lake are designated.

4.5.4.2. Essential Elements of Designated Critical Habitat

Refer to Table 10.

Table 10 Primary constituent elements (PCEs) of critical habitats designated for Pacific salmon and steelhead species (EXCEPT Snake River spring/summer run Chinook salmon, Snake River fall-run Chinook salmon, and Snake River sockeye salmon), and corresponding species life history events.

Primary Constituent Elements		Species Life History Event
Site Type	**Site Attribute**	
Freshwater spawning	Substrate Water quality Water quantity	Adult spawning Embryo incubation Alevin development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence Fry/parr growth and development
Freshwater migration	Free of artificial obstructions Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration, holding Kelt (steelhead) seaward migration Fry/parr seaward migration
Estuarine areas	Forage Free of obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation Adult "reverse smoltification" Adult upstream migration, holding Kelt (steelhead) seaward migration Fry/parr seaward migration Fry/parr smoltification Smolt growth and development Smolt seaward migration
Nearshore marine areas	Forage Free of obstruction Natural cover Water quantity Water quality	Adult sexual maturation Smolt/adult transition
Offshore marine areas	Forage Water quality	Adult growth and development

4.5.5. Bull Trout

4.5.5.1. Geographical Extent of Designated Critical Habitat

Bull trout CH was designated in 2005. The USFWS revised the designation in 2010. A final rule was published on October 18, 2010, and took effect on November 17, 2010. The mainstem Columbia and Snake Rivers, including the action area, are now included in the designation.

4.5.5.2. Essential Elements of Designated Critical Habitat

PCEs for bull trout (Table 11) are based on the needs identified in 50 CFR 17 (75 FR 63898) and the current knowledge of the life-history, biology, and ecology of the species and the characteristics of the habitat necessary to sustain the essential life history functions of the species. The USFWS has identified the following PCEs for bull trout critical habitat.

Table 11 Primary constituent elements (PCEs) of critical habitats designated for bull trout.

PCEs		
1	Water Quality	Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.
2	Migration Habitat	Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.
3	Food Availability	An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.
4	Instream Habitat	Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.
5	Water Temperature	Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.
6	Substrate Characteristics	In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system.
7	Stream Flow	A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.
8	Water Quantity	Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.
9	Nonnative Species	Sufficiently low levels of occurrence of nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

4.5.6. Canada Lynx

No critical habitat for Canada Lynx has been designated within the proposed action area. The proposed action will have no effect on lynx critical habitat.

4.5.7. Pygmy Rabbit, Ute Ladies'-tresses, Spalding's Catchfly

No critical habitat rules have been published for pygmy rabbit, Ute ladies'-tresses, or Spalding's catchfly.

5. Environmental Baseline

The action area directly affected by the proposed action begins at the confluence of the Snake and Clearwater Rivers (approximately RM 139) at Lewiston, ID and Clarkston, WA and extends downstream to the Ice Harbor Dam navigation lock approach (approximately RM 10). The action area also extends upstream from the confluence of the Clearwater and Snake Rivers to about RM 1.2 on the Clearwater River. Both adult and juvenile life stages of each of the aforementioned ESUs use the action area as a migration corridor. The action area also provides a limited amount of spawning and rearing habitat for SRF Chinook salmon, although very little SRF Chinook salmon spawning occurs in the mainstem lower Snake River below the Snake and Clearwater River confluence. Some adult Snake River steelhead and juvenile SRSS Chinook salmon also overwinter in the action area. The action area includes areas directly and indirectly affected by the proposed action. The entire action area is designated EFH for Chinook salmon, and portions are designated EFH for coho salmon.

Dams

Dam development in the Columbia River Basin began in the 1800s. Mainstem dam development began with Rock Island Dam (a non-Federal project) on the Columbia River in 1933 and continued through 1975 with the completion of Lower Granite on the Snake River. Bonneville Dam was the first Federal dam on the mainstem Columbia River. It was completed in 1938. The major period of construction on the mainstem Columbia and Snake Rivers was from the 1950s through the 1970s. Federal agencies have built 30 major dams with hydropower facilities on the Columbia and its tributaries. Overall, there are some 255 Federal and non-Federal projects that have been constructed in the basin. These dams have altered the sediment transport function of many parts of the rivers, especially at the uppermost dams, such as Lower Granite Dam.

The lower Snake River dams have disrupted sediment transport and habitat-forming deposition patterns within the entire length of the river channel. As the Snake and Clearwater Rivers meet the slackwater of the Lower Granite reservoir, bedload and suspended particles soon settle to the river bottom, resulting in a substantial accumulation of sediment near the head of the reservoir. An estimated 2.6 million cubic yards of sediment enter the Lower Granite reservoir each year. Without the dams, finer-grained materials will tend to be deposited on the river floodplain or high along the channel margins, and the riverbed will present a complex mosaic of substrate conditions along the length of the lower Snake River.

Presently, there are few shallow-water sandy shoals below the confluence area. Consequently, smolts must travel substantial distances between foraging areas, feeding during their seaward migration. There are also few accumulations of suitable spawning gravels for SRF Chinook salmon except for a limited amount in the tailraces of the dams.

Storage dams have eliminated mainstem spawning and rearing habitat. They have altered the natural flow regime of the Snake and Columbia Rivers by decreasing spring and summer flows, increasing fall and winter flow, and altering natural thermal patterns. Power operations cause fluctuating flow levels and river elevations, affecting fish movement through reservoirs, disturbing riparian areas and, possibly, stranding fish in shallow areas as flows recede. The eight dams in the migration corridor of the Snake and Columbia Rivers kill or injure a portion of the smolts passing through the area. The low velocity at which water travels through the reservoirs behind the dams slows the juvenile salmonids travel time to the ocean and enhances the survival of predatory fish (Independent Scientific Group 1996). Formerly complex mainstem habitats in the Snake River have been reduced to single, simple, reservoir-wide channels with reduced floodplains in size and function, and off-channel habitats eliminated or disconnected from the main channel (Sedell and Froggatt 1984; Independent Scientific Group 1996; and Coutant 1998). The amount of large woody debris in the river has declined, reducing habitat complexity and altering the river’s food webs (Maser and Sedell 1994).

Soils

The soils along the lower Snake River can be primarily divided into three types: upland soils along the hillslopes and canyons, alluvial soils along the river, and bench soils along the ridgetops and terraces above the river. The upland soils are primarily shallow to very deep, silty loam soils formed from loess deposits and residuum from basalt. These soils tend to have a high-to-severe erosion hazard due to rapid runoff along the steep slopes of the canyon. The bench-type soils tend to be sandy loam developed from glacial outwash, loess, volcanic ash, and basalt. These bench-type soils have slow runoff characteristics and slight erosion hazards because they tend to be on less steep slopes. Alluvial soils are found in the valley bottom and are excessively drained and range from cobbley, coarse sand underlain by stratified cobbles, boulders, gravels, and sand. These alluvial soils were more subject to periodic flooding prior to river impoundment.

Many of the Snake River Plateau soils are light and highly erodible with low rainfall limiting the ability of vegetative cover to reestablish, once removed. Wind erosion is prevalent, especially during the spring and fall, when high winds and dry soil conditions create dust storms. The severity of these dust storms is exacerbated by dryland agricultural practices that expose the soil during spring cultivation and fall harvesting.

Erosion from areas burned by forest fires and plowed for agriculture are two of the main factors that contribute sediment to the rivers. The use of no-till farming practices reduces the sediment input from agriculture. Landslides in burned areas contribute large amounts of sediment. Landslides of various types also occur along the reservoir shorelines. These landslides are generally within the surface layer sediments, especially those that are somewhat poorly drained because of an admixture of finer grained sediment.

The lower Snake River downstream of Lewiston, Idaho annually transports approximately 3 to 4 million cubic yards of new sediments which have been eroded from its drainage basin. Approximately 100 to 150 million cubic yards of sediment have been deposited upstream of the four lower Snake River dams (mostly in Lower Granite Reservoir) since Ice Harbor became operational in the early 1960s.

Other Baseline Conditions

Other human activities that have degraded aquatic habitats or affected native fish populations in the Snake River Basin include stream channelization, elimination of wetlands, construction of flood control dams and levees, construction of roads, water withdrawals, unscreened water diversions, agriculture, livestock grazing, urbanization, outdoor recreation, artificial fish propagation, fish harvest, and the introduction of non-native species (Henjum et al. 1994; Rhodes et al. 1994; Spence et al. 1996). In many watersheds, land management and development activities have: (1) reduced connectivity (i.e., the flow of energy, organisms, and materials) between streams, riparian areas, floodplains, and uplands;
(2) elevated fine sediment yields, degrading spawning and rearing habitat; (3) reduced large woody material that traps sediment, stabilizes streambanks, and helps form pools; (4) reduced

the vegetative canopy that minimizes the solar heating of streams; (5) caused streams to become straighter, wider, and either shallower or deeper than their historic or normative condition, thereby reducing rearing habitat and altering water temperature; (6) altered peak flow volume and timing, leading to channel changes and potentially altering fish migration behavior; and (7) altered floodplain function, water tables, and base flows (Henjum et al. 1994; Rhodes et al. 1994; Wissmar et al. 1994; Spence et al. 1996).

Although currently fragmented by the presence of dams, the mainstem Snake River provides habitat that may help to maintain interactions between populations in the tributaries. It currently provides for the foraging and overwintering of all ESA-listed Snake River salmonids except sockeye salmon (Table 12), and could provide some spawning habitat for SRF Chinook salmon.

Table 12 Absolute and Relative Quantification of Three Water Depth Habitats in the Lower Granite Reservoir, Snake River and Clearwater River During the Early to Mid-1980's

Pool Reach (RM)	Shallow (<20 ft) Acres (Percent)	Mid-Depth (20-60 ft) Acres (Percent)	Deep (>60 ft) Acres (Percent)	Total Acres (Percent of Total Pool or Reach)
SR107.4 – SR120.46	281 (8%)	1,241 (34%)	2,147 (57%)	3,669 (43%)
SR120.46 - SR146.33	983 (8%)	2,795 (58%)	1,017 (21%)	4,795 (57%)
SR107.4 – SR146.33	1,264 (15%)	4,036 (48%)	3,164 (37%)	8,464 (94%)
CR0.0 - CR4.4	349 (71%)	141 (29%)	0 (0%)	489 (6%)
SR107.4 - SR146.33 and R0.0 - CR4.4	1,612 (18%)	4,177 (47%)	3,164 (35%)	8,953 (100%)

Notes:
(1) Estimates calculated from U.S. Army Corps of Engineers cross section profiles.
(2) SR120.46 is the mid-reservoir section where the majority of the fine silt and sand material settles out due to increased rate of depth affecting the slowing rate of water velocity.

Turbidity

The turbidity standards in Washington and Idaho differ slightly. Washington regulations specify that turbidity shall neither exceed 5 NTUs over background levels when the background level is 50 NTUs or less nor have more than a 10 percent increase when background is more than 50 NTUs. The Idaho standard states that turbidity shall not exceed the background by more than 50 NTU instantaneously below the compliance boundary or by more than 25 NTU for more than 10 consecutive days.

Background turbidity data collected from the lower Snake River indicates that turbidity was lowest at the confluence of the Snake and Clearwater Rivers and increased farther downstream in the Snake River. Median turbidity values ranged from 2 to 4 nephelometric turbidity unit (NTUs) in the Snake River, well below Washington's 25 NTU background action limit. These measurements did not include sampling during periods of heavy runoff or heavy storm non-point source water discharge. The average background turbidity level in the Snake and Clearwater Rivers during the winter dredging period in 2006 was less than 5 NTU.

Chemical Contaminants

The Corps had a series of analyses performed on samples collected in 2011 to determine the chemical content of sediments at potential dredging sites in the lower Snake River and at the confluence of the Snake and Clearwater Rivers. The sediment samples were analyzed for grain size, total organic carbon, percent solids, TAL metals, PCBs (Arochlors), semi-volatile organic compounds, polycyclic aromatic hydrocarbons, total petroleum hydrocarbons (diesel-heavy oil range), halogenated pesticides, organophosphorus pesticides, organonitrogen pesticides, phenylurea pesticides, carbamate pesticides, glyphosate, and high resolution dioxin/furan congeners. Elutriate analyses were also completed for some of samples to evaluate the potential release of constituents from disturbed sediments. The data was compared to the 2009 marine sediment criteria contained in the Sediment Evaluation Framework for the Pacific Northwest (SEF), the Washington State Department of Ecology (WADOE) 2012 sediment management standards (SMS), and the National Oceanic and Atmospheric Administration 2011 Screening Quick Reference Tables (NOAA SQRT) for invertebrates.

Grain size data from the three DMMUs characterized the majority of the material proposed for dredging as sand with smaller amounts of silts near the mooring areas. The majority of the individual organic parameters were non-detectable. Low level dichlorprop (10 ppb) was detected in one elutriate sample from the Clarkston DMMU but did not trigger any of the criteria previously mentioned. Most of the metals data met the guidelines as well. One exception was the mercury concentration in one sediment sample from the Clarkston DMMU which was 0.009 ppb above the NOAA SQRT recommended invertebrate no effect level, but less than the SEF and SMS criteria. Dioxin and furan toxic equivalents (TEQs) were calculated for the sediment and elutriate using the U = 0 and U = ½ method for comparisons. These TEQs were consistent with the results of previous studies in agricultural soils in Washington and less than Puget Sound background levels.

5.1. Matrix of Pathways and Indicators (MPI)

NMFS uses the "Matrix of Pathways and Indicators" (MPI) (NMFS 1996) to summarize important environmental parameters and levels of condition for each (Table 13). USFWS adopted a similar strategy in 1997 based on NMFS' matrix. The NMFS matrix is divided into six overall pathways (major rows in the matrix):

- Water Quality
- Channel Condition and Dynamics
- Habitat Access
- Flow/Hydrology
- Habitat Elements
- Watershed Conditions

Each represents a significant pathway by which actions can have potential effects on anadromous salmonids and their habitats, and could be used for analyzing bull trout habitat as well.

When the Lower Granite reservoir was filled in 1975, the historical shallow-water habitat was inundated. This converted approximately 40- to 60-percent of the shallow-water sand bar habitat used by juvenile fall Chinook salmon into either mid-depth bench habitat or deep-water habitat. Mid-depth bench habitat is more suitable for sturgeon (with minimal structural cover) or adults of resident predator species (with structure in the substrate); and deep-water habitat is used by only a few species, including sturgeon.

An analysis of limiting conditions for reservoir-wide habitat readily indicates that low gradient, open sand, shallow-water habitat (with no additional cover structure) will be moderately to highly suitable for fall Chinook salmon rearing habitat (Bennett et al. 1987 through 2005, Curet 1994, and Connor et al. 2001, 2002, 2003, 2004; Tiffan and Connor 2012; Tiffan and Hatten 2012). Recent biological monitoring has suggested that reducing the criterion to define shallow water from <20 ft (the COE's current definition) to <6 ft (based on recent habitat use data) would provide the greatest amount of shallow water habitat for subyearling fall Chinook salmon based on habitat use sampling data and their transient rearing strategy and that creating new habitat in the lower portion of Lower Granite Reservoir in ribbons along the shoreline appears to provide the greatest benefit for rearing juvenile fall Chinook (Tiffan and Connor 2012; Tiffan and Hatten 2012).

Recent modeling efforts by Tiffan and Hatten (2012) indicates Lower Granite Reservoir contains about 255 ha of rearing habitat at a flow of 143 kcfs, which equates to about 7% of the reservoir area. This modeling effort demonstrated most rearing habitat is located in the upper half (i.e., upstream of Centennial Island, RM 120) of the Lower Granite reservoir and little exists in the lower half due to steep lateral bed slopes and unsuitable substrate along the shorelines. The largest habitat areas are associated with known shallow-water locations such as at Silcott Island (~85 ha) and the area near Steptoe Canyon (~32 ha).

In previous Section 7 consultations for dredging and disposal actions on the lower Snake River, NMFS has indicated that shallow-water habitat less than 10 feet deep will be preferred as highly suitable for the rearing of juvenile SRF Chinook salmon; and all constructed shallow-water habitat plots should not be located at a single site or one restricted reach of any lower Snake River reservoir. It is preferable to have an interconnected, but wider distribution of "feeding stations." Based on these previous consultations, biological monitoring of shallow water complexes in the lower Snake River reservoirs and recent modeling efforts (Tiffan and Connor 2012; Artzen et al. 2012; Tiffan and Hatten 2012; Gottfried et al. 2011), future disposal of dredge materials should occur in the lower portion of the Lower Granite Reservoir. These will begin in the mid reaches of the Lower Granite reservoir, radiating downriver and taking the fullest advantage of existing shallow to mid-depth benches to build on. The Corps realized that a minimum acreage of constructed habitat for any single disposal action will have to apply to avoid the desire to dump small quantities of excavated sediment with no short-term or long-term benefit, even though a plan could deliver more sediment in the next channel maintenance action.

The Corps did an aerial photography and bathymetry mapping exercise on measuring the size and distribution qualities of pre-reservoir sand and gravel shoreline habitat plots to determine that 4 acres constitutes the minimum rearing habitat benefit acreage. The design conditions proposed by Bennett et al., Curet, Connor et al., NMFS, Tiffan and Connor, Tiffan and Hatten and the Corps were combined to serve as the objective target for maximizing beneficial use of in-water disposal of dredged material.

Table 13 Checklist for Documenting Environmental Baseline and Effects of Proposed Action on Relevant Anadromous Salmonid Habitat Indicators

PATHWAYS	ENVIRONMENTAL BASELINE			EFFECTS OF THE ACTION		
Indicators	Properly Functioning	At Risk	Not Properly Functioning	Restore	Maintain	Degrade
Water Quality:						
Temperature			X		X	
Sediment			X		X	
Chem. Contam./Nut.		X			X	
Habitat Access:						
Physical Barriers		X			X	
Habitat Elements:						
Substrate			X		X	
Large Woody Debris			X		X	
Pool Frequency			X		X	
Pool Quality			X		X	
Off-Channel Habitat			X		X	
Refugia			X		X	
Channel Cond. & Dyn.:						
Width/Depth Ratio			X		X	
Streambank Cond.			X		X	
Floodplain Connectivity			X		X	
Flow/Hydrology:						
Peak/Base Flows			X		X	
Drainage Network Increase			X		X	
Watershed Conditions:						
Road Dens. & Loc.			X		X	
Disturbance History			X		X	
Riparian Reserves			X		X	
Watershed Name: Snake River Basin			Location: Ice Harbor Dam to Lewiston, Idaho			

5.2. Baseline Conditions Justification

The lower Snake River in the action area has been highly altered from its pre-dam condition. As a result many of the parameters below are "not properly functioning."

Water Quality: Temperature – Water temperature in the lower Snake and Clearwater Rivers is not properly functioning. Dams on the Snake River have altered the water temperatures especially during summer and fall. Coldwater releases from Dworshak Dam reduce summertime water temperature in an attempt to create more favorable conditions for migrating juvenile salmonids. During winter, when the proposed action will occur, water temperatures are likely to be similar to historic conditions.

Water Quality: Sediment – Sediment in the Snake River is not properly functioning. Many factors contribute to the altered sediment processes. The aftereffects of forest fires contribute sand and silt to the river systems, especially from the Salmon River basin. While this is a natural process, the frequency of large fires may be on the increase due to years of fire suppression and climate change. Mainstem dams trap sand and larger sediments, especially in areas such as the Snake/Clearwater confluence where faster moving water which can carry sand meets the slackwater reservoir which cannot carry sand very well. Sand and any larger sediments are deposited in these areas in large amounts, causing problems for river navigation.

Water Quality: Chemical Contaminants/Nutrients – The amount of contaminants in the sediments within the action area place this attribute at risk. Various chemical contaminants were detected within the sediments in some locations of the action area. However, the level of contaminants was largely below regulatory thresholds. The majority of the individual organic parameters were non-detectable. Low level dichlorprop (10 ppb) was detected in one elutriate sample, but did not trigger any regulatory criteria. Most of the metals data met the guidelines as well. One exception was the mercury concentration in one sediment sample which was 0.009 ppb above the recommended invertebrate no effect level, but less than the threshold for other criteria. Dioxin and furan toxic equivalents (TEQs) were calculated for the sediment and elutriate using the U = 0 and U = ½ method for comparisons. These TEQs were consistent with the results of previous studies in agricultural soils in Washington and less than Puget Sound background levels.

Habitat Access: Physical Barriers – Physical barriers in the action area make this parameter at risk. A majority of migrating adult and juvenile salmonids can successfully pass the mainstem dams, but passage is sometimes delayed and some fish do not survive the unnatural conditions around the dams. In addition, the slack water reservoirs slow the migration of juveniles which can be detrimental to their survival.

Habitat Elements: Substrate – The substrate condition in the action area is not properly functioning. The dams have halted the bedload movement of most of the gravel and cobble once transported through the system. Sand and gravel bars have mostly been covered by the slackwater reservoir. A faster moving, natural river likely contained more areas of gravel and cobble substrate where higher quality food organisms for juvenile salmonids lived.

Habitat Elements: Large Woody Debris - is not properly functioning. The reservoir conditions make what little large woody debris is on the river nonfunctional as salmonid habitat. Most of the existing woody debris is high up on the shorelines or floats down the river and is trapped behind the dams.

Habitat Elements: Pool Frequency – Pool frequency within the action area is not properly functioning. The slackwater reservoir creates one large pool where many smaller pools intermixed with runs and riffles once occurred.

Habitat Elements: Pool Quality – The pool quality in the action area is not properly functioning. Cover in the pool is provided mainly by water depth. Nonnative species/competitors reduce the amount of quality habitat for salmonids even further.

Habitat Elements: Off-Channel Habitat – The amount of off channel habitat in the action area is not properly functioning. Off-channel habitat in the form of side channels and backwater areas are limited within the lower Snake River. Areas which once contained shallow water habitat are now covered by many feet of reservoir water.

Habitat Elements: Refugia – The amount of refugia in the action area is not properly functioning. This parameter is closely related to the limited amount of large woody debris, large particle size substrate and overhead cover now available in the lower Snake River. Refugia on the mainstem river is now provided mainly by water depth.

Channel Condition and Dynamics: Width to Depth Ratio – The width to depth ratio of the Snake River in the action area is not properly functioning. The width to depth ratio of the lower Snake River has been altered since construction of the dams.

Channel Condition and Dynamics: Streambank Condition – The streambank condition in the action area is not properly functioning. Some of the streambanks in the lower Snake River have been lined with riprap. This protects the banks from erosion, but reduces the amount of riparian vegetation that is able to grow along the river.

Channel Condition and Dynamics: Floodplain Connectivity – The floodplain connectivity in the action area is not properly functioning. Prior to construction of the Snake River dams, the river had a wide floodplain. With the presence of the dams and the controlled reservoir elevation, the floodplain is dramatically reduced in width.

Flow/Hydrology: Peak/Base Flows – The peak and base flows in the action area is not properly functioning. The Snake River's peak flow has declined since larger storage Dams were constructed. Likewise baseflow has been increased as stored water is released during dry months of the year.

Flow/Hydrology: Drainage Network Increase – The drainage network in the action area is not properly functioning. Cities and towns increase the amount of impervious surface which causes water to run off the land quicker than normal. Plowed agricultural fields don't retain as much water after storms than naturally vegetated land. Snow on clearcut forests may melt sooner causing higher peak flows and lower base flows.

Watershed Conditions: Road Density and Location – The road density and location within the action area is not properly functioning. The presence of roads in the watershed can cause large amounts of fine sediment to erode into the streams and rivers of the watershed.

Watershed Conditions: Disturbance History – The disturbance history of the action area is not properly functioning. Many factors have caused disturbance to the Snake River watershed. Agriculture, forestry, road building, and stream channel straightening/altering have had great impacts on the watershed.

Watershed Conditions: Riparian Reserves – The amount of riparian reserves within the watershed is not properly functioning. In the past riparian vegetation was removed along many sections of the Snake River and its tributaries.

6. Effects of the Action

6.1. Approach to the Analysis

The approach to the effects analysis used the following questions (adapted from Johnson 2009) to determine the extent, if any, of potential effects, and justify the effects determination for each species. The fish species, with the exception of the upper and middle Columbia River stocks are analyzed collectively and their outcomes from the questions below are bolded. Since upper and middle Columbia spring Chinook and steelhead only occur below Ice Harbor Dam and any effects from removing the large sediment from the lock approach will not cause a turbidity plume, we conclude the proposed project may affect, but is not likely to adversely affect these species.

1. Is the proposed action likely to produce potential stressors or subsidies that will reasonably be expected to act directly on individual organisms or to have direct or indirect consequences (positive or negative) on the environment?

    a. An answer of "no" to #1 will result in a "no effect" determination by the Corps.
    b. An answer of "yes" to #1 will result in moving to #2.

2. If the proposed action is likely to produce those potential stressors, are endangered or threatened individuals likely to be exposed to one or more of those potential stressors or subsidies or one or more of the proposed action's direct or indirect consequences on the environment?

    a. An answer of "no" to #2 will result in a "no effect" determination by the Corps.
    b. An answer of "yes" to #2 will result a "may affect" determination by the Corps, and moving to #3.

3. If listed individuals are likely to be exposed, are those listed individuals likely to respond, positively or negatively, to that exposure?

    a. An answer of "no" to #3 will result in a "not likely to adversely affect" determination by the Corps.
    b. An answer of "yes" to #3 will result in moving to #4.

4. If listed individuals are likely to respond, are those responses likely to be sufficient to reduce their individual performance?

    a. An answer of "no" to #4 will result in a "not likely to adversely affect" determination by the Corps.
    b. An answer of "yes" to #4 will result in a "likely to adversely affect" determination by the Corps. This determination, for any potential effect, and for any given species, will result in a "may affect, likely to adversely affect" determination for that species.

Based on these questions, the Corps concludes there may be potential stressors produced as a result of the proposed action, and ESA-listed species may be exposed to those stressors.

Those species that are listed in the counties in which Corps lands are within, but that do not occur within the action area either spatially or temporally, will not be exposed to potential stressors, and, according to 2.a. in Section 6.2.1 (above), a “no effect” determination can be made for those species (Table 14).

Conversely, according to 2.b. in Section 6.2.1 (above), a “may affect” determination must be made for those species that occur in spatial and temporal proximity of the proposed action in the action area (Table 14).

Table 14 May Affect determinations based on spatial and temporal proximity of the species to the proposed action.

Species	Species Determination
NMFS	
Snake River Spring/Summer Chinook	May Affect
Snake River Fall Chinook	May Affect
Snake River Sockeye	May Affect
SRB Steelhead	May Affect
USFWS	
Bull trout	May Affect
Pygmy Rabbit	No Effect
Canada lynx	No Effect
Ute ladies’-tresses	No Effect
Spalding’s’ catchfly	No Effect

Exposure to potential stressors will be reduced by the implementation of the proposed conservation measures.

6.2. Response Analysis

If the individuals are exposed to potential stressors, then an analysis of the response must take place to gauge the effect on the individual. An individual fish may respond directly or indirectly to exposure to stressors. Examples are:

- Species
  - Mortality
  - Behavioral modification
  - Reduced predator avoidance
  - Reduced growth and reproduction
  - Physiological
  - Habitat alteration

- Critical habitat
  - Alteration of spawning gravels

- Reduction in prey species
- Water quality
- Reduction in riparian vegetation

Responses are a function of the likelihood of exposure, and the extent of that exposure to potential stressors, combined with reductions in that likelihood and extent due to conservation measures. Responses are specific to the type of stressors, and will be identified as such in each potential effect section.

The exposure profile combined with the response profile will determine the effect to the species and designated critical habitat. Potential effects will be minimized by the implementation of proposed conservation measures in the form of IMMs and BMPs.

6.3. Project Effects

Since the proposed project is confined entirely to the river, there will be no effect to any of the terrestrial plant or animal species.

Upper Columbia River (UCR) spring Chinook ESU and UCR and Middle Columbia River (MCR) steelhead DPS boundaries do not include the Snake River. Though they could stray into the Snake River protection for them would then be provided by the ESA coverage for Snake River species.

Project-related effects include direct disturbance by equipment at the dredging and disposal sites. Indirect effects to fish will occur from elevated turbidity levels downstream from the dredging and disposal sites. There is also always a chance for petroleum products to leak into the water from the equipment which will negatively impact aquatic life. The impact to prey species is also an indirect effect.

6.4. Effects on Listed Species

The Corps anticipates that project-related effects will be similar for all Snake River listed fish species that may occur within the action area, including bull trout, and will therefore be analyzed collectively. MCR and UCR steelhead and UCR spring Chinook could stray up to the Ice Harbor navigation lock approach, but if they enter the Snake River, ESA projection is provided by the coverage for SRSS Chinook and steelhead. Straying would be unpredictable and presumably in very low numbers. Because of this, effects are discountable, and warrant a “not likely to adversely affect” determination for these species.

Maintaining the Federal navigation system through the lower Snake River reservoirs indirectly affects the subject listed species by enabling habitat-affecting activities such as commercial barging in the mainstem Snake River. Juvenile salmonids, particularly sub-yearling fall Chinook, require the availability of interconnected shallow-water rearing habitat. Dredging deepens portions of the habitat while disposal in mid-depth areas can create more suitable salmon rearing habitat. In order to increase the likelihood of survival and recovery of the listed species, widespread habitat conditions in the action area need to improve.

The dredged sediment will be used to construct a uniform sand-dominated substrate, gently sloping (2-percent cap over a 3- to 5-percent base), shallow-water habitat resembling a sand bar with features optimized for resting/rearing of outmigrating juvenile salmonids, and targeted towards SRF Chinook salmon production. While it may be possible to return to this disposal area and deposit more sediment in future years, the disposal bench will be designed so that it provides the maximum benefit possible with the quantity of dredged material available from the proposed alternative. As such, adding sediment to the bench in future years is not a requirement to realize a benefit to rearing juvenile salmonids as part of this proposed action. For example, dredge materials were deposited immediately upstream of the proposed disposal location during a previous action in 2005/2006 and appear to have been successful at creating shallow-water habitat beneficial to rearing juvenile fall Chinook (Tiffan and Connor 2012; Artzen et al. 2012). Middle and Upper Columbia River steelhead and Upper Columbia spring Chinook will not be affected by the dredged material placement.

Prior to the use of the Knoxway Canyon disposal site, it was a mid- to shallow-depth bench composed of silt accumulated on the left bank. Since visual inspection of this site in 1992, habitat suitability has been poor for rearing and overwintering due to the thick silt layer accumulating at about 2 inches per year for 25 years (approximately 4 feet) over a sand base (less than 20-percent composition). Habitat suitability for spawning is nonexistent. The disposal work in 2005/2006 created a shallow water area with a sand substrate.

The Corps has continued to focus on evaluating the effects of creating in-water habitat for juvenile fall Chinook salmon. Up to 24 sampling sites have been examined in the lower Snake River reservoirs, including resurveys of the backwater of Knoxway Canyon at the tributary mouth (RM 115.9), which has been used as a reference site in the larger reservoir habitat studies (Gottfried et al. 2011; Artzen et al. 2012; Tiffan and Connor 2012). Results from Bennett et al. (2003, 2004) indicate that, compared to all reservoir sites sampled, the established reference site located within the bay at Knoxway Canyon produced the highest density of benthic macroinvertebrates throughout both the summer and fall/winter samples, but not the greatest biomass. This is a positive result, because high density in these samples represents insect larvae preferred by salmonids as prey, whereas biomass represents few, but heavy bodied mollusk species that are typically uningestable by juvenile salmonids. Monitoring for fish species composition and abundance (fish use) found that the Knoxway Canyon reference site is moderately used by juvenile SRF Chinook salmon, marginally used by SRSS Chinook salmon, marginally used by major predator species (smallmouth bass and northern pikeminnow), and not used by SRB steelhead (Bennett et al. 2003, 2005).

Beneficial Use of Dredged Material

It has been demonstrated through many years of research and monitoring in and outside of the lower Snake River corridor that juvenile fall Chinook salmon prefer shallow, open, sandy areas along shorelines for rearing (Bennett et al., 1994, 1997, 2005; Connor et al. 2004; Tiffan and Connor 2012). Research and effectiveness monitoring showed that SRF Chinook salmon used the shallow-water habitat created with in-water disposal of dredged material including areas that surround Centennial Island (Lower Granite reservoir, near Snake RM 120). In some years, as many as 10 percent of the total sample of subyearling Chinook salmon from the Lower Granite reservoir originated from the habitat created by in-water disposal. Bennett reported that SRF Chinook salmon were most commonly collected over lower gradient shorelines with low velocities and sandy substrate, most represented by the opposing sand bars and the scalloped shoreline series of sand bars observed in the historical river (1944 and 1958 aerial photography on file at the Corps, Walla Walla District). Habitat having these physical characteristics can be effectively constructed in any of the lower Snake River reservoirs with the appropriate placement of dredged material. Although previous Corps monitoring results indicate this type of construction could provide resting and rearing habitat for ESA-listed species, some resource agencies question the benefits. They consider the shallow-water rearing habitat restoration efforts in the Lower Granite reservoir to be generally beneficial, but still experimental. Previous ESA Section 7 informal and formal consultations for dredging coordinated with NMFS (NMFS 1992, 1997, 1998, and 1999; NMFS 2001, 2002, and 2003, 2005) have supported the proposal to develop this type of habitat provided that the Corps follows a monitoring plan to verify post-construction effectiveness and use by ESA-listed species.

The in-water disposal site at Knoxway Canyon (RM 116) was selected because it is on the inside of a river bend, has suitable water velocities and underwater contours to facilitate shallow-water habitat creation, and is configured so the sediment can be deposited without burying known cultural resource sites. The Corps selected this site because it is close to the confluence (where most of the dredging will occur), has potential to provide suitable resting/rearing habitat for juvenile salmonids once the river bottom is raised, will not interfere with navigation, will not impact cultural/historic properties, and is of sufficient size to accommodate the anticipated dredged sediment disposal volume.

Short-term construction-related effects warrant a “likely to adversely affect” determination for SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye, and bull trout. Long-term effects from the disposal are anticipated to be beneficial to SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye, and bull trout.

6.4.1. Direct Effects from Equipment

Direct effects from the clamshell dredge are possible, but not very likely. At the Lewiston/Clarkston sites and the disposal site adult steelhead, bull trout, and some juvenile Chinook and steelhead may be present during the winter in-water work window. Individual fish could be killed or trapped as the bucket is dropped into the river. The determination for this activity is “likely to adversely affect” for the listed fish species. However, adult steelhead and bull trout will likely be scared away from the dredging activity, so the likelihood of one being trapped or killed is unlikely. Juvenile fish are also likely to avoid the immediate area around the dredge. The same scenario holds for the sediment removal work below Ice Harbor Dam, except adult upper and middle Columbia steelhead may also be present. There is very low likelihood any adult fish will be impacted by the dredging work.

The area below the Ice Harbor navigation lock identified for dredging will be surveyed for SRF Chinook redds prior to the dredging work. If redds are identified, work at the site will stop and

NMFS will be contacted for further coordination prior to continuation of dredging activities. The proposed work below Ice Harbor is "not likely to adversely affect" listed fish species.

At the disposal site fish could be directly crushed by the material being dumped out of the barge, however this is unlikely due to the minimal number of salmonids likely to be present during this time period, the likelihood any that are present will be pelagically oriented, the loud nature of the equipment likely allowing individuals to quickly egress from the area (Tiffan and Connor 2012; Artzen et al. 2012). The use of the clamshell dredge at this location to reposition the dredged material to create shallow water habitat could also affect individual fish, though as for the initial dredging, the chance of this type of impact is low. These reasons lead to a "likely to adversely affect" determination for SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye, and bull trout.

6.4.2. Elevated Suspended Sediment and Turbidity

Dredging and disposal of dredged material will resuspend some fine sediment. High levels of suspended sediment and turbidity can result in direct mortality of fish by damaging and clogging gills (Curry and MacNeill 2004). Sublethal levels of suspended sediment may cause undue physiological stress on fish, which may reduce the ability of the fish to perform vital functions (Cederholm and Reid 1987).

The introduction of sediment in excess of natural amounts can have multiple adverse effects on bull trout and their habitat (Berry et al. 2003; Rhodes et al. 1994). The effect of sediment beyond natural background conditions can be fatal at high levels. Other salmonids are affected in the same way. No threshold has been determined in which fine-sediment addition to a stream is harmless (Suttle et al. 2004). Even at low concentrations, fine-sediment deposition can decrease growth and survival of juvenile salmonids.

Sigler et al. (1984) found that a reduction in growth occurred in steelhead and coho salmon when turbidity was as little as 25 NTUs. The slower growth was presumed to be from a reduced ability to feed; however, more complex mechanisms such as the quality of light may also affect feeding success rates.

Large bull trout may feed almost exclusively on fish. While low levels of turbidity and suspended sediment may not directly impact bull trout, the increased sediment input may affect prey for bull trout. The following effects of sediment are not specific to bull trout alone. All salmonids can be affected similarly.

Newcombe and Jensen (1996) developed a scale of severity from suspended sediment on salmonids. Table 15 (Table 1 from Newcombe and Jensen 1996) shows the scale. Based on the near-real time monitoring which allows rapid response to elevated turbidity levels and the low turbidity levels recorded during the Corps 2005/2006 dredging effort we estimate the severity level to be between 1 and 5.

Table 15 Severity scale of excessive suspended sediment on salmonids (Table 1 from Newcombe and Jensen 1996).

Table 1 – Scale of the severity (SEV) of ill effects associated with excess suspended sediment on salmonids.

SEV	Description of Effect
	Nil effect
0	No behavioral effects
	Behavioral effects
1	Alarm reaction
2	Abandonment of cover
3	Avoidance response
	Sublethal effects
4	Short-term reduction in feeding rates; short-term reduction in feeding success
5	Minor physiological stress; increase in rate of coughing; increased respiration rate
6	Moderate physiological stress
7	Moderate habitat degradation; impaired homing
8	Indications of major physiological stress; long-term reduction in feeding rate; long-term reduction in feeding success; poor condition
	Lethal and paralethal effects
9	Reduced growth rate; delayed hatching; reduced fish density
10	0-20% mortality; increased predation; moderate to severe habitat degradation
11	> 20 – 40% mortality
12	> 40 – 60% mortality
13	> 60 – 80% mortality
14	> 80 – 100% mortality

Table 16 is also from Newcombe and Jensen (1996). This table links the severity levels with ESA effect determinations. For juvenile fish the applicable determination for a value of 5 is "likely to adversely affect". Adult or subadult may use the rivers/reservoirs to overwinter, but it is unlikely that juveniles would migrate from their natal streams to use the action area during the proposed work period.

Table 16 ESA Effect calls for different bull trout life stages in relation to the duration of effect and severity of ill effect. Effect calls for habitat, specifically, are provided to assist with analysis of effects to individual bull trout

	SEV	**ESA Effect Call**
Egg/alevin	1 to 4	Not applicable - alevins are still in gravel and are not feeding.
	5 to 14	LAA - any stress to egg/alevin reduces survival
Juvenile	1 to 4	NLAA
	5 to 14	LAA
Subadult and Adult	1 to 5	NLAA
	6 to 14	LAA
Habitat	1 to 6	NLAA
	7 to 14	LAA due to indirect effects to bull trout

The monitoring program for the 2005/2006 dredging was designed to monitor parameters on a near real-time basis as dredging progressed. Water quality monitoring ensured the activities of dredging and disposal of sediments met the terms and conditions of the Water Quality Certifications specified by the States of Washington and Idaho and the Endangered Species Act (ESA). The Port of Lewiston, Project 4000 did not experience any exceedence of turbidity levels according to Idaho state standards of 50 NTU above background station readings. The other monitoring stations saw very low exceedences above the 5 NTU standard. Table 17 shows the average turbidity values above 5 NTU for the 2005/2006 dredging and disposal work. The highest average turbidity was only 15 NTU.

The material to be removed below Ice Harbor Dam is larger gravel and cobble, mostly free of fines. Removal of this material is not likely to create a turbidity plume downstream. Some Chinook, steelhead and a few bull trout may be found in the area, but impacts will be minimal at this site.

Table 17 Average turbidity values above the WA State water quality standard of 5 NTU.

Lower Monumental Dam Project 1000

Station	300		400		900	
Depth	Deep	Shallow	Deep	Shallow	Deep	Shallow
Total Project Hours	175	175	175	175	175	175
Exceedance Hours	3	0	35	24	27	25
Percent in Compliance	98.29%	100.00%	80.00%	86.29%	84.57%	85.71%
Average Turbidity Over	1.22	0.00	9.63	6.95	8.26	5.47

Lower Granite Dam Project 2000

Station	300		400		900	
Depth	Deep	Shallow	Deep	Shallow	Deep	Shallow
Total Project Hours	6	6	6	6	6	6
Exceedance Hours	0	1	0	0	0	1
Percent in Compliance	100.00%	83.33%	100.00%	100.00%	100.00%	83.33%
Average Turbidity Over	0.00	1.03	0.00	0.00	0.00	1.93

Port of Clarkston WA Project 3000

Station	300		400		900	
Depth	Deep	Shallow	Deep	Shallow	Deep	Shallow
Total Project Hours	851	851	851	851	851	851
Exceedance Hours	90	16	301	168	129	60
Percent in Compliance	89.42%	98.12%	64.63%	80.26%	84.84%	92.95%
Average Turbidity Over	4.58	2.62	5.84	3.87	4.62	3.86

Disposal Site Project 7000

Station	300		400		700	
Depth	Deep	Shallow	Deep	Shallow	Deep	Shallow
Total Project Hours	1665	1665	1665	1665	1665	1665
Exceedance Hours	206	62	167	30	179	14
Percent in Compliance	87.63%	96.28%	89.97%	98.20%	89.25%	99.16%

Overall, effects lead to a “likely to adversely affect” determination for SRF Chinook, SRSS Chinook, SRB steelhead, and SR sockeye. A “not likely to adversely affect” determination for bull trout is warranted, based on the information above.

6.4.3. Effect on Prey Species

Distance of prey capture and prey capture success both were found to decrease significantly when turbidity was increased (Berg and Northcote 1985; Sweka and Hartman 2001; Zamor and Grossman 2007). Waters (1995) states that loss of visual capability, leading to reduced feeding, is one of the major sublethal effects of high suspended sediment. Increases in turbidity were reported to decrease reactive distance and the percentage of prey captured (Bash et al. 2001; Klein 2003; Sweka and Hartman 2001). At 0 NTUs, 100 percent of the prey items were consumed; at 10 NTUs, fish frequently were unable to capture prey species; at 60 NTUs, only 35 percent of the prey items were captured. At 20 to 60 NTUs, significant delay in the response of fish to prey was observed (Bash et al. 2001). Loss of visual capability and capture of prey leads to depressed growth and reproductive capability.

Macroinvertebrate numbers in the dredging and disposal areas will decline due to the action. These areas are likely to repopulated within several months. This impact on prey items will cause an indirect effect on listed fish. This leads to a "likely to adversely affect" determination for SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye, and bull trout.

6.4.4. Chemical Contamination

Operation of equipment requires the use of fuel and lubricants, which, if spilled into the channel of a waterbody or into the adjacent riparian zone, can injure or kill aquatic organisms. Petroleum-based contaminants contain poly-cyclic aromatic hydrocarbons (PAHs), which can be acutely toxic to salmonids at high levels of exposure and can cause lethal and sublethal chronic effects to other aquatic organisms (Neff 1985). Equipment will be inspected and cleaned prior to any instream work. Because of the nature of operating large equipment on a barge which is floating on the river, an accidental discharge could occur. A spill would call for a "likely to adversely affect" determination for for SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye, and bull trout. However, implementation of standard BMPs associated with this type of work reduces the likelihood of a spill to a level that is not reasonably certain to occur. Because of implementation of the BMPs, chemical contamination is discountable, and, therefore "not likely to adversely affect" any of the fish species.

Monitoring of contaminants in the sediment to be dredged was conducted in 2011. Only a very small number of samples contained contaminants higher than Washington and Idaho regulatory criteria.

6.5. Effects on Critical Habitat

Those critical habitats that are designated for species in the counties in which Corps lands are within, but that do not occur within the action area, will not be exposed to potential stressors, a "no effect" determination can be made for those species. All of the fish species have designated critical habitat within the action area. Since there will be in-water work in areas where the listed fish species occur, the appropriate determination for all of the fish species is "may affect" (Table 18).

Table 18 May Affect determinations based on spatial and temporal proximity of proposed and designated critical habitat to the proposed action.

Species	Critical Habitat Determination
NMFS	
Snake River Spring/Summer Chinook	May Affect
Snake River Fall Chinook	May Affect
Snake River Sockeye	May Affect
SRB Steelhead	May Affect
USFWS	
Bull trout	May Affect
Pygmy Rabbit	None Designated
Canada lynx	No Effect
Ute ladies'-tresses	None Designated
Spalding's' catchfly	None Designated

6.5.1. Snake River Spring/Summer Chinook, Fall Chinook, Steelhead, and Sockeye

6.5.1.1. Spawning and Juvenile Rearing Areas

Cover/shelter: The only spawning habitat in the action area is below each of the Snake River dams, where SRF Chinook sometimes spawn. There is adequate depth in these areas which provides cover for both spawning and rearing Chinook. Some marginal SRF Chinook spawning habitat has been found downstream from the proposed dredging site below Ice Harbor Dam (Mueller and Coleman 2007, 2008). The proposed project will not change the amount of cover available below the dams.

The part of the action area above Lower Granite Dam contains rearing area mainly for juvenile Snake River steelhead and SRF Chinook. Water depth is the main feature providing cover in these areas as well. The proposed project will not affect the amount of cover available for these ESU/DPSs.

Food (juvenile rearing): The dredging and disposal actions could decrease the amount of food available to juvenile salmonids for a few months. Aquatic organisms which these fish feed on will be removed with the dredged material. At the disposal site aquatic food items will be buried with up to several feet of material. There could be a decrease in the amount of food items available to juvenile salmonids rearing in these areas. Once the shallow water habitat is placed and has time to repopulate with benthic organisms, more food items will be available for juvenile fish.

Riparian vegetation: The proposed action will not affect riparian vegetation.

Space: The proposed action will not affect the amount of space available to ESA listed fish species.

Spawning gravel: The cobble/gravel in the navigation lock approach could be suitable for SRF Chinook spawning. Redd surveys will be conducted prior to removing the sediment. Removal of the material could decrease the amount of spawning habitat available below Ice Harbor Dam.

Water quality: Turbidity is the main water quality factor that will be affected by the proposed action. The turbidity level below the Ice Harbor navigation lock approach is not likely to increase because there is no fine sediment in the material to be dredged. However, the turbidity generated by the upriver in-water work (around the Snake/Clearwater confluence and at the disposal site) will eventually be deposited as fine sediment in downstream substrates. Much of the accumulated sediment is sand which will settle out of the water relatively rapidly. Some of the material to be dredged is silt, so some substrate embeddedness in areas downstream of the dredge may temporarily increase as a result. Some of the fine sediment will be remobilized downstream during the next high flow event, though most will likely continue to accumulate in the slack water of the reservoir. The turbidity data collected upstream and downstream of the disposal location during the 2005/2006 channel maintenance project does show a few instances of elevated turbidity values. Washington State standards were exceeded by a small amount for short periods. Average turbidity values did not exceed 15 NTU (Table 17).

During the two and a half months when monitoring occurred 24-hrs per day, the number of instances when four-hour criteria was exceeded ranged from zero to two at the three shallow sondes, and from three to ten at the deep sondes. These events were primarily the outcome of scows releasing dredged material. It should be noted that between scows, which arrived approximately every six hours, turbidity levels returned to background levels for several hours prior to the subsequent scow.

Sediment samples have been taken throughout the action area to measure the levels of pollutants in the sediment. As previously mentioned, very low levels of contaminants were found in a small number of the sediment samples.

There will be no increase in water temperature as a result of the proposed action.

Water quantity: The proposed action will have no effect on water quantity.

6.5.1.2. Juvenile Migration Corridors

Cover/shelter: The proposed action will occur during winter when juvenile salmonids will not be migrating. The main cover feature in the Snake River is provided by water depth. There will be no measurable effect on cover from the proposed action.

Food: There will be a decrease in the abundance of macroinvertebrates for a few months from the dredging and disposal actions within the action area. At the dredging sites, juvenile fish prey items will be removed from the river. Downstream from the dredging sites fine material will settle out of the water column and reduce the number of macroinvertebrates available as prey items. Prey items will also be buried under several feet of dredged material at the disposal site. This will decrease the amount of prey items available to juvenile salmonids during the first year after placement.

Riparian vegetation: The proposed action will have no effect on riparian vegetation.

Safe passage: The proposed action will not affect safe passage through the downstream migration corridor.

Space: There will be no effect on the amount of space available within the juvenile migration corridor.

Substrate: Part of the juvenile migration corridor will be affected by the dredging and disposal upstream from Lower Granite Dam. Most of the existing substrate is sand and the streambed will remain covered with sand after the proposed work. However, there will be some silt resuspended in the water column which will settle out downstream causing some embeddedness of sand or gravel areas downstream. Some of the fine sediment will be remobilized and move further downstream during the next high flow event.

At the disposal site, the silty bottom will be covered with additional silt and sand to create shallow water habitat for juvenile SRF Chinook.

At the Ice Harbor navigation lock approach gravel and cobble will be removed, leaving a gravel, cobble and bedrock bottom.

Water quality: Water quality will have returned to normal prior to the juvenile out-migration timeframe. The proposed action will have no effect on water quality during the juvenile migration season.

Water quantity: The proposed action will have no effect on water quantity.

Water temperature: The proposed action will have no effect on water temperature.

Water velocity: The proposed project will have no measurable effect on water velocity.

Areas for growth and development to adulthood: The proposed creation of shallow water habitat at the disposal site will increase the amount of area available for juveniles to rear; especially SRF Chinook. The dredging action both at the Snake/Clearwater confluence and at the Ice Harbor navigation lock approach will not affect areas of growth and development of juvenile salmonids.

Ocean areas: The proposed action will have no effect on ocean areas.

6.5.1.3. Adult Migration Corridors

Cover/shelter: The proposed action will have no effect on cover available to adult salmonids.

Riparian vegetation: The proposed action will have no effect on riparian vegetation.

Safe passage: The proposed action will have no effect on safe passage for adult salmonids in the Snake River.

Space: The proposed action will have no effect on the amount of space available to adult salmonids.

Substrate: Areas of sand will generally remain as sandy areas after completion of the proposed action. The proposed action will not affect the substrate in the adult migration corridor.

Water quality: Adult steelhead will be in the action area during the winter in-water work period. The turbidity generated by the upriver in-water work (around the Snake/Clearwater confluence and at the disposal site) will eventually be deposited as fine sediment in downstream substrates. Much of the accumulated sediment is sand which will settle out of the water relatively rapidly. Some of the material to be dredged is silt, so some substrate embeddedness in areas downstream of the dredge may temporarily increase as a result. Some of the fine sediment will be remobilized downstream during the next high flow event, though most will likely continue to accumulate in the slack water of the reservoir. The turbidity data collected upstream and downstream of the disposal location during the 2005/2006 channel maintenance project does show a few instances of elevated turbidity values. Washington State standards were exceeded by a small amount for short periods. Average turbidity values did not exceed 15 NTU (Table 17).

Sediment samples have been take to analyze the level of any pollutants that could be resuspended by the proposed action. Contaminants were only found at very low levels in a small number of samples which will not affect the adult migration corridor.

Water temperature: No measurable increases in water temperature will result from the proposed action.

Water velocity: There will be no effect to water velocity due to the proposed action.

6.5.2. Bull Trout

The mainstem Snake and Clearwater Rivers are designated as foraging, migration, and overwintering critical habitat for bull trout. Few bull trout are expected to be in the action area during the proposed work, but winter is the most likely time of year for them to be found there.

Water quality: Water quality will be affected by the proposed project. The main water quality parameter that will be affected is turbidity. Turbidity levels will be monitored near real-time to enable adjustment of the work to keep turbidity levels below regulatory thresholds. During the previous dredging and disposal effort, turbidity levels exceeded state standards by 1 to 10 NTU for up to 301 (nonconsecutive) hours.

Bull trout (and other salmonids) could be negatively affected by high turbidity levels. Even at lower levels there could be some negative effects.

Migration corridors: Increased turbidity levels could have a negative effect on bull trout migration corridors. However, the increased turbidity will not span the entire width of the river. Bull trout could swim around the turbidity plume.

Food availability: Any bull trout residing in the Snake or Clearwater Rivers during winter are likely to be larger sub-adults and adults which prey mainly on smaller fish. Smaller fish are likely to be attracted to the churned up work area as food items are mobilized. This could lead bull trout into the turbidity plume to prey on the small fish. While bull trout may find food, they will also be exposed to increased levels of turbidity which could be harmful to them.

Instream habitat: The proposed project will have a minor effect on foraging, migration and overwintering habitat for bull trout while the work is occurring. The river is quite large and this type of habitat is not limited, so the effect on bull trout will be minimal.

Water temperature: The proposed project will have no effect on water temperature.

Substrate characteristics: Most of the material to be dredged is sand. As sand is removed, some will be suspended in the water column. Sand will redeposit on the riverbed a short distance downstream. Any silt in that is suspended will move further downstream before redepositing. Silt will cover the existing substrate (most likely sand) which could have a negative effect on any macroinvertebrates on the riverbed.

Stream flow: The proposed project will have no effect on stream flow.

Water quantity: The proposed project will have no effect on water quantity.

Nonnative species: The proposed project will have no effect on nonnative species.

6.5.3. Pygmy Rabbit

No critical habitat rules have been published for the Pygmy rabbit.

6.5.4. Canada Lynx

No critical habitat for Canada lynx has been designated within the proposed action area.

6.5.5. Ute ladies'-tresses

No critical habitat rules have been published for the Ute ladies'-tresses.

6.5.6. Spalding's Silene

No critical habitat rules have been published for Spalding's silene.

6.6. Effects from Interdependent and Interrelated Actions

Based on over 10 years of data, all anticipated indirect effects from interdependent or interrelated actions will likely not be significant. They occur as part of the environmental baseline. The experimentation data compiled by Bennett et al. (1987 through 2005), NMFS (Ledgerwood et al. 1997, and subsequent Section 7 consultations), and USFWS (Connor et al. 2001, 2004), indicate that the previous loss of shoreline sandbar habitat could be mitigated. Studies conducted by Bennett et al.; Tiffan and Connor (2012); and Tiffan and Hatten 2012) indicate there may be beneficial uses of the dredged material in the reservoir as long as certain criteria are followed in the selection and placement of the material. Shallow water habitat will be created with dredged material. This habitat is especially important to juvenile SRF Chinook.

Dredging of port basins should provide little increased use in the number of net commercial and recreational vessels or commercial tour boat ventures. Since the depth of the navigation channel and all access channels remains relatively shallow, at 14 feet for shallow-draft vessels, it is anticipated that no deep-draft vessels will be capable of utilizing the dredged areas.

Restoring the navigation channel and berthing areas to a minimum depth of 14 feet at the MOP will allow the reservoir to be operated at MOP which is the most favorable operation for juvenile salmonids as per the 2008 FCRPS and the 2010 Supplement.

Channel maintenance will provide safer access to port facilities for commercial barges. The risk of grounding a barge will be greatly reduced. This will decrease the chance of pollutants being released into the river.

6.6. Cumulative Effects

Given the geographic scope of the action area, which encompasses numerous government entities exercising various authorities, an analysis of cumulative effects is difficult. State and local governments may be faced with pressures from population growth and movement. Such population trends will place greater overall and localized demands on the action area, affecting water quality directly and indirectly, and the need for transportation and communication will proportionately increase. The effects of private actions are the most uncertain. Private landowners may convert their lands from current uses, or they may intensify or diminish those uses. Based on the population and growth trends, cumulative effects are likely to increase.

The navigation channel and berthing areas have been dredged multiple times in the past. The normal process currently was to do the work during winter when fewer ESA-listed species are present. A clamshell bucket was normally used as opposed to a suction dredge, which could more easily entrain fish.

The additional acres of shallow-water habitat will be expected to provide long-term cumulative benefits for the aquatic ecosystem. Juvenile SRF Chinook will likely have the greatest benefit from the increased shallow water rearing habitat.

Impacts from contaminant spills could occur depending on the nature and quantity of the contaminants involved. Even smaller, more frequent spills may add to the degradation of the aquatic environment. These spills may occur at any time throughout the action area, with different parties (local, state, private) responsible for the contamination.

Throughout the action area, much of the land is likely to remain rural and used for agricultural purposes. However, most arable lands have been developed and water resource development has slowed in recent years. Increasing environmental regulations and diversification in local economies has reduced some impacts that have been previously associated with water and land use by agriculture and extractive industries.

There are significant pressures within the State of Washington to begin appropriating water directly from the Columbia and Snake Rivers and from local aquifers that may be hydraulically connected to the Columbia. Furthermore, although the State withdrew the water of the mainstem Columbia and Snake Rivers from further appropriation in 1995, it reopened these rivers for further appropriation in 2002. It is difficult to predict long-term trends in water quantity and quality, but impacts are reasonably certain to continue on some level.

Wetlands are not present at the disposal site. Sanctuaries and refuges, mud flats, vegetated shallows, and riffle and pool complexes are not present at the disposal site. Commercial fishing is not conducted in the vicinity of the proposed disposal site or the dredging sites. Recreational fishing for Snake River steelhead and resident fish does, however, occur in the vicinity. In-water disposal and habitat creation activities may have a localized, short-term impact on recreational fishing in the immediate vicinity of the site. Short-term impacts will be minimized by restricting work to the in-water work window, which does not occur during a period of high recreational use. The creation of shallow-water fish habitat is expected to have a long-term beneficial effect on recreational fisheries.

The Corps also has specific commitments to uphold under the Basin-wide Salmon Recovery Strategy. Of particular significance in this consultation is the Corps' responsibility to operate the lower Snake River dams at MOP during the juvenile out-migration. The proposed dredging will allow this operation to continue without disrupting shipping commerce. The proposed action is consistent with the Corps' responsibilities under the Basin-wide Salmon Recovery Strategy.

Monitoring embankment stability will be accomplished by taking soundings soon after disposal is complete. Soundings will again be taken in the summer after high flows in order to determine if the embankment slumped or moved. This information will be used to make adjustments in the percentage of silt allowable for potential future dredged material placement, and to determine whether or not a berm should be constructed around the toe of the embankment to prevent movement. Monitoring of the biological use of the embankment will be accomplished by sampling fish species presence and abundance in the area post-construction.

6.7. Determination

Each effect was evaluated based on the exposure and response to potential stressors. Although each individual effect had a determination made for it, it is the combined determination for the proposed action for each species and critical habitat that is the ultimate determination that needs to be made. These determinations are based on findings in the exposure and response analyses.

A "no effect" determination was made for those species or critical habitats that are temporally or spatially separated from potential stressors of the action, and could, therefore, not be exposed to potential stressors of the proposed action. Those species that had a "may affect" determination after the exposure analysis went through the response analysis for each potential stressor.

A "not likely to adversely affect" determination was made for those species or critical habitats unlikely to have a response sufficient to reduce their individual performance. A "likely to adversely affect" determination was made for a species as a whole for those likely to have a response sufficient to reduce its individual performance. A "not likely adversely affect" determination was made for critical habitat that may be affected, but for which the conservation value will not be significantly reduced. A "likely to adversely affect" determination for critical habitat was made when habitat value will be significantly reduced.

The combined summary of species and critical habitat determinations is shown in Table 19.

Table 19 Summary of Determination of Effects on Listed Species and Critical Habitat.

Species	Species Determination	Critical Habitat Determination
NMFS		
Snake River Spring/Summer Chinook	**May Affect, Likely to Adversely Affect**	**May Affect, Likely to Adversely Affect**
Snake River Fall Chinook	**May Affect, Likely to Adversely Affect**	**May Affect, Likely to Adversely Affect**
Snake River Sockeye	May Affect, Not Likely to Adversely Affect	**May Affect, Likely to Adversely Affect**
SRB Steelhead	**May Affect, Likely to Adversely Affect**	**May Affect, Likely to Adversely Affect**
USFWS		
Bull trout	**May Affect, Likely to Adversely Affect**	**May Affect, Likely to Adversely Affect**
Pygmy Rabbit	No Effect	None Designated
Canada lynx	No Effect	No Effect
Ute ladies'-tresses	No Effect	None Designated
Spalding's' catchfly	No Effect	None Designated

7. Conclusions

This BA documents potential impacts to ESA-listed species that may occur from navigation channel maintenance activities at five sites on the lower Snake River. Up to 500,000 cubic yards of sand, silt, and gravel/cobbles, across 72.5 acres, will be dredged. The dredged sediment will be disposed of at one site to create 3.7 acres of high quality and 11.7 acres of lesser quality shallow-water rearing habitat for the rearing of SRF Chinook salmon.

The purpose of the routine channel maintenance is to provide a 14-foot depth throughout the designated Federal navigation channel in the project area and to restore access to selected port berthing areas. The Corps is working to develop methods to maintain navigation, while avoiding or minimizing negative impacts to the environment. Sediment management is an important aspect of maintaining navigation.

The proposed action: **may affect, and is likely to adversely affect** SRSS Chinook, SRF Chinook, SRB steelhead, and bull trout; **may affect, but is not likely to adversely affect** SR sockeye; **may affect, and is likely to adversely affect** designated critical habitat for SRSS Chinook, SRF Chinook, SRB steelhead, SR sockeye and bull trout**.**

I. Magnuson-Stevens Fishery Conservation and Management Act

The consultation requirement of section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) directs Federal agencies to consult with NMFS on all actions, or proposed actions that may adversely affect Essential Fish Habitat (EFH). Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that may be taken by the action agency to conserve EFH.

The Pacific Fishery Management Council (PFMC) designated EFH for ground fish (PFMC 2005), coastal pelagic species (PFMC 1998), and Chinook salmon, Coho salmon, and Puget Sound pink salmon (PFMC 1999).

The action area includes areas designated as EFH under the MSA for various life-history stages of Chinook and/or Coho salmon (PFMC 1999).

- 17060103 – Lower Snake – Asotin Creek is identified as currently accessible, but unutilized historic EFH for Chinook and Coho.
- 17060107 – Lower Snake – Tucannon River is identified as current EFH for Chinook and currently accessible, but unutilized historic EFH for Coho.
- 17060110 – Lower Snake River is identified as current EFH for Chinook and currently accessible, but unutilized historic EFH for Coho.
- 17060306 – Clearwater River is identified as current EFH for Chinook and currently accessible, but unutilized historic EFH for Coho.

1. Description of the Proposed Action

The proposed action and action area for this assessment are described in the ESA portion of this document.

2. Effects of the Proposed Action

Based on information provided in this BA, and the analysis of effects presented in the ESA portion of this document, the Corps concludes that the effects on Chinook and Coho salmon EFH are the same as those for designated and proposed critical habitat for the fish species listed in this document designated critical habitat and are described in detail in *Effects on Critical Habitat* section of the ESA portion of this document. The proposed action may result in short-term adverse effects on water quality habitat parameters.

2.1. Effects on EFH

Effects on EFH resulting from the proposed action are described in the ESA portion of this document under *Effects to Critical Habitat*.

2.2. Effects on Managed Species

Effects on Chinook salmon resulting from the proposed action are described in the ESA portion of this document.

2.3. Effects on Associated Species, Including Prey Species

Effects on prey species resulting from the proposed action are described in the ESA portion of this document.

2.4. Cumulative Effects

Chinook and coho salmon have been impacted by a wide array of factors related to hatchery impacts, harvest impacts, hydropower impacts, habitat impacts, and ocean conditions. These factors continue to play a role in the response of salmon populations.

Cumulative effects to coho occur from the same sources as those to Chinook. A cumulative effects analysis on Chinook and other ESA-listed species was presented in the preceding ESA assessment.

3. Proposed Conservation Measures

- Conservation measures (IMMs and BMPs) listed in the ESA portion of this document.
- Environmentally critical habitats such as spawning gravels that may be encountered and should be avoided.

4. Conclusions by EFH

Based on the following circumstances and precautions, the Corps believes there will be adverse effects to EFH and on managed species, as described in the ESA portion of this document.

II. Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) authorizes the USFWS the authority to evaluate the impacts to fish and wildlife species from proposed Federal water resource development projects that could result in the control or modification of a natural stream or body of water that might have effects on the fish and wildlife resources that depend on that body of water or its associated habitats. This action is maintenance of an existing facility and therefore does not involve activities subject to the FWCA. If structural measures such as dike fields are proposed this Act may apply and the appropriate coordination will be conducted.

III. 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.

The proposed action will be conducted in winter, outside of nesting season, and predominantly in and on the Snake River. There is no nesting habitat in the proposed project area. Some waterfowl may be in the area, but will easily avoid the work barges without being harmed. Therefore, the proposed action will not result in taking migratory birds, their nests, eggs, or parts thereof.

IV. Bald and Golden Eagle Protection

The Bald and Golden Eagle Protection Act (BGEPA) prohibits the taking or possession of and commerce in bald and golden eagles, with limited exceptions, primarily for Native American Tribes. Take under the BGEPA includes both direct taking of individuals and take due to disturbance. Disturbance is further defined on 50 CFR 22.3.

A few bald eagles winter along the lower Snake River within the action area. Bald eagles could be present near the dredging and disposal sites, but are not likely to be bothered by the work. Bald eagles are known to nest in a few areas of Corps managed lands in the Walla Walla District. Nesting typically begins in March, but there are no known nests near the dredging or disposal areas.

Throughout most of the western United States golden eagles are mostly year-long residents (Polite and Pratt 1999), breeding from late January through August with peak activity in March through July (Polite and Pratt 1999). They may also move down-slope for winter or upslope after the breeding season (Polite and Pratt 1999; Technology Associates 2009). Golden eagles could be located on the cliffs overlooking the lower Snake River, but are unlikely to be disturbed by the proposed project.

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Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement

Appendix K

Endangered Species Act Consultation

Section 3. Letters Requesting Restart of Consultation

USACE, Walla Walla District to NMFS, February 24, 2014

USACE, Walla Walla District to USFWS, February 24, 2014

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

REPLY TO
ATTENTION OF:

February 24, 2014

Planning, Programs, and Project
Management Division

Mr. David Mabe
National Marine Fisheries Service
10095 W. Emerald St.
Boise, Idaho 83704

Dear Mr. Mabe:

In December 2012, we requested Section 7 consultation with National Marine Fisheries Service (NMFS') Ellensburg, Washington office on our proposed 2013-2014 Lower Snake River Navigation Channel Maintenance Project (Corps EC# PM-EC-2007-0001). We later requested the consultation be suspended due to a requirement for additional sediment testing and evaluation. We have now received the results from this additional evaluation and request consultation be restarted.

We understand NMFS' areas of responsibility have changed and your office is now the lead for consultations on lower Snake River projects. We have been in contact with Mr. Bob Ries with regard to our project. If you have any questions or would like additional information about the proposed action, please contact Mr. Ben Tice at 509-527-7267 or Ben.J.Tice@usace.army.mil.

Sincerely,

Michael S. Francis
Chief, Environmental Compliance Section

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

REPLY TO
ATTENTION OF:

February 24, 2014

Planning, Programs, and Project
Management Division

Mr. Russ MacRae, Field Supervisor
U.S. Fish and Wildlife Service
Eastern Washington Field Office
11103 East Montgomery Dr.
Spokane Valley, Washington 99206

Dear Mr. MacRae:

In December 2012, we requested Section 7 consultation with your office on our proposed 2013-2014 Lower Snake River Navigation Channel Maintenance Project (Corps EC# PM-EC-2007-0001). We later requested the consultation be suspended due to a requirement for additional sediment testing and evaluation. We have now received the results from this additional evaluation and request consultation be restarted.

We have been in contact with Mr. Chris Warren with regard to this project. If you have any questions or would like additional information about the proposed action, please contact Mr. Ben Tice at 509-527-7267 or Ben.J.Tice@usace.army.mil.

Sincerely,

Michael S. Francis
Chief, Environmental Compliance Section

Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement

Appendix K

Endangered Species Act Consultation

Section 4. Letters Requesting Review of Biological Assessment

USACE, Walla Walla District to NMFS, July 30, 2014

USACE, Walla Walla District to USFWS, July 30, 2014

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

REPLY TO
ATTENTION OF:

July 30, 2014

Planning, Programs, and Project
Management Division

Mr. David Mabe
National Marine Fisheries Service
Boise, Idaho Office
10095 West Emerald
Boise, ID 83704

Dear Mr. Mabe:

Pursuant to Section 7(c) of the Endangered Species Act, we request your review and formal consultation on the Walla Walla District, Corps of Engineers' proposed Programmatic Sediment Management Plan. We determined that our proposed project "may affect, and is likely to adversely affect", Snake River (SR) spring/summer Chinook, SR fall-run Chinook, SR sockeye, and Snake River Basin steelhead. In addition we have determined the project will not appreciably diminish the conservation value of designated critical habitats of these species. Finally we have determined that the proposed action "may affect, but is not likely to adversely affect" Upper Columbia River (UCR) spring Chinook, UCR steelhead, and Mid-Columbia River steelhead, and there will be "no effect" to their designated critical habitat.

Enclosed for your review is our biological assessment. We also request review of your draft biological opinion when it is available.

The biological assessment also includes determinations for species under jurisdiction of the U.S. Fish and Wildlife Service. If you have any questions or would like additional information about the proposed action, please contact Mr. Ben Tice at 509-527-7267, or by email at ben.j.tice@usace.army.mil.

Sincerely,

Michael S. Francis
Chief, Environmental Compliance Section

Enclosure

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

REPLY TO
ATTENTION OF:

July 30, 2014

Planning, Programs, and Project
Management Division

Mr. Russ MacRae
U.S. Fish and Wildlife Service
Eastern Washington Field Office
11103 E. Montgomery Dr.
Spokane Valley, Washington 99206

Dear Mr. MacRae:

Pursuant to Section 7(c) of the Endangered Species Act, we request your review and formal consultation on the Walla Walla District, Corps of Engineers' Programmatic Sediment Management Plan. We determined that our proposed project "may affect, and is likely to adversely affect" bull trout. The project will not appreciably diminish the conservation value of bull trout critical habitat. Further we determined the project "may affect, but is not likely to adversely affect" Washington ground squirrel.

We have also determined that our proposed action will have "no effect" on pygmy rabbit, Canada lynx, gray wolf, Ute ladies'-tresses, Spalding's catchfly, greater sage-grouse, yellow-billed cuckoo, Umtanum Desert buckwheat, White Bluffs bladderpod, and there will be no effect on Canada lynx, Umtanum Desert buckwheat, and White Bluffs bladderpod critical habitat.

Enclosed for your review is our biological assessment. We also request review of your draft biological opinion when it is available.

The biological assessment also includes determinations for species under jurisdiction of the National Marine Fisheries Service. If you have any questions or would like additional information about the proposed action, please contact Mr. Ben Tice at 509-527-7267, or by email at ben.j.tice@usace.army.mil.

Sincerely,

Michael S. Francis
Chief, Environmental Compliance Section

Enclosure

Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement

Appendix K

Endangered Species Act Consultation

Section 5. Lower Snake River Programmatic Sediment Management Plan, Environmental Impact Statement Biological Assessment

U.S. Army Corps of Engineers
Walla Walla District

July 2014

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

Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement

PM-EC-2007-0001

Biological Assessment

Prepared by:

U.S. Army Corps of Engineers
Walla Walla District

July 2014

EXECUTIVE SUMMARY

This document is a Biological Assessment (BA) prepared to analyze the effects of the U.S. Army Corps of Engineers, Walla Walla District (Corps) proposed Programmatic Sediment Management Plan (PSMP). The Corps provides this BA for consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS).

The Corps proposes to adopt and implement a PSMP for managing sediment within the lower Snake River system to meet the existing authorized project purposes that are affected by sediment deposition. The affected purposes of the Lower Snake River Projects (LSRP) are commercial navigation, recreation, fish and wildlife conservation, and flow conveyance. This document analyzes the potential impacts to federally protected species and habitats that may occur from adoption of the PSMP, and any known or projected effects of future implementation actions. Managing problem sediments is an important part of maintaining the LSRP, pursuant to the authorities.

The PSMP implementation process involves problem sediment identification, triggers for action, actions in response to triggers and the planning process for actions for evaluating measures/actions to address sediment that interferes with existing authorized project purposes.

Decisions to pursue sediment management measures will be based on review of monitoring reports and feedback from river users. Action will be taken (implementation of management measures) when information indicates a need (trigger) for immediate or future sediment management to address sediment accumulation that could interfere with existing authorized project purposes of the LSRP.

The way in which the Corps responds to triggers will differ based on the existing authorized project purpose and the two trigger levels. Measures implemented to address both immediate need and future forecast need shall be the least cost, technically feasible and environmentally acceptable, in accordance with Corps regulations (33 CFR 335-338 and Engineer Regulation 1105-2-100). Stated below is the process and description of actions to be taken for both immediate need and future forecast need for each of the four existing authorized project purposes that can be affected by sediment accumulation. The process identified below for both immediate and future forecast needs is stated (generally) in the order such actions will be implemented to manage problem sediment.

Development and identification of future actions under the PSMP (both immediate need and future forecast need actions) will use the NEPA review planning process tiered from the PSMP Environmental Impact Statement. This BA document focuses on formal adoption of the PSMP. It also includes the potential effects associated with any future implementations actions that are quantifiable programmatically at the plan level to the greatest extent possible. It is also understood that implementation of future actions under the PSMP may require evaluation of site-specific potential effects, if the effects are in addition to what is considered at the plan level in this document. Proposed future actions under the PSMP that would require additional consultations would be tiered from the programmatic consultation.

This document contains the Corps' analysis of effects of the action for the Endangered Species Act (ESA), Magnuson-Stevens Fishery Conservation and Management Act (MSA), Migratory Bird treaty Act (MBTA), and the Bald and Golden Eagle Protection Act (BGEPA).

The Corps' analysis of effects pursuant to section 7(a)(2) of the ESA concluded that the proposed action ***may affect, and is likely to adversely affect*** Snake River (SR) spring/summer Chinook, SR fall Chinook, SR sockeye, Snake River Basin (SRB) steelhead, bull trout, and Washington ground squirrel. The Corps has concluded that the proposed action ***may affect, and is likely to adversely affect*** designated critical habitat, but is not expected to result in any alteration that appreciably diminishes the conservation value of critical habitat for listed species. Therefore, the Corps has concluded that the proposed action is ***not likely to destroy or adversely modify designated critical habitat***.

The Corps also concludes that the proposed action ***may affect, but is not likely to adversely affect*** Mid-Columbia River (MCR) steelhead, Upper Columbia River (UCR) spring Chinook, UCR steelhead.

Additionally, the Corps has determined that the proposed action will have ***no effect*** on pygmy rabbit, Canada lynx, gray wolf, Ute ladies'-tresses, Spalding's' catchfly, yellow-billed cuckoo, Umtanum Desert buckwheat, White Bluffs bladderpod, and greater sage-grouse. The Corps has also determined there will be ***no effect*** on Canada lynx, Umtanum Desert buckwheat, and White Bluffs bladderpod critical habitat.

The analysis of effects on essential fish habitat (EFH) pursuant to section 305(b) of MSA resulted in the Corps' belief that there will be some adverse effects to EFH, and any short-term adverse effects will be minimized by the proposed conservation measures. The Corps determined that the proposed action will result in ***adverse effects*** to EFH, albeit small-scale and short-term.

The Corps identified conditions that would lead to determinations of ***no take*** or conditions where the Corps would need to seek permits under the MBTA and BGEPA, as well as impact avoidance and minimization measures, in accordance with Executive Order (EO) 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds" and the Memorandum of Understanding between DoD[1] and USFWS required by the EO.

This action will require further review in order to re-analyze the potential adverse effects on federal resource species or habitats if any significant changes in the action are proposed or occur after the date of this document. The Corps has also detailed a process in this document for

[1] Department of Defense (DoD)

identifying the need for future (tiered) consultations for future implementation actions under the proposed PSMP.

If additional information regarding this document is required, please contact Jason Achziger, Compliance Biologist in the Environmental Compliance Section of the U.S. Army Corps of Engineers, Walla Walla District, at (509) 527-7262, or by email at jason.k.achziger@usace.army.mil. Other correspondence can be mailed to:

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In reply, please reference Environmental Compliance Section tracking number PM-EC-2007-0001.

____
Jason Achziger
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Contents

TABLES

FIGURES

ACRONYMS

BA	Biological Assessment
BCC	Birds of Conservation Concern
BCR	Bird Conservation Regions
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
BO	Biological Opinion
BPA	Bonneville Power Administration
CEC	Commission for Environmental Cooperation
CEQ	Council on Environmental Quality (CEQ)
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
CH	Critical Habitat
Corps	U.S. Army Corps of Engineers, Walla Walla District
CRRU	Columbia River Recovery Unit
CWA	Clean Water Act
cy	Cubic Yards
District	U.S. Army Corps of Engineers, Walla Walla District
DMMP	Dredged Material Management Plan
DMMU	Dredge Material Management Unit
DPS	Distinct Population Segment
EA	Environmental Assessment
EC	Environmental Compliance Section
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ER	Engineer Regulation
ERDC	Engineering Research and Design Center
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FONSI	Finding of No Significant Impact
FWCA	Fish and Wildlife Coordination Act
GIS	Geographic Information Systems
HEC-RAS	Hydrologic Engineering Center-River Analysis System
HD	House Document
HMU	Habitat Management Unit
HUC	Hydrologic Unit Code
ICBTRT	Interior Columbia Basin Technical Recovery Team
IDFG	Idaho Department of Fish and Game
LSRFWCP	Lower Snake River Fish and Wildlife Compensation Plan
LSRP	Lower Snake River Projects
MBTA	Migratory Bird Treaty Act
MCR	Middle Columbia River

mcy	Million Cubic Yards
MOP	Minimum Operating Pool
MPG	Major Population Group
MPI	Matrix of Pathways and Indicators
MSA	Magnuson-Stevens Fishery Conservation and Management Act
msl	Mean Sea Level
NABCI	North American Bird Conservation Initiative
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NORO	Navigation Objective Reservoir Operation
NTU	nephelometric turbidity unit
PCE	Primary Constituent Element
PFMC	Pacific Fishery Management Council
PIF	Partners in Flight
PL	Public Law
POC	Port of Clarkston
PSMP	Programmatic Sediment Management Plan
rkm	river kilometers
RM	river mile
RPA	Reasonable and Prudent Alternative
Services	National Marine Fisheries Service and U.S. Fish and Wildlife Service
SEF	Sediment Evaluation Framework
SL	Screening Level
SMS	Sediment Management Standards
SOP	Standard Operating Procedure
SPF	Standard Project Flood
SR	Snake River
SRB	Snake River Basin
SRF	Snake River Fall-Run
SPL	Sound Pressure Level
TEQ	Toxic Equivalents
TOC	Total Organic Carbon
UCR	Upper Columbia River
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WDOE	Washington Department of Ecology
WRDA	Water Resources Development Act

1 INTRODUCTION

The U.S. Army Corps of Engineers (Corps) proposes to adopt and implement a Programmatic Sediment Management Plan for managing sediment within the lower Snake River system to meet the existing authorized project purposes that are affected by sediment deposition. These affected purposes of the Lower Snake River Projects (LSRP) are commercial navigation, recreation, fish and wildlife conservation, and flow conveyance.

The 2014 preliminary final Programmatic Sediment Management Plan (PSMP) is a long-term plan that forms the basis of the Corps' decision-making process for future sediment management activities needed to maintain and meet existing authorized project purposes of the LSRP. The PSMP does not prescribe site-specific solutions. Rather, it provides a set of potential measures that may be applicable for sediment accumulation that interferes with existing authorized purposes of the LSRP and a framework for selecting those measures.

As a part of its Congressional authorization, the Corps operates and maintains the navigation system on the lower Snake River, which is part of an inland navigation system from Lewiston, Idaho to the Pacific Ocean and includes the Columbia River.

The Corps constructed four dams on the Snake River in Washington State (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite) between 1961 and 1975 (Table 1). The Corps' sediment management area includes the lower Snake River from the confluence with the Columbia River2 to the upstream limits of Lower Granite reservoir. For the purposes of this BA, the sediment management area, including the four dams and their associated locks and reservoirs, is referred to as the Corps' LSRP (Figure 1).

Table 1. Lower Snake River Projects

Dam	Year Completed	Operating Range*
McNary	1954	335-340
Ice Harbor	1961	437-440
Lower Monumental	1969	537-540
Little Goose	1970	633-638
Lower Granite	1975	733-738

**Elevation in feet above mean sea level*

Sediment accumulation in the lower Snake River can interfere with the following existing authorized project purposes of the LSRP:

- *Commercial navigation* by reducing the depth of the federal navigation channel to less than the authorized depth (14 feet) when operating at minimum operating pool (MOP), thereby

[2] The lower Snake River between the confluence with the Columbia River and Ice Harbor Dam is within the reservoir formed by McNary Dam on the Columbia River.

impairing access to port berthing areas, access to navigation locks, and safe movement of tugs and multi-barge tows;

- *Recreation* by limiting water depth at boat basins to less than original design dimensions and thereby impairing access;
- *Fish and wildlife* conservation by sediment accumulation interfering with irrigation water intakes at Habitat Management Units (HMUs), juvenile ESA-listed fish barge access to loading facilities, and fish barge passage through the reservoirs and locks within the LSRP.
- *Flow conveyance* at Lewiston[3] by reducing the capacity of the river channel between levees to pass high flows. Sediment management at the confluence of the Snake and Clearwater Rivers may be needed in the long-term to manage the risk of flooding consistent with applicable Corps policies.

The Corps has historically used dredging as its primary method of removing accumulated sediment that interferes with the existing authorized project purposes of the LSRP. Dredged sediments were moved to and placed in areas where they would no longer interfere with the authorized project purposes, either in-water within the reservoirs or on upland sites.

Between 1999 and 2002 the Corps prepared a Dredged Material Management Plan (DMMP) EIS, which evaluated alternatives for managing dredged sediments in the LSRP. Following publication of the Record of Decision for the DMMP EIS in September 2002, a group of environmental and fishing interests (collectively referred to as the "plaintiffs") filed a lawsuit in November 2002, alleging compliance failures by the National Marine Fisheries Service (NMFS) with respect to the Endangered Species Act (ESA) and by the Corps with respect to the National Environmental Policy Act (NEPA). The U.S. District Court, Western District of Washington, granted a preliminary injunction, halting further action under the DMMP by the Corps. The Corps withdrew the Record of Decision and in 2005 prepared an EIS for a one-time navigation channel maintenance action (dredging). The litigation ended in 2005 through a settlement agreement between the plaintiffs and the Corps. Under the settlement agreement the plaintiffs agreed not to challenge the Corps on a one-time dredging action of the federal navigation channel and related port berthing areas in the winter of 2005/2006. The Corps agreed to "…initiate and complete a NEPA analysis on a long-term plan for the management of sediment in the lower Snake River, to be designated the Programmatic Sediment Management Plan…." The PSMP is designed to evaluate actions for sediment management to meet existing authorized project purposes.

The Corps has prepared a programmatic EIS to evaluate potential effects associated with formal adoption and implementation of the PSMP. The proposed PSMP is Appendix A of the EIS and is based on the preferred alternative in the EIS. This BA presents the ESA analysis of the PSMP. The proposed current immediate action consistent with the PSMP to reestablish the congressionally authorized navigation channel, and any related Regulatory permit reviews

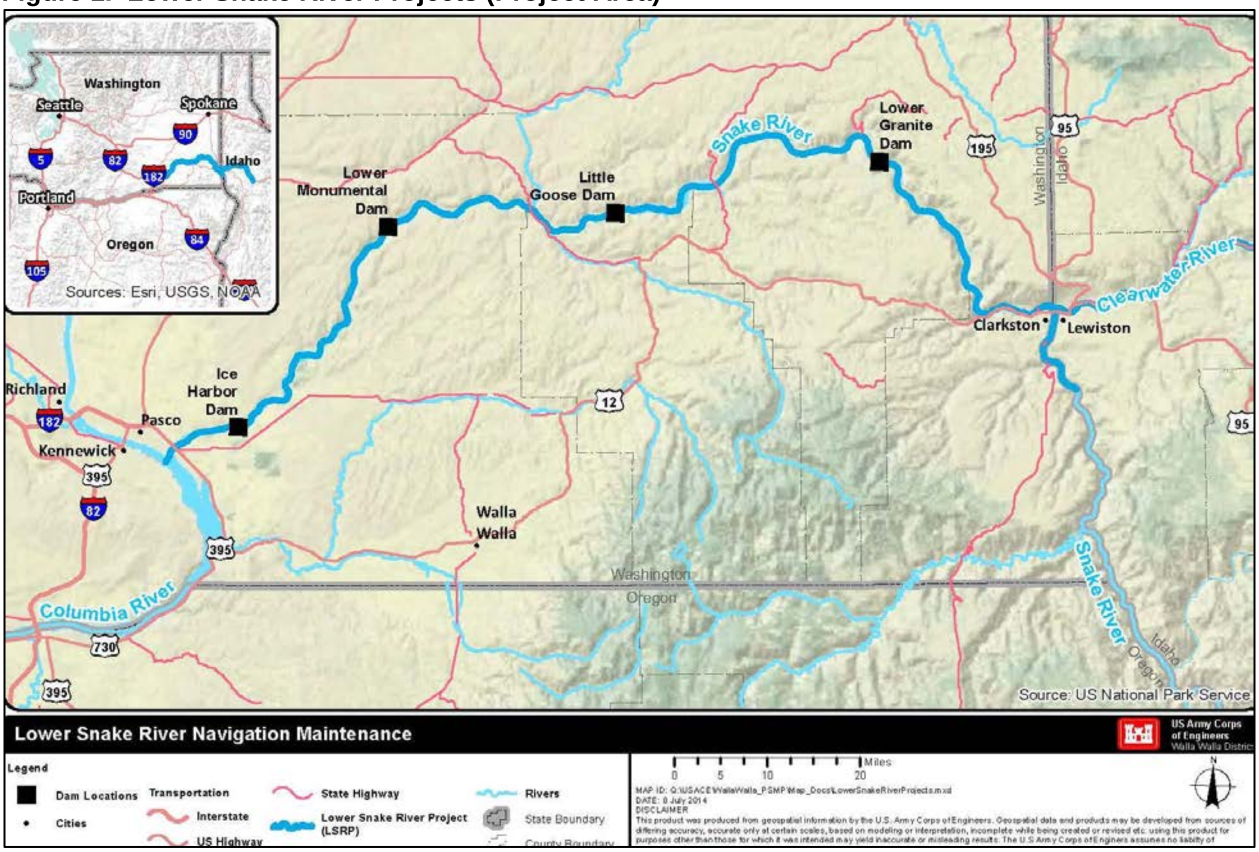
[3] Although flood risk management is not an authorized project purpose of the LSRP, ensuring adequate flow conveyance through the Lewiston levee system supports the original Lower Granite Project design and all associated project purposes.

associated with ancillary berthing area maintenance by the Ports of Lewiston, Idaho and Clarkston, WA, will be addressed in a separate/tiered BA.

2 BACKGROUND/HISTORY

The Federal navigation channel in the Snake River refers to that portion of the Columbia-Snake River inland navigation waterway maintained by the Corps. It begins at the Columbia/Snake River confluence and includes the Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Locks and Dams and associated reservoirs (Lake Wallula, Lake Sacajawea, Lake West, Lake Bryan, and Lower Granite Lake, respectively) on the lower Snake River and ends on the Clearwater River about 1.5 miles upstream of the Snake/Clearwater River confluence. Each reservoir has a 3-5 foot operating range and the Corps maintains a 14-foot-deep, 250-foot-wide navigation channel, as measured at MOP, through these reservoirs.

Figure 1. Lower Snake River Projects (Project Area)



Each of the four lower Snake River projects is authorized to provide navigation facilities, including locks with dimensions 86 feet wide and over 665 feet long to allow passage of a tug with the four-barge tow commonly used in river navigation. Construction of these dams created a series of slackwater reservoirs on the Snake River, adding an additional 140 miles to the Columbia/Snake River shallow-draft (14-foot) inland navigation system. Areas in the Federal navigation channel within approximately 0.25 to 0.5 miles below the navigation locks at Ice Harbor, Little Goose, Lower Monumental, and Lower Granite Dams periodically experience shoaling caused by dam operations. The materials are cobble and gravel, similar to the riverbed materials in adjacent areas outside the navigation channel and just below the dams. The cobble and gravel are too large to be readily suspended and are not likely to be bedload, as bedload is unlikely to pass through the locks or over the dam. The source of these unwanted sediment deposits are believed to be a redistribution of local riverbed material caused by flow passing through the spillways during high flows and the sloughing from steep slopes of the channel through hydraulic actions of barge guidance into the lock and initiation of passage through the locks. Discharge through the spillways has been increased in the past decade to aid downriver juvenile salmonids passage through each dam.

Non-Federal navigation areas adjacent to the federal navigation channel include commercial ports and berthing areas operated by local port districts or private companies. These facilities are typically designed to accommodate river tugs with up to four barges in tow. Some facilities also accommodate river tour boats carrying recreational passengers. The Corps is not responsible for maintaining such areas. The Corps has, at the request of the ports, dredged accumulated sediments at adjacent berthing areas when such ancillary/related maintenance coincides with dredging to maintain the federal navigation channel. In those cases, the federal government has been reimbursed the additional cost of dredging the port facilities by charging for that area of activity and disposal plus administrative costs.

A history of Walla Walla District dredging in the lower Snake and Clearwater Rivers is shown in Table 2.

Table 2. History of Channel Maintenance in the Lower Snake and Clearwater Rivers

Dredging Location	Year	Purpose	Amount Dredged [cubic yards (cy)]	Disposal
Excavation of Navigation Channel, Ice Harbor, Part I and II, Channel Construction	1961	Navigation	3,309,500	Upland and in-Water
Navigation Channel, Ice Harbor Part III, Channel Construction	1962	Navigation	120,000	Upland and in-Water
Downstream Navigation Channel, Ice Harbor Lock and Dam	1972	Navigation	80,000	Upland and in-Water
Downstream Approach Navigation Channel, Lower Monumental Lock and Dam	1972	Navigation	25,000	Upland
Navigation Channel Downstream of Ice Harbor Lock and Dam	1973	Navigation	185,000	Upland and in-Water
Downstream Approach Channel Construction, Lower Monumental Lock	1973	Navigation	10,000	Upland
Downstream Approach Channel Construction, Ice Harbor Lock	1978	Navigation	110,000	Upland and In-water

Dredging Location	Year	Purpose	Amount Dredged [cubic yards (cy)]	Disposal
Downstream Approach Channel Construction, Ice Harbor Lock	1978 1981/82	Navigation	816,814	Upland and in-water
Various Boat Basins, Swallows Swim Beach, Lower Granite Reservoir (Corps)	1975-1998	Recreation	20,000	Upland sites
Port of Lewiston – Lower Granite Reservoir (Corps)	1982	Navigation/Maintain Flow Conveyance Capacity	256,175	Upland sites
Port of Clarkston – Lower Granite Reservoir (Corps)	1982	Navigation	5,000	Upland sites
Downstream Approach Channel Construction, Ice Harbor Lock	1985	Navigation	98,826	In-water
Confluence of Clearwater and Snake Rivers (Corps)	1985	Maintain Flow Conveyance Capacity	771,002	Upland site
Port of Lewiston – Lower Granite Reservoir (Corps)	1986	Navigation/Maintain Flow Conveyance Capacity	378,000	Upland sites
Confluence of Clearwater and Snake Rivers (Corps)	1988	Maintain Flow Conveyance Capacity	915,970	In-water
Confluence of Clearwater and Snake Rivers (Corps)	1989	Maintain Flow Conveyance Capacity	993,445	In-water
Schultz Bar – Little Goose (Corps)	1991	Navigation	27,335	Upland site
Confluence of Clearwater and Snake Rivers (Corps)	1992	Maintain Flow Conveyance Capacity	520,695	In-water
Barge Approach Lane, Juvenile Fish Facilities, Lower Monumental	1992	Navigation	10,800	Upland site
Ports of Lewiston (Lower Granite Reservoir), Almota and Walla Walla	1991/92	Navigation	90,741	Upland and in-water
Schultz Bar – Little Goose (Corps)	1995	Navigation	14,100	In-water
Confluence of Clearwater and Snake Rivers (Corps)	1996/97	Navigation	68,701	In-water
Confluence of Clearwater and Snake Rivers (Corps)	1997/98	Navigation	215,205	In-water
Greenbelt Boat Basin, Clarkston – Lower Granite Reservoir	1997/98	Recreation	5,601	In-water

Dredging Location	Year	Purpose	Amount Dredged [cubic yards (cy)]	Disposal
Port of Lewiston – Lower Granite Reservoir (Port)	1997/98	Navigation	3,687	In-water
Port of Clarkston – Lower Granite Reservoir (Port)	1997/98	Navigation	12,154	In-water
Lower Granite Navigation Lock Approach	1997/98	Navigation	2,805	In-water
Lower Monumental Navigation Lock Approach	1998/99	Navigation	5,483	In-water
Lower Monumental Navigation Lock Approach	2005/06	Navigation	4,583	In-water
Lower Granite Navigation Lock Approach	2005/06	Navigation	342	In-water
Port of Lewiston	2005/06	Navigation	7,744	In-water
Port of Clarkston	2005/06	Navigation	19,896	In-water
Confluence of Clearwater and Snake Rivers (Corps)	2005/06	Navigation	538,052	In-water
Ice Harbor downstream navigation lock approach	2012	Navigation	400	Upland

2.1 Consultation History

The following is a summary of previous consultation efforts addressing effects to listed species and critical habitat from various sediment management activities in the lower Snake River that have been proposed or undertaken by the Corps.

Prior to 1996 ESA consultations with the Services were conducted through informal consultation.

April 1999: The Corps received species lists identifying species that may occur in the vicinity of the Corps' proposed Dredge Materials Management Plan (DMMP).

July 1999: The Corps sent the Services initial planning information and a request to initiate section 7 consultation pursuant to the ESA regarding proposed dredging activities in the lower Snake River and the potential effects to listed species.

September 2000: The Corps requested informal consultation with NMFS on the DMMP. NMFS disagreed with the Corps' determination that the proposed DMMP was "*not likely to adversely affect*" the Snake River ESUs.

June 2001: The Corps sent a request for informal consultation with the Services on proposed winter 2002/2003 dredging activities in the lower Snake River and the programmatic DMMP over its anticipated 20-year span, a BA addressing potential project effects, and an Executive Summary of the Preliminary Draft Environmental Impact Statement for the DMMP.

August 2001: The USFWS submitted a concurrence letter to the Corps addressing potential effects to listed species from the proposed near-term dredging activities and the overall DMMP.

September 2001: Consultation was initiated with NMFS.

May 2002: Consultation was reinitiated with NMFS.

June 2002: The Corps sent a request to reinitiate consultation to address several changes to the previously proposed near-term dredging activities and overall DMMP, and potential project effects to listed species. Included with the request was an addendum to the previous BA for the project describing the proposed changes.

June 2002: The USFWS submitted a concurrence letter to the Corps addressing potential effects to listed species from the updated proposed near-term dredging activities and the overall DMMP.

July 2002: Consultation was concluded with NMFS with the issuance of NMFS' Biological Opinion (BO).

July 2002: The Corps sent the Services a Final EIS for the DMMP.

September 2002: The Corps sent notification to the Services that minor revisions to the proposed activities were being considered, and that the Corps concluded these changes represented a minor revision to the proposed activities that would not require reinitiation of section 7 consultation.

November 2002: The National Wildlife Federation *et al.*[4] sought a preliminary injunction against the implementation of the DMMP on the basis that the 2002 DMMP EIS and Record of Decision and NMFS' BO were inadequate.

December 2002: The U.S. District Court, Western District of Washington, granted plaintiff's motion for preliminary injunction.

April 2003: The parties asked the Court to the stay the case in a joint status report. The Corps and NMFS subsequently withdrew the Record of Decision and the BO, respectively. The proposed action was modified to a standalone project to maintain, in the near term, the navigation, public access, and flood control benefits of the lower Snake River dams.

July 2003: The Corps sent a request to reinitiate consultation for the project based on the following proposed changes: rescheduling of the near-term dredging activities to winter 2003/2004, consideration of proposed bull trout critical habitat, and suspension of the long-term activities identified for the overall DMMP.

[4] Washington Wildlife Federation, Idaho Wildlife Federation, Idaho Rivers United, Pacific Coast Federation of Fishermen's Associations, and Institute for Fisheries Resources.

September 2003: The USFWS submitted a concurrence letter to the Corps regarding the proposed changes and the potential effects to listed species.

December 2003: The Corps sent a letter to NMFS notifying them of the intention to delay dredging operations until the winter of 2004/2005 and that the Corps would not require receipt of the NMFS' BO until mid-January, 2004.

March 2004: NMFS issued a BO for the standalone project to maintain, in the near term, the navigation, public access, and flood control benefits of the lower Snake River dams.

March 2004: The Corps sent notification to the USFWS that the near-term dredging activities were being rescheduled for winter 2004/2005, and that the Corps concluded this change represented a minor revision to the proposed activities that would not require reinitiation of section 7 consultation.

June 2004: The USFWS submitted a letter to the Corps concurring that rescheduling the near-term dredging activities to winter 2004/2005 represented a minor revision to the proposed activities that would not require reinitiation of section 7 consultation.

September 2004: The Corps sent a request for formal consultation regarding proposed winter 2004-2005 dredging activities in the lower Snake River and the potential effects to listed species. This request for formal consultation was based on new information concerning the status of bull trout in the Snake and Clearwater Rivers.

October 2004: The USFWS issued a BO to the Corps addressing potential effects to listed species from the proposed winter 2004-2005 dredging activities in the lower Snake River. Critical habitat for the bull trout was not addressed in this previous BO because, at the time critical habitat for bull trout was not identified within the action area for the project.

May 2005: The Corps sent notification that the near-term dredging activities were being rescheduled for winter 2005/2006, there were several other changes to the proposed activities, and the Corps concluded these changes represented a minor revision to the proposed activities that would not require reinitiation of section 7 consultation.

June 2005: The USFWS submitted a letter to the Corps concurring that rescheduling the near-term dredging activities to winter 2005/2006, along with the other proposed changes, represented a minor revision to the proposed activities that would not require reinitiation of section 7 consultation.

Winter 2005/2006: The Corps dredged roughly 571,000 cubic yards (cy) of sediment from five sites in the lower Snake and Clearwater Rivers, including three of the four sites considered in this current consultation (excluding only the Ice Harbor Lock downstream approach), and deposited the material in-water at the same general location proposed for disposal in this consultation.

April 9, 2012: The Corps sent a letter to NMFS and USFWS to confirm that consultation on the Corps' proposed Programmatic Sediment Management Plan (PSMP) for the lower Snake River was not appropriate, but that site-specific consultation would be conducted once there was sufficiently detailed project information available.

April 11, 2012: The USFWS responded by electronic email to the Corps' April 9 letter stating they would like to wait on consultation until there is a defined federal action.

May 29, 2012: NMFS responded by electronic email agreeing with the Corps' April 9 letter and stating there was no value in consulting on the potential effects of vaguely described actions.

October 19, 2012: The Corps notified the Services that the removal of a small amount of accumulated cobble from the Ice Harbor Lock approach that presented an immediate safety hazard to navigation activities during fall 2012 would have no effect on ESA-listed species or designated critical habitats.

October 25, 2012: The Corps documented the determination that the excavation to remove 400 cubic yards of substrate that forms an obstruction to navigation 200 feet below the navigation lock at Ice Harbor Dam would have no effect on ESA-listed species or designated critical habitats.

December 17, 2012: The Corps sent a request for formal consultation on proposed winter 2013/2014 dredging activities in the lower Snake River, a BA addressing potential Project effects, and a Draft Environmental Impact Statement (DEIS) for the PSMP.

May 21, 2013: The Corps sent a request for informal consultation on proposed additional sediment sampling for the Project and overall PSMP, and a BA addressing potential project effects. The sediment sampling BA also described several anticipated modifications to the proposed winter 2013/2014 dredging operations.

June 17, 2013: The Service submitted a concurrence letter to the Corps addressing potential effects to listed species from the proposed additional sediment sampling.

August 5, 2013: The Corps sent notification that the 2013/2014 project would be delayed pending completion of the additional sediment sampling and further assessment of potential project design changes.

February 25, 2014: The Corps submitted the results of the additional sediment sampling, along with an assessment of the results, and descriptions of other project design changes, including rescheduling of the proposed actions to winter 2014-2015 to the Services.

February 24, 2014: The Corps sent a letter to the Services requesting consultation be restarted, and that the Corps acknowledged the change in areas of responsibility for NMFS field offices for the project.

April 29, 2014: The Corps submitted a revised Disposal Plan for the 2014-2015 dredging activities.

May 13, 2014: The Corps submitted an updated sediments and chemicals of concern modeling assessment for the 2014-2015 dredging activities.

May 23, 2014: The Corps sent the Services an August 20, 2013 Biological Evaluation that determined the PSMP would have “no effect” on federally listed species.

June 16, 2014: The Corps sent the Services a revised Monitoring Plan for the 2014-2015 dredging activities.

July 10, 2014: The Corps sent an electronic email to the Services indicating that the Corps had reassessed its position with regard to Section 7 consultation on the PSMP, and that the Corps was in the process of preparing a BA to submit to the Services with a request for consultation. The Corps also withdrew the "No effect" determination sent to the Services on May 23, 2014.

3 PROPOSED ACTION

This section provides a detailed (often-verbatim) description of the PSMP. The PSMP is not appended to this BA, however, as it would be largely redundant. The Services have separately been provided with a copy of the PSMP and it should be viewed as providing the final/complete proposed action description.

3.1 Authority

As authorized by Congress, the Corps constructed and now operates and maintains the Federal navigation system on the lower Snake River. This portion of the inland navigation system stretches from Lewiston, Idaho, to the Pacific Ocean; and includes a portion of the Columbia River. Congress authorized the reservoir system and the navigation channel that runs through the reservoirs with the River and Harbor Act of 1945 (Public Law [PL] 79-14), Section 2. This Act included authorization to construct Ice Harbor, Lower Monumental, Little Goose, and Lower Granite lock and dams for the purposes of inland navigation, power generation, and incidental irrigation water supply. The Flood Control Act of 1944 (PL 78-534) authorized the Chief of Engineers to construct, maintain, and operate recreational facilities in reservoir areas under Corps management. Compliance with the Fish and Wildlife Coordination Act of 1958 (PL 85 624) resulted in certain modifications to the LSRP during and after construction, and added fish and wildlife conservation/mitigation as an authorized project purpose under the Water Resources Development Act of 1976 (PL 94-587).

The Flood Control Act of 1962 (PL 87-874) mandated the establishment of the navigation channel within the LSRP at 14 feet deep by 250 feet wide at the minimum operating pool (MOP) level, and provides the Corps with authority to maintain the channel at those dimensions.

Based on the authorizing legislation and associated Congressional documents, Congress intended for the Corps to maintain the lower Snake River navigation channel at the dimensions specifically designated by Congress (i.e., 14 feet deep and 250 feet wide) and for slack water navigation to be possible on the lower Snake River on a year-round basis. The Corps lacks discretion to designate alternative channel dimensions.

The LSRP provide aquatic and shoreline recreational opportunities. There are 51 designated recreation sites located on the shores and adjacent areas of the Snake River between the confluence with the Columbia River and the upstream end of the Lower Granite reservoir on the Snake River. These facilities include local and state parks, and marinas, which are managed and operated by the Corps and local and state recreation agencies. The PSMP would apply to sediment management actions at Corps maintained recreation areas/facilities. It does not apply to recreation facilities owned by others or leased from the Corps (e.g., marinas).

Although flood risk reduction is not an authorized purpose of the Lower Granite Project, the original enabling legislation for the project included construction and maintenance of levees as appurtenant facilities of the project. This means the levees provide for normal operating reservoir water levels from 733 to 738 feet above mean sea level in Lewiston – permitting commercial navigation without inundating portions of Lewiston. The levees were originally designed to have a 5-foot freeboard during the "standard project flood," or SPF[5]. This means that the top of the levee would be 5 feet higher than the water level during the SPF.

Design of the levees was consistent with applicable required standards at the time of the construction of the Lower Granite Project. Subsequently Engineer Regulation (ER) 1105-2-101 *Risk Analysis for Flood Damage Reduction Studies* (January 2006) provides guidance on analyzing risks of potential flooding associated with facilities like the Lewiston levee system. ER 1105-2-101 provides a revision to the design standard that required 5 feet of freeboard when passing the SPF, and directs the Corps to use risk analysis to determine the appropriate project approach. The Corps has now adopted risk-based methodology to assess the level of flood risk reduction provided by its facilities. The SPF and original design freeboard is no longer the only criterion used to evaluate the risk of flooding.

An important constraint currently affecting the Federal navigation channel is Reasonable and Prudent Alternative (RPA) Action 5 in the 2008 Federal Columbia River Power System Biological Opinion, as supplemented in 2010 and 2014 (FCRPS BO). RPA Action 5 states that the lower Snake River reservoirs will be operated within 1 foot of MOP from April through August each year to help move threatened and endangered juvenile salmonids through the river system to the ocean. Operating the reservoirs at MOP versus full pool (a drop in elevation of 3 to 5 feet) is intended to decrease the amount of time downstream migrating juvenile fish spend in the reservoirs, thereby increasing their overall survival rates. Over time, sediment deposition in the navigation channel reduces the water depth to less than 14 feet deep at MOP, which interferes with navigation. The reservoir level may be adjusted (i.e. raised) to meet authorized project purposes, primarily navigation, per RPA 5, but this deviation from MOP operation is intended as an interim measure only until navigation channel maintenance can be performed.

Finally, the Corps agreed to complete a NEPA analysis on a long-term plan (i.e., PSMP) for the management of sediment that interferes with existing authorized project purposes of the LSRP as part of the 2005 settlement agreement.[6]

3.2 Program Purpose and Objectives

The PSMP provides a comprehensive framework for Corps maintenance actions to manage and prevent, if possible, the accumulation of sediment that interferes with existing authorized purposes of the LSRP (i.e., commercial navigation, recreation, fish and wildlife conservation, and flow conveyance at Lewiston, Idaho). The PSMP does not attempt to address all sediment deposition in the LSRP. It addresses only sediment that interferes with existing authorized project purposes of the LSRP. The PSMP is a long-term plan that forms the basis of the Corps' decision-making process for future sediment management activities needed to maintain and meet

[5] SPF, or standard project flood, is a hypothetical flood caused by the maximum amount of precipitation falling over a major portion of an entire watershed.
[6] National Wildlife Federation v. NMFS, Case No. CV02-2259L (W.D. Wash).

existing authorized project purposes of the LSRP. The PSMP is intended to be a proactive adaptive management plan, addressing both the immediate near term problems and anticipated future problems before they are critical and solutions become limited. Adaptive management is a systematic process designed to continually improve management policies and practices by learning from the results of implemented measures. The PSMP will be reviewed periodically by the Corps and modified if such changes become necessary to better address sediment accumulation that interferes with the Corps' ability to maintain the LSRP.

The PSMP does not prescribe site-specific solutions. Rather, it provides a set of potential measures that may be applicable for sediment accumulation that interferes with existing authorized purposes of the LSRP and a framework for selecting those measures. The Corps will select measures to effectively address problems in the least costly, environmentally acceptable manner, consistent with engineering requirements and in accordance with applicable laws and regulations. The PSMP will guide only those actions taken by the Corps within the project boundaries of the LSRP that are within the Corps' authority.

3.3 Project Description

3.3.1 Addressing Maintenance Needs

Based on historic data of sediment accumulation and dredging actions, as well as data collected while preparing the PSMP EIS, it is clear that sediment accumulation will continue to be a maintenance issue within the LSRP – primarily at the confluence of the Snake and Clearwater Rivers. Studies conducted in association with development of the PSMP EIS indicates land use Best Management Practices (BMPs) within the watershed may be effective in reducing some sediment from entering the system (primarily in tributaries) at a localized level, but not on a scale that would reduce the need for sediment management in the LSRP. The findings indicate there is not a clear, quantifiable relationship between reduction of sediment at its source and reduction of sediment deposition that interferes with the authorized project purposes of the LSRP. Therefore, the Corps would continue to address maintenance of the LSRP by managing sediment accumulation within the LSRP, in accordance with federal laws and Corps regulations.

The accumulation of sediment in some locations in the LSRP adversely affects existing authorized purposes of the LSRP, including commercial navigation, fish and wildlife conservation, recreation and flow conveyance. Managing problem sediments is an important part of maintaining the LSRP, pursuant to the authorities described in Section 3.1 above. The Corps has historically maintained:

- The Federal navigation channel at the congressionally authorized depth of 14 feet deep and 250 feet wide.
- Access and use of Corps managed recreation facilities.
- Irrigation water intakes for Corps maintained irrigated habitat management units (HMUs).
- Flow conveyance through the Lewiston levee system consistent with ER 1105-2-101.

Additionally, although the Corp is not responsible for maintaining such areas, local ports can request the Corps to dredge adjacent port berthing areas when such ancillary/related maintenance coincides with dredging to maintain the federal navigation channel. In those cases, the ports must obtain all applicable regulatory permits (e.g., Section 404/10 permits) and reimburse the federal Government for all additional costs of dredging and disposal plus administrative costs.

3.3.2 Sediment Accumulation Problem Areas

The Corps evaluated locations where sediment accumulation could interfere with the LSRP authorized purposes. The Corps identified 48 locations in the LSRP where sediment accumulation historically has affected authorized purposes or sediment accumulation may potentially be a problem in the future[7]. Table 3 lists these areas, their authorized project purpose, and their approximate river mile location. Of the locations identified, 20 sites are used for recreation, 16 are navigation sites[8], and 12 sites are related to water intakes to irrigate HMUs (i.e. fish and wildlife). Flow conveyance (as it relates to flood risk management through the Lewiston levee system) and navigation are affected project purposes at the Snake/Clearwater confluence.

Table 3. Potential Sedimentation Problem Areas

Reservoir	River	Approx. River Mile[1]	Site Name	Purpose
McNary	Snake	0	Sacajawea State Park	Recreation
		1.5	Hood Park Boat Ramp	Recreation
		9.2	Ice Harbor Lock Approach/Nav Coffer Cells	Navigation
		0.0–1.5	Snake River Entrance	Navigation
		2.0–10.0	Nav Channel Below Ice Harbor	Navigation
Ice Harbor	Snake	10	North Shore Boat Ramp	Recreation
		11.5	Charbonneau Park	Recreation
		13.5	Levey Park	Recreation
		15	Big Flat Habitat Management Unit (HMU)	Fish and wildlife
		18	Fishhook Park	Recreation
		23	Lost Island HMU	Fish and wildlife
		24.5	Hollebeke HMU	Fish and wildlife
		29.0–33.3	Walker's Elevator	Navigation
		39	Windust Boat Ramp	Recreation

[7] It should be noted that, to date, dredging has occurred at relatively few of the sites identified; however, the Corps has attempted to identify all areas where sediment accumulation could potentially affect authorized purposes in the future.

[8] Several of these sites are port facilities. The ports may apply for permits to conduct maintenance activities not covered in previous permits. The Corps has, at the request of the ports, dredged accumulated sediments at these permitted locations to coincide with dredging to maintain the federal channel. In these cases, the federal government is reimbursed the additional cost of dredging the port facilities by charging for that area of activity and disposal plus administrative costs.

Reservoir	River	Approx. River Mile[1]	Site Name	Purpose
		41	Lower Monumental Lock Approach	Navigation
Lower Monumental	Snake	48	Skookum HMU	Fish and wildlife
		51	Ayer	Recreation
		55	55-Mile HMU	Fish and wildlife
		56.5	Joso HMU	Navigation
		59.5	Lyons Ferry Park	Recreation
		66	Texas Rapids Boat Basin	Recreation
		68	John Henley HMU	Fish and wildlife
		70	Little Goose Lock Approach	Navigation
Little Goose	Snake	76	Ridpath HMU	Fish and wildlife
		81	New York Bar HMU	Fish and wildlife
		82.5	Central Ferry Park	Recreation
		83	Port of Garfield Access	Navigation
		83.5	Port of Central Ferry	Navigation
		88	Willow Landing HMU	Fish and wildlife
		93	Rice Bar HMU	Fish and wildlife
		95	Swift Bar HMU	Fish and wildlife
		100.0-102.0	Navigation Channel at Schultz Bar	Navigation
		103.5	Port of Almota	Navigation
		103.5	Illia Landing	Recreation
		105.5	Boyer Park and Marina	Recreation
		107	Lower Granite Lock Approach	Navigation
Lower Granite	Clearwater	1.0-2.0	Port of Lewiston	Navigation
		3	Clearwater Boat Ramp	Recreation
	Snake/ Clearwater	131.5-139.5/ 0.0-2.0	Snake River at Mouth of Clearwater River	Navigation, conveyance
	Snake	128-130	Silcott Island	Navigation
		132	Chief Timothy HMU	Fish and wildlife
		137	Hells Canyon Resort *	Recreation
		139	Port of Clarkston	Navigation
		139.5	Greenbelt Boat Basin	Recreation
		140.5	Southway Boat Ramp	Recreation
		141.5	Swallows Park Boat Basin and Swim Beach	Recreation
		142.5	Hells Gate State Park	Recreation
		146	Chief Looking Glass Park	Recreation

3.3.3 Historical Sediment Management Activities

The Corps has historically used periodic dredging to manage sediment as part of operating and maintaining the LSRP. The Corps has disposed of the material either upland or in the reservoirs (called "in-water disposal"). More recently, the Corps has placed dredged sediments to create shallow water habitat for resting and rearing habitat for outmigrating juvenile salmon and steelhead, listed as threatened or endangered under the Endangered Species Act (ESA). Table 2 details the Corps' past dredging actions, most of which were conducted to maintain navigation or flow conveyance. The Corps has dredged problem sediment areas approximately every 3 to 5 years, scheduling this dredging when river survey data indicated the sediment deposition was interfering with navigation or other uses of the reservoirs.

Approximately 80 percent of the volume of material historically dredged from the LSRP system has come from Lower Granite reservoir, which is mostly sand from the Snake-Clearwater confluence area. Lower Granite is the furthest upstream of the four reservoirs, and the confluence location is susceptible to sediment deposition as it is located at the upper end of the reservoir where the two rivers change from free-flowing to slack water. Suspended sand from both rivers is transported into the reservoir as far downstream as Silcott Island. Based on recent studies and historic data, it is anticipated that the majority of problem sediment management activities will continue to occur within Lower Granite reservoir.

3.3.4 The PSMP Management Measures

Through a collaborative process that included a series of workshops involving technical experts from the Corps and other agencies input from scoping and stakeholders, the Corps developed a broad range of management measures that could address sediment accumulation problems. The management measures fall within four general categories: dredging and dredged material management; structural management, system management, and upland sediment reduction (Table 4). These categories are summarized in the following subparagraphs, which also provide generally a worst-case description of quantities and frequency associated with each measure to facilitate ESA consultation. The actual/anticipated quantities/frequencies associated with such measures may be much less.

Table 4. Management Measures

Measure	Description
Dredging and Dredged Material Management	
Navigation and Other Dredging	Dredging typically consists of excavation, transport, and placement of dredged sediments. The excavation process for the lower Snake River generally involves the removal by mechanical means (e.g., a barge-mounted "clamshell" dredge scooping sediments from the reservoir bottom) to restore the intended dimension or use of the area where sediment has accumulated. Removal of material by hydraulic means (e.g., suction or water induced vacuum) may also be considered for recreation and HMU irrigation facilities when potential adverse effects to ESA listed fish is unlikely. This measure would also have ancillary benefit for flow conveyance through the Lewiston levee system.

Measure	Description
Dredge to improve conveyance capacity	This measure differs from the “Navigation and Other Dredging” measure in that it involves removal of substantially greater quantities of sediments from areas outside the navigation channel, access channel and port berthing areas, and/or recreation facilities. The excavation process involves sediment removal by mechanical means at the Snake and Clearwater Rivers confluence to improve flow conveyance.
Beneficial use of sediment	Beneficial use of dredged material includes a wide variety of options that utilize the dredged material for some productive purpose such as habitat restoration/enhancement, construction and industrial use, etc and can apply to upland or in-water disposal options. The Corps views dredged material as a valuable and manageable resource and seeks opportunities to use it beneficially whenever possible. The Corps has beneficially used dredged material in the past to create fish habitat. Other potential beneficial uses include: habitat restoration/enhancement, beach nourishment, aquaculture, parks and recreation, agriculture, forestry, horticulture, strip mine reclamation, landfill cover for solid waste management, shoreline stabilization, erosion control, construction, and industrial use. Beneficial use of dredged material generally requires a cost-share sponsor (See ER 1105-2-100), unless it is the least cost, environmentally acceptable alternative.
In-water disposal of sediment	In-water disposal of dredged sediment is the discharge of dredged material back into the waterway. Typically, dredged material is transported to a previously identified in-water location selected to minimize impacts and released into the water.
Upland disposal of sediment	In upland placement, dredged material is placed on land, above high water, and out of wetland areas. The dredged material is typically placed in a cell behind levees/dikes that contain and isolate it from the surrounding environment. The dredged material is dewatered through evaporation and/or settling with the effluent discharged as clean water.
Structural Sediment Management	
Bendway weirs	Bendway weirs are rock sills located on the outside of a stream or river bend that are angled upstream into the direction of flow. With the weirs angled upstream, flow is directed away from the outer bank of the bend and toward the point bar or inner part of the bend. This redirection of flow occurs at all stages higher than the weir crest. Where there is sufficient velocity and volume, the redirection of flow generally results in a widening of the channel through scour of the point bar. Bendway weirs are typically used to maintain navigation channels.
Dikes/dike fields	Dikes are longitudinal structures used to maintain navigation channels through effects on channel depth and alignment. Dikes constrict low and intermediate flows, causing the channel velocity to increase within the reach, thereby scouring a deeper channel. Dikes are typically built of rock, but can also be constructed using other materials.
Agitation to resuspend	This technique involves the deliberate agitation and resuspension of deposited sediment; the sediment is then carried downriver as part of the suspended load of the river. This technique requires both some form of agitation mechanism, and sufficient river flow (velocity and volume) to carry the additional sediment load away from the targeted area. There are numerous potential means to mechanically agitate and resuspend sediment, including high pressure air and water pumps and using propellers to move sediment.

Measure	Description
Trapping Upstream Sediments (In-Reservoir)	This measure would involve excavating a pit, or sediment trap, in a depositional part of the upstream reach of a river or reservoir to trap incoming sediment, thus reducing the sediment available to deposit in other areas where it may interfere with existing authorized project purposes. Sediment would have to be periodically removed from the trap and managed by one of the measures described above (i.e., beneficial use, in-water or upland placement).
System Management	
Navigation Objective Reservoir Operation	This measure involves operating reservoirs of the LSRP at water surface elevations that would provide a 14-foot deep channel within the Federal navigation channel. The Corps would manage pool levels within the preset operating range for each reservoir to maintain 14 feet of water depth over areas where sediment deposition has occurred in the channel. Currently the Corps operates the LSRP at MOP, or as close to MOP as possible, during the juvenile salmonid outmigration season (typically from April through August, but as late as October in Lower Granite reservoir), and at varying levels within each reservoir's 3 or 5-foot operating range through the rest of the year. This measure would provide the Corps the option of operating above MOP and even at the upper end of the operating range year-round as needed to maintain the 14-foot deep navigation channel.
Reconfigure affected facilities	Corps facilities affected by sediment deposition may be reconfigured or otherwise modified to avoid the deposited sediment. This measure applies to Corps facilities only and could include a range of facility modifications. Examples include water intake structures, mooring facilities, docks, boat ramps, and loading/unloading facilities that could potentially be extended to reach out beyond nearshore areas where sediment deposition is occurring. In addition to reconfiguring water intake structures, alternative water sources for irrigation could be explored. Reconfiguration of recreation facilities may also include consideration of repurposing; temporarily, partial or full closing; and/or reducing the scope of the facility.
Relocate affected facilities	Corps facilities affected by sediment deposition may be relocated to avoid recurring problems with sediment deposition. Moving or relocating affected facilities is potentially suitable for navigation facilities, recreational boating facilities, and water intake structures. In addition to relocating water intake structures, alternative water sources for irrigation could be explored. The Corps' ability to consider/study the feasibility of reconfiguring or relocating port facilities is limited and generally requires a cost-share sponsor and specific authority. The Corps could consider/study reconfiguration or relocation of port facilities, if requested by the Ports, subject to availability of authority and funding.
Raise Lewiston Levee to Manage Flood Risk	The Lewiston levee system is an upstream extension of Lower Granite dam and was designed to protect parts of Lewiston, ID from inundation during the SPF. The confluence of the Snake and Clearwater Rivers at upper reach of the Lower Granite reservoir collects much of the sediment carried into the reservoir. Current analysis indicates that flood risk is within acceptable limits, however if future sediment accumulation changes the flood risk to Lewiston by raising the water level in the reservoir, raising the levee would be an option for reducing flood risk. Location and height of change would be determined through detailed site- and time-specific studies.

Measure	Description
Reservoir Drawdown to Flush Sediment)	In this measure, flow would be temporarily modified to increase the capacity of the river system to scour and carry sediment, thereby flushing deposited sediments downstream. The ability of a river system to carry sediment is determined by the river's velocity and volume. Flow modification would be created by a drawdown of a reservoir to increase velocity. Drawing down the pool elevation by 10 to 15 feet during a 30- to 45-day period in an effort to flush sediments from the navigation channel. Flow modification would be created by a drawdown of the Lower Granite reservoir. Lower Granite reservoir is the only LSRP reservoir in which this measure would be effective. Flow modifications would be temporary and would be timed to take advantage of naturally-occurring periods of high flows.
Upland Sediment Reduction (Expanded)	
Local Sediment Management Group (LSMG) Coordination Meetings	The LSMG is an information exchange forum comprised of the Corps and Federal and state regulatory agencies, tribal governments, local governments, and non-governmental organizations (e.g., barge operators, Ports, Pacific Northwest Waterways Association).

3.3.4.1 Dredging and Dredged Materials Management

Dredging involves physical removal of sediments from one location, and placement of the dredged material in another location. The dredging process typically consists of excavation, transport, and placement of dredged sediments. Excavation would generally be by mechanical means (i.e., physically scooping sediments with a clamshell or backhoe). Removal of material by hydraulic means (e.g., suction or water induced vacuum) may also be considered for recreation and HMU irrigation facilities when potential adverse effects to ESA listed fish are unlikely. Once dredged, sediments are transported to a disposal or placement area. Dredged material may be disposed of in-water or upland and may be beneficially used for purposes other than disposal only, such as habitat creation. The disposal method is ultimately identified through evaluation of disposal alternatives under the substantive provisions of Section 404(b)(1) of the Clean Water Act, guidelines established by the EPA (40 CFR 230) and Corps regulations.

Dredging

Dredging is a measure that is applicable to almost any sediment accumulation issue. Dredging technologies can be scaled to address small or large quantities of sediment and can be applied in almost any environment. A corresponding measure to manage dredged sediments must be available (see "Dredged Material Management" below).

Dredging consists of removal, transport, and placement of dredged sediments. For the purposes of this analysis, the term "dredging" will refer to the excavation process, as placement and disposal options are discussed separately. The excavation process involves the removal of deposited sediment as part of maintenance activities. After excavation, the sediment is transported from the dredging site to a site where it will be used or permanently placed. This transport operation is typically accomplished by the dredge itself or by using additional equipment such as barges. Use and/or placement can occur in-water or in an upland area.

Backhoe and bucket (such as clamshell, or dragline) are types of mechanical dredges (Figure 2). Clamshell buckets are the most commonly used dredges in the lower Snake River. Mechanical dredging has been used primarily due to concerns about potential entrainment of fish associated with hydraulic, or suction, dredging. Sediments excavated with a mechanical dredge are generally placed onto a barge or truck (for near-shore excavations) for transportation to the use or disposal site.

Figure 2. Dredging Operation on the Snake River.

Selection of equipment and method to perform a dredging operation is typically dependent on:

- Physical characteristics of the material to be dredged.
- Quantities of material to be dredged.
- Dredging depth.
- Distance to reuse or placement area.
- Physical environment of the dredging and placement areas.
- Contamination level of sediments (if any).
- Method of placement or beneficial use.
- Production required.
- Type of dredges available.
- Cost.

Dredging has historically been the most common method used to remove sediment and maintain navigation channels, recreation areas, berthing areas, and flow conveyance capacity. Additionally, due to concerns over potential effects to listed endangered anadromous species and other aquatic resources, dredging in the lower Snake River is typically limited to a winter in-water work window of December 15 to March 1. Summer dredging may also be considered for other off-channel areas such as boat basins, swim beaches, or irrigation intakes on a case-by-case basis. These shallow-water areas would be expected to have elevated water temperatures during the summer and would not likely have salmonid fish present. The material dredged from these sites would probably be disposed of at an upland location since the in-water disposal areas are located in the main river channel and may have salmonid fish present during the disposal activity.

On a case-by-case basis, hydraulic dredging may be considered for off-channel areas such as boat basins, swim beaches, or irrigation intakes, when potential adverse effects to ESA listed fish are unlikely. This would probably be done in the summer when salmonid fish are less likely to be found in these off-channel areas because of elevated water temperatures. The dredged material would exit the dredge as a slurry that is likely to be 65 to 80 percent water and would not be suitable for in-water disposal as described above. Instead, this slurry could be incorporated into the wildlife habitat planting areas or used to restore eroded streambanks near the intakes.

<u>Navigation and Other Dredging</u>. Dredging typically consists of excavation, transport, and placement or disposal of dredged sediments. The excavation process for the lower Snake River generally involves the removal by mechanical means (e.g., a barge-mounted “clamshell” dredge scooping sediments from the reservoir bottom) to restore the congressionally authorized navigation channel dimensions or use of non-navigation areas where sediment has accumulated.

Removal of material by hydraulic means (e.g., suction or water induced vacuum) may also be considered for recreation and HMU irrigation facilities when potential adverse effects to ESA listed fish are unlikely. This measure would also have ancillary benefit for flow conveyance through the Lewiston levee system.

The Corps anticipates that dredging 200,000-500,000 cy of material, primarily from the Snake-Clearwater rivers confluence area, will be needed every 3-5 years, unless longer-term solutions are identified. The Corps anticipates dredging 500-15,000 cy of material from other areas (recreation or fish and wildlife sites) every 3-9 years. For additional information on potential actions that may be taken in response to sediment accumulation, see Section 3.4.3 below.

Dredging to Improve Flow Conveyance. This measure differs from the "Navigation and Other Dredging" measure in that it involves removal of substantially greater quantities of sediments from areas outside the Federal navigation channel, access channel and port berthing areas, and/or recreation facilities. The excavation process involves sediment removal by mechanical means at the Snake and Clearwater Rivers confluence at the upstream end of Lower Granite reservoir to improve flow conveyance.

Figure 3. Dredging Priority Areas for Flow Conveyance

Flow conveyance dredging in the Lower Granite reservoir would extend from the Port of Wilma near Snake RM 134 to the U.S. Highway 12 bridge located upstream of the confluence of the Snake and Clearwater Rivers, near Snake RM 139.5. The Clearwater River dredging would extend from the Snake River confluence upstream to RM 2.0. The priority areas for dredging within the template are depicted in Figure 3.

The Snake/Clearwater Rivers confluence area dredging template varies in width from 300 feet, near the Port of Wilma, to 1,700 feet in the Clearwater River confluence area. The average dredging width on the Snake River within this area would be 750 feet. Material would be removed to about elevation 708, which is 25 feet below MOP. Material would not be removed from the original riverbed or shoreline.

The Corps anticipates dredging in the confluence area would require annual removal of between 750,000-1,000,000 cy of material to maintain the current conveyance capacity. See also Section 3.4.3 below.

Dredged Material Management

Disposal options available to the Corps for dredged materials are identified in accordance of Corps regulations (33 CFR 335-338). The "Federal Standard" for disposal of dredged material is defined as "[T]he least costly alternatives consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process. . . ." (33 CFR 335.7). The Corps considers both upland and in-water disposal alternatives when dredging is proposed. For proposed in-water disposal, the disposal method is ultimately identified after evaluation of disposal alternatives under the substantive provisions of Section 404(b)(1) of the Clean Water Act (CWA), associated EPA guidelines (40 CFR 230) and Corps regulations. When in-water disposal is proposed, the Corps is required to identify and utilize the lowest cost, least environmentally damaging, practicable alternative as its disposal method. The alternatives analysis in the Section 404(b)(1) evaluation is incorporated into the NEPA process and ultimately identifies the Corps proposed/preferred disposal alternative. Additionally, it is the Corps' policy to always consider beneficial use of dredged material when evaluating disposal options (Engineer Manual 1110-2-5026).

Beneficial Use of Sediment. Beneficial use of dredged material includes a wide variety of options that utilize the dredged material for some productive purpose and can apply to upland or in-water disposal options. Broad categories of beneficial uses based on the functional use of the dredged material include:

- Habitat restoration/enhancement (wetland, upland, island, and aquatic sites including use by ESA-listed fish).
- Beach nourishment.
- Aquaculture.
- Parks and recreation (commercial and noncommercial).

- Agriculture, forestry, and horticulture.
- Landfill cover for solid waste management.
- Shoreline stabilization and erosion control (fills, artificial reefs, submerged berms, etc.).
- Construction and industrial use (including port development, airports, urban, and residential).
- Fill for other uses (dikes, levees, parking lots, and roads). (USACE 1992; USACE 2007b).

It is Corps practice to secure the maximum practicable benefits of dredged material within authority and funding limitations. The Corps views dredged material as a valuable and manageable resource and seeks opportunities to use it beneficially whenever possible. The Corps has beneficially used dredged material in the past to create fish habitat in the lower Snake River. Specific applications are dependent on opportunities available at the time the dredging is occurring. Opportunities for beneficial use would be identified and evaluated as part of the planning for any dredging activity.

Beneficial use of dredged material is applicable to a wide variety of settings and uses when it is determined to be the preferred disposal method consistent with environmental reviews and the Federal Standard. Often, a local sponsor must be identified as part of the beneficial use.

If the Corps were to implement beneficial use of dredged materials to create shallow water habitat, the Corps would likely select sites based on proximity to dredging site, potential to provide suitable resting/rearing habitat for juvenile salmonids if the river bottom were to be raised, the site could not interfere with navigation, and could not impact cultural/historic properties, and is of sufficient size to accommodate the anticipated dredged sediment disposal volume.

<u>In-water Disposal of Sediment</u>. In-water disposal of dredged material is simply the discharge of dredged material into the waterway for purposes of disposal (as opposed to placing it in-water for a beneficial purpose). Typically, dredged material is transported to a suitable location in a bottom dump barge, and released into the water at the upstream end of a deep-water area. All dredged material is a candidate for in-water disposal if it meets the requirements of the Federal Standard. For future actions, the Corps would perform all required sediment sampling and analysis and determine suitability for in-water disposal. If the sediment sampling and analysis results showed the sediments had unacceptable concentrations of chemicals of concern that would preclude using unconfined in-water disposal, the Corps would either not dredge the area or would pursue an alternate acceptable disposal method.

In-water disposal of sediment is applicable to most dredged material management needs in the LSRP. The Corps has identified multiple locations with sufficient capacity to accept the volumes of dredged material that could be generated by potential dredging activities in LSRP.

Upland Disposal of Sediment. Upland disposal of sediment is the placement of dredged material on land, above high water and out of wetland areas, but not for a beneficial purpose. The dredged material is typically placed in a cell behind berms that contain and isolate it from the surrounding environment and is dewatered through evaporation and/or settling and discharge of clean water. There may be other uses of the land during and after the site is used for dredged material placement.

Upland disposal can be used for any dredged material, coarse or fine-grained. The material would be transported to and placed on the upland site using methods such as scooping it out with a clamshell bucket, using an auger or a conveyor belt, or hydraulic pumping.

Upland disposal is an option for disposal when it is determined to be the preferred disposal method consistent with environmental reviews and the Federal Standard. Depending on dredged material quantities, upland disposal could require a fairly large area with proximity and good access to the waterbody being dredged. Site development, including a containment berm and dewatering channels, is typically required.

3.3.4.2 Structural Sediment Management

Structural sediment management measures seek to control the location and rate at which sediment is deposited at a specific location, in order to reduce or eliminate the magnitude of the sediment interference with existing authorized purposes of the LSRP. Examples of structural management measures include weirs and sediment traps, which prevent sediment from accumulating in certain areas or intercept and collect sediment that may otherwise interfere with existing authorized project purposes. Such measures would require site-specific tier-off NEPA analysis and ESA consultation, and may require additional congressional authority and funding to implement.

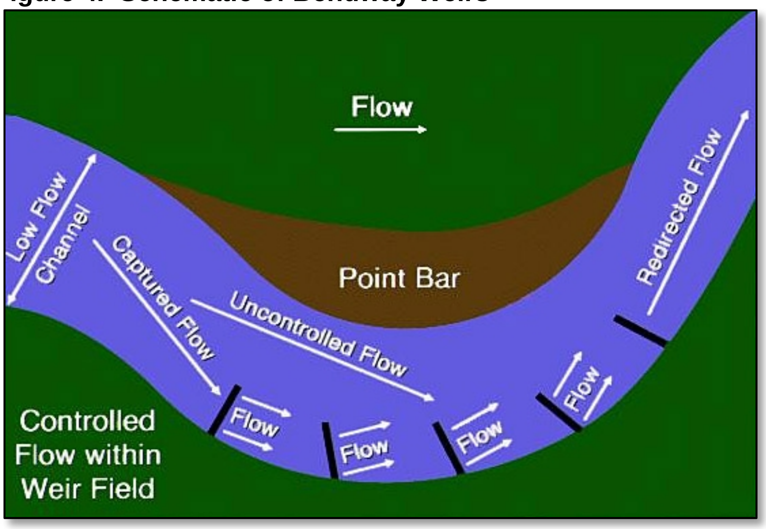
Structural sediment management measures described below could be considered by the Corps subject to authority and funding.

Bendway Weirs

Bendway weirs would be placed at strategic locations along the banks of the Lower Snake to redirect water flow in a manner that would prevent problem sediment accumulation and maintain navigation channel dimensions. Bendway weirs are rock structures located on the outside of a stream or river bend, angled upstream into the direction of flow. Water flowing over the bendway weirs is redirected at an angle perpendicular to the middle of the weir. With the weirs angled upstream, flow is directed away from the outer bank of the bend and toward the point bar or inner part of the bend. This redirection of flow occurs at all stages higher than the weir crest. Where there is sufficient velocity and volume, the redirection of flow generally results in a widening of the channel through scour of the point bar (Figure 4). Other possible effects include:

- Deposition at the toe of the ***revetment*** (river bank stabilization armoring) on the outside of the bend, thus increasing bank stability.
- Scouring on the point bar creating a flow path on the inside of the bend.
- Surface water velocities are more uniform across any cross-section.
- Flow patterns in the bends are generally parallel with the banks (not concentrated on the outer bank of the bend).
- The ***thalweg*** (deepest, continuous line in river) of the channel is moved from the toe of the outer bank revetment to the stream ends of the weirs.

Figure 4. Schematic of Bendway Weirs



Weirs are generally built in sets (4 to 14 weirs per bend) and are designed to act as a system to control velocities and current directions through the bend and well into the downstream crossing.

Typically, bendway weirs are applied to unimproved or revetted bends where growth of the point bar is restricting the navigation channel width, or an improved navigation channel alignment is desired. Bendway weirs are commonly used on both navigable rivers and smaller streams.

Bendway weirs are applicable in locations where there is sufficient flow and velocity to sustain sediment transport (and possibly mobilize accumulated sediments) through the area of influence of the structures. For the LSRP, bendway weirs could be applicable in locations like the main river channel through Snake-Clearwater confluence where flow velocities are relatively high. Bendway weirs would generally not be effective in off-channel or backwater locations, like some recreation sites or at locations further downstream within the reservoirs where flow depths are larger and flow velocities smaller. Bendway weirs would require sufficient lead time to plan, design, and implement.

Dikes/Dike Fields

Dikes would work in a similar manner as bendway weirs to redirect river flows and velocities and prevent problem sediment accumulation and maintain navigation channel dimensions. Dikes are linear structures used to maintain navigation channels through effects on channel depth and alignment. Dikes constrict channels at low and intermediate flows, causing the channel velocity to increase within the reach and thereby scour a deeper channel. Dikes are typically built of rock but may be constructed with other suitable materials (Figures 5 and 6).

Dikes are generally used to contract river channels at low and intermediate flows, forcing all flow through a narrower width. The resulting increased velocity erodes or scours the bed to a lower elevation. Scour is commonly needed only to provide navigable depths during periods of low flow; therefore, low dikes are more desirable than high dikes, which can cause excessive scour at high flows. Scour can also be greater for dikes angled upstream rather than perpendicular to flow or angled downstream.

Maintenance of open water areas in dike fields can be encouraged through variations in the design, such as notches or rootless (e.g., not attached to the riverbank) dikes. Dikes have traditionally been designed to induce sediment deposition within the dike fields although stone dikes do not necessarily have to fill with sediment to be effective.

Figure 5. Dike Construction

Figure 6. Dike on the Mississippi River

Applicability of dikes and dike fields is similar to that of bendway weirs.

Agitation to Resuspend

Agitation to resuspend sediments involves the deliberate agitation and resuspension of deposited sediment. Following agitation, the sediment is carried downriver as part of the suspended load of the river. This technique requires both some form of agitation mechanism, and sufficient river flow (velocity and volume) to carry the additional sediment load away from the targeted area. There are numerous potential means to mechanically agitate and resuspend sediment, including hydraulic dredges, high pressure air and water pumps, and using propellers to move sediment. In this technique, jets of air and/or water are applied to the deposited sediments at sufficient pressure to dislodge them from the bottom causing the sediments to become resuspended in the water column and carried downriver by the current.

The effectiveness of this measure is dependent on the ability of the agitation mechanism to resuspend the deposited sediment and the ability of the river to carry the resuspended sediment a sufficient distance downriver to avoid problems with resettling. The Corps has used this method before in the lower Snake River. It is suited to addressing smaller, localized sediment issues with fine sediments. Assuming conditions are met for the measure to work, agitation and resuspension could be used as a short-term sediment management measure. The measure would not prevent sediment from depositing in the same location in the future, nor does it control where resuspended sediment is transported and potentially resettles.

Agitation to resuspend sediments is applicable only in those areas where there is sufficient flow, both in terms of volume and velocity, to transport resuspended sediments away from areas where they interfere with authorized project purposes of the LSRP, such as locations within the main channel of a reservoir. In addition, hydraulic conditions downstream should be such that the resuspended (and transported) sediment does not interfere with an authorized project purpose in another location.

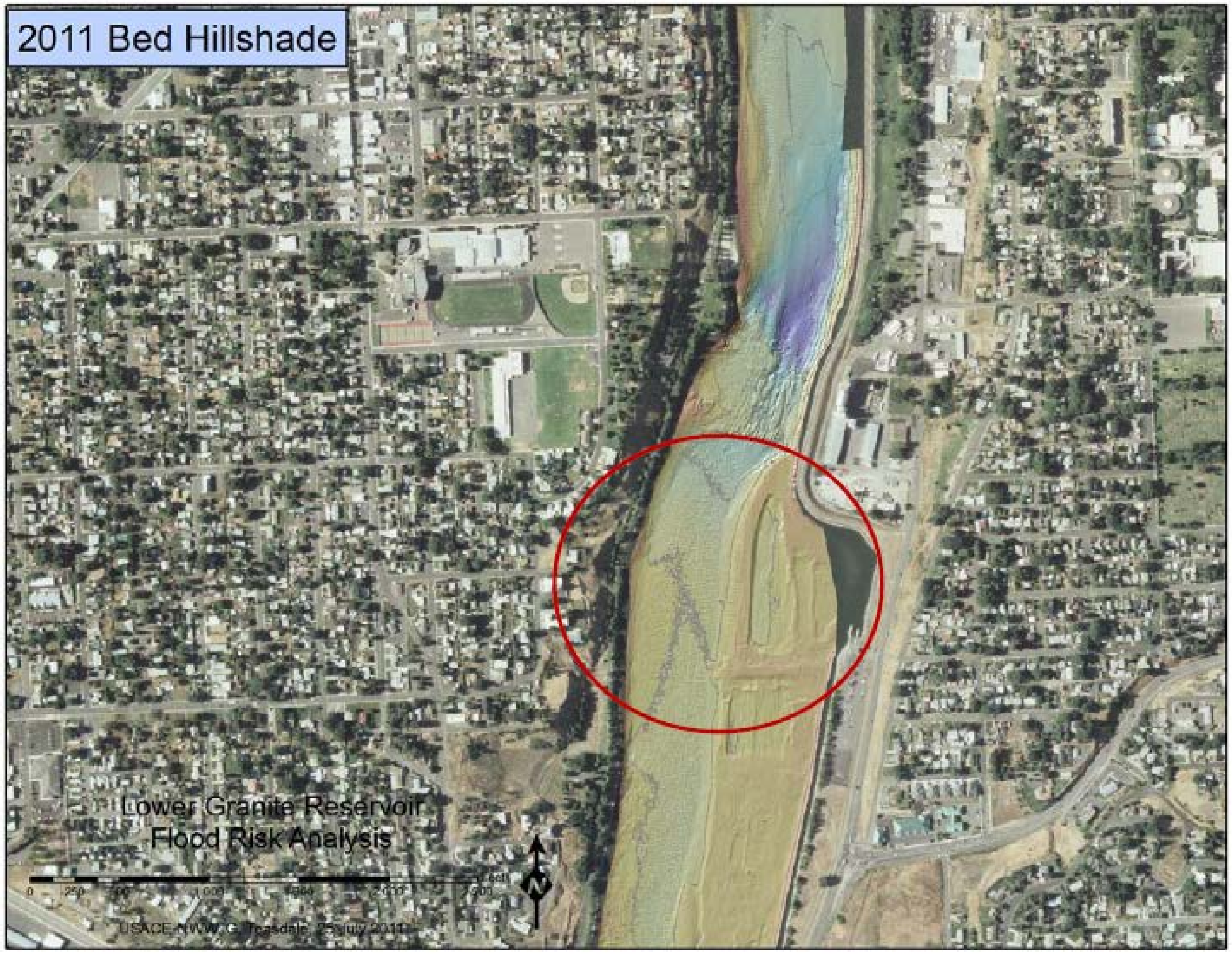
Trapping Upstream Sediments (In-Reservoir)

Trapping upstream sediment involves creating a location within a depositional reach at the upstream end of a reservoir where sediments settle and are captured, thus preventing them from reaching other locations where they may interfere with authorized project purposes of the LSRP. A pit in the river bottom would be excavated to create the trap. Sediment caught in the trap would need to be periodically removed through dredging or other means. The removed sediment would be managed using one of the dredged material management measures described above. This technique has been successfully applied on small river systems (Lipscomb et al. 2005). Trapping upstream sediments (in-reservoir) would require sufficient lead time to plan, design, and implement.

This measure is applicable in areas where there is sufficient space and hydraulic conditions allow for the capture of sediment upstream of where sediment interferes with authorized project purposes of the LSRP.

The Corps performed a sediment load analysis that showed the volume of sand delivered to Lower Granite reservoir from the Snake River is about 600,000 cy per year. A large part of this load is bedload which is evident from the sand waves that form upstream from the Lewiston Levee System on the Snake River as seen in the 2009 and 2011 bathymetries. Potentially, substantial volumes of sand bedload can be trapped and harvested in the channel, thereby reducing the amount of sediment that accumulates below the confluence. A possible location for a sediment trap is immediately upstream from the right bank levee on the Snake River at RM 140.7 (Figure 7). This location is advantageous because narrowing of the channel produces a local backwater effect that reduces the amount of sand carried in suspension.

Figure 7. Location of a Potential Sediment Trap on the Snake River
Lewiston is on the right and Clarkston is on the left.



The Corps evaluated the efficiency of a sand trap at this location. A trap about 1900 feet long would hold about 770,000 cy of sediment. The Corps estimates about 300,000 cy of material would be trapped over a two year period. An equal amount of sediment would need to be removed from the trap every 2 years to maintain its usefulness. Further analysis and detailed hydraulic modeling of alternative sediment trap configurations would be needed before an actual sediment trap could be designed and constructed.

3.3.4.3 System Management

System management measures modify reservoir operations (such as pool depth) or facilities so that sediment deposition does not adversely affect existing authorized purposes. Examples of system management measures include reconfiguring or relocating navigation facilities, managing reservoir water levels for navigation, and modifying flows to flush sediments from problem areas. It should be noted that measures for reconfiguring or relocating recreation and irrigation intake facilities apply only to facilities operated and maintained by the Corps.

Navigation Objective Reservoir Operation

This measure involves operating reservoirs of the LSRP at water surface elevations that would provide a 14-foot-deep channel within the federal navigation channel. The Corps would manage pool levels within the preset operating range for each reservoir to maintain 14 feet of water depth over areas where sediment deposition has occurred in the channel. This measure would provide the Corps the option of operating above MOP and even at the upper end of the operating range as needed to maintain the 14 foot deep navigation channel. Raising the operating pool as part of this measure provides a temporary means to provide desired water depths; however, there are physical limits as to how much the pool levels can be raised based on design specification for the dams. For example, the operating range of Lower Granite reservoir is 733 to 738 feet above mean sea level (msl) and the Corps does not have the authority to raise the pool above 738 msl. Once the pool has been raised to the maximum level, it cannot be raised further and the measure ceases to be effective. Additionally, raising the operating pool in a reservoir has a greater effect near the dam than upriver due to the normal change in elevation moving upstream.

The McNary reservoir and lower Snake River reservoirs are typically operated within a three to five-foot range with the lowest end of the range designated as the MOP. Currently the Corps operates the lower Snake River reservoirs at MOP or near MOP during the juvenile salmonid outmigration season, typically from April through August, and as late as October at Lower Granite, to ensure compliance with the NMFS FCRPS BO. Under this measure, the Corps would operate the projects as needed at a pool level above MOP to provide temporary relief from sediment accumulated in the navigation channel. The Corps would coordinate with NMFS when proposing to operate above MOP during the juvenile salmonid outmigration season.

The Corps could also adjust operation of the dams to influence water depth at the downstream entrance to the navigation locks. An example would be adjusting operation of the dam to temporarily increase water releases from the dam to provide sufficient depth for a barge tow to enter or exit the navigation lock.

This measure is applicable within the operating range of the reservoirs, and subject to ESA compliance.

Reconfigure/Relocate Affected Facilities

Facilities affected by unwanted sediment deposition may be relocated or otherwise modified to avoid those areas where sediment deposition tends to accumulate and interfere with facility uses. This measure could include a range of facility modifications, such as extending a dock or mooring facility, changing the entrance to a boat basin, or adding an inlet to provide water circulation within a boast basin. It could also include temporarily or permanently closing Corps-managed recreation facilities. Moving or relocating affected facilities is potentially suitable for commercial navigation facilities, recreational boating facilities, and water intake structures. It is not practicable to move the existing navigation channels, locks, or lock approach channels.

Water intake structures and some docks could potentially be extended to reach out beyond near-shore areas where unwanted sediment deposition is occurring. This technique has been successfully used on several water intake structures in the program area. In lieu of reconfiguring or relocating water intake structures, alternative water sources for irrigation that would alleviate the need for the intake, such as a well, could be explored. Other facilities, such as boat ramps, would likely need to be completely relocated. The effectiveness and applicability of this measure is highly site-and facility-specific and would have to be determined on a case-by-case basis.

This measure would be applicable where the use of the affected facility can be replaced, relocated, or potentially closed, and it would be more economical than managing sediment that affects its use. The Corps' ability to consider the feasibility of reconfiguring or relocating port facilities is limited and generally requires a cost-share sponsor and specific authority. This measure is primarily applicable to Corps-managed facilities.

Reconfiguring or relocating affected facilities would require sufficient lead-time to plan, design, and implement modifications to infrastructure.

Raise Lewiston Levee to Manage Flood Risk

This measure involves raising critical portions of the Lewiston levee system to limit the risk of being overtopped during a high flow event. The Lewiston levee system is an upstream extension of Lower Granite dam and was designed to protect parts of Lewiston, Idaho from being flooded by the creation of the reservoir and from inundation during the SPF. The Corps' criteria for managing flood risk at facilities like the Lewiston levee has changed over time. Currently, the Corps uses risk analysis to determine the appropriate approach to managing flood risk. Current analysis indicates that flood risk is within acceptable limits, however if future sediment accumulation changes the flood risk to Lewiston, raising portions of the levee system would be a viable option for reducing flood risk, subject to authority. Location and height of change would be determined through detailed site- and time-specific studies. Based on past analysis of levee modification, any future levee raise would likely involve raising the earthen embankments or building low walls on portions of the existing levees, and modifying surrounding roads and other infrastructure affected by the levee raise (USACE 2002b).

Raising levees would be applicable if other means of managing flood risk per the Risk Analysis for Flood Damage Reduction Studies (January 2006) were determined infeasible or otherwise unacceptable. This measure would only be applicable in the existing area of the Lewiston levee system. Lewiston levee raise would require sufficient lead-time to plan, design, and implement modifications to infrastructure.

Reservoir Drawdown to Flush Sediment

The reservoir drawdown to flush sediment would draw the Lower Granite reservoir down 10 to 15 feet below MOP (measured at the confluence of the Snake and Clearwater Rivers) and would occur on a one-time basis for up to 6 weeks sometime during the period of late April through late

June. This period takes advantage of naturally high spring freshet flows and corresponds with the juvenile salmonid outmigration season. Drawing down Lower Granite reservoir would create a high flow and velocity condition that would scour and transport accumulated sediment from the confluence of the Snake and Clearwater Rivers. Most of the sediment scour would occur within the main channel of both rivers and the scoured sediment would be transported downstream and redeposited. Much of the sediment would likely redeposit within Lower Granite reservoir or in the upper reaches of Little Goose reservoir. Sediments could potentially deposit in areas where they would interfere with authorized project purposes of the LSRP. There must be adequate high flow prediction and modeling allowing the Corps to conduct drawdown operations in a timely manner for this measure to function effectively.

Drawdown would be most effective during high flow conditions, such as those resulting from spring snowmelt and runoff, when scouring and transport of sediments would be greater. Drawdown affects an entire reservoir and mobilizes sediments from area(s) where they interfere with authorized project purposes of the LSRP, as well as, other locations in the reservoir. Drawdown would be applicable only to Lower Granite reservoir where it could address accumulation of sediment in the Snake-Clearwater confluence area. Reservoir drawdown would require sufficient lead-time to plan, design, and implement modifications to infrastructure.

3.3.4.4 Upland Sediment Reduction (Expanded)

Local Sediment Management Group (LSMG) Coordination Meetings: The only upland sediment reduction measure carried forward into the PSMP by the Corps is continued LSMG meeting coordination. The Corps would continue to coordinate meetings with all applicable land use management agencies and groups through the annual LSMG meeting. The LSMG meeting would serve as an information exchange forum between the Corps and federal and state regulatory agencies, tribes, local governments, and other stakeholders. The primary purposes of the meeting would be to share data and compare trends observed by each agency, identify potential opportunities to improve each agency's independent sediment reduction practices, and analyze trends on a watershed basis. Information gained from LSMG meetings may be used by the Corps to adapt PSMP measures. The Corps may also participate in other regional coordination meetings hosted or facilitated by other agencies (e.g., EPA) or stakeholders concerning sediment management in the lower Snake River basin.

3.4 PSMP Measure Implementation Process

The PSMP implementation process involves problem sediment identification, triggers for action, actions in response to triggers and the planning process for actions for evaluating measures/actions to address sediment that interferes with existing authorized project purposes.

Decisions to pursue sediment management measures will be based on review of monitoring reports and feedback from river users. Action will be taken when information indicates a need (trigger) for immediate or future sediment management to address sediment accumulation that could interfere with existing authorized project purposes of the LSRP.

Project-specific applied measures will also be monitored for compliance with applicable environmental regulations and requirements. Specific monitoring requirements and protocols will be identified in the environmental compliance documentation associated with NEPA, ESA, Clean Water Act (CWA), and National Historic Preservation Act (NHPA) compliance. Specific requirements or protocols may be established based on the selected measure and its site-specific application.

3.4.1 Sediment Problem Identification

The Corps will review all monitoring reports[9] to identify locations experiencing sediment accumulation that potentially interfere with existing authorized purposes, thus requiring corrective action. Problem identification will include location description; site type/authorized use affected; magnitude of the problem; history of previous management/monitoring actions taken; observed trends; and the timeframe for action. Problem identification will allow the Corps to determine specific steps of planning, design, and implementation. For each problem location identified, the Corps will note whether sediment is currently affecting an existing authorized project purpose or is likely to do so in the future. The forecast of future conditions will be used in selecting appropriate corrective measures and evaluating the potential effectiveness of those measures. The forecast will also consider the timeframe to address the problem. If there is time to develop a solution prior to the problem reaching a critical state, the potential list of correction measures may include solutions requiring a longer implementation time.

3.4.2 Triggers for Action

Problem identification may "trigger" the need for action(s) to address problem sediment. There are two (2) trigger levels (immediate need and future forecast need), which are described below.

- ***Immediate Need.*** An immediate need action is warranted when sediment accumulation is currently impairing an existing authorized project purpose of the LSRP.
- ***Future Forecast Need.*** A future forecast need warranting initiation of an analysis of long-term solutions to reoccurring sediment deposition problems occurs when sediment accumulation that impairs an existing authorized project purpose has occurred at a particular location(s) more frequently than once in the past 5 years[10] or is anticipated to reoccur more than once in the next 5 years. The PSMP does not restrict the Corps ability to initiate other future forecast need studies when warranted.

The following sections describe the triggers for each of the four existing authorized project purposes that can be affected by sediment accumulation. Triggers for both an immediate need action and future forecast action can exist simultaneously at the same location, and monitoring

[9] Monitoring reports include "plan-level" system monitoring identified in the PSMP. This includes navigation bathymetric surveys and reports, recreation boater/recreational user reports/complaints, fish and wildlife operations reports on water intakes, flow conveyance, and Lower Snake River monitoring by others.
[10] Five years was selected as the appropriate time period for establishing future forecast needs based on historical dredging actions (see Table 2-2).

and future forecasting are designed to limit repeated immediate need actions at such locations. Section 3.4.3 describes the actions that may be implemented in response to such triggers.

3.4.2.1 Navigation Triggers

Situations triggering the need to take action for navigation include:

- Navigable depth in the Federal navigation channel is less than 14 feet deep at MOP and is impairing the safe movement of tug and multi-barge tows and other commercial vessels through the navigation system.
- Navigable depth is less than 14 feet deep at MOP within the Federal navigation channel and is impairing access to any of the four navigation locks on the lower Snake River.

Table 5. Potential Sedimentation Problem Areas for Navigation
(See Table 9 for potential navigation sites associated with flow conveyance.)

<table>
<tr><th>Reservoir</th><th>River</th><th>Approx. River Mile [1]</th><th>Site Name</th></tr>
<tr><td rowspan="3">McNary</td><td rowspan="14">Snake</td><td>0.0–1.5</td><td>Snake River Entrance</td></tr>
<tr><td>2.0–10.0</td><td>Nav Channel Below Ice Harbor</td></tr>
<tr><td>9.2</td><td>Ice Harbor Lock Approach/Nav Coffer Cells</td></tr>
<tr><td rowspan="2">Ice Harbor</td><td>29.0–33.3</td><td>Walker's Elevator</td></tr>
<tr><td>41</td><td>Lower Monumental Lock Approach</td></tr>
<tr><td rowspan="2">Lower Monumental</td><td>56.5</td><td>Joso HMU</td></tr>
<tr><td>70</td><td>Little Goose Lock Approach</td></tr>
<tr><td rowspan="5">Little Goose</td><td>83</td><td>Port of Garfield Access*</td></tr>
<tr><td>83.5</td><td>Port of Central Ferry</td></tr>
<tr><td>100.0-102.0</td><td>Navigation Channel at Schultz Bar</td></tr>
<tr><td>103.5</td><td>Port of Almota*</td></tr>
<tr><td>107</td><td>Lower Granite Lock Approach</td></tr>
<tr><td rowspan="3">Lower Granite</td><td>128-130</td><td>Silcott Island</td></tr>
<tr><td>139</td><td>Port of Clarkston*</td></tr>
<tr><td>Clearwater</td><td>1.0-2.0</td><td>Port of Lewiston*</td></tr>
</table>

[1] "River Mile" indicates the number of miles upstream of the mouth of the Snake River at its confluence with the Columbia River. *Non-Corps managed.

This consultation will cover these known sites. Any other sites identified by monitoring not identified here will require review for potential further consultation.

3.4.2.2 Recreation

Situations triggering the need to take action for recreation include:

- Boat basin depths at MOP are less than the original design criteria and boats are having difficulty maneuvering within the basin.
- Sediment has built up at the entrance to boat basins, blocking access.

Table 6. Potential Sedimentation Problem Areas for Recreation

Reservoir	River	Approx. River Mile [1]	Site Name
McNary	Snake	0	Sacajawea State Park*
		1.5	Hood Park Boat Ramp
Ice Harbor		10	North Shore Boat Ramp
		11.5	Charbonneau Park
		13.5	Levey Park
		18	Fishhook Park
		39	Windust Boat Ramp
Lower Monumental		51	Ayer
		59.5	Lyons Ferry Park
		66	Texas Rapids Boat Basin
Little Goose		82.5	Central Ferry Park
		103.5	Illia Landing
		105.5	Boyer Park and Marina*
Lower Granite		137	Hells Canyon Resort *
		139.5	Greenbelt Boat Basin
		140.5	Southway Boat Ramp
		141.5	Swallows Park Boat Basin and Swim Beach
		142.5	Hells Gate State Park*
		146	Chief Looking Glass Park*
	Clearwater	3	Clearwater Boat Ramp

[1] "River Mile" indicates the number of miles upstream of the mouth of the Snake River at its confluence with the Columbia River. *Non-Corps managed.

This consultation will cover these known sites. Any other sites identified by monitoring not identified here will require review for potential further consultation.

3.4.2.3 Fish and Wildlife

Situations triggering the need to take action for fish and wildlife include:

- Sediment has buried an irrigation intake at a Corps-managed HMU
- Sediment is clogging an irrigation intake at a Corps managed HMU

Table 7. Potential Sedimentation Problem Areas for Fish and Wildlife

Reservoir	River	Approx. River Mile [1]	Site Name
Ice Harbor	Snake	15	Big Flat HMU
		23	Lost Island HMU
		24.5	Hollebeke HMU
Lower Monumental		48	Skookum HMU
		55	55 Mile HMU
		68	John Henley HMU
Little Goose		76	Ridpath HMU
		81	New York Bar HMU
		88	Willow Bar HMU
		93	Rice Bar HMU
		95	Swift Bar HMU
Lower Granite		132	Chief Timothy HMU

[1] "River Mile" indicates the number of miles upstream of the mouth of the Snake River at its confluence with the Columbia River. *Non-Corps managed.

This consultation will cover these known sites. Any other sites identified by monitoring not identified here will require review for potential further consultation.

Skookum HMU had the irrigation intake extended in 2012, and it should not require any additional maintenance for many years.

The Corps will continue to withdraw the same amount of water at each of the irrigated HMUs (from approximately April 1 to September 30) each year to irrigate wildlife habitat in the existing HMUs to mitigate impacts to fish and wildlife resulting from the lower Snake River dams under the Lower Snake River Fish and Wildlife Compensation Plan (Comp Plan). The Corps is not consulting under this BA on the use of the water for the Comp Plan purposes, but more specifically on managing sediment that interferes with irrigation intake structures.

3.4.2.4 Flow Conveyance

Situation triggering the need to take action for flow conveyance include:

- Consecutive surveys show an accelerated rate of sediment accumulation in the channel near Lewiston *and*
- Hydraulic modeling indicates a heightened risk of overtopping the Lewiston levees during extreme floods within 5 years if the rate of accumulation continues *and*
- The risk of flooding cannot be reduced to acceptable levels with normal reservoir operations prescribed in the authorized water control manual.

Table 8. Potential Sedimentation Problem Areas for Navigation and Flow Conveyance (See the Flow Conveyance Section below).

Reservoir	River	Approx. River Mile [1]	Site Name
Lower Granite	Snake	131.5-139.5/	Snake River at Mouth of Clearwater River
	Clearwater	0.0-2.0	

[1] "River Mile" indicates the number of miles upstream of the mouth of the Snake River at its confluence with the Columbia River.

3.4.3 Actions in Response to Triggers

The way in which the Corps responds to triggers will differ based on the existing authorized project purpose and the two trigger levels. Measures implemented to address both immediate need and future forecast need shall be the least cost, technically feasible and environmentally acceptable, in accordance with Corps regulations (33 CFR 335-338 and Engineer Regulation 1105-2-100). Below is stated the process and description of actions to be taken for both immediate need and future forecast need for each of the four existing authorized project purposes. The process identified below for both immediate and future forecast needs is stated (generally) in the order such actions will be implemented to manage problem sediment.

Management measures that may be employed for each action in response to triggers are identified under each existing authorized purpose and the triggers.

The Corps tried to identify some general frequency/amount/duration parameters as worst case scenarios for any future implementation actions. This allows for the effects analysis to be based primarily on the high end of the extent of action scenarios, using historic information and best professional judgment, and attempts to help reduce the need for future section 7 consultations. The actual frequency/amount/duration of such future implementation actions may be less often/smaller/shorter.

See Appendix A for a table detailing general timing, frequency, duration, magnitude, and BMPs for each management measure that may be employed as a result of an action trigger under each existing authorized purpose.

3.4.3.1 Navigation

For navigation, the following management measures may be employed:

- Navigation and Other Dredging.
- Dredge to improve Conveyance Capacity.
- Beneficial use of Sediment.
- In-water Disposal of Sediment.
- Upland Disposal of Sediment.
- Bendway Weirs.

- Dikes/Dike Fields.
- Trapping Upstream Sediments (in reservoir).
  - Navigation Objectives Reservoir Operations.
  - Reconfigure/Relocate Affected Facilities.
  - Reservoir Drawdown to Flush Sediment.

Immediate Need Actions for Navigation

Actions:

1. Use Navigation Objective Reservoir Operation (NORO) (Interim), in accordance with operational requirements.
2. Dredge area(s) of problem sediment deposition and dispose of dredged material (3 options – Beneficial, In-water or Upland), in accordance with applicable laws and regulations including the Federal Standard).

Description: The Corps would first implement appropriate operational changes, (i.e., raising the reservoir elevation, adjusting spill patterns, or releasing water at one or more of the dams) as in interim action, in accordance with any FCRPS BO in effect at the time as needed to provide a 14-foot navigation channel. These actions could remain in effect until the Corps could implement a dredging action to remove the accumulated sediment. During preparation of the EIS/PSMP, the Corps evaluated a wide range of alternatives and identified only one (1) measure that can effectively manage sediment once it has deposited and is interfering with navigation – i.e., dredging. The interim action (NORO) could continue for a period of 1 to 3 years, allowing time for the Corps to secure funding, prepare plans and specifications, perform necessary environmental compliance, award a contract, and get a contractor onsite. The dredging method would probably be mechanical, with clamshell dredging the most likely. The disposal site would be decided on a case-by-case basis in accordance with Corps regulations, but could be upland or in-water. The Corps would dredge the problem areas to the congressionally authorized depth (14 feet deep at MOP plus up to 2 feet of overdig).[11] The disposal method would be selected based on the applicable Federal regulations and would consider beneficial use of dredged material, either in-water or upland subject to authority and funding.

The Corps anticipates that dredging 300,000-500,000 will be required for immediate need actions for navigation every 3 to 5 years, unless/until longer-term solutions are identified.

[11] Of the additional 2 feet, 1 foot is considered allowable overdepth, which is the additional depth below the required section specified in a dredging contract, and is permitted because of inaccuracies in the dredging process. The other foot is considered advanced maintenance, which is the additional depth and/or width specified to be dredged beyond the project channel dimensions for the purpose of reducing overall maintenance costs and effects by decreasing the frequency of dredging.

Future Forecast Actions for Navigation

Actions:

1. Subject to availability of funds, the Corps would evaluate long-term solutions using a NEPA analysis (see Section 3.3.4.3 in the EIS) of the measures identified below (not in order of preference):
   i. Dredging.
   ii. Disposal (consider a range of alternatives, in-water and upland. Beneficial uses will be considered consistent with applicable authorities and guidelines).
   iii. Bendway weirs.
   iv. Dikes/Dike fields.
   v. Sediment traps.
   vi. Drawdown.
   vii. Reconfigure affected facilities.
   viii. Relocate affected facilities.
2. Complete the tier-off NEPA analysis of applicable measures applying the PSMP process for future forecast need actions (Section 3.3.4.3).
3. Address any necessary immediate need action [i.e., pool manipulation (Interim), dredge and disposal] until the long-term solution identified during the analysis can be implemented.

Description: The Corps would seek to initiate and implement a tier-off NEPA analysis to evaluate long term solutions when an area in the Federal navigation channel exhibits (chronic/recurring) sediment deposition and the situation is expected to continue. This analysis would follow the process described above and in Section 3.3.4. The analysis would determine the most cost-effective, technically acceptable and environmentally acceptable action(s) to manage the sediment depositing in that area. It may take several years to complete the analysis and accompanying environmental compliance and implement the recommended action, subject to authority and funding. While that analysis is being conducted, the Corps may need to go through interim operations with possible dredging as described for the immediate need.

Most likely the confluence of Snake and Clearwater Rivers would be the first location to perform the NEPA analysis for the future forecast analysis. The NEPA analysis would analyze the available measure to solve the reoccurring sediment deposition at the confluence.

Structural measures: The upper end of Lower Granite reservoir is the only location where structural measures would be effective. Typical structure dimensions are trapezoidal in shape, 10’ top width with 1V:2H side slopes. The height of the structures could range from several feet above maximum pool for visibility to several feet below the congressionally authorized navigation channel depth to avoid presenting a commercial navigation hazard. The purpose of the structure would be to restrict/reduce the reservoir flow area to maintain sediment transport velocities. The structure length could be up to half the existing reservoir section at the confluence.

See section 3.3.4.2.4 (Trapping Upstream Sediments (in Reservoir)) and Figure 7 (Location of a potential sediment trap on the Snake River (above). The potential sediment trap would be dredged annually, with estimated quantities of 250,000-350,000 cy.

Ports: The Corps' ability to study the feasibility of reconfiguring or relocating port facilities is limited and generally requires a cost-share sponsor and specific authority. The Corps could study reconfiguration or relocation of port facilities, if requested by the Ports, subject to availability of authority and funding. Reconfigure/relocate affected facilities are only for ones that are Corps owned/managed. This could include a range of facility modifications. Examples include, mooring facilities, docks and loading/unloading facilities that could potentially be extended to reach out beyond nearshore areas where sediment deposition is occurring. Moving or relocating affected facilities is potentially suitable for commercial navigation facilities, recreational boating facilities, and water intake structures. In addition to relocating water intake structures, alternative water sources for irrigation could be explored.

Reservoir Drawdown to Flush Sediment: Reservoir drawdown to flush sediment would draw the Lower Granite reservoir down 10 to 15 feet below MOP (measured at the confluence of the Snake and Clearwater Rivers) and would occur on a one-time basis for up to 6 weeks, sometime during the period of late April through late June. This period takes advantage of naturally high spring freshet flows and corresponds with the juvenile salmonid outmigration season. Drawing down Lower Granite reservoir would create high flow and velocity conditions that would scour and transport accumulated sediment from the confluence of the Snake and Clearwater Rivers. Most of the sediment scour would occur within the main channel of both rivers and the scoured sediment would be transported downstream and redeposited. Much of the sediment would likely redeposit within Lower Granite reservoir or in the upper reaches of Little Goose reservoir. Sediments could potentially deposit in areas where they would interfere with authorized project purposes of the LSRP. There must be adequate high flow prediction and modeling allowing the Corps to conduct drawdown operations in a timely manner for this measure to function effectively. Navigation only benefits slightly with the drawdown and the remaining sediment in the congressionally authorized federal navigation channel dimensions would be dredged to restore the 14' at MOP.

3.4.3.2 Recreation

For recreation, the following management measures may be employed:

- Navigation and Other Dredging.
- Beneficial use of Sediment.
- In-water Disposal of Sediment.
- Upland Disposal of Sediment.
- Agitation to Resuspend.

- Navigation Objectives Reservoir Operations.
- Reconfigure/Relocate Affected Facilities.

Immediate Need Actions for Recreation

Actions:

If necessary for safety, post warnings or close boat ramp/basin (Interim)[12].

1. Use agitation to resuspend problem sediment; or.
2. Dredge area(s) of problem sediment deposition and dispose of dredged material (3 options – Beneficial, In-water or Upland), in accordance with applicable laws and regulations including the Federal Standard).

Description: As an interim action, the Corps may possibly post warnings that the boat basin/ramp is experiencing shallow water conditions caused by sediment accumulation. If the boat basin or marina becomes too hazardous for boaters, the Corps may close the facility and direct boaters to other nearby facilities. These actions would remain in effect until funding could be secured to perform the planning, environmental compliance and award a contract for a more permanent solution (i.e., agitation or dredging action).

Siltation at recreation areas upstream of Silcott Island, in the Lower Granite reservoir, would occur with higher frequency (more frequent) because of the sediment loads in the confluence. The frequency of the recreation dredging in Lower Granite (upstream of Silcott) would be consistent with the navigation dredging schedules, because of the cost savings of the dredging mobilization/demobilization if all dredging is consolidated in one contract. The Corps anticipates dredging recreation sites upstream of Silcott Island every 3-5 years and recreation sites downstream of Silcott Island 6-9 years.

Most likely agitation to resuspend would not be used to remove sediment from the recreation areas upstream of the Silcott Island based on the sand size particles, lack of flow lane, and small potential to flood risk in Lewiston. Agitation to resuspend would be used if problem sediment is mostly silt and at the entrance of the boat basin.

Hydraulic dredging could be used in recreation sites (boat basin) if there is a suitable upland disposal location.

Recreation facilities/sites would have a fraction of the quantities compared to the navigation dredging actions; 1,000 – 15,000 cubic yards versus 20,000 – 500,000 cubic yards. Based on the quantities and production of the dredge, typical mechanical dredge production rate is 250-300 cy

[12] The EIS identified that Navigation Objective Reservoir Operation could be effective as an interim measure to address sediment deposition interfering with recreation facilities (See Table 2-4). The PSMP does not list it as a viable measure for recreation, but changes in reservoir operation for navigation could provide ancillary benefits for recreation.

per hour or 6,000 – 7,200 per day. However, boat basins are smaller and shallower than the main navigation channel and may not be accessible to barge-mounted derrick dredges. Boat basin dredging may be performed by smaller equipment such as a backhoe or excavator fastened to a smaller work barge. Because the bucket on this equipment would be smaller, it would likely take several days to dredge a boat basin.

Quantities associated with agitation to resuspend are typically small, including less than 500 cy per site. Hydraulic dredging would be 500-1,500 cy, if a disposal site is readily available, and the largest mechanical dredging action for recreation sites would be approximately less than 15,000 cy. This would occur on average of every 3-9 years.

Future Forecast Actions for Recreation

Actions:

1. Subject to availability of funds, the Corps would need to conduct a tier-off NEPA analysis of all measures identified for the recreation authorized project purpose, listed below in the order presented in Table 4:
   i. Dredging
   ii. Disposal (3 options – Beneficial, In-water or Upland)
   iii. Agitation to resuspend
   iv. Reconfigure affected facilities
   v. Relocate affected facilities.
2. Complete the in-depth analysis of applicable measures applying the PSMP process for future forecast need actions.
3. Address any necessary immediate need actions (i.e., agitation or dredge and disposal) until the long-term solution identified during the analysis can be implemented.

Description: The Corps would perform a tier-off NEPA analysis when a problem area in a Corps-managed boat basin/ramp exhibits chronic sediment deposition and is expected to continue to have a problem. This analysis would follow the process described above and in Section 3.3.4. The analysis would determine the most cost-effective, technically acceptable, and environmentally acceptable action(s) to manage the sediment depositing in that area. The measures would include reconfiguring, relocating or closing the facilities. It may take several years to complete the analysis and environmental compliance and to implement the recommended action. While that analysis is being conducted, the Corps may implement immediate need actions to address problem sediment.

A future forecast need warranting initiation of an analysis of long-term solutions to reoccurring sediment deposition problems occurs when sediment accumulation that impairs an existing authorized project purpose has occurred at a particular location(s) more frequently than once in the past 5 years or is anticipated to reoccur more than once in the next 5 years. The PSMP does not restrict the Corps ability to initiate other future forecast need studies when warranted.

Dredging, agitation to resuspend, and disposal actions for the future forecast action would be the same as the description above for an immediate need action.

Reconfiguring or relocating affected facilities would be used only for Corps owned/managed recreation facilities. Reconfiguration of a recreation facility may also include consideration of repurposing; temporarily, partially or fully closing; and/or reducing the scope of the facility. Corps facilities affected by sediment deposition may be relocated to avoid recurring problems with sediment deposition. Moving or relocating affected facilities is potentially suitable for recreational boating facilities.

Reconfiguring or relocating would presumably happen once, although some modifications may be needed. The Corps may use dredging to restore the original design contours (depths) as part of the reconfiguration. BMPs would include performing work during an applicable in-water work window and controlling turbidity by using silt fences and/or using similar techniques as for dredging. Any structures would be designed to minimize their ability to provide hiding cover for predators.

3.4.3.3 Fish and Wildlife

For fish and wildlife, the following management measures may be employed:

- Navigation and Other Dredging.
- Beneficial Use of Sediment.
- In-water Disposal of Sediment.
- Upland Disposal of Sediment.
- Agitation to Resuspend.
- Reconfigure/Relocate Affected Facilities.

The identified sites for fish and wildlife include all of the potential sites (irrigation intakes at HMUs). Therefore, maintenance of existing irrigation intakes at HMUs will require no further consultation. Relocation of these facilities has the potential to trigger additional review for ESA compliance.

Immediate Need Actions for Fish and Wildlife Conservation

<u>Actions</u>:

1. Routine operation and maintenance (O&M) of existing irrigation intake facilities could occur in place by lifting/raising the intake out of the sediment to clear sediment, moving/shifting intake, or limited excavation (e.g., by hand).
2. Install temporary irrigation intake line or use other available water source (Interim).
3. Dredge area(s) of problem sediment deposition and dispose of dredged material by 3 options, including, Beneficial, In-water or Upland disposal, in accordance with applicable laws and regulations).

Description: If an irrigation intake becomes buried by or clogged with sediment during the irrigation season, the Corps would likely take immediate action to restore the flow of water to the intake. These actions could include lifting the intake out of the sediment if possible, moving or shifting the intake, or limited excavation/agitation (e.g., by hand). If immediate routine O&M action is unsuccessful, the Corps would restore irrigation flow by installing a temporary irrigation intake line, use trucked in water or use other available water source (interim). Last, dredge problem sediment and dispose of dredged material would be completed in accordance with applicable laws and regulations.

When dredging is needed, the work at these sites may be allowed during a summer window when water temperatures are above 73°F.

Irrigation intakes for HMUs are typically located near shore where the fine sediment (silt) is the main problem sediment. Siltation at irrigation intakes upstream of Silcott Island in the Lower Granite reservoir would have a higher frequency (more frequent) because of the sediment loads in the confluence. The Corps anticipates performing dredging actions every 7-9 years at intakes upstream of Silcott Island and every 10-15 years at intakes downstream of Silcott Island.

Most likely agitation to resuspend would be used to remove sediment from the irrigation intakes. If mechanical dredging is chosen, the equipment would be consistent with the recreation dredging (smaller equipment such as a backhoe or excavator fastened to a smaller work barge). Because the bucket on this equipment would be smaller, it would likely take one to two days to dredge an irrigation intake.

Irrigation intakes would have a smaller quantity compared to a recreation action with quantities ranging to 100-1000 cubic yards vs. 1000- 15,000 cy.

Future Forecast Actions for Fish and Wildlife Conservation

Actions:

1. Initiate future forecast action by requesting (budgeting for) funding to conduct a tier-off NEPA analysis of all measures identified for the fish and wildlife conservation authorized project purpose, listed below in the order presented in Table 4 :
   i. Dredging.
   ii. Disposal (Beneficial, In-water, or Upland).
   iii. Agitation to resuspend.
   iv. Reconfigure affected facilities.
   v. Relocate affected facilities.
2. Complete the tier-off NEPA analysis of applicable measures applying the PSMP process for future forecast need actions (Section 3.3.4.3).
3. Address any necessary immediate need actions (i.e., routine O&M, interim actions, or dredge and disposal) until the long-term solution identified during the analysis can be implemented.

Description: The Corps would begin a tier-off NEPA analysis when an irrigation intake exhibits chronic sediment deposition and is expected to continue to have a problem. This analysis would follow the process described later in Section 3.3.4.3, and would evaluate a variety of potential sediment management measures to determine the most cost-effective, technically feasible and environmentally acceptable alternative. The analysis would include consideration of all measures identified in Table 4 as applying to the authorized fish and wildlife conservation purpose, including relocating the affected irrigation facility or reconfiguration (e.g., identification of an alternate, permanent, water source such as a groundwater well). It may take several years to obtain funding, complete the analysis and environmental compliance, and implement the recommended action. While that analysis is being conducted, the Corps may implement immediate need actions to address problem sediment.

A future forecast need warranting initiation of an analysis of long-term solutions to reoccurring sediment deposition problems occurs when sediment accumulation that impairs an existing authorized project purpose has taken place at a particular location(s) more frequently than once in the past 5 years or is anticipated to reoccur more than once in the next 5 years. The PSMP does not restrict the Corps ability to initiate other future forecast need studies when warranted.

The dredging, agitation, disposal actions would be the same as for the immediate need action.

Reconfigure/relocate affected facilities are for Corps owned/managed facilities. This measure applies to Corps facilities and would include a range of facility modifications. Examples include water intake structures that could potentially be extended to reach out beyond nearshore areas where sediment deposition is occurring. In addition to reconfiguring water intake structures, alternative water sources for irrigation could be explored.

Reconfiguring or relocating would presumably happen once, although some modifications may be needed. The Corps may use dredging to restore the original design contours (depths) as part of the reconfiguration.

BMPs would include performing work during an applicable in-water work window and controlling turbidity by using silt fences and/or using similar techniques as for dredging. Any structures would be designed to minimize their ability to provide hiding cover for predators.

3.4.3.4 Flow Conveyance

For flow conveyance, the following management measures may be employed:

- Dredge to Improve Conveyance Capacity.
- Beneficial Use of Sediment.
- In-water Disposal of Sediment.
- Upland Disposal of Sediment.
- Trapping Upstream Sediments (in reservoir).

- Raise Lewiston Levee to Manage Flood Risk.
- Reservoir Drawdown to Flush Sediment.

Immediate Need Actions for Flow Conveyance

<u>Actions</u>:

1. Use reservoir operations during high flow event to lower reservoir water surface and increase capacity, in accordance with the Lower Granite Project Water Control Manual (Interim).
2. Conduct bathymetric surveys and develop new hydraulic models for the confluence area.
3. Perform conveyance dredging and dispose of dredged material.

<u>Description</u>: Immediate need actions for flow conveyance could include extraordinary reservoir operations, such as advanced lowering of the reservoir water surface, in accordance with the Lower Granite Project Water Control Manual. Following the high flow event, the bathymetry of the confluence area would be surveyed and new hydraulic models developed. If the hydraulic modeling indicates that an unacceptable risk of overtopping the levees remains, conveyance dredging would be performed as soon as practicable to reduce the risk during subsequent high flow events. Conveyance dredging would be similar to that for navigation, but would involve much higher quantities of material and would consider beneficial use of the dredged material subject to authority and funding.

Based on probabilistic analysis of flood risk, the current risk of overtopping the Lewiston Levees by extreme flood discharge is acceptable by current Corps policy. The conveyance dredging description is for potential ESA consultation consideration. This will be an annual dredging program to maintain flood risk level.

This action is based on up to 1 million cubic yards dredged annually to maintain the level of flood risk. Due to the large quantities the action would be accomplished by at least two dredging plants. Based on the quantities and production of the dredge – max 2.5 months or 75 days, typical mechanical dredge production rate is 250-300 cy per hour or 6,000 – 7,200 per day.

See section 3.3.4.1.2 (Dredged Material Management) and Figure 3 (Dredging priority areas for flow conveyance) above. As previously discussed, there would be up to 1 million cubic yards (mcy) dredged annually to maintain the level of flood risk.

Future Forecast Action for Flow Conveyance

<u>Actions</u>:

1. Initiate future forecast action by requesting (budgeting for) funding to conduct an in-depth analysis of all measures identified for flow conveyance, listed below in the order presented in Table 4:
    i. Conveyance dredging.

   ii. Disposal (3 options – beneficial use, in-water or upland).
   iii. Upstream (in reservoir) sediment traps.
   iv. Raise height of Lewiston Levees.

2. Complete the in-depth analysis of applicable measures applying the PSMP process for future forecast need actions (Section 3.3.4.3).
3. Address any necessary immediate need actions (i.e., routine O&M, interim actions, or dredge and disposal) until the long-term solution identified during the analysis can be implemented.

Description: The Corps would begin a tier-off NEPA analysis when flow conveyance is being adversely affected by sediment deposition and hydraulic modeling indicates that the risk of overtopping the levees is unacceptable. This analysis would follow the process described in Section 3.3.4.3 and would evaluate the applicable management measures, including dredging and raising the levees, to determine the most cost-effective, technically feasible and environmentally acceptable action(s) to manage the sediment deposition affecting flow conveyance. It may take several years to obtain funding, complete the analysis and environmental compliance, and implement the recommended action. While that analysis is being conducted, the Corps may need to implement immediate need actions to address problem sediment.

Trapping Sediment: See section 3.3.4.2.4 (Trapping Upstream Sediments (in Reservoir)) and Figure 7 (Location of a potential sediment trap on the Snake River) (above). The potential sediment trap would be dredged bi-annually, with estimated quantities up to 300,000 cy.

Reservoir Drawdown to Flush Sediment: The reservoir drawdown to flush sediment would draw the Lower Granite reservoir down 10 to 15 feet below MOP (measured at the confluence of the Snake and Clearwater Rivers) and would occur on a one-time basis for up to 6 weeks sometime during the period of late April through late June. This period takes advantage of naturally high spring freshet flows and corresponds with the juvenile salmonid outmigration season. Drawing down Lower Granite reservoir would create a high flow and velocity condition that would scour and transport accumulated sediment from the confluence of the Snake and Clearwater Rivers. Most of the sediment scour would occur within the main channel of both rivers and the scoured sediment would be transported downstream and re-deposited. Much of the sediment would likely redeposit within Lower Granite reservoir or in the upper reaches of Little Goose reservoir. Sediments could potentially deposit in areas where they would interfere with authorized project purposes of the LSRP. There must be adequate high flow prediction and modeling, allowing the Corps to conduct drawdown operations in a timely manner for this measure to function effectively. Navigation only benefits slightly with the drawdown and the remaining sediment in the congressionally authorized federal navigation channel dimensions would be dredged to restore the 14' at MOP.

Levee raise: Most likely the levee raise would be accomplished adding a vertical structure (flood wall) on the top of the levee or a levee raise on the crown (the top third of the levee). Work in the river/reservoir will be limited if not zero.

3.5 Management Measure Action Summary

The PSMP implementation process involves problem sediment identification, triggers for action, actions in response to triggers and the planning process for actions for evaluating measures/actions to address sediment that interferes with existing authorized project purposes.

The above sections detailing the PSMP can be summarized in the following implementation procedure:

1. Has monitoring identified a problem area where sediment accumulation interfering with the LSRP authorized purposes?
   a. No. No action required.
   b. Yes. Go to 2.
2. Identify the existing authorized project purpose(s) not being met:
   a. Navigation. Go to 3.
   b. Recreation. Go to 3.
   Fish and Wildlife. Go to 3.
   Flow Conveyance. Go to 3.
3. Identify the trigger level for each existing authorized project purpose:
   a. Immediate need action. Go to 4.
   b. Future forecast need action. Go to 4.
4. Implement actions (management measures) identified in plan for each existing authorized project purpose.

Table 9 illustrates which management measures are associated with triggers for actions that could address sediment accumulation problems affecting authorized project purposes.

Table 9. Management Measures Associated with Actions in Response to Triggers

		Management Categories												
		Dredging and Dredged Materials Management					Structural Sediment Management				System Management			
Triggers		Navigation and Other Dredging	Dredge to improve Conveyance Capacity	Beneficial use of Sediment	In-water Disposal of Sediment	Upland Disposal of Sediment	Bendway Weirs	Dikes/Dike Fields	Agitation to Resuspend	Trapping Upstream Sediments (in reservoir)	Navigation Objectives Reservoir Operations	Reconfigure/Relocate Affected Facilities	Raise Lewiston Levee to Manage Flood Risk	Reservoir Drawdown to Flush Sediment
Navigation	Immediate Need	X		X	X	X					X			
	Future Forecast Need	X		X	X	X	X	X		X	X	X		X
Recreation	Immediate Need	X		X	X	X			X		X			
	Future Forecast Need	X		X	X	X			X		X	X		
Fish and Wildlife	Immediate Need	X		X	X	X			X			X		
	Future Forecast Need	X		X	X	X			X			X		
Flow Conveyance	Immediate Need		X	X	X	X								
	Future Forecast Need		X	X	X	X				X			X	X

3.6 Planning Process for Sediment Management Actions

The Corps will follow the process outlined below when planning and implementing sediment management actions identified in the PSMP, subject to availability of authority and funding.

3.6.1 Routine or Interim Actions

This plan identifies a number of routine O&M or interim actions (e.g., raising/lowering reservoirs; posting warnings or closing boat ramps/basins, lifting/raising/shifting irrigation intakes, conducting bathymetric surveys), to be implemented before site-specific immediate/future need actions can occur. These actions do not require a tier-off NEPA analysis, as they are currently addressed under existing LSRP construction or operations documentation/reviews.

3.6.2 Immediate Need Actions

Development and consideration of alternatives for immediate need actions will use the NEPA review planning process – tiered from the EIS. The Corps anticipates tiered NEPA documentation for immediate need actions will generally be an EA, but minor actions may be covered by a CATEX[13]. The tiered NEPA review process will consider only measures identified in Table 4 above (or combination of such measures) for the applicable authorized project purpose when developing alternatives. 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 (beneficial use upland or in-water). The tiered NEPA review process will follow the process outlined in Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1599), and Corps regulations (33 CFR 230), and include documentation establishing compliance with other applicable environmental laws, including:

- The ESA, Section 7.
- The National Historic Preservation Act (NHPA), Section 106.
- The Clean Water Act (CWA), Section 404 and 401.

The dredged material disposal option for such immediate need actions will be consistent with all applicable laws and regulations.

3.6.3 Future Forecast Need Actions

Development and consideration of alternatives for future forecast need actions will use the NEPA review planning process, tiered from the EIS. When a problem area meets a trigger for a future need action, location-specific alternatives for addressing the problem will be formulated and will draw from the list of measures in Table 4. An alternative may be composed of a single measure or a combination of measures. It may take several years to obtain funding, complete the analysis and environmental compliance, and implement the recommended action. While that analysis is being conducted, the Corps may need to implement immediate need actions to address problem sediment. The evaluation of alternatives will consider the least costly, technically feasible and environmentally acceptable alternatives to implement. Following evaluation and comparison of alternatives, which will be summarized in the project-specific tier-off NEPA analysis, the District Commander will select the alternative to be implemented. This decision will be documented in either a Finding of No Significant Impact (FONSI) if an EA is prepared or a Record of Decision (ROD) if a supplemental EIS is prepared. The selected alternative will then be advanced into final design and implementation. Once an alternative has been selected

[13] See Footnote 1 to Section 1.5 of the EIS.

for implementation, final design and modeling would be conducted as appropriate, plans and specs developed, and contract documents prepared as applicable. The Corps, in coordination with other parties as applicable, will implement the alternative selected to address sediment accumulation at the subject location(s). Project-specific monitoring will be conducted in order to evaluate effectiveness of the alternative implemented and compliance with applicable environmental laws/regulations.

3.7 Interdependent and Interrelated Actions

Interdependent actions are those that have no independent utility apart from the proposed action. Interrelated actions are part of a larger action and depend on the larger action for their justification. As sediment continues to accumulate within the LSRP, especially in the Lower Granite reservoir, commercial navigation and other existing authorized project purposes of the LSRP may be affected. Formal adoption and implementation of the PSMP should not, however, be considered the "but for" cause of all commercial navigation and other existing authorized project purposes. Such action could occur at varying levels without the PSMP based on reduced need, use and/or market forces.

To the extent that the PSMP facilitates interrelated/interdependent actions, the effects of those actions reasonably certain to occur have already been considered in the direct/indirect effects analysis to the greatest extent possible. A certain level of commercial navigation/barging is an interrelated/interdependent action. Barges can leak petroleum products and possibly cargo into the river, which reduces water quality. When shallow water is encountered, barges can ground, or stir up sediments from the river bottom, also affecting water quality. Barge traffic can cause streambank erosion which can also generate turbidity.

The Corps' juvenile salmonid transportation program is not an interrelated/interdependent action as it was consulted on in the FCRPS BO.

3.8 Operational Characteristics of the Proposed Action

The proposed action is an operation and maintenance plan to maintain the four identified purposes. The proposed action will not change any operations of hydrosystem facilities that underwent the formal consultation process in the NMFS FCRPS BO. No operational changes to the system are expected.

3.9 Action Area

The action area includes all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. For the purposes of this consultation, the action area is defined by the management measures, interdependent and interrelated actions, and the expected extent of effects resulting from implementation of those actions.

For the PSMP, the action area begins (at the downstream end) at the confluence of the Snake River with the Columbia River at river mile (RM) 0. The action area extends upstream to approximately RM 146 on the Snake, and from RM 0 to approximately RM 3 on the Clearwater River. The action area also includes all Corps lands adjoining the action area within the rivers where upland disposal or action implementation staging may occur, which are all within and bound by the Corps' boundaries.

3.10 Proposed Conservation Measures

The Corps proposes the following conservation measures as part of the proposed action in order to minimize potential adverse effects related to implementation of the proposed action. These conservation measures are not meant to be mitigation for the proposed action, but are integral to the reduction of impacts (potential adverse effects) that may be incidental to the proposed action, and must be considered when analyzing the potential effects of the proposed action.

General

- The Corps will observe appropriate in-water work windows. For example, dredging in the lower Snake River is typically limited to a winter in-water work window of December 15 to March 1.
- The Corps will comply with applicable state water quality standards.
- The Corps will comply with applicable site/action-specific conservation measures when implementing subsequent actions.
- Worksite isolation would be used as a minimization practice, consisting of several measures meant to decrease fish exposure to the effects of construction activities.
- No in-water disposal in summer for actions.
- The Raise Lewiston Levee to Manage Flood Risk measure would not involve in-water placement of materials.

Conservation measures associated with minimization of identified effects of the action include:

Dredging

Sediment sampling – The Corps will perform sediment sampling and analysis prior to dredging as required by applicable regional agreements such as the 2009 *Sediment Evaluation Framework for the Pacific Northwest*.

- Work Windows:
  - Fish and Wildlife only: Summer window for hydraulic (water temps above 73°F)
  - Winter in-water work window Dec 15-Mar 1
- Employ an experienced equipment operator.

- A qualified biologist trained in identification of Washington ground squirrel burrows would survey potential upland disposal areas within the range of Washington ground squirrel prior to disposal.
- The Corps will avoid any Washington ground squirrel burrows found by a qualified biologist.

Turbidity

- The Corps would implement a number of techniques to minimize turbidity effects resulting from project operations.
  - The Corps would monitor turbidity levels and modify dredging operations to avoid prolonged negative effects.
  - The Corps would use best management practices (BMPs) at dredging and disposal locations to prevent remobilization of sediments, and subsequent turbidity, through dewatering activities or storage.
  - If water standards for turbidity are exceeded the Corps will employ one or more of the following bucket control BMPs:
    - No reopening to fill a partially filled bucket.
    - Do not overfill the bucket.
    - Close the bucket as slowly as possible on the bottom.
    - Pause before hoisting the bucket off of the bottom to allow any overage to settle near the bottom.
    - Hoist load very slowly.
    - Pause bucket at water surface to minimize distance of discharge.
    - "Slam" open the bucket after material is dumped to dislodge any additional material that is potentially clinging to the bucket.
    - Ensure that all material has been dumped from the bucket before returning for another bite.
    - Do not dump partial or full buckets of material back into the waterway.
    - Vary the volume, speed, or both of digging passes to minimize siltation to the maximum extent practicable.

SRF Chinook Redds

- To prevent disturbance or harm to potential SRF Chinook redds below the dams, the Corps will conduct underwater surveys of the proposed dredging site and within 900 feet downstream of the navigation locks in November and the first two weeks of December prior to commencing dredging. Techniques similar to those used by Battelle from 1993 to 2008 will be employed (Dauble et al. 1996; Dauble et al. 1994; Dauble and Watson 1997; Mueller and Coleman 2007; Mueller and Coleman 2008). This technique has used a combination of a boat mounted underwater video camera tracking system to look at the bottom of the river to identify redds. Results of the surveys will be transferred to the Corps within 2 days of the survey dates in order for compilation prior to December 15, at which time the Corps can communicate results to NMFS for appropriate action.
- If no redds are located, then the Corps will proceed with proposed dredging within the boundaries of the surveyed template.

- If one or more redds are located within the proposed dredging template and such redds are verified with video, then the Corps will coordinate with NMFS to determine if dredging can proceed without harming or disturbing the redd(s) or needs to be delayed until fry are able to move out of the area.

Spills

- All over-water construction vessels would be fueled at existing commercial fuel docks. Such facilities have existing spill prevention systems in place that would be adequate to avoid spills or immediately address any accidental spills that might occur.
- Equipment will be inspected and cleaned prior to any instream work.

Suspension of Chemicals of Concern

- Conduct dredging and disposal during the winter when listed salmonids in the area are at the lowest point of the year.
- Continue to sample sediments for chemicals of concern during disturbance activities, and do not dispose of any contaminated sediments in water.
- Use BMPs to prevent spills of fuel, or hydraulic leaks during the dredging and disposal operation.
- The Corps would use best management practices (BMPs) at disposal locations to prevent remobilization of sediments, and subsequent turbidity, through dewatering activities or storage.

Entrainment

- Dredging activities would be accomplished using mechanical means which are slow enough to frighten fish and give them time to move away.

MBTA

- Avoid or minimize adverse effects in accordance with Executive Order 13186 and the Memorandum of Understanding between the Department of Defense and the USFWS.
- Survey upland disposal sites for active nests prior to activities within the nesting season.
- Avoid nest sites if possible.
- Observe a 660 ft buffer around raptor nest sites, when possible.
- MBTA permits would be required for any take between (in general) April 1-August 15.

BGEPA

- Avoid or minimize adverse effects in accordance with Executive Order 13186 and the Memorandum of Understanding between the Department of Defense and the USFWS.
- Maintain a buffer of at least 660 feet (200 meters) between project activities and eagle nests (including active and alternate nests). If a similar activity is closer than 660 feet, then maintain a distance buffer as close to the nest as the existing tolerated activity.
- Maintain established landscape buffers that screen the activity from the nest.

- Avoid to the greatest extent practicable conducting work during dawn and dusk hours.
- Wait to the greatest extent practicable to begin activity until later in the breeding season when chances of disturbance are lessened.
- BGEPA permits may be required during nesting season (Jan 1-Aug 15), or for disturbance in roosting areas (Nov 15-Mar 15).

3.11 Plan and Consultation Timeline

The period of analysis over which the effects of the proposed agency action are being evaluated is indefinite for the PSMP.

3.12 Future Action-Specific Consultations

Development and identification of future actions under the PSMP (both immediate need and future forecast need actions) will use the NEPA review planning process tiered from the PSMP EIS. This consultation focuses on formal adoption of the PSMP. It also includes the potential effects associated with any future implementations actions that are quantifiable programmatically at the plan level to the greatest extent possible. It is also understood that implementation of future actions under the PSMP may require evaluation of site-specific potential effects, if the effects are in addition to what is considered at the plan level in this consultation. Proposed future actions under the PSMP that would require additional section 7 consultations would be tiered from this programmatic consultation.

This consultation will cover the known sites identified in the sections above. Any other sites identified by monitoring not identified here will require review for potential further consultation. For fish and wildlife, the identified sites include all of the potential sites (irrigation intakes at HMUs). Therefore, maintenance of existing irrigation intakes at HMUs will require no further consultation.

The Corps will use the following process to determine if further ESA consultation is required for future implementation actions, and the approach to the effects analysis (adapted from Johnson 2009) to determine the extent, if any, of potential effects, and justify any effects determinations:

1. Has monitoring identified a problem area where sediment accumulation interferes with the LSRP authorized purposes?
    a. No. No action required.
    b. Yes. Go to 2.
2. Identify the existing authorized project purpose(s) not being met:
    a. Navigation. Go to 3.
    b. Recreation. Go to 3.
    c. Fish and Wildlife. Go to 3.
    d. Flow Conveyance. Go to 3.
3. Identify the trigger level for each existing authorized project purpose:
    a. Immediate need action. Go to 4.
    b. Future forecast need action. Go to 4.

4. Identify the appropriate actions (management measures) identified in the plan for each existing authorized project purpose. Go to 5.
5. Consult with a District Compliance Biologist to determine the adequacy of existing plan-level ESA consultation for the implementation action. Does the implementation action require further section 7 consultation tiered from the plan-level consultation?
   a. No. Proceed with the implementation action.
   b. Yes. Conduct an individual consultation for the implementation action. Go to 6.
6. Is the proposed action likely to produce potential stressors that would reasonably be expected to act directly on individual organisms or to have direct or indirect consequences (positive or negative) on the environment?
   a. An answer of “no” would result in a “no effect” determination by the Corps.
   b. An answer of “yes” would result in moving to #7.
7. If the proposed action is likely to produce those potential stressors, are endangered or threatened individuals likely to be exposed to one or more of those potential stressors or one or more of the proposed action’s direct or indirect consequences on the environment?
   a. An answer of “no” would result in a “no effect” determination by the Corps.
   b. An answer of “yes” would result a “may affect” determination by the Corps, and moving to #8. (Consultation is required with NMFS and/or USFWS)
8. If listed individuals are likely to be exposed, are those listed individuals likely to respond, positively or negatively, to that exposure?
   a. An answer of “no” would result in a “not likely to adversely affect” determination by the Corps.
   b. An answer of “yes” would result in moving to #9.
9. If listed individuals are likely to respond, are those responses likely to be sufficient to reduce their individual performance?
   a. An answer of “no” would result in a “not likely to adversely affect” determination by the Corps. Informal consultation is required with NMFS and/or USFWS.
   b. An answer of “yes” to #10 would result in a “likely to adversely affect” determination by the Corps. This determination, for any potential effect, and for any given species, would result in a “may affect, likely to adversely affect” determination for that species. Formal consultation is required with NMFS and/or USFWS.

4 ENDANGERED SPECIES ACT OF 1973: BIOLOGICAL ASSESSMENT

4.1 Species Lists from NMFS and USFWS

On July 1, 2014 the Corps reviewed the current list of threatened and endangered species that pertain to the proposed project area under the jurisdiction of NMFS and USFWS for the following counties. Table 10 identifies the species that are listed in the counties where work could occur.

- Nez Perce County, ID.
- Asotin County, WA.
- Benton County, WA.
- Columbia County, WA.
- Franklin County, WA.
- Garfield County, WA.
- Walla Walla County, WA.
- Whitman County, WA.

Table 11 identifies ESA-listed species and critical habitats in the action area. Table 11 also shows the listed species occurrence in each county (and Project) in the action area.

Table 10. Federal Register Notices for Final Rules That List Threatened and Endangered Species, Designate Critical Habitats, or Apply Protective Regulations To Listed Species Considered In This Consultation

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon (*Oncorhynchus tshawytscha*)			
Upper Columbia River spring-run ESU	E 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	ESA section 9
Snake River spring/summer run ESU	T 6/28/05; 70 FR 37160	10/25/99; 64 FR 57399	6/28/05; 70 FR 37160
Snake River fall-run ESU	T 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
sockeye salmon (*O. nerka*)			
Snake River ESU	E 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	ESA section 9
steelhead (*O. mykiss*)			
Middle Columbia River DPS	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River DPS	T 6/18/09; court decision*	9/02/05; 70 FR 52630	ESA section 9 applies

Species	Listing Status	Critical Habitat	Protective Regulations
Snake River Basin DPS	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
bull trout (*Salvelinus confluentus*)			
Columbia River DPS	T 6/10/98; 63 FR 31647 31674	9/02/05; 70 FR 56211 56311 10/18/10; 75 FR 63898	
pygmy rabbit (*Brachylagus idahoensis*)			
Columbia Basin DPS	E 11/30/01; 66 FR 59769 59771	Not applicable	
Canada lynx (*Lynx canadensis*)			
Contiguous U.S. DPS	T 3/24/00; 63 FR 16051 16086	2/25/09; 74 FR 8615 8702	
Gray Wolf (*Canis lupus*)			
U.S.A.: not included in an experimental population; and portions of WA	E 3/11/67; 32 FR 4001	Not applicable	
Ute ladies'-tresses (*Spiranthes diluvialis*)			
Contiguous U.S. DPS	T 1/17/92; 57 FR 2048 205	Not applicable	
Spalding's' catchfly (*Silene spaldingii*)			
Contiguous U.S., Palouse region	T 10/10.2001: 66 FR 51597 51606	Not applicable	
Greater Sage-Grouse (*Centrocercus urophasiunus)*			
Candidate	C	Not applicable	
Yellow-billed cuckoo (*Coccyzus americanus)*			
Western DPS	PT 12/26/2013: 78 FR 78321 78322	Not applicable	
Washington ground squirrel (*Urocitellus washingtoni)*			
Candidate	C	Not applicable	
Umtanum desert buckwheat (*Eriogonum codium)*			
Wherever found	T 12/20/13; 78 FR 76995 77005	T 12/20/13; 78 FR 76995 77005	
White Bluffs bladderpod (*Physaria douglasii ssp. tuplashensis)*			
Wherever found	T 12/20/13; 78 FR 76995 77005	T 12/20/13; 78 FR 76995 77005	

Listing status: 'T' means listed as threatened under the ESA; 'E' means listed as endangered; "P" means proposed for listing or designation, "C" means the species is a candidate for listing.

*UCR steelhead was initially listed as an endangered species (6/18/97; 62 FR 43937), status upgraded to threatened (1/5/06; 71 FR 834), then reinstated as endangered status per a decision in U.S. District Court on June 13, 2007 (Trout Unlimited et al. v. Lohn, No. CV06-0483-JCC). Their status was updated to threatened (6/18/09) per a decision in U.S. District Court.

Table 11. Species Listed under the ESA by County on Corps Managed Lands in the District
The District's Projects (Dams) are also shown under the counties in which they lie.

	State	**Idaho**	**Washington**						
	County	**Nez Perce**	**Asotin**	**Garfield**	**Whitman**	**Columbia**	**Franklin**	**Walla Walla**	**Benton**
	Corps Operating Project	***Lower Granite***				***Lower Monumental***			
				Little Goose			***Ice Harbor***		
							McNary		
Jurisdiction	**Species**								
NMFS	SR Spring/summer Chinook*	X	X	X	X	X	X	X	X
	SR Fall Chinook*	X	X	X	X	X	X	X	X
	SR Sockeye*	X	X	X	X	X	X	X	X
	SRB Steelhead*	X	X	X	X	X	X	X	X
	MCR Steelhead*[1]						X	X	X
	UCR Spring Chinook*[1]						X	X	X
	UCR Steelhead*[1]						X	X	X
USFWS	Bull trout*	X	X	X	X	X	X	X	X
	Pygmy rabbit						X		X
	Canada lynx	X	X	X		X		X	
	Gray wolf						X		X
	Ute ladies'-tresses		X	X	X	X	X	X	X
	Spalding's' catchfly	X	X		X				
	Greater sage-grouse								X
	Yellow-billed cuckoo		X	X		X	X	X	X
	Washington ground squirrel					X	X	X	
	Umtanum Desert buckwheat								X
	White Bluffs bladderpod						X		

*Critical habitat is within the action area.
[1] MCR and UCR steelhead and UCR spring Chinook could stray up to the Ice Harbor navigation lock approach, but if they enter the Snake River, ESA projection is provided by the coverage for SRSS Chinook and steelhead. Straying would be unpredictable and presumably in very low numbers. Because of this, effects are discountable, and warrant a "not likely to adversely affect" determination for these species.

Critical habitat has been designated for all of the fish species as well as Canada lynx. No critical habitat exists on Corps lands for Canada lynx, Umtanum Desert buckwheat, or White Bluffs bladderpod.

4.2 Status of Species

4.2.1 SR Spring/Summer Chinook

4.2.1.1 Listing History

The Snake River spring/summer (SRSS) Chinook salmon ESU, listed as threatened on April 22, 1992, (67 FR 14653), includes all natural-origin populations in the Tucannon, Grande Ronde, Imnaha, and Salmon Rivers. Fish returning to several of the hatchery programs are also listed, including those returning to the Tucannon River, Imnaha, and Grande Ronde River hatcheries, and to the Sawtooth, Pahsimeroi, and McCall hatcheries on the Salmon River. Critical habitat was designated for SRSS Chinook salmon on December 28, 1993 (58 FR 68543), and was revised on October 25, 1999 (64 FR 57399).

4.2.1.2 Life History/Biological Requirements

In the Snake River, spring and summer Chinook share key life history traits. Both are stream-type fish, with juveniles that migrate swiftly to sea as yearling smolts. Depending primarily on location within the basin (and not on run-type), adults tend to return after either 2 or 3 years in the ocean. Both spawn and rear in small, high elevation streams (Chapman et al. 1994), although where the two forms co-exist, spring-run Chinook spawn earlier and at higher elevations than summer-run Chinook.

Spring/summer Chinook salmon use smaller, higher elevation tributary systems for spawning and juvenile rearing compared to fall run fish, which spawn in main stem of larger rivers. Spring/summer Chinook salmon normally spawn in late July–September using gravel bars in smaller river and tributary streams. As with most salmon, adults die after spawning providing a large nutrient source for juvenile fish. Juvenile spring/summer Chinook salmon behave differently than fall Chinook in that they remain in headwater streams for a year and out–migrate the following spring. Optimal water temperatures range from 59–64°F (14–19°C) with temperatures exceeding 73°F (21°C) being lethal (Wydoski and Whitney 2003). Juvenile Chinook salmon feed on small aquatic invertebrates in both fresh and salt water, primarily arthropods in freshwater and crustaceans in marine environments. As they grow in saltwater, they quickly change to a fish diet (IDFG 2005).

4.2.1.3 Distribution

See Figure 8 for distribution. Based on genetic and geographic considerations, the ICBTRT (2003) established five major population groups in this ESU: the Lower Snake River Tributaries, the Grande Ronde and Imnaha Rivers, the South Fork Salmon River, the Middle Fork Salmon River, and the upper Salmon River. The ICBTRT further subdivided these groupings into a total of 31 extant, demographically independent populations. However, Chinook salmon have been extirpated from the Snake River and its tributaries above Hells Canyon Dam, an area that encompassed about 50 percent of the pre-European spawning areas in the Snake River Basin. In

1927, major subbasins in the Clearwater River Basin were blocked to Chinook salmon by the construction of Lewiston Dam.

4.2.1.4 Local Empirical Information

Juvenile spring Chinook salmon have been documented as using the backwater areas of Lake Wallula for rearing. Limited sampling has occurred in the lower Snake River demonstrating that individuals of SRSS Chinook salmon may show very limited use of shallow water areas of lower Snake River reservoirs for periods of rearing during the spring outmigration period or overwintering between July and March (Tiffan and Connor 2012; Artzen et al. 2012). Because this ESU is an upriver stock, no spawning habitat is present in the lower Snake River.

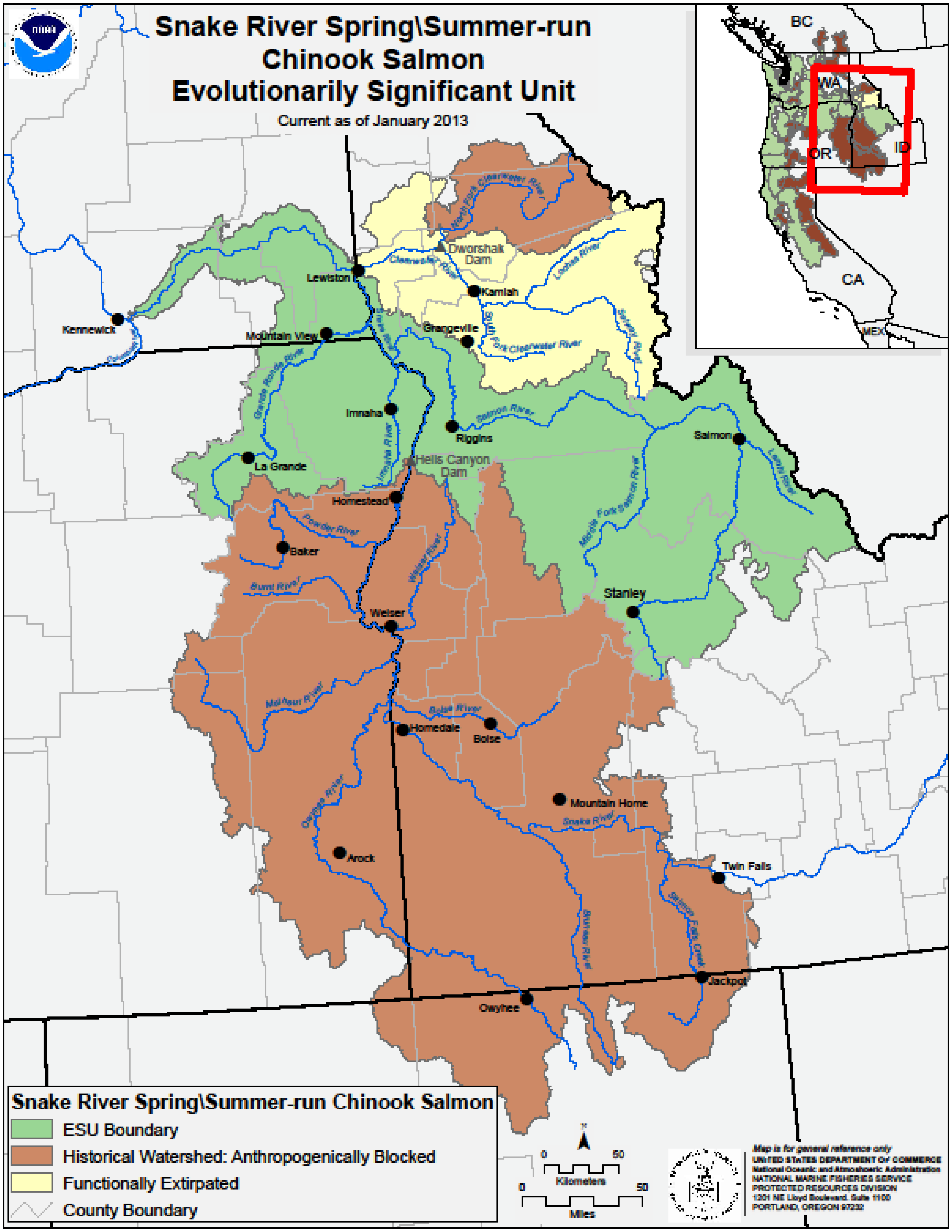
Juvenile SRSS Chinook salmon generally migrate through the Snake River during March through July. Most adult SRSS Chinook salmon migrate through the lower Snake River between April and mid-August.

There has been a general increase in the number of adult and jack SRSS Chinook passing over Ice Harbor Dam in recent years, though the latest years' data hasn't reached the peak of the number counted in 2001 (191,866). The latest 10 year average (2002- 2011) was 91,937. The previous 10 year average was 41,130 (FPC 2012).

4.2.1.5 Ongoing Monitoring

Passage of adult and juvenile Chinook salmon is monitored at the Snake River dams. There are also several other monitoring programs by other federal, state and tribal organizations throughout the watershed.

Figure 8. SR Spring/Summer Chinook Distribution



4.2.2 SR Fall Chinook

4.2.2.1 Listing History

NMFS listed SR fall-run Chinook salmon as threatened on April 22, 1992 (57 CFR 14653) and their threatened status was reaffirmed on June 28, 2005 (70 CFR 37160).

4.2.2.2 Life History/Biological Requirements

Detailed life history data (age at spawning, sex ratios, etc.) are plentiful for hatchery populations, but limited and inconsistent for wild populations. More data are also available for some subbasins and streams than others, and different types of data are available for different streams at different times. Age at spawning and associated fecundity differ between the adults returning to the Middle Fork and main Salmon Rivers and all other areas where information is available. In these two areas, 3-ocean adults (especially females) with higher fecundity predominate, whereas 2-ocean adults with lower fecundity predominate in other areas. This is in spite of the fact that spring- and summer-run Chinook salmon inhabit parts of both areas. This suggests that geography or other environmental factors are more influential in determining age at return than run-timing (Mathews and Waples 1991).

The generalized life history of Pacific salmon involves incubation, hatching, and emergence in freshwater, migration to the ocean, and subsequent initiation of maturation and return to freshwater for completion of maturation and spawning. Juvenile rearing in freshwater can be minimal or extended. Additionally, some male Chinook salmon mature in freshwater, thereby foregoing emigration to the ocean. The timing and duration of each of these stages is related to genetic and environmental determinants and their interactions to varying degrees. Salmon exhibit a high degree of variability in life-history traits; however, there is considerable debate as to what degree this variability is the result of local adaptation or the general plasticity of the salmonid genome (Ricker 1972, Healey 1991, Taylor 1991).

Juveniles emerge from the gravels in March and April of the following year, moving downstream from natal spawning and early rearing areas from June through early fall. Juvenile fall-run Chinook salmon move seaward slowly as subyearlings, typically within several weeks of emergence (Waples et al. 1991).

Adults return to the Snake River at ages 2 through 5, with age 4 most common at spawning (Waples et al. 1991). Adult SRF Chinook salmon enter the Columbia River in July and August and reach the mouth of the Snake River from the middle of August through October. Spawning occurs in the main stem and in the lower reaches of large tributaries in October and November.

4.2.2.3 Distribution

SRF Chinook salmon spawning and rearing occurs only in larger, mainstem rivers such as the Salmon, Snake, and Clearwater Rivers. Historically, the primary fall-run Chinook salmon spawning areas were located on the upper mainstem Snake River (Connor et al. 2005). A series of Snake River mainstem dams block access to the upper Snake River, which has significantly reduced spawning and rearing habitat for SRF Chinook salmon. The vast majority of spawning today occurs upstream from Lower Granite Dam, with the largest concentration of spawning sites in the Clearwater River, downstream from Lolo Creek. Currently, natural spawning is limited to the Snake River from the upper end of Lower Granite reservoir to Hells Canyon Dam, the lower reaches of the Imnaha, Grande Ronde, Clearwater, Salmon, and Tucannon Rivers, and small areas in the tailraces of the lower Snake River hydroelectric dams (Good et al. 2005; Mueller and Coleman 2007). The tailrace of Ice Harbor Dam has been surveyed for fall Chinook redds during six years from 1993-2008 with one redd located below Ice Harbor Dam in 1996 and two in 2007 with none in the vicinity of the navigation lock approach. The area downstream of the navigation lock approach has a low suitability as fall Chinook spawning habitat (Mueller and Coleman 2007).

As a consequence of losing access to historic spawning and rearing sites in the upper Snake River, fall Chinook salmon now reside in waters that are generally cooler than the majority of historic spawning areas. In addition, alteration of the lower Snake River by hydroelectric dams has created a series of low-velocity pools in the Snake River that did not exist historically. Both of these habitat alterations have created obstacles to fall Chinook survival. Prior to alteration of the Snake River Basin by dams, fall Chinook salmon exhibited a largely ocean-type life history, where they migrated downstream and reared in the mainstem Snake River during their first year. Today, fall Chinook salmon in the basin exhibit one of two life histories that Connor et al. (2005) have called ocean-type and reservoir-type. The reservoir-type life history is one where juveniles overwinter in the pools created by the dams, prior to migrating out of the Snake River. The reservoir-type life history is likely a response to early development in cooler temperatures, which prevents juveniles from reaching a suitable size to migrate out of the Snake River.

While most SRF Chinook salmon spawn above the confluence and navigation lock approach area targeted for dredging, a few have been documented periodically (1993 and 1994

in the tailwaters of the lower Snake River dams) spawning within suitable areas of the tailwater environment outside the navigation lock approaches (Bennett et al. 1983, 1992; Dauble et al. 1994, 1995).

See Figure 10 for distribution.

4.2.2.4 Local Empirical Information

Adult SRF Chinook numbers passing over Ice Harbor Dam have increased in the last several years. The latest 10-year average (2004 – 2013) is 43,539. The previous 10 year average was 12,822 (FPC 2012).

Wild juvenile fall Chinook salmon typically pass through the Lower Snake River from mid-June through September, with double peaks in mid-July and some lingering portion of the annual migration lasting until December. Many of the juvenile fall Chinook salmon outmigrating from the Clearwater and Snake Rivers spend time in shoreline areas (less than 3 meters [9.8 feet] in depth) in the Lower Granite reservoir and less time in downriver reservoirs, where they prefer sand-substrate areas (Bennett et al. 1997). Tiffan and Connor (2012) similarly reported low gradient shoreline areas less than 2 meters deep were highly used by naturally produced juvenile fall Chinook salmon. When water temperatures reach about 21.1°C (70°F), these fish appear to have achieved adequate growth and fitness due to the warming conditions of these shallow-water habitat areas. They leave the shoreline areas to either continue rearing or begin their migration in the cooler pelagic zone of the reservoirs (Bennett et al. 1997).

Though most juvenile Chinook salmon migrate to the ocean as sub-yearlings, passive integrated transponder (PIT) tag detections from 1993 to 1995 brood year juvenile fall Chinook salmon from the Clearwater River were recorded in the spring of 1994 to 1996 at some lower Snake River dams. More PIT-tagged fall Chinook salmon outmigrants were detected in the spring of 1994 and 1995 than in the previous year, while the trend was reversed with the 1995 brood year. It is apparent from these detections that some Clearwater River fall Chinook salmon migrate to the ocean as yearlings, rather than as subyearlings.

The Snake River upper reach, Snake River lower reach, Grande Ronde River, and Clearwater River are recognized as the four major spawning aggregates of Snake River Basin natural fall Chinook salmon upstream of Lower Granite reservoir (ICBTRT 2007). Though treated as one population, temperature during incubation and early rearing fosters life history diversity among the juveniles of the spawning aggregates (Connor et al. 2002, 2003a). Natural fall Chinook salmon in the Snake River upper reach typically emerge and enter Lower Granite reservoir as subyearlings earliest followed in overlapping order by natural fall Chinook salmon subyearlings (hereafter, natural subyearlings) from the Snake River lower reach, Grande Ronde River, and finally the Clearwater River subbasin. Passage of natural subyearlings from the four spawning aggregates through the lower Snake River reservoirs is a protracted event (Connor et al. 2002) based on data collected on fish implanted with passive integrated transponder (PIT) tags (Prentice et al. 1990). Thus, there is large potential for natural subyearlings to use shallow water habitat complexes throughout the spring and summer.

Natural subyearlings most likely enter Lower Granite reservoir as both newly emergent fry and as parr after they have reared upstream in natal riverine habitat. Those fish that enter the reservoir as fry probably locate nearshore areas and reside there as they grow into parr. Fry abundance likely decreases over time due to mortality, recruitment to parr, and as fish move downstream. Natural subyearlings that remain in natal riverine rearing areas upstream of Lower Granite reservoir are believed to progress through four migrational phases including: discontinuous downstream dispersal along the shorelines of the free-flowing river; abrupt and mostly continuous downstream dispersal offshore in the free-flowing river; passive, discontinuous downstream dispersal offshore in Lower Granite reservoir; and, active and mostly continuous seaward migration (Connor et al. 2003b). Thus, the potential for use of shallow water habitat by natural fall Chinook salmon subyearlings is regulated by the dispersal of fry and parr as well as the survival and behavior of fish passing through these two life stages.

Some of the natural and hatchery subyearlings discontinue active migration before or after entering the reservoirs in mid-summer (Arnsberg and Statler 1995). These “reservoir-type” juveniles are primarily natural fall Chinook salmon (Connor et al. 2005) and they feed and grow as they move downstream offshore in reservoirs during fall and winter and into spring when they become yearlings (Tiffan et al. 2012). Winter is a critical season that can greatly influence the survival and behavior of juvenile anadromous salmonids. Fish in small streams limit their winter movement and energy expenditure by seeking nearshore cover and holding (review by Brown et al. 2011). Shallow water habitat in the lower Snake River reservoirs would also be important to overwinter survival of reservoir-type juveniles if they exhibited the behavior of their counterparts that inhabit small streams. However, Tiffan et al. (2012) hypothesized that the need for cover, protection from predators, and energy conservation are met in reservoirs in ways that allow fish more unrestricted movement at lower energetic costs than observed in small streams. Further, the same authors deduced from angling catch data that reservoir-type juveniles are largely pelagic. Furthermore, sampling data, including radio-telemetry efforts, suggests that use of shallow water habitat during the fall and winter by juvenile fall Chinook is limited and that while juveniles passed shallow water habitat sites, relatively few entered them. Radio-tagged fish located during mobile tracking in the winter of 2010 were pelagically oriented, and generally not found over shallow water or close to shore (Tiffan and Connor 2012).

Cold-water releases from Dworshak Dam, aimed at augmenting flows for adult migration, may cause stunted growth rates in juveniles in the late summer and early fall, causing these fish to overwinter. Overwintering and early rearing of fall Chinook salmon in Lake Wallula backwater areas has been documented and it will be logical to assume that the potential for overwintering and rearing exists in the lower Snake River as well.

Redd surveys have been performed in the lower Snake River since at least 1993 (Mueller 2009). For example, seven redds were found downstream of Lower Monumental Dam in 2008 by the Pacific Northwest National Laboratory (Mueller 2009). The redds were located approximately 30 meters (m) (100 ft) downstream of the fish bypass pipe and adjacent to the fish loading dock on the north side of the river in water depths of 4 to 5.5m (13 to 18 ft) with near bottom water velocities of 0.37 to 0.46 m/sec (1.2 to 1.5 feet per second (ft/s)). This was the first time that redds were found at this location (Arnsberg et al. 2009). At Ice Harbor Dam, redd surveys have been performed in multiple years (Table 12), with only 1 redd found downriver of the powerhouse near the outfall pipe in 1996 and 2 redds found in 2007 390 feet downstream of the bypass pipe in 22-23 feet of water (Mueller and Coleman 2008; Mueller 2009).

The low velocity and relatively fine substrate along a high percentage of the reservoir shorelines of the Lower Snake River reservoirs preclude spawning in these areas. The limited spawning that does occur is in the tailrace areas below all of the lower Snake River dams, where water velocity is high and substrate size is relatively large (Mueller and Coleman 2007, 2008). No redds have been located in other regions of the reservoirs, including shoreline areas that could be potentially affected by site development. As shown in Figure 9, although a large percentage of the areas examined downstream of Ice Harbor dam for potential fall Chinook spawning habitat contains suitable substrate, low water velocities are likely a key variable precluding suitable spawning conditions and therefore result in low quality spawning habitat (Mueller and Coleman 2007).

Since there is potential to encounter fall Chinook redds during the proposed action at Ice Harbor, Fall Chinook redd surveys will be conducted below Ice Harbor Dam in November and December 2013, prior to the proposed dredging action.

Table 12. Fall Chinook Redd Counts from Deepwater Video Surveys Conducted in the Tailrace Sections of Lower Snake River Dams, 1993–2008
(Mueller 2009)

	Lower Snake River Dam			
Survey Year	Lower Granite	Little Goose	Lower Monumental	Ice Harbor
1993	14	4	0	0
1994	5	4	0	0
1995	0	4	n/s[(a)]	n/s
1996	0	1	0	1
1997	0	n/s	n/s	n/s
1998	n/s	n/s	n/s	n/s
1999	n/s	n/s	n/s	n/s
2000	n/s	n/s	n/s	n/s
2001	n/s	n/s	n/s	n/s
2002	0[(b)]	n/s	0[(b)]	n/s
2003	n/s	n/s	n/s	n/s
2004	1[(b)]	n/s	0[(b)]	n/s
2005	0[(b)]	n/s	0[(b)]	n/s
2006	1	2	0	0
2007	4	0	0	2
2008	8	0	7	0

(a) No survey.
(b) Partial survey.

Figure 9. Fall Chinook Salmon Spawning Habitat Suitability Downstream from Ice Harbor Dam. Habitat suitability assessment is based on a 50% exceedance discharge (21.7 kcfs) during a normal water year, with the McNary Dam forebay at normal pool elevation. Suitability index values indicate a range of potential habitat from unsuitable (0.0) to high quality (1.0). (Mueller 2009).

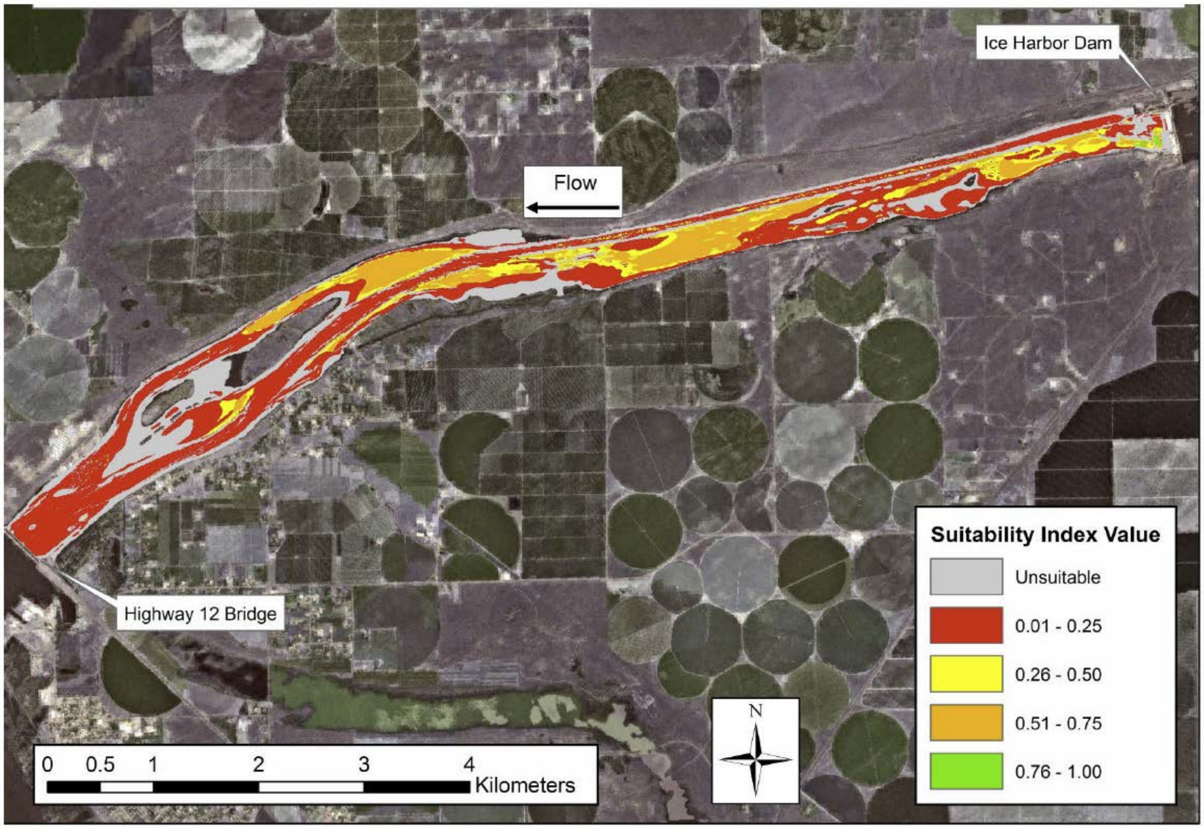
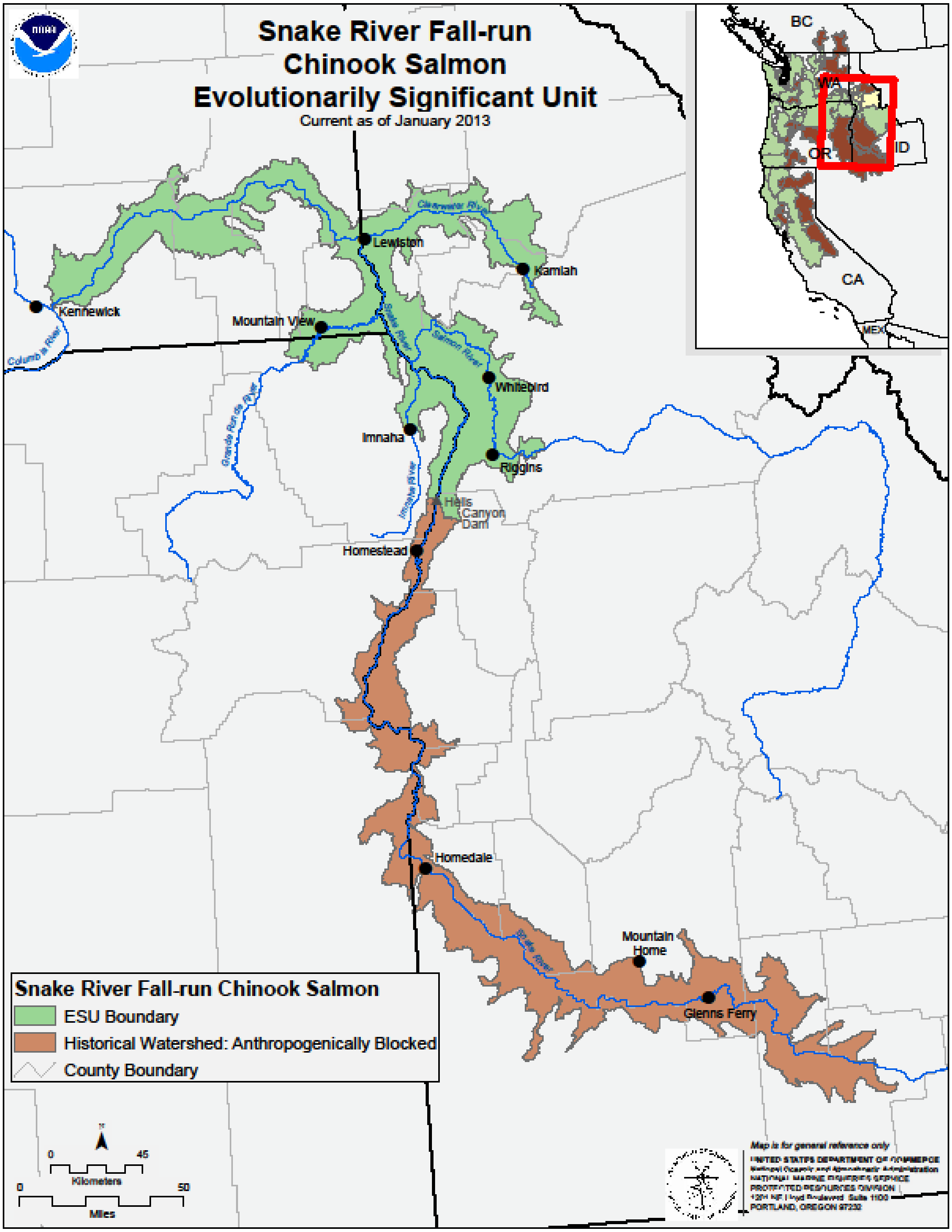


Figure 10. SR Fall Chinook Distribution



While SRF Chinook (eggs, embryos, and stream type juveniles), SRSS Chinook (juveniles) and SR steelhead (adults and overwintering juveniles) would be present in the action area during the in-water work window, the majority of juveniles will be at the downstream ends of the reservoirs (Tiffan and Connor 2012) and will continue moving downstream through the winter. SRF Chinook juveniles are likely to be more abundant than other species or life history stages during the proposed work window. Tiffan and Connor (2012) found that reservoir-type juvenile SRF Chinook numbers in Lower Granite reservoir was highest in October and decreased over the fall and winter with the lowest abundance in February. With the opposite trend in the lower reservoirs, low numbers in fall, increasing through the winter, indicating that reservoir-type juvenile SRF Chinook move downstream out of the action area before and during the proposed work window (December 15 to March 1). Tiffan and Connor (2012) also found that only 3 percent of the juveniles they found in the winter (November through March) in Lower Granite reservoir were in water less than 20 feet deep and only 7 percent were within 80 feet of shore for short times (less than an hour). Low densities of ESA-listed salmonids are likely to be present in the action area during dredging. Fish are likely to be transitory in the dredging zone, and the limited area of dredging lowers the likelihood of fish entrainment. Therefore, few overwintering juvenile Chinook are expected to be near the dredging operations that will be in waters less than 20 feet deep.

4.2.2.5 Ongoing Monitoring

Passage of adult and juvenile Chinook salmon is monitored at the Snake River dams. There are also several other monitoring programs by other Federal, state and tribal organizations throughout the watershed. Fish numbers are posted on the fish passage center's website (FPC 2012). Recently there have been significantly higher numbers of fall Chinook since prior to 1975. Use of shallow water habitat by juvenile fall Chinook has been ongoing for several years as part assessing placement of dredge materials for creation of shallow water habitat (Gottfried et al. 2011, Artzen et al 2012; Tiffan and Connor 2012). Based on recent monitoring by Tiffan and Hatten (2012) estimating subyearling fall Chinook habitat in Lower Granite reservoir, suggests that deposition of dredge spoils at RM 116 will increase the amount of available rearing habitat in the lower Snake River. As part of the proposed action, monitoring will continue in the future to assess whether juvenile fall Chinook utilize the disposal site as expected.

4.2.3 SR Sockeye

4.2.3.1 Listing History

NMFS listed SR sockeye salmon as endangered on April 22, 1992 (57 FR 14653) and their threatened status was reaffirmed on June 28, 2005 (70 FR 37160). The SR sockeye salmon species includes all anadromous and residual sockeye salmon from the Snake River basin, Idaho, as well as artificially –propagated sockeye salmon from the Redfish Lake captive broodstock program (NMFS 2005).

4.2.3.2 Life History/Biological Requirements

Overall age of maturity in sockeye salmon ranges from 3 to 8 years. Male sockeye salmon are capable of maturing at any of 22 different combinations of freshwater and ocean ages, while female sockeye salmon may mature at any of 14 different age compositions (Healey 1986, 1987). Kokanee generally mature after either 2, 3, or 4 years in fresh water. For a given fish size, female sockeye salmon have the highest fecundity and the smallest egg size among the Pacific salmon (Burgner 1991). Average fecundity across the range of sockeye salmon is from 2,000 to 5,200 and from about 300 to slightly less than 2,000 for kokanee (Burgner 1991, Manzer and Miki 1985). Emerging fry possess heritable rheotactic and directional responses that allow fry from outlet tributaries to move upstream and fry from inlet tributaries to move downstream, in order to reach the nursery lake habitat (Raleigh 1967, Brannon 1972, Burgner 1991). Adult body size may also be affected by variations in stock abundance. Based on fishery catch data, which tends to select for larger fish than are present in the total run, Columbia River sockeye salmon average about 1.58 kg after two winters at sea (Gustafson et al. 1997).

4.2.3.3 Distribution

Anadromous sockeye were once abundant in a variety of lakes throughout the Snake River Basin, including Alturas, Pettit, Redfish, Stanley, and Yellowbelly Lakes in the Sawtooth Valley; as well as Wallowa, Payette, and Warm Lakes. However, the only remaining population resides in Redfish Lake.

Federally-listed Snake River sockeye salmon are known to occur in the project area. The lower Snake River corridor is designated as critical habitat for migration of wild SR sockeye salmon. Critical habitat for rearing or overwintering for Snake River sockeye salmon is not present in the lower Snake River corridor. The components of the migration corridor and run timing of designated critical habitat for juvenile and adult migration passage are present between mid-March and mid-June. No spawning habitat for sockeye salmon is present in the project area.

See Figure 11 for distribution.

4.2.3.4 Local Empirical Information

Snake River sockeye adults and juveniles can be found in the Columbia, Snake and Salmon Rivers. Adult and juvenile wild Snake River sockeye salmon are not expected to be present in the mainstem Snake or Clearwater Rivers between mid-December and February. Wild Snake River juvenile sockeye salmon generally migrate downriver during April and May, and wild adult sockeye salmon are not typically counted at Ice Harbor Dam before June or after October (Corps Annual Fish Passage Reports, 1980-2011). During sampling in May and June 2002, Bennett et al. (2003) found 21 and 14 juvenile sockeye salmon rearing along shallow-water shorelines in the Lower Granite and Little Goose reservoirs, respectively. Similarly, Artzen et al. (2012) found up to 22 juvenile sockeye at shallow water sample sites in Little Goose and Lower Granite reservoirs from April to July 2011.

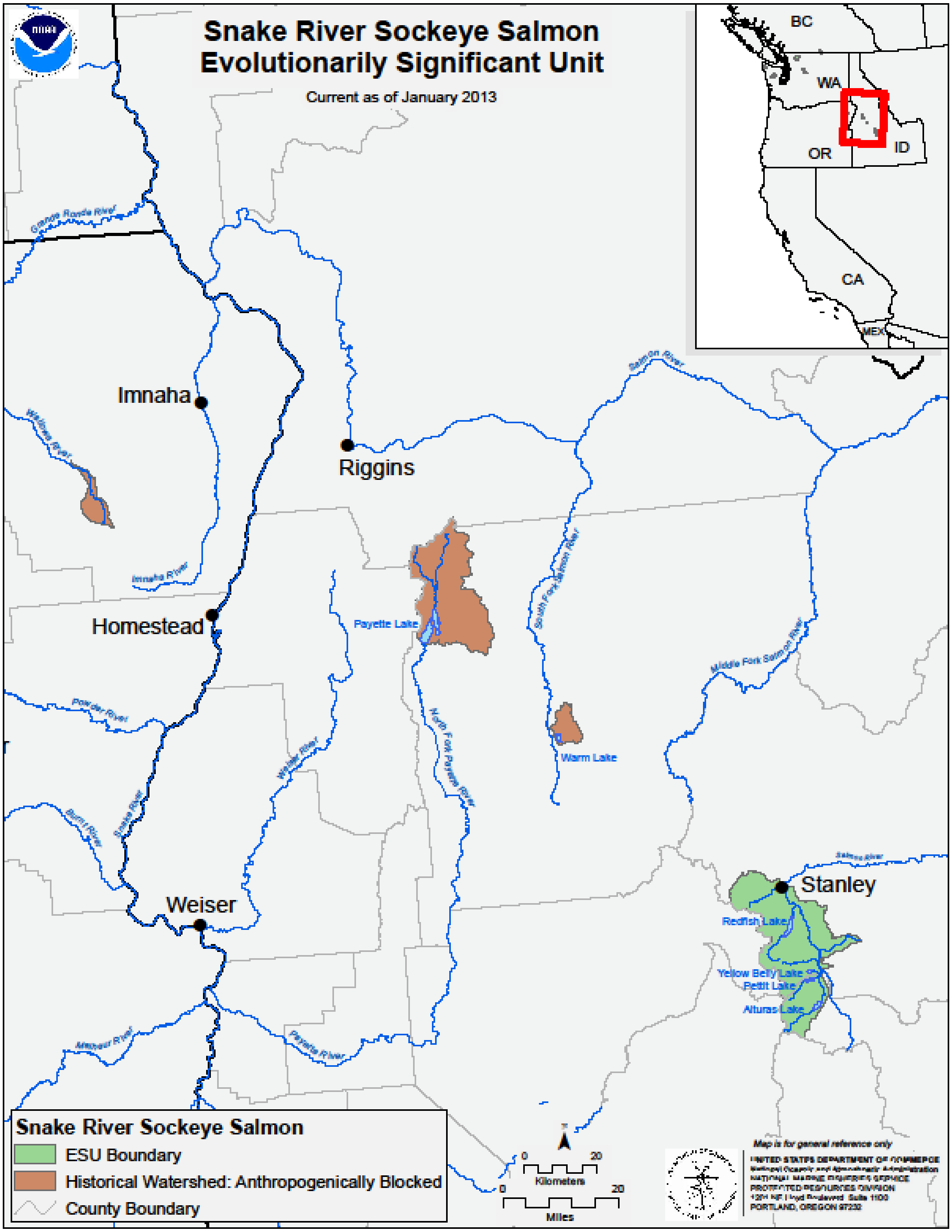
The Snake River sockeye salmon ESU currently consists of Redfish Lake stock in the captive broodstock program at Eagle and Beef Creek hatcheries, and the hatchery fish released from this program into Redfish Lake, Pettit Lake, Pettit Creek and Redfish Lake Creek; wild residual sockeye in Redfish Lake and their out-migrating progeny; any naturally-spawned progeny of broodstock adults released into Redfish Lake; and any adults returning to Redfish or Pettit Lake.

The population of Snake River sockeye salmon is extremely low, but has shown a substantial increase recently. Since 1962, the highest count of adults at Ice Harbor dam was 1,302 in 2010. Zero adults were counted at Ice Harbor dam in 1994 (this may be somewhat misleading since in 1994, six were counted at Lower Monumental, 44 at Little Goose and 5 at Lower Granite, all of which are located upstream from Ice Harbor). The latest 10-year average (2004-2013) is 540. The previous 10-year (1994-2003) average was 38 (FPC 2012).

4.2.3.5 Ongoing Monitoring

Snake River sockeye salmon are counted at the Corps' Snake River dams. Adults are counted as they move up through the ladders. Juveniles are sampled from the juvenile bypass systems and abundance estimates are made. Additional monitoring takes place in and near the lakes where sockeye spawn and rear.

Figure 11. SR Sockeye Distribution



4.2.4 SRB Steelhead

4.2.4.1 Listing History

SRB steelhead was listed as threatened on August 18, 1997 (62 FR 43937) and protective regulations were issued under section 4(d) of the ESA on July 10, 2000 (65 FR 42422). Their threatened status was reaffirmed on June 28, 2005 (70 FR 37160). The DPS includes all naturally spawned steelhead populations below natural and manmade impassable barriers in streams in the SRB of southeast Washington, northeast Oregon, and Idaho, as well as six artificial propagation programs: the Tucannon River, Dworshak NFH, Lolo Creek, North Fork Clearwater River, East Fork Salmon River, and the Little Sheep Creek/Imnaha River Hatchery steelhead hatchery programs.

4.2.4.2 Life History/Biological Requirements

The Interior Columbia Basin Technical Recovery Team (ICBTRT 2003) identified six major population groups in the DPS: (1) The Grande Ronde River system, (2) the Imnaha River drainage, (3) the Clearwater River drainage, (4) the Salmon River, (5) Hells Canyon, and (6) the lower Snake. The SR historically supported more than 55% of total natural-origin production of steelhead in the Columbia River Basin. It now has approximately 63% of the basin's natural production potential.

SRB steelhead migrate a substantial distance from the ocean (up to 940 miles) and use high elevation tributaries (up to 6,562 feet above sea level) for spawning and juvenile rearing. SR steelhead occupy habitat that is considerably warmer and drier (on an annual basis) than other steelhead distinct population segments (DPSs). Managers classify up-river summer steelhead runs into two groups based primarily on ocean age and adult size upon return to the Columbia River. A-run steelhead are predominately age-1-ocean fish while B-run steelhead are larger, predominated by age-2-ocean fish. SRB steelhead are generally classified as summer run, based on their adult run timing pattern. SRB steelhead enter fresh water from June to October, and, after holding over the winter, spawn during the following spring from March to May. SRB steelhead usually smolt as 2- or 3-year-olds. Outmigration occurs during the spring and early summer periods, coinciding with snowmelt in the upper drainages. Median and 90% passage dates at Lower Granite Dam for PIT tagged groups from the Imnaha River were: wild steelhead trout - May 2 and May 9; and hatchery steelhead trout (NPT and FPC) - May 31 and June 16. Hatchery steelhead trout displayed small peaks in arrival timing at Lower Granite and Little Goose Dams in mid-May to mid-June; however, the general trend at each dam was a long protracted emigration (Blenden et al. 1996).

A-run populations are found in the tributaries to the lower Clearwater River, the upper Salmon River and its tributaries, the lower Salmon River and its tributaries, the Grand Ronde River, Imnaha River, and possibly the SR's mainstem tributaries below Hells Canyon Dam. B-run steelhead occupy four major subbasins, including two on the Clearwater River (Lochsa and Selway) and two on the Salmon River (Middle Fork and South Fork Salmon); areas that are for the most part not occupied by A-run steelhead. Some natural B-run steelhead are also produced in parts of the mainstem Clearwater and its major tributaries. There are alternative escapement objectives of 10,000 (Columbia River Fisheries Management Plan) and 31,400 (Idaho) for B-run steelhead. B-run steelhead, therefore, represent at least one-third and as much as three-fifths of the production capacity of the DPS.

Steelhead adult migration preferred temperatures are between approximately 39.2 and 48.2°F (4 and 9°C) (Bell 1990). Steelhead preferred temperatures fall between 50 and 55.4°F (10 and 13°C), while the upper lethal limit for steelhead is 75°F (23.9 °C) (Spence et al. 1996).

With one exception (the Tucannon River production area), the tributary habitat used by Snake River steelhead DPS is above Lower Granite Dam. Annual return estimates are limited to counts of the aggregate return over Lower Granite Dam. Returns to Lower Granite Dam fluctuated widely in the 1980s and remained at relatively low levels through the 1990s. The 2001 run size at Lower Granite Dam was substantially higher relative to the 1990s. The 2002 through 2005 return years declined annually but continued to remain higher than the 1990s return years. Counts of wild steelhead passing over Lower Granite Dam, which began in 1994, show a marked increase in 2001, then a decreasing trend through 2006, followed by a small increase since that time reaching a peak of 76,161 in 2009 (FPC 2012).

4.2.4.3 Distribution

The SRB steelhead DPS is distributed throughout the Snake River drainage system, including tributaries in southwest Washington, eastern Oregon and north/central Idaho (Good et al. 2005). SRB steelhead no longer occur above Dworshak Dam. The ICBTRT (2007) identified 26 populations in the following six major population groups (MPGs) for this species: Clearwater River, Grande Ronde River, Hells Canyon, Imnaha River, Lower Snake River, and Salmon River. The North Fork population in the Clearwater River is extirpated. The ICBTRT noted that SRB steelhead remain spatially well distributed in each of the six major geographic areas in the basin (Good et al. 2005). Environmental conditions are generally drier and warmer in these areas than in areas occupied by other steelhead species in the Pacific Northwest. SRB steelhead were blocked from portions of the upper Snake River beginning in the late 1800s and culminating with the construction of Hells Canyon Dam in the 1960s.

A-run populations are found in the tributaries to the lower Clearwater River, the upper Salmon River and its tributaries, the lower Salmon River and its tributaries, the Grand Ronde River, Imnaha River, and possibly the Snake River's mainstem tributaries below Hells Canyon Dam. B-run steelhead occupy four major subbasins, including two on the Clearwater River (Lochsa and Selway) and two on the Salmon River (Middle Fork and South Fork Salmon); areas that are for the most part not occupied by A-run steelhead. Some natural B-run steelhead are also produced in parts of the mainstem Clearwater and its major tributaries.

SRB steelhead are not known to spawn in the impounded reaches of the Snake River, but it is possible that some juveniles overwinter or rear there for short periods. Adult steelhead hold in the mainstem Snake and Columbia Rivers for extended periods (months) prior to spawning and some are likely to be in the action area during the proposed work window (Bjornn et al. 2000).

See Figure 12 for distribution.

4.2.4.4 Local Empirical Information

Very little information is documented on near-shore habitat use by juvenile steelhead in the main stem Columbia and Snake Rivers. Juvenile steelhead are thought to utilize the deeper, higher velocity areas away from the shoreline to migrate. They could potentially use the shoreline area during the winter and spring for rearing.

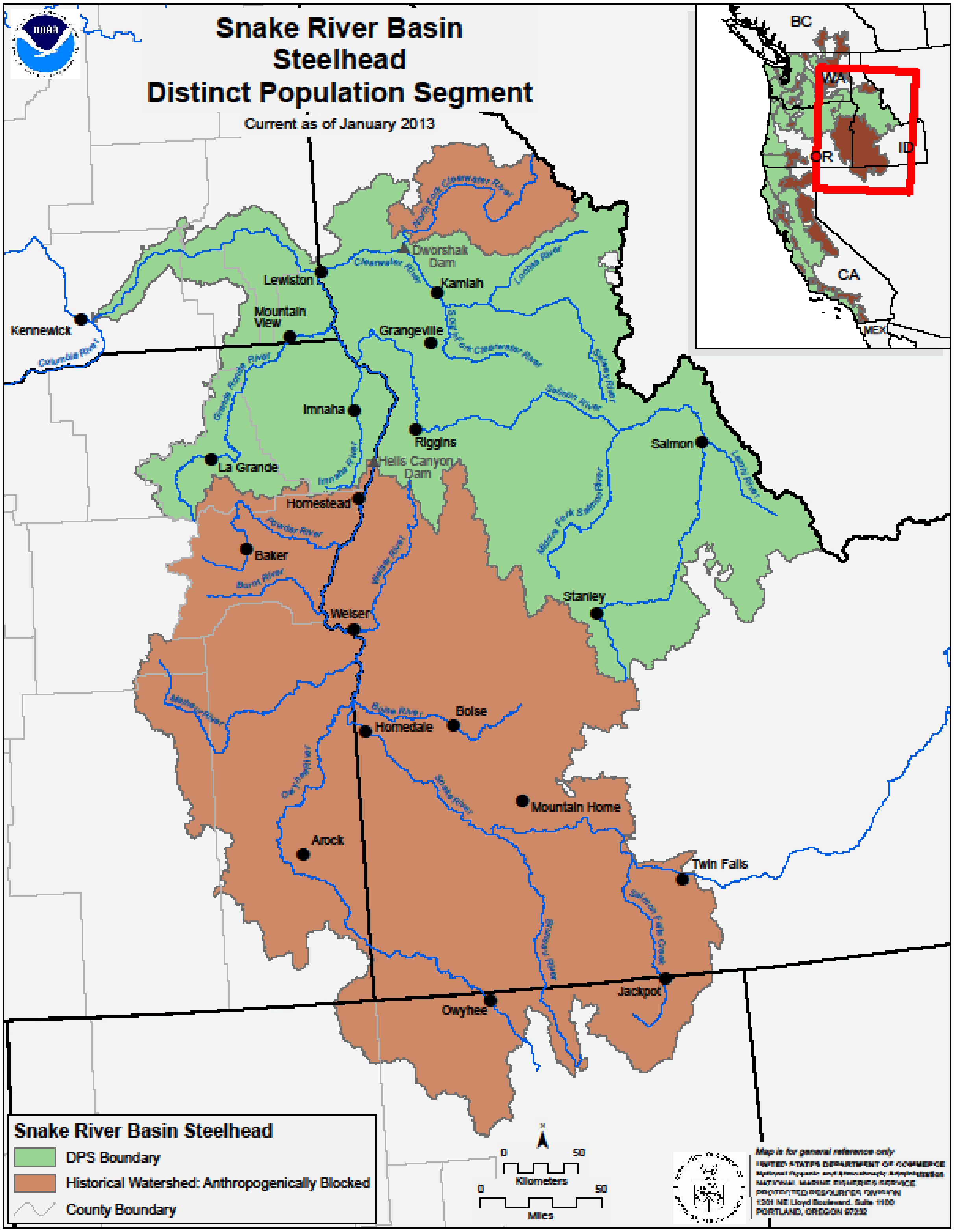
Most wild adult steelhead typically migrate through the reach between June and August for the A-run and between late August and November for the B-run. Adults from this stock may be migrating in deeper water or individuals may be holding in mid-channel areas prior to moving upriver into tributaries for spawning in early spring. Adult wild steelhead numbers passing over Ice Harbor Dam have generally increased over the last 15 years. The latest 10 year average is 45,812. The previous 7 year average (data isn't available for a 10 year average) was 19,066 (FPC 2012).

Wild juvenile SRB steelhead generally migrate downstream through the lower Snake River, mainly between late March and the end of August. Some rearing or overwintering may occur in the reservoirs.

4.2.4.5 Ongoing Monitoring

Passage of adult and juvenile steelhead is monitored at the Snake River dams. There are also several other monitoring programs by other federal, state and tribal organizations throughout the watershed.

Figure 12. SR Steelhead Distribution



4.2.5 MCR Steelhead

4.2.5.1 Listing History

MCR steelhead were listed as threatened under the ESA on March 25, 1999 (64 FR 14517), and confirmed as threatened on January 5, 2006 (71 FR 834). Protective regulations for MCR steelhead were issued under section 4(d) of the ESA on June 28, 2005 (70 FR 37160). The spawning range of the MCR steelhead DPS extends over an area of approximately 35,000 square miles in the Columbia plateau of eastern Washington and eastern Oregon. MCR steelhead include all naturally-spawning populations of steelhead in streams within the Columbia River basin from above the Wind River in Washington and the Hood River in Oregon (exclusive) upstream to, and including, the Yakima River in Washington, and excluding steelhead from the Snake River basin (64 FR 14517, March 25, 1999). MCR steelhead, as defined, do not include the resident form of *O. mykiss* (rainbow trout) co-occurring with these steelhead.

4.2.5.2 Life History/Biological Requirements

Life history characteristics for MCR steelhead are similar to those of other inland steelhead DPSs. Most fish smolt at two years and spend one to two years in salt water before re-entering freshwater, where they may remain up to a year before spawning (Howell et al. 1985). All steelhead upstream of The Dalles Dam are summer-run (Reisenbichler et al. 1992) fish that enter the Columbia River from June to August. Adult steelhead ascend mainstem rivers and their tributaries throughout the winter, spawning in the late winter and early spring. Fry emergence typically occurs between May and mid-July.

4.2.5.3 Distribution

MCR steelhead use Lake Wallula (McNary Project) for migration only (NOAA 2005). MCR steelhead could stray up to the Ice Harbor navigation lock approach, but if they enter the Snake River, ESA projection is provided by the coverage for SRSS Chinook and steelhead. Straying would be unpredictable and presumably in very low numbers. Because of this, effects are discountable, and warrant a ***"not likely to adversely affect"*** determination.

4.2.6 UCR Spring Chinook

4.2.6.1 Listing History

UCR spring Chinook were listed as endangered under the ESA on March 24, 1999 (64 FR 14308), and their status was reaffirmed on June 28, 2005 (70 FR 37160). This evolutionarily significant unit (ESU) includes all naturally spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. The ESU also includes six artificial propagation programs: the Twisp River, Chewuch River, Methow Composite, Winthrop National Fish Hatchery (NFH), Chiwawa River, and White River spring-run Chinook salmon hatchery programs. The Interior Columbia Basin Technical Recovery Team

(ICBTRT) has identified three populations in one major population group (Eastern Cascades) for this species. A historic population in the Okanogan River has been extirpated (ICBTRT 2005). Spatial structure and genetic diversity of this ESU are not sufficient to support viability.

4.2.6.2 Life History/Biological Requirements

UCR spring-run Chinook salmon exhibit classic stream-type life-history strategies. They emigrate from freshwater as yearling smolts in the spring and undertake extensive offshore ocean migrations. Most of these fish return to the Columbia River from March through mid-May as four-year olds. Spawning occurs in tributaries in August through September.

4.2.6.3 Distribution

UCR spring Chinook salmon use the portion of the Columbia River in the District as a migration corridor. UCR spring Chinook do not occur upstream of Ice Harbor Dam. Lake Wallula (McNary Project) is used for migration only (NOAA 2005). UCR spring Chinook salmon could stray up to the Ice Harbor navigation lock approach, but if they enter the Snake River, ESA projection is provided by the coverage for SRSS Chinook and steelhead. Straying would be unpredictable and presumably in very low numbers. Because of this, effects are discountable, and warrant a “not likely to adversely affect” determination.

4.2.7 UCR Steelhead

4.2.7.1 Listing History

UCR steelhead were listed as endangered on August 18, 1997 (62 FR 43937), and their status was upgraded to threatened on January 5, 2006 (71 FR 834). They were then reinstated as endangered status per a decision in U.S. Court on June 13, 2007 (Trout Unlimited *et al.* v. Lohn, No. CV06-0483-JCC). Their status was upgraded to threatened per U.S. District Court order on June 18, 2009. This DPS includes all naturally spawned anadromous steelhead populations below natural and manmade impassable barriers in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S.-Canada border, including six artificial propagation programs: the Wenatchee River, Wells Hatchery (in the Methow and Okanogan Rivers), Winthrop National Fish Hatchery (NFH), Omak Creek, and the Ringold steelhead hatchery programs. The ICBTRT has identified five populations within this DPS: the Wenatchee River, Entiat River, Methow River, Okanogan Basin, and Crab Creek (ICBTRT 2005). The Crab Creek anadromous component is functionally extirpated (ICBTRT 2007).

4.2.7.2 Life History/Biological Requirements

Life history characteristics for UCR steelhead are similar to those of other inland steelhead DPSs. However, smolt age is dominated by two- and three-year-olds and some of the oldest smolt ages for steelhead, up to seven years, are reported from this DPS. Based on limited data, steelhead from the Wenatchee and Entiat rivers return to freshwater after one year in salt water, whereas Methow River steelhead primarily return after two years in salt water. Similar to other inland Columbia River basin steelhead DPSs, adults typically return to the Columbia River between May and October and are considered summer-run steelhead. Adults may remain in freshwater up to a year before spawning. Most adult UCR steelhead quickly migrate up the mainstem to their natal tributaries. A portion of the returning run overwinters in the mainstem reservoirs, passing over the upper Mid-Columbia River dams in April and May of the following year. Unlike Chinook or sockeye salmon, steelhead adults attempt to migrate back to the ocean after spawning. These fish are known as kelts, and those that survive will migrate from the ocean to spawn again.

4.2.7.3 Distribution

Lake Wallula (McNary Project) is used for migration only (NOAA 2005). UCR steelhead could stray up to the Ice Harbor navigation lock approach, but if they enter the Snake River, ESA projection is provided by the coverage for SRSS Chinook and steelhead. Straying would be unpredictable and presumably in very low numbers. Because of this, effects are discountable, and warrant a ***"not likely to adversely affect"*** determination.

4.2.8 Bull Trout

4.2.8.1 Listing History

The USFWS issued a final rule listing the Columbia River population of bull trout as a threatened species on June 10, 1998 (63 FR 31647). Bull trout are currently listed throughout their range in the coterminous United States as a threatened species. Bull trout critical habitat was designated in September 2005. The designation was revised in October 2010. The revised designation includes the mainstem Columbia and Snake Rivers.

4.2.8.2 Life History/Biological Requirements

Individual bull trout may exhibit resident or migratory life history strategies. Resident bull trout carry out their entire life cycle in the stream in which they spawn and rear. Migratory bull trout spawn in tributary streams, but eventually travel to larger streams (or lakes) where they mature. Habitat components that appear to influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrates and migratory corridors (with resting habitat). All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders and deep pools.

Bull trout normally reach maturity in four to seven years and may live as long as twelve years. They generally spawn from August to November during periods of decreasing water temperatures. Migratory bull trout may travel over one hundred miles to their spawning grounds. Egg incubation is normally 100 to 145 days and fry remain in the substrate for several months.

Bull trout are opportunistic feeders. Their diet requirements vary depending on their size and life history strategy. Resident and juvenile bull trout prey on insects, zooplankton and small fish. Adult migratory bull trout mainly eat other fish.

4.2.8.3 Distribution

In the Columbia River Basin, bull trout historically were found in about 60% of the basin. They now occur in less than half of their historic range. Populations remain in portions of Oregon, Washington, Idaho, Montana, and Nevada. Bull trout are distributed throughout most of the large rivers and associated tributary systems within the Columbia River Recovery Unit. Wydoski and Whitney (2003) indicate that all four life history types of bull trout (anadromous, adfluvial, fluvial, and resident) require water temperatures below 15°C (59° F). They also note bull trout are occasionally collected in the tailraces of Priest Rapids and Wanapum Dams on the mainstem Columbia River. In Idaho, bull trout were found at elevations from 2,000 to 3,800 feet in elevation with gradients ranging from 1.9 to 8.3% (Wydoski and Whitney 2003).

Fish passage at all of the Corps Projects is monitored. Any bull trout observations are recorded, though only a few, if any, are generally seen in any year. Table 13 shows adult bull trout observations between 2008 and 2011 at the Columbia and Snake River Corps Projects.

Table 13. Bull Trout Fish Ladder Counts for Corps Dams in Snake and Columbia Rivers in the Action Area[14],[15]

Ladder	Totals (number of individuals)			
	2011	2010	2009	2008
McNary Oregon shore fish ladder at McNary Dam	0	0	0	0
McNary Washington shore fish ladder at McNary Dam	0	0	0	0
Ice Harbor South fish ladder at Ice Harbor Dam	3	0	0	0
Ice Harbor North fish ladder at Ice Harbor Dam	0	0	0	0
Lower Monumental South fish ladder at Lower Monumental Dam	0	0	0	0
Lower Monumental North fish ladder at Lower Monumental Dam	47	12	5	2
Little Goose Dam (one fish ladder)	161	73	37	27
Lower Granite Dam (one fish ladder)	1	8	6	8

[14] Originally obtained from the Portland District website, and included in the District's terrestrial Pest management Program BA.
[15] Current fish passage data can be obtained at:
http://www.nwp.usace.army.mil/Missions/Environment/Fish/Data.aspx

Table 13 (continued)

Dam Facilities	Total Number of Bull Trout Recorded by Year								Total	Average
	2006	2007	2008	2009	2010	2011	2012	2013		
Ice Harbor	0	0	0	0	0	3	0	1	4	1
Lower Monumental	2	4	2	5	12	47	27	26	125	14
Little Goose	3	6	27	37	73	161	42	64	413	50
Lower Granite	2	8	8	6	8	1	2	0	35	5
Total	7	18	37	48	93	222	63	91	579	72

Anglin et al. (2010) estimated a total of 192 bull trout emigrated from the Walla Walla Basin to the Columbia River from November 2007 through December 2009. They estimated that 36 PIT tagged bull trout entered the Columbia from the Walla Walla in 2009. However, over the duration of their 2009 study, only one bull trout was detected, in June, returning to the Walla Walla River from the Columbia River. Four Walla Walla Basin bull trout were detected at mainstem Columbia River dams over the duration of the study. Detections at the juvenile facilities at John Day and McNary dams indicated two of these bull trout were moving downstream. Detections in the adult ladders at McNary and Priest Rapids dams indicated two of these bull trout were moving upstream (Anglin et al. 2010). Two additional bull trout were detected returning to the Walla Walla from the Columbia River in mid-April 2010.

Anglin et al. (2010) also indicate bull trout dispersed into the mainstem Columbia River from the Walla Walla Basin, and at times, this dispersal included a relatively long migration. One bull trout moved 130 river kilometers (rkm) upstream and was detected at Priest Rapids Dam, and another moved 162 rkm downstream to John Day Dam (Anglin et al. 2010).

The timing of migratory bull trout movement from the Walla Walla River to the Columbia River varies from year to year, but generally occurs between October and May, peaking between December and February (Anglin et al. 2010). Adult bull trout migrating from the Columbia River might initiate upstream movement in April (R. Koch, personal communication, August 30, 2010).

Faler et al. (2008) report that bull trout in the Tucannon River, upstream of Lower Monumental Dam, migrated upstream in spring and early summer to the spawning areas in upper portions of the Tucannon River watershed. The fish in their study quickly moved off the spawning areas in the fall, and either held or continued a slower migration downstream until March or April. By June 1, most bull trout had ascended the Tucannon River. During late fall and winter, bull trout were distributed in the lower half of the Tucannon River basin, down to and including the mainstem Snake River below Little Goose Dam.

They observed bull trout migrations into the Lower Monumental reservoir area influenced by the lower Tucannon River and/or the Snake River for 6 individuals. Two of the fish never returned to the Tucannon River. One individual made multiple movements to and from the reservoir near the mouth of the Tucannon, but it spent much of the winter within the reservoir influence area of the Tucannon River (Faler 2008).

Two Tucannon PIT tags have also been detected outside of the reservoir. One by NMFS personnel conducting Avian Predation Study efforts on a Columbia River island in 2002, and the other in the Catherine Creek (tributary to the Grande Ronde River) acclimation pond in 2003 (Faler 2008).

Based on the Anglin et al. studies (ongoing), and the Faler et al. studies, it is clear that some individual bull trout migrate out of their natal streams and into the mainstem Columbia and Snake Rivers. Clearly actual abundance and amount of usage by bull trout during migration and overwintering is not yet known in reservoirs behind Corps operated dams, but given the evidence, the number of migratory bull trout using the action area is extremely low relative to other salmonids.

There have been several observations of adult bull trout passing Lower Monumental and Little Goose dams. From 1994 to 1996, 27 bull trout passed the adult fish counting station (mainly in April and May) at Little Goose. At least six bull trout passed counters at Lower Monumental and Little Goose in 1990 and 1992 (Kleist 1993). Kleist also observed one bull trout in 1993 just downstream of the count window at Lower Monumental. One bull trout was captured in the Palouse River below Palouse Falls in 1998. These were likely migratory fish from the Tucannon River; however, one bull trout was observed at Lower Granite in 1998 that may indicate fluvial fish are migrating to other upstream populations. Incidental collection of bull trout at lower Snake River dams in juvenile bypass facilities, observations of bull trout within adult fish ladders (Battelle 2004, Bretz 2011), and radio telemetry and PIT tag studies (Faler et al. 2003, 2004, 2005, 2006, 2007; Bretz 2008, 2009) have shown that migratory adults from the Tucannon River utilize the mainstem Snake River as overwintering habitat and as a migratory corridor (Bretz 2011; DeHaan and Bretz 2012). Although bull trout have been observed at these dams, the extent to which FCRPS operations alter the migratory patterns of bull trout or impede passage and the origins of the fish observed at the Snake River dams are relatively unknown. The results of DeHaan and Bretz (2012) suggest that migratory bull trout originating from the tributaries such as the Tucannon and Imnaha Rivers are utilizing the fish facilities at Little Goose Dam.

During recent sampling of shallow water habitats in the Lower Snake River reservoirs, single bull trout have been collected some years at a sampling site in the Lower Tucannon River (Seybold and Bennett 2010, Artzen et al. 2012). Researchers speculated this sampling was probably not indicative of widespread bull trout use of the Lower Snake River reservoirs; instead, it is potentially indicative of an adfluvial life history strategy (Seybold and Bennett 2010). During sampling and tracking of bull trout in the lower Tucannon River between the fall of 2005 and spring of 2009, Bretz (2010) estimated a minimum proportion of 6-29% of PIT-tagged bull trout migrated between the Tucannon River and the mainstem Snake River within a single migratory year. Evaluation of PIT-tag passage data in the Tucannon River by Bretz (2010) indicates bull trout are in the reservoir influence zone during October, November and December with juvenile and adult outmigrating occurring between October and February; which supports the time frame of outmigration established by Faler et al. (2008) who observed the distribution of bull trout in the lower Tucannon River and the mainstem Snake River during the late fall and winter months. The detections within the months of March through June are adults returning to the Tucannon River to spawn. A single bull trout was detected leaving the Tucannon River in May 2010 and subsequently detected at Little Goose Dam, both in the Full Flow Bypass and the Adult Fish Return (Bretz 2011).

Foraging, migrating, and over-wintering bull trout are most likely to be present in the lower Snake River reservoirs from November through May (Corps 1999). Studies have also documented bull trout originating from local populations in the upper Clearwater River watershed migrating downstream as far as Lewiston, Idaho (USFWS 2008, p. 33), which is at the upper end of the action area just above the confluence of the Snake and Clearwater Rivers. The mainstem of the lower Clearwater River provides potential connectivity of these local populations to occupied areas within the broader region of the Snake and Columbia Rivers (USFWS DRAFT BO).

Relative to other salmonids, very few bull trout occur within the lower Snake and Clearwater Rivers and little is known about their specific movements and habitat use patterns while in the mainstems of these rivers. The available information indicates that a relatively small number of bull trout may occur in the action area and that these fish likely represent occasional migrants traveling among the major tributaries within the broader Snake, Clearwater, and Columbia River Systems.

4.2.8.4 Local Empirical Information

The few remaining bull trout strongholds in the Columbia River basin tend to be found in large areas of contiguous habitats in the Snake River basin of the central Idaho mountains, upper Clark Fork and Flathead Rivers in Montana, and several streams in the Blue Mountains in Washington and Oregon. Populations also exist in the Yakima River watershed. Very little is known about the number of bull trout within the mainstem, lower Snake River. The number is presumed to be very low.

4.2.8.5 Ongoing Monitoring

Fish passage, including bull trout, at the lower Snake River dams is monitored. Any bull trout observations are recorded, though only a few, if any, are generally seen in any year. However, fish counting does not occur during winter when bull trout are most likely to be present. The USFWS operates a PIT tag detector on the lower Walla Walla River which has detected some bull trout leaving and returning to the Walla Walla River. They also operate a smolt trap on the Walla Walla River in conjunction with the Confederated Tribes of the Umatilla Indian Reservation.

4.2.9 Pygmy Rabbit

4.2.9.1 Listing History

The Columbia Basin distinct population segment of the pygmy rabbit (*Brachylagus idahoensis*) was listed as an endangered species by USFWS under an emergency regulation in 2001. The official status of the pygmy rabbit is 'Endangered' in Washington State only. It was extirpated from the wild in Washington by 2004. The species was confirmed listed as endangered on March 5, 2003, without designation of critical habitat.

4.2.9.2 Life History/Biological Requirements

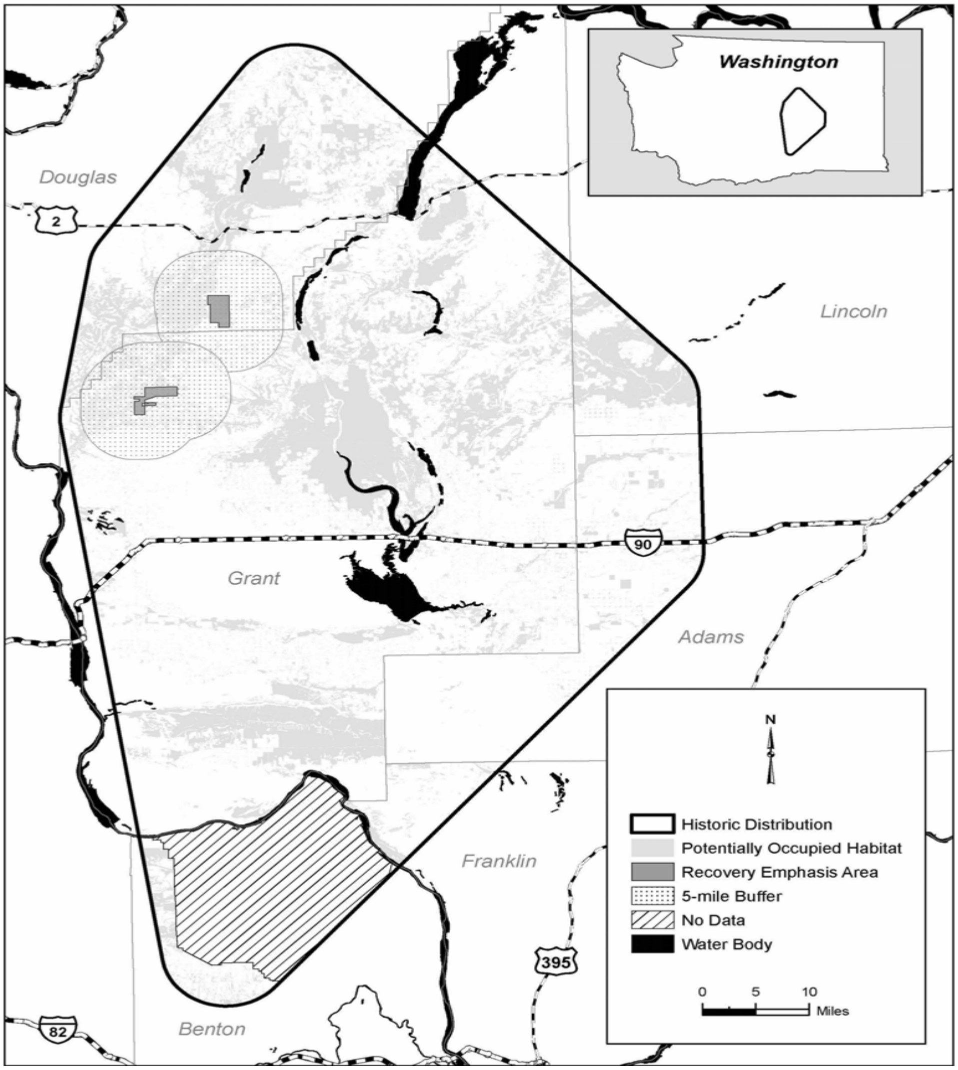
Pygmy rabbits occur in the semiarid shrub steppe biome of the Columbia Basin, Great Basin, and adjacent intermountain regions of the western United States. Within this broad biome, pygmy rabbits are typically found in habitat types that include tall, dense stands of sagebrush (Artemesia spp.), upon which they are highly dependent on for food and shelter throughout the year. The pygmy rabbit is one of only two rabbit species in North America that digs its own burrows and, therefore, is most often found in areas that also include relatively deep, loose soils that allow burrowing (USFWS 2007).

4.2.9.3 Distribution

There are no known pygmy rabbit populations in the action area. Washington distribution can be seen in Figure 13, and shows the historic distribution occurring outside (north and west) of Corps managed lands in the McNary Project area. Pygmy rabbits are known, or believed, to occur in Benton and Franklin counties, Washington. Currently, pygmy rabbits are known to survive in five isolated fragments of suitable habitat in Douglas County. The pygmy rabbit historical range includes portions of the following states: California, Oregon, Nevada, Idaho, Montana, Wyoming, Utah, and Washington[16].

[16] http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A0GG#recovery

Figure 13. Historic Distribution of the Columbia Basin Pygmy Rabbit, Potentially Occupied Habitat, and Recovery Emphasis Areas with 5-mile Buffers (USFWS 2007)



4.2.9.4 Local Empirical Information

Because of their habitat requirements, pygmy rabbits are not anticipated to occur in the action area. Geospatial data obtained from Washington Department of Fish and Wildlife (WDFW 2013) and the Idaho Conservation Data Center (IDFG 2008) indicate that the species has not been observed in the action area. The closest known occurrence to the action area was a single observation approximately 17 miles outside the action area in Whitman County (WDFW 2013). Therefore, the proposed action will have no effect on the species, and any further analysis of potential effects is not warranted.

4.2.10 Canada Lynx

4.2.10.1 Listing History

The Canada lynx was listed as a threatened species in 2000. In 2003, in response to a court order to reconsider the listing, USFWS clarified their final listing decision. Due to a lack of data, the historic and current status of resident lynx populations in Oregon is uncertain.

4.2.10.2 Life History/Biological Requirements

Canada lynx are medium-sized cats, generally measuring 75-90 centimeters long (30-35 inches) and weighing 8-10.5 kilograms (18-23 pounds). Canada lynx are smaller than the European lynx with a shorter tail and longer hind legs. They have large feet adapted to walking on snow, long legs, tufts on the ears, and black-tipped tails. They are highly adapted for hunting snowshoe hare, the primary prey, in the snows of the boreal forest.

Lynx in the contiguous United States are at the southern margins of a widely distributed range across Canada and Alaska. The center of the North American range is in north-central Canada. Lynx occur in mesic coniferous forests that have cold, snowy winters and provide a prey base of snowshoe hare (Ruggiero et al. 2000). These forests are generally described as boreal forests. In North America, the distribution of lynx is nearly coincident with that of snowshoe hares. Lynx survivorship, productivity, and population dynamics are closely related to snowshoe hare density in all parts of its range. A minimum density of snowshoe hares (greater than 0.5 hare per hectare (1.2 hares per acre)) distributed across a large landscape is necessary to support survival of lynx kittens and recruitment into and maintenance of a lynx population.

The southernmost extent of the boreal forest that supports lynx occurs in the contiguous United States in the Northeast, western Great Lakes, northern and southern Rockies, and northern Cascades. Here the boreal forest transitions into other vegetation communities and becomes more patchily distributed. As a result, the southern boreal forests generally support lower snowshoe hare densities, hare populations do not appear to be as highly cyclic as snowshoe hares further north, and lynx densities are lower compared to the northern boreal forest. Individual lynx maintain large home ranges (reported as generally ranging from 31 to 216 kilometers^2 (km^2), or 12-83 miles^2 (mi^2). Thus, a lynx population can only persist in a large boreal-forested landscape that contains appropriate forest types, snow depths, and high snowshoe hare densities.

4.2.10.3 Distribution

Recent observations of lynx are primarily from the Cascade Range and the Blue Mountains. Canada lynx likely have never been as abundant in the lower 48 States as they were in northern Canada and Alaska because there is less lynx and snowshoe hare habitat at the southern part of the range.

In western states, most lynx occurrences (83%) were associated with Rocky Mountain Conifer Forest, and most (77%) were within the 1,500-2,000 m (4,920-6,560 ft) elevation zone

(McKelvey et al. 2000). Primary vegetation that contributes to lynx habitat is lodgepole pine, subalpine fir, and Engelmann spruce (Aubry et al. 2000). In extreme northern Idaho, northeastern Washington, and northwestern Montana, cedar-hemlock habitat types may also be considered primary vegetation. In central Idaho, Douglas fir on moist sites at higher elevations may also be considered primary vegetation. Secondary vegetation when interspersed within subalpine forests, may also contribute to lynx habitat. These vegetation types include cool, moist Douglas fir, grand fir, western larch, and aspen forests. Dry forest types (e.g., ponderosa pine, climax lodgepole pine) do not provide lynx habitat (USACE 2006).

4.2.10.4 Local Empirical Information

Because of their habitat requirements, Canada lynx are not anticipated to occur in the action area. Geospatial data obtained from Washington Department of Fish and Wildlife (WDFW 2013) and the Idaho Conservation Data Center (IDFG 2008) indicate that the species has not been observed in proximity to the action area. Therefore, the proposed action will have no effect on the species, and any further analysis of potential effects is not warranted.

4.2.11 Gray Wolf

4.2.11.1 Listing History

The gray wolf was listed as endangered by USFWS in 1967. The USFWS's 1987 recovery plan for wolves in the Northern Rocky Mountains included reintroducing them in central Idaho in 1995 and 1996. A non-essential experimental population was established in 1994. In 2008, the Northern Rocky Mountain Distinct Population Segment (NRMDPS) population of the gray wolf was delisted. An injunction order went into effect in 2008 halting the delisting decision. In April 2009, the NRMDPS population was classified as a distinct population segment (DPS), and the ESA listing status was revised (USFWS 2010b).

The U.S. Federal District Court in Missoula, Montana, issued an order on August 5, 2010, in Defenders of Wildlife et al. v. Salazar, CV 09-77-M-DWM and Greater Yellowstone Coalition v. Salazar, CV 09-82-M-DWM, which vacated the delisting of the NRM DPS of the gray wolf. In compliance with this order, wolves are again considered endangered throughout the NRMDPS except where they are classified as experimental populations (southern Montana, Idaho south of Interstate 90, and all of Wyoming) (USFWS 2010a).

On April 15, 2011, President Obama signed the Department of Defense and Full-Year Appropriations Act, 2011. A section of that Appropriations Act directs the Secretary of the Interior to reissue within 60 days of enactment the final rule published on April 2, 2009, that identified the NRMDPS of gray wolf as a DPS and to revise the List of Endangered and Threatened Wildlife by removing most of the gray wolves in the DPS.

On May 5, 2011, the USFWS announced that they were proposing to delist the gray wolf, in accordance with the April 15, 2011 legislation, reinstating the Service's 2009 decision to delist biologically recovered gray wolf populations in the Northern Rocky Mountains. In Washington, gray wolves that occur outside of the boundaries of this DPS remain federally listed as endangered.

The USFWS announced on June 13, 2013 a proposal to remove the gray wolf (*Canis lupus*) from the List of Endangered and Threatened Wildlife. The public comment period was reopened on February 10, 2014, but additional listing information was not available at the time of the project review, and the gray wolf was considered to remain listed as Endangered. Wolves west of the centerline of Highways 395, and 78 north of Burns Junction are listed. Any wolf east of the line is part of the delisted Northern Rocky Mountain DPS, but is protected by Oregon law. Habitats surrounding the project area are very narrow bands of sagebrush/shrub/steppe habitat intermixed with urban areas along the Columbia River.

The area where wolves remain listed is outside the action area. Therefore, the proposed action will have no effect on wolves, and any further analysis of potential effects is not warranted.

4.2.12 Ute Ladies'-tresses

4.2.12.1 Listing History

Ute ladies'-tresses was listed as threatened in 1992 in its entire range. Within the area covered by this listing, this species is known to occur in Colorado, Idaho, Montana, Nebraska, Utah, Washington, and Wyoming. In 2004, USFWS contracted for a comprehensive status review of this species. A draft of this report became available in February 2005. A final draft of the status review was completed in October 2005. USFWS has determined that a petition to remove the Ute ladies'-tresses orchid from federal protection under the Endangered Species Act provides substantial biological information to indicate that removal may be warranted.

4.2.12.2 Life History/Biological Requirements

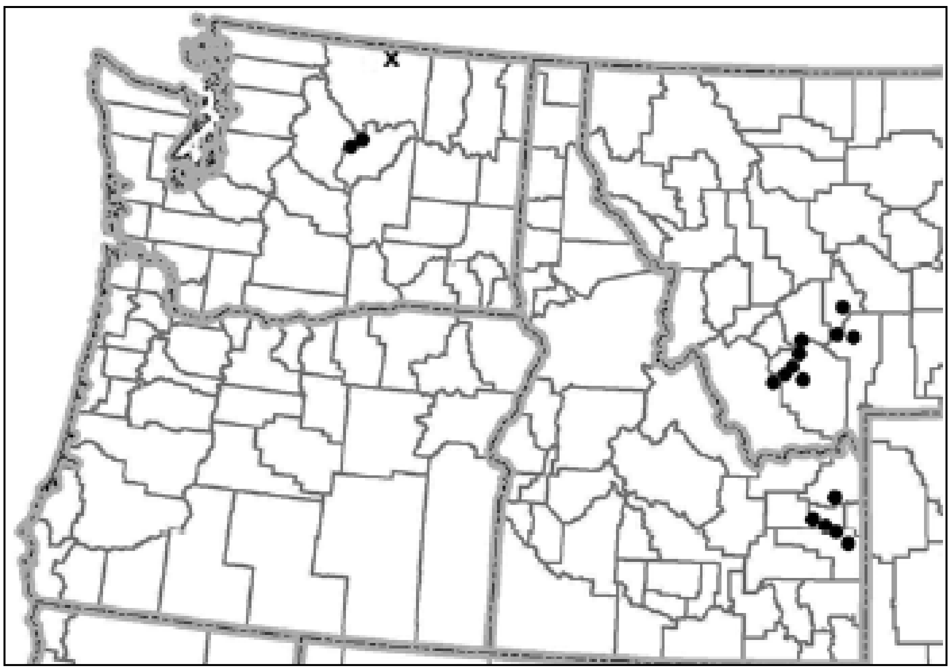
Ute-ladies'-tresses (*Spiranthes diluvialis*) is a perennial, terrestrial orchid with 7 to 32-inch stems arising from tuberous, thickened roots. The flowering stalk consists of few too many small white or ivory flowers clustered into a spiraling spike arrangement at the top of the stem. The species is characterized by whitish, stout flowers. It blooms, generally, from late July through August. The orchid occurs along riparian edges, gravel bars, old oxbows, high flow channels, and moist to wet meadows along perennial streams. It typically occurs in stable wetland and seep areas associated with old landscape features within historical floodplains of major rivers, as well as in wetlands and seeps near freshwater lakes or springs. Ute ladies'-tresses ranges in elevation from 720 to 1,830 ft in Washington to 7,000 ft in northern Utah. Nearly all occupied sites have a high water table (usually within 5 to 18 inches) of the surface augmented by seasonal flooding, snowmelt, runoff, and irrigation. States in which *Spiranthes diluvialis* is known to occur include Colorado, Idaho, Montana, Nebraska, Nevada, Utah, Washington, and Wyoming.

Since 1992, at least 26 new populations of Ute ladies'-tresses have been documented from perennial stream, river, lakeshore, and spring sites directly associated with human-developed dams, levees, reservoirs, irrigation ditches, reclaimed gravel quarries, roadside barrow pits, and irrigated meadows. In all, 33 of 61 documented populations (54%) occur in sites in which natural hydrology has been influenced by dams, reservoirs, or supplemental irrigation. Even sites with undisturbed hydrology, however, have been influenced by human agricultural practices, urban development, or road and dam construction (Fertig et al. 2005).

4.2.12.3 Distribution

Distribution of Ute ladies'-tresses is shown in Figure 14. It does not appear to occur on Corps managed lands in the District.

Figure 14. Known Distribution of Spiranthes diluvialis in Western North America circa July 2005
Extant populations are indicated by black circles, while extirpated populations are marked by an "x". Excerpted from Fertig et al. 2005.



Spiranthes diluvialis was first discovered in Washington at Wannacut Lake in Okanogan County (also in the Okanogan watershed and ecoregion) in 1997 (Bjork 1997). In 2000, the species was also found along a reservoir bordering the Columbia River near Chelan in Chelan County (Chief Joseph watershed) within the Columbia Plateau ecoregion (Fertig et al. 2005).

4.2.12.4 Local Empirical Information

There are no known local populations of Ute ladies'-tresses in the action area. This plant was not found in any of the Corps' HMU's from Lyon's Ferry (RM 59) upstream to Asotin Slough (RM 147), and upstream of the confluence of the Snake and Clearwater rivers to RM 8.2 on the Clearwater during a 2008 vascular plant survey on Corps lands in the upper Snake River (Bailey

2008a, 2008b). Additionally, geospatial data obtained from Washington National Heritage Program (WDNR 2012) and the Idaho Conservation Data Center (IDFG 2008) indicate that the species has not been observed in proximity to the action area. Therefore, the proposed action will have no effect on the species, and any further analysis of potential effects is not warranted.

4.2.13 Spalding's Catchfly

4.2.13.1 Listing History

Spalding's catchfly was listed as a threatened species on October 10, 2001. Spalding's catchfly is native to portions of Idaho, Montana, Oregon, Washington, and British Columbia, Canada. Fifty-eight percent of Spalding's catchfly populations occur either entirely or partially on private land; while the remaining 42% occur on federal lands (U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Refuges, National Park Service, and Department of Defense), state, or tribal lands.

4.2.13.2 Life History/Biological Requirements

Spalding's catchfly is an herbaceous perennial in the pink family (*Caryophyllacea*). Spalding's catchfly produce one to several vegetative or flowering stems that arise from a simple or branched persistent underground stem (caudex), which surmounts a long, narrow taproot. Plants range from 20 to 40 cm in height. Each stem typically bears 4 to 7 pairs of simple, opposite leaves that are 5 to 8 cm in length and 2 to 4 cm in width. Reproductive individuals produce 3 to 20 cream to pink or light green flowers that are borne in a branched, terminal inflorescence. All green portions of the plant (foliage, stem, and flower bracts) are covered in dense sticky hairs that frequently trap dust and arthropods, giving this species the common name 'catchfly'. Plants (both vegetative and reproductive) emerge in mid-to late May. Flowering typically occurs from mid-July through August, but may occasionally continue into October.

Rosettes are formed the first and possibly the second year, followed by the formation of vegetative stems. Aboveground 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. Spalding's catchfly was listed as threatened in 2001 and a final recovery plan for this plant was released October 15, 2007.

4.2.13.3 Distribution

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. Occupied habitat includes five physiographic (physical geographic) regions: 1) the Palouse Grasslands in west-central Idaho and southeastern Washington; 2) the Channeled Scablands in east-central Washington; 3) the Blue Mountain Basins in northeastern Oregon; 4) the Canyon Grasslands along major river systems in Idaho, Oregon, and Washington; and 5) the Intermontane Valleys of northwestern Montana and British Columbia, Canada. Plants can be found from 1,900 to 3,600 ft in elevation, growing on all aspects, but more often on north facing slopes, with a preference of deep silt-loam soils (Natureserve 2010).

4.2.13.4 Local Empirical Information

No Spalding's catchfly were found in any of the HMUs on Corps lands between Lyon's Ferry (RM 59) upstream to Asotin Slough (RM 147), or upstream of the confluence of the Snake and Clearwater rivers to RM 8.2 on the Clearwater during a 2008 vascular plant survey on Corps lands in the upper Snake River (Bailey 2008a, 2008b). There are no known local populations of Spalding's catchfly in the action area.

Additionally, geospatial data from Washington National Heritage Program (WDNR 2012) indicates that the species does occur within a few miles of the action area in Whitman County, but the species hasn't been observed in the action area. Geospatial data from the Idaho Conservation Data Center (IDFG 2008) indicates that the closest occurrence is approximately 5 miles outside the action area. Therefore, the proposed action will have no effect on the species, and any further analysis of potential effects is not warranted.

4.2.14 Yellow-billed Cuckoo

4.2.14.1 Listing History

The USFWS proposed listing listed yellow-billed cuckoo (*Coccyzus americanus*) as threatened under the ESA on December 26, 2013 (78 FR 78321 78322). Critical habitat was not proposed.

4.2.14.2 Life History/Biological Requirements

The yellow-billed cuckoo is a medium sized brown bird, about 12 inches long and weighing about two ounces. The bird's most notable physical features are a long boldly patterned black and white tail and an elongated down-curved bill, which is yellow on the bottom.

Yellow-billed cuckoos prefer open woodlands with clearings and a dense shrub layer. They are often found in woodlands near streams, rivers, or lakes. In North America, their preferred habitats include abandoned farmland, old fruit orchards, successional shrubland, and dense thickets. In winter, yellow-billed cuckoos can be found in tropical habitats with similar structure, such as scrub forest and mangroves.

In Idaho, they are reported to occur most frequently and consistently in cottonwood forests with thick understory. Dense understory foliage appears to be an important factor in nest site selection, while cottonwood trees are an important foraging habitat. Yellow-billed cuckoos appear to require large blocks of riparian habitat for nesting (IDFG 2005).

4.2.14.3 Distribution

In the Pacific Northwest, the species was common in willow bottoms along Willamette and Columbia Rivers in Oregon, and in the Puget Sound lowlands and along the lower Columbia River in Washington (Gabrielson and Jewett 1970, pp. 329–330; Jewett et al. 1953, pp. 342–343; Roberson 1980, pp. 225–226; Marshall 1996, as cited in USFWS 2010c). The species was also found in southeast British Columbia (Hughes 1999), but the available data are not adequate to determine historic abundance. The species was rare east of the Cascade Mountains in these States and provinces. The last confirmed breeding records were in the 1930s in Washington. According to the Washington breeding bird atlas, yellow-billed cuckoo is believed to have been extirpated as a breeder in Washington (Smith et al. 1997).

The Washington Department of Fish and Wildlife rank the species as having historical occurrences only, but still being expected to occur in Washington and it is currently a state candidate species (Washington Natural Heritage Program 2009, p. 9, 35; Washington Department of Fish and Wildlife 2007, p. 4). Although several surveys have been conducted in Okanogan and Yakima Counties in the last several years to check locations of previous sightings (Okanogan County) and potential habitat (Yakima County), no cuckoos were detected, despite a small number of statewide accounts in recent years (Salzer 2010, as cited in USFWS 2010c).

4.2.14.4 Local Empirical Information

This species is not likely to occur on Corps lands due to the lack of suitable and abundant riparian habitat. Geospatial data obtained from Washington Department of Fish and Wildlife (WDFW 2013) and the Idaho Conservation Data Center (IDFG 2008) indicate that the species has not been observed in proximity to the action area.

While there are no known occurrences of yellow-billed cuckoo in any of the areas that are part of this proposed action, it is possible that there may be individuals that could occur in the project area. However, the proposed action will not affect any riparian forest habitat, and any individuals that may enter the action area would most likely be transient, and limited to a few individuals. Additionally, the timing further eliminates the possibility of exposure of any individuals to the proposed action, as the timing of the proposed action is outside the nesting season, migrants would not be expected to be passing through the action area until late spring, and beginning winter migration in August (Hughes 1999).

Because of their status in Washington, and the nature and timing of the proposed action, yellow-billed cuckoo are not anticipated to occur in the action area. Therefore, the proposed action will have no effect on the species, and any further analysis of potential effects is not warranted.

4.2.15 Umtanum Desert Buckwheat

4.2.15.1 Listing History

The USFWS listed Umtanum Desert buckwheat (*Eriogonum codium*) as threatened under the ESA on December 20, 2013 (78 FR 76995 77005). Critical habitat was designated at the time of the listing.

4.2.15.2 Life History/Biological Requirements

E. codium is found exclusively on exposed basalt from the Lolo Flow of the Wanapum Basalt Formation. The soils are classified as Lithosols and are composed of fine reddish to blackish basalt overlain with pumice (Reidel and Fecht 1981). It is unknown if the close association of *E. codium* with the Lolo Flow is related to the chemical composition or physical characteristics of the particular bedrock on which it is found, or possibly other factors (USFWS 2010d).

4.2.15.3 Distribution

Umtanum Desert buckwheat is endemic to a very narrow range in Benton County in south-central Washington. The only known population of this species occurs at elevations ranging between 1,100 to 1,320 feet on flat to gently sloping micro-sites near the top of the steep, north-facing basalt cliffs overlooking the Columbia River. The population has a discontinuous distribution along a narrow, 1.6 kilometer (1 mile) long portion of the ridge. The species was discovered in 1995, and there are no records of any collections prior to 1995 from anywhere else in North America (USFWS 2010d).

4.2.15.4 Local Empirical Information

There is only one population known to exist, and it is outside of the action area.

Geospatial data from Washington National Heritage Program (WDNR 2012) indicates that the species does not occur within proximity of the action area. Based on the known distribution and occurrence data, the proposed action will have no effect on the species, and any further analysis of potential effects is not warranted.

4.2.16 White Bluffs Bladderpod

4.2.16.1 Listing History

The USFWS listed White Bluffs bladderpod (*Physaria douglasii tuplashensis*) as threatened under the ESA on December 20, 2013 (78 FR 76995 77005). Critical habitat was designated at the time of the listing.

4.2.16.2 Life History/Biological Requirements

White Bluffs bladderpod is a low-growing, herbaceous, perennial plant with a sturdy taproot and a dense rosette of broad gray-green pubescent leaves. The species produces showy yellow flowers on relatively short stems in May, June, and July (USFWS 2010e).

4.2.16.3 Distribution

The White Bluffs bladderpod is only found in a very small area in Franklin County, Washington adjacent to the Columbia River, outside of Corps managed lands. The species is restricted to dry, barren, nearly vertical exposures of calcium carbonate paleosol.

This taxon is still known only from the single population that occurs along the upper edge of the White Bluffs of the Columbia River in Franklin County, Washington. The population occurs intermittently in a narrow band (usually less than 33 ft (10 m) wide) along an approximately 10.6-mi (17 km) stretch of the river bluffs. Most of the species distribution (85 percent) is within the Hanford Reach National Monument/Saddle Mountain National Wildlife Refuge (USFWS 2010e).

4.2.16.4 Local Empirical Information

There is only one population known to exist, and it is outside of the action area. The area where the species is listed is outside the action area. Therefore, the proposed action will have no effect on White Bluffs bladderpod, and any further analysis of potential effects is not warranted.

4.3 Candidate Species

4.3.1 Greater Sage Grouse

4.3.1.1 Listing History

The greater sage grouse is currently a candidate for listing under the ESA.

4.3.1.2 Life History/Biological Requirements

Greater sage grouse are the largest grouse in North America. Males often weigh in excess of 4-5 pounds and hens weigh in at 2-3 pounds. On the ground and in flight they appear almost black, and their long pointed tail is approximately half the length of their body. Both sexes have narrow, pointed tail feathers, feathering to the base of the toes, and a variegated pattern of grayish brown, buff, and black on the upper parts, with paler flanks and a diffuse black pattern on the abdomen. Adult males have blackish-brown throat feathers, which are separated by a narrow band of white from a dark V-shaped pattern on the neck. White breast feathers conceal 2 large, skin sacs (used in courtship displays) which are yellow-green in color. Males also have yellow eyecombs (obvious in the spring during courtship displays). Female sage grouse lack the specialized structures used for courtship displays but generally resemble males in coloration.

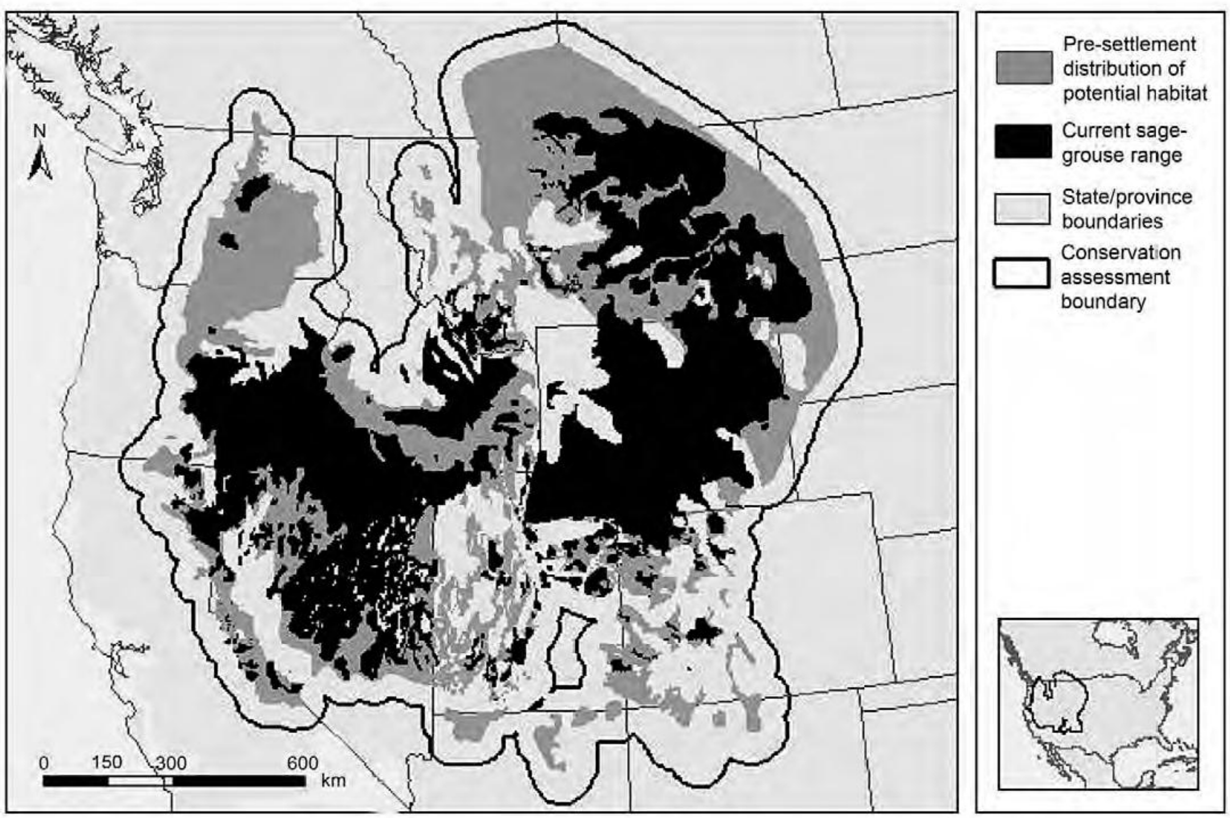
However, in comparison to males, their throats are buffy with blackish markings and the lower throat and breast are barred which presents a blackish-brown appearance. Immature birds (less than 1 yr of age) can be distinguished from adults by their light yellowish green toes (adults have dark green toes).

Greater sage grouse are found in shrub-steppe and meadow-steppe habitats. They are typically found in areas with low, rolling hills adjacent to valleys. They prefer medium-density sagebrush mixed with a variety of other plants for cover and food. The birds are found at elevations ranging from 4,000 to over 9,000 feet.

4.3.1.3 Distribution

The greater sage grouse occurs in 11 states and 2 Canadian provinces including Alberta, California, Colorado, Idaho, Montana, Nevada, North Dakota, Oregon, Saskatchewan, South Dakota, Utah, Washington, and Wyoming. This bird is widely distributed throughout sagebrush–dominated habitats of southern Idaho (Schroeder et al. 1999). Figure 15 shows its distribution.

Figure 15. Greater Sage-Grouse Distribution (Knick and Connely 2011)



4.3.1.4 Local Empirical Information

There is no current local population information in relation to Corps managed lands in the District.

Because of their habitat requirements, greater sage grouse are not anticipated to occur in the action area. Geospatial data obtained from Washington Department of Fish and Wildlife (WDFW 2013) and the Idaho Conservation Data Center (IDFG 2008) indicate that the species has not been observed in proximity to the action area. Based on the known distribution and occurrence data, the proposed action will have no effect on the species, and any further analysis of potential effects is not warranted.

4.3.2 Washington Ground Squirrel

4.3.2.1 Listing History

The Washington ground squirrel is currently a candidate for listing under the ESA.

4.3.2.2 Life History/Biological Requirements

Although Washington ground squirrels are associated with sagebrush-grasslands of the Columbia Plateau, recent studies indicate that silt-loam soils, especially those classified as Warden soils, are of particular importance. Washington ground squirrels occupy areas with a greater grass and forb cover than adjacent unoccupied areas, but soil type may be the most important habitat feature. Warden soils not only have a high silt content, they are very deep, allowing for deeper burrows that maintain their structure compared to sandy or shallow soils. Warden soils occur east and south of the Columbia River.

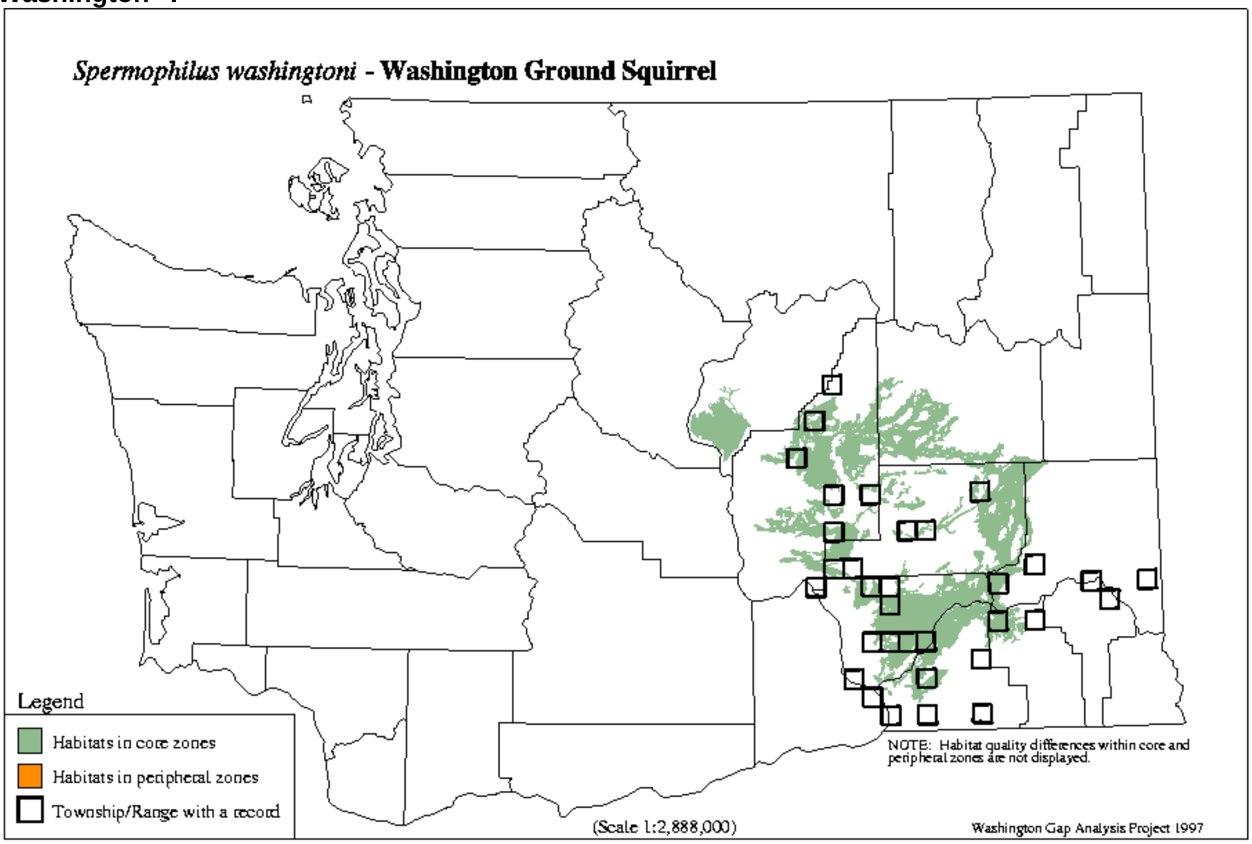
The Washington ground squirrel spends much of its time underground, with seasonal dormancy in winter and summer. Washington ground squirrels produce only one litter of young per year due to their limited period of activity and reproduction. The species return to their simple and unbranched burrows in late spring or early summer from late May to early June after an active season of 4-5 months duration, whereas juveniles remain active until late June or early July. Squirrels enter dormancy in late spring and early summer. Adults emerge from hibernation between January and early March, depending on elevation and microhabitat conditions, with males emerging before females. Their active time is spent in reproduction and fattening for their six-month or longer dormancy. The diet consists of succulent vegetation, flowers, roots, bulbs, seeds, seedpods, and insects (Richart and Yensen 1991; USFWS 2013).

Agricultural conversion of shrub-steppe habitat is the primary cause of the decline of the Washington ground squirrel. Because the squirrel is so closely tied to deep, silty soils, specifically Warden soils, tilling and other mechanisms involved in conversion of shrub-steppe habitats to agricultural crop production destroys the species' food source, and renders the soils, that are necessary for burrowing, unuseable and irretrievably modified. Intensive grazing reduces cover and forage, adversely affecting Washington ground squirrels. Often viewed as pests, they are subject to recreational shooting and poisoning (USFWS 2013).

4.3.2.3 Distribution

Washington ground squirrel occurs in dry grassland or in patches of grass and other herbaceous plants within low open sagebrush. They prefer deep, loose soil, which it needs for digging burrows. The greater part of its current range is uncultivated steppe in Walla Walla, Franklin, Adams, Lincoln, and Grant Counties. Core habitat and recorded locations in Washington can be seen in Figure 16.

Figure 16. Core Habitat and Recorded Locations of Washington Ground Squirrel in the State of Washington[17].



4.3.2.4 Local Empirical Information

There are no known populations of Washington ground squirrel on Corps managed lands in the District. Geospatial data obtained from Washington Department of Fish and Wildlife indicates that closest occurrence is within a mile of the action area near Ice Harbor Dam in Walla Walla County, and within 3 miles in Franklin County (WDFW 2013). Given the known distribution and occurrence data, it is possible that there may be individuals that could occur in the

[17] WDFW http://wdfw.wa.gov/conservation/gap/gapdata/mammals/gifs/spwa.gif

downstream portions of the action area near Lake Sacajawea. However, the proposed action will be conducted during the dormancy period of the species.

4.4 Status of Critical Habitat

In 1993, NMFS determined that the critical habitat designations for SR sockeye, SR spring/summer Chinook salmon, and SR fall-run Chinook salmon would focus on the physical and biological features of the habitat that are essential to the conservation of the species. In 2005, NMFS published final critical habitat designations for 12 evolutionary significant units of west coast salmon and steelhead, including upper Columbia River spring Chinook, upper and mid-Columbia River steelhead, and Snake River Basin steelhead. NMFS focused on certain habitat features called “primary constituent elements” (PCEs) that are essential to support one or more of the life stages of salmon and steelhead. The 2005 designations also analyzed areas that will provide the greatest biological benefits for listed salmon and balance the economic and other costs for areas considered for designation.

Unlike the 1993 designations, which relied on the U.S. Geological Survey’s (USGS) maps of sub-basins and included “all accessible river reaches within the current range of the listed species,” the 2005 designations used a much finer, more specific scale in designating critical habitat for salmon and steelhead. The 2005 designations identify stream and near-shore habitat areas where listed salmon and steelhead have actually been observed, or where biologist with local area expertise presume them to occur. These habitat areas are found within more than 800 watersheds in the Northwest and California.

The fish species addressed in this document occupy the same geographic areas and have similar life history characteristics and, therefore, require many of the same habitat functions provided by critical habitat. The 1993 critical habitat designation lists these critical functions as essential physical and biological features and the 2005 critical habitat designation lists these as PCEs; however, they function the same for all listed species. Both the essential physical and biological features and the PCEs are identified in the documents designating critical habitat and listed below in Tables 14 and 15.

4.4.1 UCR Spring Chinook

4.4.1.1 Geographical Extent of Designated Critical Habitat

NMFS designated CH for UCR spring-run Chinook salmon in the Chief Joseph, Methow, Upper Columbia/Entiat, and Wenatchee subbasins, and the Columbia River migration corridor. There are 31 watersheds within the range of this ESU. Five watersheds received a medium conservation value rating while 26 received a high conservation value rating (NMFS 2005). The Columbia River rearing/migration corridor downstream of the spawning range is considered to have a high conservation value and is the only habitat area designated in 15 of the high value watersheds. Of the 1,002 miles of habitat areas eligible for designation, 974 miles of stream and 4 square miles of lake are designated.

4.4.1.2 Essential Elements of Designated Critical Habitat

Table 14. Primary Constituent Elements (PCEs) of Critical Habitats Designated for Pacific Salmon And Steelhead Species
(EXCEPT SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, and SR sockeye salmon, and corresponding species life history events.)

Primary Constituent Elements		Species Life
Site Type	**Site Attribute**	**History Event**
Freshwater spawning	Substrate Water quality Water quantity	Adult spawning Embryo incubation Alevin development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence Fry/parr growth and development
Freshwater migration	Free of artificial obstructions Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration, holding Kelt (steelhead) seaward migration Fry/parr seaward migration
Estuarine areas	Forage Free of obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation Adult “reverse smoltification” Adult upstream migration, holding Kelt (steelhead) seaward migration Fry/parr seaward migration Fry/parr smoltification Smolt growth and development Smolt seaward migration
Nearshore marine areas	Forage Free of obstruction Natural cover Water quantity Water quality	Adult sexual maturation Smolt/adult transition
Offshore marine areas	Forage Water quality	Adult growth and development

4.4.2 SR Spring/Summer Chinook

4.4.2.1 Geographical Extent of Designated Critical Habitat

NMFS designated critical habitat for SR spring/summer Chinook to include the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to Hells Canyon Dam.

Critical habitat also includes river reaches presently or historically accessible (except reaches above impassable natural falls (including Napias Creek Falls and Dworshak and Hells Canyon Dams) to Snake River spring/summer Chinook salmon in the following hydrologic units: Hells Canyon, Imnaha, Lemhi, Little Salmon, Lower Grande Ronde, Lower Middle Fork Salmon, Lower Salmon, Lower Snake-Asotin, Lower Snake-Tucannon, Middle Salmon-Chamberlain, Middle Salmon-Panther, Pahsimeroi, South Fork Salmon, Upper Middle Fork Salmon, Upper Grande Ronde, Upper Salmon, Wallowa. Critical habitat borders on or passes through the following counties in Oregon: Baker, Clatsop, Columbia, Gillium, Hood River, Morrow, Multnomah, Sherman, Umatilla, Union, Wallowa, Wasco; the following counties in Washington: Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Klickitat, Pacific, Skamania, Wahkiakum, Walla Walla, Whitman; and the following counties in Idaho: Adams, Blaine, Custer, Idaho, Lemhi, Lewis, Nez Perce, Valley.

4.4.2.2 Essential Elements of Designated Critical Habitat

Table 15. Primary Constituent Elements (PCEs) of Critical Habitats Designated for SR Spring/Summer Run Chinook Salmon, SR Fall-Run Chinook Salmon, and SR Sockeye Salmon, and Corresponding Species Life History Events

Primary Constituent Elements		Species Life
Site	**Site Attribute**	**History Event**
Spawning and juvenile rearing areas	Access (sockeye) Cover/shelter Food (juvenile rearing) Riparian vegetation Space (Chinook) Spawning gravel Water quality Water temperature (sockeye) Water quantity	Adult spawning Embryo incubation Alevin development Fry emergence Fry/parr growth and development Fry/parr smoltification Smolt growth and development
Juvenile migration corridors	Cover/shelter Food Riparian vegetation Safe passage Space Substrate Water quality Water quantity Water temperature Water velocity	Fry/parr seaward migration Smolt growth and development Smolt seaward migration
Areas for growth and development to adulthood	Ocean areas – not identified	Adult growth and development Adult sexual maturation Fry/parr smoltification Smolt/adult transition
Adult migration corridors	Cover/shelter Riparian vegetation Safe passage Space Substrate Water quality Water quantity Water temperature Water velocity	Adult sexual maturation Adult “reverse smoltification” Adult upstream migration Kelt (steelhead) seaward migration

4.4.3 SR Fall Chinook

4.4.3.1 Geographical Extent of Designated Critical Habitat

NMFS designated CH for SR fall Chinook to include the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; the Snake River, all river reaches from the confluence of the Columbia River, upstream to Hells Canyon Dam; the Palouse River from its confluence with the Snake River upstream to Palouse Falls; the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam. Critical habitat also includes river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River fall Chinook salmon in the following hydrologic units; Clearwater, Hells Canyon, Imnaha, Lower Grande Ronde, Lower North Fork Clearwater, Lower Salmon, Lower Snake, Lower Snake-Asotin, Lower Snake-Tucannon, and Palouse. Critical habitat borders on or passes through the following counties in Oregon: Baker, Clatsop, Columbia, Gillium, Hood River, Morrow, Multnomah, Sherman, Umatilla, Wallowa, Wasco; the following counties in Washington: Adams, Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Klickitat, Lincoln, Pacific, Skamania, Spokane, Wahkiakum, Walla Walla, Whitman; and the following counties in Idaho: Adams, Benewah, Clearwater, Idaho, Latah, Lewis, Nez Perce, Shoshone, Valley.

4.4.3.2 Essential Elements of Designated Critical Habitat

Refer to Table 15.

4.4.4 SR Sockeye

4.4.4.1 Geographical Extent of Designated Critical Habitat

NMFS designated critical habitat for SR sockeye to include the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to the confluence of the Salmon River; all Salmon River reaches from the confluence of the Snake River upstream to Alturas Lake Creek; Stanley, Redfish, Yellow Belly, Pettit, and Alturas Lakes (including their inlet and outlet creeks); Alturas Lake Creek, and that portion of Valley Creek between Stanley Lake Creek and the Salmon River. Critical habitat is comprised of all river lakes and reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River sockeye salmon in the following hydrologic units: Lower Salmon, Lower Snake, Lower Snake-Asotin, Lower Snake-Tucannon, Middle Salmon-Chamberlain, Middle Salmon-Panther, and Upper Salmon. Critical habitat borders on or passes through the following counties in Oregon: Clatsop, Columbia, Gillium, Hood River, Morrow, Multnomah, Sherman, Umatilla, Wallowa, Wasco; the following counties in Washington: Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Klickitat, Pacific, Skamania, Wahkiakum, Walla Walla, Whitman; and the following counties in Idaho: Blaine, Custer, Idaho, Lemhi, Lewis, Nez Perce.

4.4.4.2 Essential Elements of Designated Critical Habitat

Refer to Table 15.

4.4.5 MCR Steelhead

4.4.5.1 Geographical Extent of Designated Critical Habitat

NMFS designated CH for MCR steelhead in the Upper Yakima, Naches, Lower Yakima, Middle Columbia/Lake Wallula, Walla Walla, Umatilla, Middle Columbia/Hood, Klickitat, Upper John Day, North Fork John Day, Middle Fork John Day, Lower John Day, Lower Deschutes, Trout, and Upper Columbia/Priest Rapids subbasins, and the Columbia River migration corridor. There are 114 watersheds within the range of this DPS. Nine watersheds received a low conservation value rating, 24 received a medium rating, and 81 received a high rating (NMFS 2005). The lower Columbia River rearing/migration corridor downstream of the spawning range is considered to have a high conservation value and is the only habitat area designated in three of the high value watersheds. Of the 6,529 miles of habitat areas eligible for designation, 5,815 miles of stream are designated.

4.4.5.2 Essential Elements of Designated Critical Habitat

Refer to Table 14.

4.4.6 SRB Steelhead

4.4.6.1 Geographical Extent of Designated Critical Habitat

NMFS designated CH for SR steelhead in the Hells Canyon, Imnaha River, Lower Snake/Asotin, Upper Grande Ronde River, Wallowa River, Lower Grande Ronde, Lower Snake/Tucannon, Upper Salmon, Pahsimeroi, Middle Salmon-Panther, Lemhi, Upper Middle Fork Salmon, Lower Middle Fork Salmon, Middle Salmon-Chamberlain, South Fork Salmon, Lower Salmon, Little Salmon, Upper Selway, Lower Selway, Lochsa, Middle Fork Clearwater, South Fork Clearwater, and Clearwater subbasins, and the Lower Snake/Columbia River migration corridor (NMFS 2005). There are 289 watersheds within the range of this DPS. Fourteen watersheds received a low conservation value rating, 44 received a medium conservation value rating, and 231 received a high conservation value rating. The lower Snake/Columbia River rearing/migration corridor downstream of the spawning range is considered to have a high conservation value and is the only portion designated in 15 of the high value watersheds. Of the 8,225 miles of habitat areas eligible for designation, 8,049 miles of stream and 4 square miles of lake are designated.

4.4.6.2 Essential Elements of Designated Critical Habitat

Refer to Table 14.

4.4.7 Bull Trout

4.4.7.1 Geographical Extent of Designated Critical Habitat

Bull trout critical habitat was designated in 2005. The USFWS revised the designation in 2010 (Figure 17). A final rule was published on October 18, 2010, and took effect on November 17, 2010. Bull trout critical habitat has been designated in the entire action area.

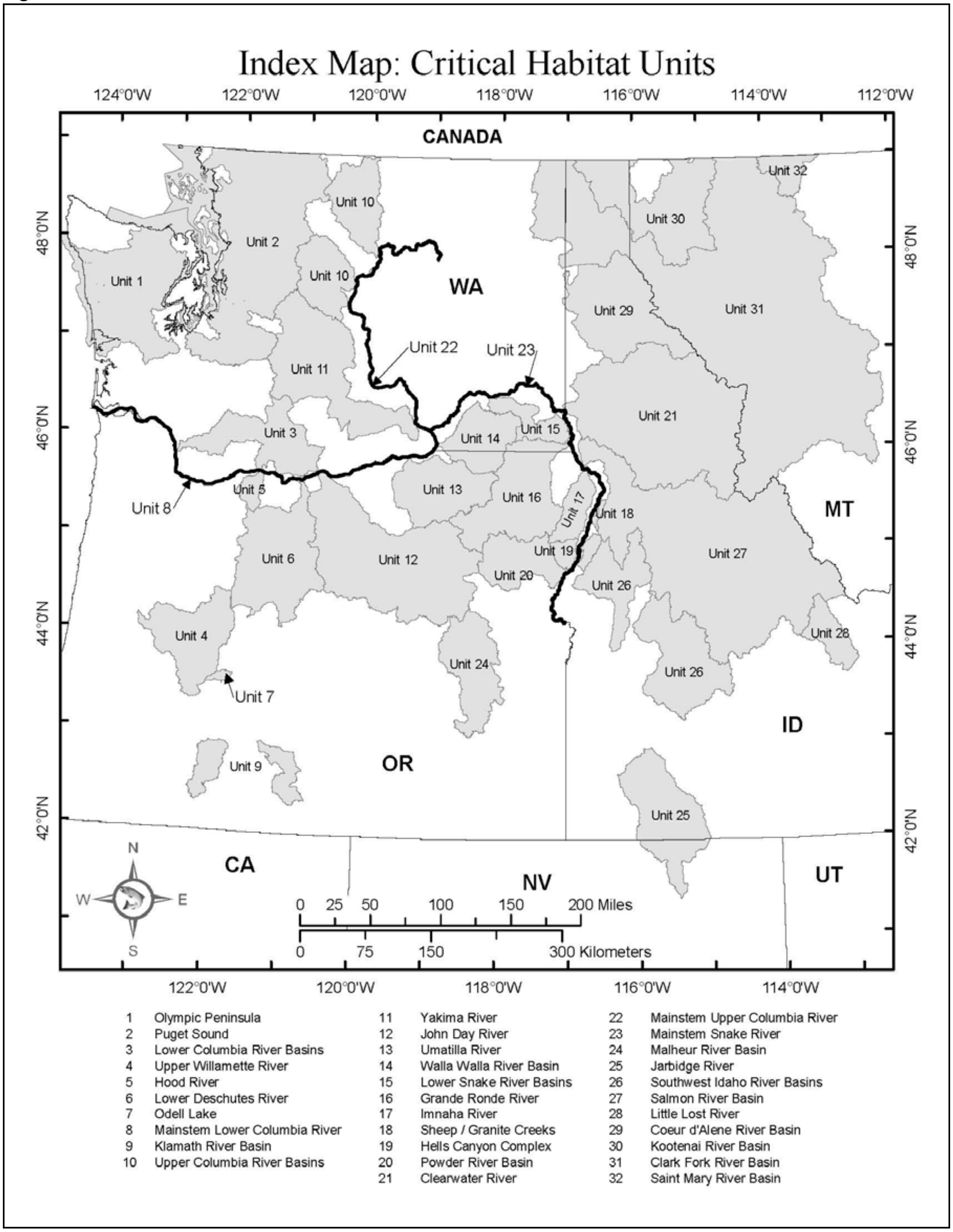
4.4.7.2 Essential Elements of Designated Critical Habitat

Primary Constituent Elements for Bull trout based on the needs identified in 50 CFR 17 (75 FR 63898) and the current knowledge of the life-history, biology, and ecology of the species and the characteristics of the habitat necessary to sustain the essential life history functions of the species, the USFWS has identified the following PCEs (Table 16) for bull trout critical habitat.

Table 16. Primary Constituent Elements (PCEs) of Critical Habitats Designated for Bull Trout

PCEs		
1	Water Quality	Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.
2	Migration Habitat	Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.
3	Food Availability	An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.
4	Instream Habitat	Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.
5	Water Temperature	Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.
6	Substrate Characteristics	In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system.
7	Stream Flow	A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.
8	Water Quantity	Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.
9	Nonnative Species	Sufficiently low levels of occurrence of nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

Figure 17. Bull Trout Final Rule Critical Habitat Units



4.4.8 Canada Lynx, White Bluffs Bladderpod, and Umtanum Desert Buckwheat

No critical habitat for Canada lynx, White Bluffs bladderpod, or Umtanum Desert buckwheat has been designated within the action area.

4.4.9 Pygmy Rabbit, Ute Ladies'-Tresses, Yellow-billed Cuckoo, Gray Wolf, and Spalding's Catchfly

No critical habitat rules have been published for the species listed above.

5 ENVIRONMENTAL BASELINE

The geographical area for which the environmental baseline is being established is discussed in the Action Area section of this document. This section is an analysis of the effects of past and ongoing human and natural factors leading to the status of the species, its habitat (including designated critical habitat), and ecosystem within the action area. The environmental baseline is a “snapshot” of a species’ health at a specified point in time. It does not include the effects of the action under review in the consultation.

The environmental baseline represents the set of environmental conditions, captured as of the consultation benchmark date, to which the direct and indirect effects of the proposed action would be added. It “includes the past and present impacts of all Federal, State, or private activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process.” (50 CFR 402.02). The baseline discussion in this section focuses primarily on the habitat conditions for the ESA-listed fish species addressed in this document.

For an ongoing federal action, generating effects on the environment that predate the relevant listing(s) and designation(s), the environmental baseline is comprised of two components.

The first environmental baseline component consists of those environmental effects resulting from past resource commitments as of the benchmark date of the consultation. This component of the environmental baseline is comprised of the collective effects of past and ongoing human activities “leading to the current status of the species, [the] habitat (including designated critical habitat), and ecosystem, within the action area.” This is the “snapshot” of species’ health – exclusive of the effects of the proposed action (USFWS and NMFS 1998).

The second component of the environmental baseline of this ongoing agency action is comprised of the unavoidable effects of the existence of the LSRP (and existing baseline operation and maintenance relative to addressing the sediment issues) on the species, their habitat and the ecosystem, throughout the period of analysis over which the effects of the proposed agency action are being evaluated, indefinite in this case for the PSMP. These components are discussed in more detail below.

For the purpose of this analysis, past unalterable resource commitments include construction of the LSRP itself and the associated infrastructure. The structures are, therefore, part of the environmental baseline. The presence of the LSRP constitutes an “existing human activity” that over the course of time has generated effects on listed species and designated critical habitat, and by its very presence will continue to cause impacts.

The “existence” of the LSRP must necessarily also encompass the basic level of physical maintenance required to keep that structure intact and functional; if a structure could not be maintained in an intact state, the concept of a baseline "existence" of a structure that pre-dates listing would lose all relevant meaning. Failure to adequately maintain the LSRP would risk eventual catastrophic failure of the LSRP, which would also result in failure to undertake a key element or elements of the existing authorized purposes of the LSRP (a legislative act predating listing and even the ESA, itself), and the timing and consequences of such a failure would be impossible to predict. The baseline also includes the effects of current discretionary baseline operation and maintenance (O&M) actions undertaken to manage sediment that have undergone previous Section 7 consultation (i.e., navigation objective reservoir operation to maintain navigation).

However, the existence of various project purposes (navigation, recreation, fish and wildlife, flow conveyance) do not create immutable obligations that are therefore nondiscretionary. Legislation authorizing the LSRP established authorized project purposes and broad goals associated with those purposes, but did not (generally) direct the Corps to perform any specific nondiscretionary actions. Congress did, however, specifically establish the authorized dimensions of the federal navigation channel at 14 feet deep and 250 feet wide at minimum operating pool (MOP). See PL 87-874. While the goals themselves may be requirements, the Corps generally retains considerable discretion in choosing what specific actions to take in order to implement them. See, National Association of Home Builders v. Defenders of Wildlife, 551 U.S. 644 (2007).

It is also reasonable to conclude that Congress generally left it to the Corps' discretion to determine the means by which LSRP O&M could best serve those broad goals/purposes.

Changes in operation can be discretionary, to a certain point. O&M can be discretionary as long as the O&M still meet the purpose of the LSRP. Such changes may be possible if they can be implemented in a manner consistent with the intended purpose of the action, can be implemented consistent with the scope of the action agency's legal authority and jurisdiction, and are economically and technologically feasible. However, the project purposes are not discretionary. This means that changes in O&M imposed by any potential RPA or RPM must still allow the Corps to meet the authorized purposes.

The environmental baseline encompasses the collective effects of all O&M activities conducted prior to the date of this BA. It includes a diminished and degraded river and habitat. It also includes sediment input from throughout the basin, existing flows, existing water temperatures, etc. More detailed descriptions of the environmental baseline are provided below.

The second component of the environmental baseline extends to prospective effects inherent in the passive existence of the LSRP and its structures, distinct from the effects of any O&M. By its very existence, the LSRP necessarily alter the habitat conditions of the action area, and this modification of conditions carries with it a variety of consequent effects – positive, negative, and neutral, all part of the baseline.

Because the environmental baseline of a continuing agency action, like the existing LSRP, consists of more than a mere "snapshot" and must have a prospective component, it is critical to identify the dividing line that distinguishes future effects encompassed within the environmental baseline from the future effects of the proposed action. The dividing line between effects falling within the environmental baseline versus those proximately caused by the proposed action is found by identifying agency activities that involve the exercise of agency discretion

The Corps has identified the dividing line for this consultation as the existing conditions and structures, combined with baseline operation and maintenance (O&M) actions undertaken to manage sediment that have undergone previous Section 7 consultation (i.e., navigation objective reservoir operation to maintain navigation), versus other potential discretionary O&M actions that may be implemented under the PSMP.

It is widely accepted that baseline conditions are degraded. The existence of the structures in the action area are part of the "baseline" condition. The discretion by the Corps comes in how discretionary maintenance actions may be implemented under the PSMP to manage sediment that interferes with existing authorized project purposes of the LSRP.

Effects of the proposed action are those effects that are brought about by the Corps' O&M actions under the PSMP.

5.1 Existing Baseline Conditions

The Lower Snake River is confined and controlled by four hydroelectric, concrete, run-of-the-river dams, all part of the FCRPS. The three lower dams, Ice Harbor, Lower Monumental and Little Goose each create a reservoir that extends upstream to the next dam. The fourth dam, Lower Granite creates a reservoir that extends 46 miles upstream to Asotin, Washington. At RM 139.2, the Clearwater River enters the reservoir at Lewiston, Idaho. All four of the dams have upstream and downstream fish passage facilities.

Ice Harbor Dam and Reservoir: Located at RM 9.7, construction began in 1955, completed in 1961. The reservoir is known as Lake Sacajawea and stretches upstream to the base of Lower Monumental Dam, 31.9 miles upstream. The Wallula Channel, formed from the backup of Snake River entering the Columbia River, runs 10 miles (16 km) downstream from the base of the dam.

Lower Monumental Dam and Reservoir: Located at RM 41.6, formed Lake Herbert G. West behind the dam, which extends 28.7 miles (45 km) upstream (east) to the base of Little Goose Dam. Construction began in 1961 with the dam and three generators completed in 1969.

Little Goose Dam and Reservoir: Located at RM 70.3, construction began in 1963. The main structure and three generators were completed in 1970. The reservoir, Lake Bryan, runs upstream 37.2 miles to Lower Granite Dam.

Lower Granite Reservoir: Located at RM 107.5, construction on Lower Granite Dam began in 1965 with the main structure and three generators completed in 1972. This is the most upstream dam in the Snake River system that has a fish ladder to allow anadromous fish to migrate upstream for spawning. Lower Granite Lake extends upstream from the dam to Lewiston, Idaho, 39.3 miles into the Snake, and 4.6 miles into the lower Clearwater River. The reservoir influence on the Snake River ends shortly upstream of Clarkston, Washington and the next dam, Hell's Canyon is at RM 247. From Clarkston, Washington upstream approximately 110 miles to the Hell's Canyon Complex, the Snake River is relatively free flowing.

The No Action Alternative in the EIS captures the current baseline operational practices of managing the LSRP, including use of the interium navigation objective reservoir operation measure (NORO).

As part of the environmental baseline, the Corps:

- Continues to implement the navigation objective reservoir operation (NORO), but does not implement any other navigation related sediment management measures.
- Does not implement any measures to maintain recreation at the boat basins.
- Performs routine maintenance to keep the intakes functioning for fish and wildlife (i.e. HMU irrigation intake maintenance).
- Does not implement actions to address flow conveyance.

5.1.1 Navigation

For navigation, the NORO already exists, and is a component of the current baseline conditions. This maintains reservoir level above MOP, as needed, and even at the upper end of the operating range year-round to maintain the 14-foot navigation channel. This is part of the discretion by the Corps in how structures are operated (within the limits of the structures and purposes of the LSRP) to maintain navigation. This measure is part of the environmental baseline, as it is has already undergone formal section 7 consultation (FCRPS BO), and involves impacts of the past and present impacts of federal actions.

Deposition of sediment in the upper portion of the reservoirs may deposit within the navigation channel (restricting barge traffic). Dredging has historically been used by the Corps in the past to remove sediment from this part of the river to maintain the navigation channel.

5.1.2 Recreation

The action area provides a variety of opportunities for outdoor recreation, including the recreation facilities and land available for recreational use in the LSRP are managed and operated by the Corps, USFWS, local and state recreation agencies, and public port authorities. These areas, and their use, are part of the environmental baseline.

For Corps managed recreation areas (boat basins or ramps) the Corps may post warnings or close affected facilities if either of these actions was needed for safety.

Sediment is being deposited in slow-moving waters near recreational facilities (such as boat basins) in the action area. The environmental baseline does not include any actions to address these areas (i.e. the Corps does not routinely implement measures to maintain boat basins). Turbidity from prop wash could continue to adversely affect aquatic plants, if present in the vicinity of boat basins, by reducing light penetration within a limited area and dislodging of plants could occur as boats pass near and or over them. Settling of fine sediments stirred up by prop wash could potentially cover aquatic plants. If the Corps closed boat basins affected by sediment accumulation, the effects on aquatic plants from prop wash would cease.

5.1.3 Fish and Wildlife

As part of the Lower Snake River Fish and Wildlife Compensation Plan, a terrestrial wildlife mitigation program was initiated to compensate for habitat lost in the development of the LSRP. The plan called for the creation of a number of Habitat Management Units (HMUs) to provide high quality upland habitat for a variety of wildlife and for obtaining additional land to fully compensate for upland game habitat losses that resulted from the construction of the lower Snake River dams (USACE 2004). HMUs help address the LSRP-authorized purposes of fish and wildlife conservation. HMUs are Corps-owned lands designated primarily to be managed as wildlife habitat, and provide essential habitat for the vast array of plants and wildlife species that use the LSRP study area. The HMU habitats were developed either purposefully by restoration activities, including irrigation intake facilities, or established naturally over time through long periods of normal reservoir conditions. Eleven of these HMUs are irrigated to provide intended habitat conditions (USACE 2002b). Sedimentation around some HMU irrigation intakes can interfere with their operation.

The environmental baseline includes the existence of these HMUs and their use, along with the Corps performing routine maintenance to keep the irrigation intakes at HMUs functioning for fish and wildlife. The Corps performs routine maintenance on existing irrigation intakes (e.g. lifting or shifting the intakes, or doing limited excavation), install a temporary intake, or use another available water source to address sediment accumulation at HMU intakes. This could include small amounts of excavation (usually after an observation of reduced flows or affected irrigation capabilities in those HMUs during operations between spring and fall) to remove the accumulated sediment, which could have a similar localized effect on plankton and benthic organisms as for recreation areas from turbidity. This does not include larger-scale dredging efforts for the intakes, relocating intakes, or exploring alternative irrigation methods.

5.1.4 Flow Conveyance

Reservoir operations are used during high flow events, in accordance with the Lower Granite Project Water Control Manual (USACE 1987b), if needed to provide flow conveyance at the Snake/Clearwater Rivers confluence. No further actions for flow conveyance are currently part of the baseline. Existing conditions affecting flow conveyance at the confluence of the Snake and Clearwater rivers are part of the baseline.

Deposition of sediment in the upper portion of the reservoirs could potentially reduce the flow conveyance capacity of the Lewiston levee system and increase the risk of flooding during extreme high flow events. Dredging has historically been used by the Corps in the past to remove sediment from this part of the river to maintain the flow conveyance capacity.

5.1.5 Plankton, Benthic Invertebrates, and Aquatic Plants

Zooplankton can compose an important component to the diet of rearing anadromous and resident fish species (Bennett et al. 1983). The times of year when zooplankton and phytoplankton are most active can be measured by assessing the Primary productivity within the study area. This measure is used to describe the rate that plants and other photosynthetic organisms produce organic compounds in the ecosystem. Primary productivity in the lower Snake River reservoirs has been measured at its lowest during December and highest from March through May (Seybold and Bennett 2010).

Studies from the 1980s indicate that shoreline areas less than 15.5 feet deep generally had the highest invertebrate abundance, species diversity, and species evenness (similar number of individuals for each species) in the Lower Granite reservoir (Bennett and Shrier 1986, Bennett et al. 1988). These studies also found that annual and seasonal population abundance was more variant for species exhibiting seasonal emergence as they pupated into adults and left the aquatic environment (e.g., chironomids) than species that are aquatic through all life stages (e.g., aquatic oligochaetes – worms).

Chironomids, a type of fly that resembles mosquitoes, can make up a substantial portion of the diets of juvenile salmonids and other local fish species. Chironomids are most likely located in sandy silt sediments and decrease in both finer and coarser sediment-type environments. The chironomid communities within the LSRP are composed of several different species, thus resulting in chironomids being readily susceptible to predation by rearing salmonid smolts across the duration of the smolt migration seasons.

Crayfish are an important component to the diet of smallmouth bass, northern pike minnow, channel catfish, and white sturgeon and predominantly inhabit shallow water riprap areas from which they forage riverward for oligochaetes and other soft substrate inhabitants (Bennett et al. 1983; Zimmerman 1999). Crayfish were found in the Lower Granite reservoir during the physical drawdown test in 1992 (Bennett et al. 1995a; Curet 1994), and in the unimpounded Snake River between Lower Granite reservoir and Hells Canyon Dam (Nelle 1999). The important role of crayfish in resident and predatory fish diets is extensively documented in both Lower Granite reservoir (Bennett et al. 1988; Zimmerman 1999) and in the unimpounded Snake River upriver of Lower Granite reservoir (Nelle 1999; Petersen et al. 1999, Zimmerman 1999).

Aquatic plants also called ***macrophytes*** typically grow in shallow water along the shorelines of lakes or in the slow-moving reaches of rivers. They can be entirely submerged or emergent (partially above the water surface). In both cases, they provide many important roles in the aquatic environment, including cover for fish, oxygen production, substrate for invertebrates, and food sources for fish and wildlife. Additionally macrophytes supply surfaces for fish eggs to incubate, provide protection for fish species during various life stages, and function as a direct food source for many aquatic organisms. They are also especially important for young fish that hide among plant stems and leaves to escape predators.

Macrophytes help stabilize shorelines by reducing erosion and recycling nutrients. Both submerged and emergent macrophytes are far more extensive in the lower reservoirs (Lower Monumental and Ice Harbor) than in the upper reservoirs (Lower Granite and Little Goose) and upstream Snake River stations (Seybold and Bennett 2010).

NORO would maintain the current baseline conditions on plankton and benthic community, and aquatic plants. Reservoirs levels would be within authorized operating ranges and would not substantially change shallow water aquatic plant habitat in the reservoirs. For fish and wildlife, maintenance of HMU irrigation intakes would have similar effects on aquatic plants, if present in the vicinity of intakes, as the effects on plankton and benthic communities described above. Because the Corps would not implement measures to address flow conveyance under this alternative, there would be no effect on aquatic plants.

5.1.6 Fish

Within the action area, anadromous salmonids and trout are seasonally present, with juveniles of some stocks present year-round in rearing tributaries and the LSRP.

Current conditions within much of the mainstem Snake and Clearwater Rivers are degraded relative to historic conditions. Dams and their associated reservoirs have reduced or eliminated much of the mainstem areas downstream of the Clearwater River confluence previously used by SRF Chinook salmon for spawning and altered the functional capacity of the existing habitat for all rearing and migrating salmon and steelhead. Formerly complex habitat in the mainstem and lower tributaries of the Snake River have been reduced, for the most part, to single channels with reduced or disconnected floodplains, side channels or off-channel habitats (Sedell and Froggatt 1984; Ward and Stanford 1995). A study of the available rearing habitat in Lower Granite reservoir by Tiffan and Hatten (2012) estimated that 44 percent of the shoreline of the reservoir is lined with riprap. Most riprapped shorelines were located along the road and railway along the north side of the reservoir and along the roadway on the south side of the reservoir from Silcott Island to Clarkston. The entire shoreline of the Clearwater River within the action area (RM 0 to 1.9) is lined with riprap.

NORO would maintain the current baseline conditions on fish (including threatened and endangered species). NORO could result in minor adverse effects on listed salmonid species by affecting juvenile passage survival through reservoirs due to maintenance of reservoir levels above MOP. Raising the operating pool above MOP would have a greater effect in the areas near the dams than it would further upriver due to the normal change in elevation moving upstream.

If sediment accumulated at boat basins, increased prop wash from recreational boating would stir up sediment and increase turbidity. Any adverse effects on ESA-listed fish from increased turbidity would be localized in the area where sediments were disturbed by prop wash.

For fish and wildlife, maintenance of HMU irrigation intakes would have localized turbidity, which could have minor adverse effects on fish. Like boat basins, this effect would be localized and limited to the area surrounding the irrigation intake being maintained.

Because the Corps would not implement measures to address flow conveyance under this alternative, there would be no effect on fish, including threatened and endangered fish species.

5.1.7 Shallow Water Habitat

In previous Section 7 consultations for dredging and disposal actions on the lower Snake River, NMFS has indicated that shallow-water habitat less than 10 feet deep will be preferred as highly suitable for the rearing of juvenile SRF Chinook salmon; and all constructed shallow-water habitat plots should not be located at a single site or one restricted reach of any lower Snake River reservoir. It is preferable to have an interconnected, but wider distribution of “feeding stations.” Based on these previous consultations, biological monitoring of shallow water complexes in the lower Snake River reservoirs and recent modeling efforts (Tiffan and Connor 2012; Arntzen et al. 2012; Tiffan and Hatten 2012; Gottfried et al. 2011), future disposal of dredge materials to create shallow water habitat would have greater benefit for juvenile SRF Chinook salmon if it occurred in the lower portion of the Lower Granite reservoir. For any future shallow water habitat creation, the Corps would begin in the mid reaches of the Lower Granite reservoir downstream of RM 120, radiating downriver and taking the fullest advantage of existing shallow to mid-depth benches to build on.

The Corps did an aerial photography and bathymetry mapping exercise on measuring the size and distribution qualities of pre-reservoir sand and gravel shoreline habitat plots to determine that 4 acres constitutes the minimum rearing habitat benefit acreage. The design conditions proposed by Bennett et al., Curet, Connor et al., NMFS, Tiffan and Connor, Tiffan and Hatten and the Corps were combined to serve as the objective target for maximizing beneficial use of in-water disposal of dredged material.

An important element of fish use of the lower Snake River reservoirs is the availability and use of shallow water habitat (less than 20 feet deep). When the Lower Granite reservoir was filled in 1975, the historical shallow-water habitat was inundated. This converted approximately 40- to 60-percent of the shallow-water sand bar habitat used by juvenile fall Chinook salmon into either mid-depth bench habitat or deep-water habitat. Mid-depth bench habitat is more suitable for sturgeon (with minimal structural cover) or adults of resident predator species (with structure in the substrate); and deep-water habitat is used by only a few species, including sturgeon.

Currently, less than 10 percent of Lower Granite reservoir consists of shallow water habitat (Seybold and Bennett 2010). Because shallow water habitat is considered the most productive habitat in aquatic ecosystems in terms of supporting the largest populations and most diverse array of species (Wetzel 2001), the aquatic productivity of the reservoirs could potentially be enhanced by increasing the amount of shallow water habitat.

An analysis of limiting conditions for reservoir-wide habitat readily indicates that low gradient, open sand, shallow-water habitat (with no additional cover structure) will be moderately to highly suitable for fall Chinook salmon rearing habitat (Bennett et al. 1987 through 2005, Curet 1994, and Connor et al. 2001, 2002, 2003, 2004; Tiffan and Connor 2012; Tiffan and Hatten 2012). Recent biological monitoring has suggested that reducing the criterion to define shallow water from <20 ft (the COE's current definition) to <6 ft (based on recent habitat use data) would provide the greatest amount of shallow water habitat for subyearling fall Chinook salmon based on habitat use sampling data and their transient rearing strategy and that creating new habitat in the lower portion of Lower Granite reservoir in ribbons along the shoreline appears to provide the greatest benefit for rearing juvenile fall Chinook (Tiffan and Connor 2012; Tiffan and Hatten 2012).

Recent modeling efforts by Tiffan and Hatten (2012) indicates Lower Granite reservoir contains about 255 ha of rearing habitat at a flow of 143 kcfs, which equates to about 7% of the reservoir area. This modeling effort demonstrated most rearing habitat is located in the upper half (i.e., upstream of Centennial Island, RM 120) of the Lower Granite reservoir and little exists in the lower half due to steep lateral bed slopes and unsuitable substrate along the shorelines. The largest habitat areas are associated with known shallow-water locations such as at Silcott Island (~85 ha) and the area near Steptoe Canyon (~32 ha).

Based on recent biological monitoring and modeling, shallow water habitat in the lower portion of Lower Granite reservoir in shallow depths along the shoreline is likely to be most beneficial for outmigrating juvenile fall Chinook (Arntzen et al. 2012, Tiffan and Connor 2012, Tiffan and Hatten 2012).

In light of this, the Corps has created several dredged material placement sites in the Lower Granite reservoir and one site in Ice Harbor reservoir, and has supported numerous research and monitoring efforts in the Lower Granite reservoir to assess the biological impacts and potential benefits of in-water placement of dredged material to enhance fish habitat (Tiffan and Connor 2012; Arntzen et al 2012; Gottfried 2011; Bennett and Seybold 2004; Bennett and Shrier 1986; Seybold et al. 2007). Although some researchers have associated deposited sediments in reservoirs with unproductive habitat (Summerfelt 1993; Waters 1995), outmigrating sub yearling Chinook salmon have exhibited preference for sand substrates in the lower Snake River (Bennett et al. 1988, 1998; Curet 1994, Gottfried et al. 2011, Tiffan and Connor 2012; Tiffan and Hatten 2012). Results of these studies have indicated in-water placement of dredged material has improved habitat conditions for listed juvenile salmonids by providing feeding and rearing habitat, while maintaining the overall fish community composition and structure (Chipps et al. 1997; Gottfried et al. 2011, Tiffan and Connor 2012; Tiffan and Hatten 2012).

5.1.8 Predatory Fish Species

During recent sampling of all four reservoirs in the lower Snake River, studies found that smallmouth bass were the most common predator of all of the eight predatory species (northern pikeminnow, smallmouth and largemouth bass, walleye, yellow perch, white and black crappies, and channel catfish) (Seybold and Bennett 2010). Smallmouth bass were most abundant in Lower Granite reservoir, while northern pikeminnow were more abundant at sampling stations downstream of Lower Granite Dam. Walleye were only caught in Lower Monumental and Ice Harbor reservoirs. Largemouth bass, crappies, yellow perch, and channel catfish were most frequently caught in Lower Monumental and Ice Harbor reservoirs, though catch rates were low.

Larger predatory individuals may seasonally forage for juvenile salmonids residing in, or migrating through, the reservoirs. However, other than juvenile fall Chinook salmon, fish predation appears to be relatively low for yearling Chinook salmon and steelhead (USACE 1999b; 2002a). Due to their abundance, the most prevalent predator on juvenile salmonids is likely smallmouth bass (USACE 1999b). Smallmouth bass catch rates were high in created shallow water habitats in the lower Snake River; however, no yearling or subyearling Chinook salmon were identified in piscivore stomachs (Seybold and Bennett 2010). This may be attributed to the fact that most smallmouth bass were caught in the fall, and outmigrating salmonid juveniles were only abundant during spring. Further, approximately half of the smallmouth bass captured were below the predatory size threshold of 6 inches (i.e., too small to prey on juvenile salmonids). Recent sampling by Arntzen et al. (2012) found that smallmouth diets consisted of less than six percent of juvenile Chinook salmon by weight, indicating that salmonids were not a significant portion of their diet at shallow water habitat sites.

Recently, predation by northern pikeminnow on juvenile salmonid migrants in the Columbia River Basin has been reduced from 8 percent to 6 percent of all predation-related mortality. This reduction has been accomplished by the Sport Reward Program under the Northern Pikeminnow Management Program (NMFS 2004) and by scientific sampling funded by the BPA (USACE 2002a). Both of these programs removed significant numbers of northern pikeminnows from the basin. Bull trout are also predatory species present in the LSRP and were addressed previously in this section.

5.1.9 Dams

Dam development in the Columbia River Basin began in the 1800s. Mainstem dam development began with Rock Island Dam (a non-Federal project) on the Columbia River in 1933 and continued through 1975 with the completion of Lower Granite on the Snake River. Bonneville Dam was the first Federal dam on the mainstem Columbia River. It was completed in 1938. The major period of construction on the mainstem Columbia and Snake Rivers was from the 1950s through the 1970s. Federal agencies have built 30 major dams with hydropower facilities on the Columbia and its tributaries. Overall, there are some 255 Federal and non-Federal projects that have been constructed in the basin. These dams have altered the sediment transport function of many parts of the rivers, especially at the uppermost dams, such as Lower Granite Dam.

The lower Snake River dams have disrupted sediment transport and habitat-forming deposition patterns within the entire length of the river channel. As the Snake and Clearwater Rivers meet the slackwater of the Lower Granite reservoir, bedload and suspended particles soon settle to the river bottom, resulting in a substantial accumulation of sediment near the head of the reservoir. An estimated 2.6 million cubic yards of sediment enter the Lower Granite reservoir each year. Without the dams, finer-grained materials will tend to be deposited on the river floodplain or high along the channel margins, and the riverbed will present a complex mosaic of substrate conditions along the length of the lower Snake River.

Presently, there are few shallow-water sandy shoals below the confluence area. Consequently, smolts must travel substantial distances between foraging areas, feeding during their seaward migration. There are also few accumulations of suitable spawning gravels for SRF Chinook salmon except for a limited amount in the tailraces of the dams.

Storage dams have eliminated mainstem spawning and rearing habitat. They have altered the natural flow regime of the Snake and Columbia Rivers by decreasing spring and summer flows, increasing fall and winter flow, and altering natural thermal patterns. Power operations cause fluctuating flow levels and river elevations, affecting fish movement through reservoirs, disturbing riparian areas and, possibly, stranding fish in shallow areas as flows recede. The eight dams in the migration corridor of the Snake and Columbia Rivers kill or injure a portion of the smolts passing through the area. The low velocity at which water travels through the reservoirs behind the dams slows the juvenile salmonids travel time to the ocean and enhances the survival of predatory fish (Independent Scientific Group 1996). Formerly complex mainstem habitats in the Snake River have been reduced to single, simple, reservoir-wide channels with reduced floodplains in size and function, and off-channel habitats eliminated or disconnected from the main channel (Sedell and Froggatt 1984; Independent Scientific Group 1996; and Coutant 1998). The amount of large woody debris in the river has declined, reducing habitat complexity and altering the river’s food webs (Maser and Sedell 1994).

Hydroelectric dams have eliminated or reduced mainstem spawning and rearing habitat and have altered the normal flow regime of the Snake and Clearwater Rivers, decreasing spring and summer flows, increasing fall and winter flow and altering natural thermal patterns (Coutant 1999). Power operations cause fluctuating flow levels and river elevations, affecting fish movement through the reservoirs, disturbing shoreline or shallow water areas and possibly stranding fish in shallow areas when flows recede quickly. A substantial fraction of the mortality experienced by juvenile outmigrants through the portion of the migratory corridor affected by the Federal Columbia River Power System occurs in the reservoirs. This includes about half of the mortality of all in-river migrating juvenile salmon and steelhead (NMFS 2008a). The altered habitats in many reservoirs reduce smolt migration rates and create more favorable habitat conditions for fish predators, including native northern pikeminnow, nonnative walleye and smallmouth bass (ISG 1998; NRC 1996).

In the Lower Snake River and the lower reach of the Clearwater River, dams have changed food web interaction both directly and indirectly. Impoundments have directly increased predation risk for anadromous salmon and steelhead smolts by delaying downstream migration, thereby prolonging their exposure to piscivorous birds and fishes. Impoundments have also changed trophic interaction indirectly by creating extensive new habitat (e.g., riprap banks) that favors some native piscivorous fishes like northern pikeminnow and providing new opportunities for non-native piscivores like walleye and smallmouth bass (Beamesderfer and Rieman 1988; Kareiva et al. 2000; Petersen and Poe 1993). The new and poorly understood food webs that have developed in run-of-the-river reservoirs in recent decades may not support the energetic needs of over winter juvenile rearing, spring-migrating salmon and steelhead or other native organisms. Future changes in run-of-the-river food webs can be expected as new non-native species become established, and these additions also may have unanticipated effects on the nutritional condition and fitness of migrating juvenile salmon (Kareiva et al. 2000).

5.1.10 Soils

The soils along the lower Snake River can be primarily divided into three types: upland soils along the hillslopes and canyons, alluvial soils along the river, and bench soils along the ridgetops and terraces above the river. The upland soils are primarily shallow to very deep, silty loam soils formed from loess deposits and residuum from basalt. These soils tend to have a high-to-severe erosion hazard due to rapid runoff along the steep slopes of the canyon. The bench-type soils tend to be sandy loam developed from glacial outwash, loess, volcanic ash, and basalt. These bench-type soils have slow runoff characteristics and slight erosion hazards because they tend to be on less steep slopes. Alluvial soils are found in the valley bottom and are excessively drained and range from cobbley, coarse sand underlain by stratified cobbles, boulders, gravels, and sand. These alluvial soils were more subject to periodic flooding prior to river impoundment.

Many of the Snake River Plateau soils are light and highly erodible with low rainfall limiting the ability of vegetative cover to reestablish, once removed. Wind erosion is prevalent, especially during the spring and fall, when high winds and dry soil conditions create dust storms. The severity of these dust storms is exacerbated by dryland agricultural practices that expose the soil during spring cultivation and fall harvesting.

Erosion from areas burned by forest fires and plowed for agriculture are two of the main factors that contribute sediment to the rivers. The use of no-till farming practices reduces the sediment input from agriculture. Landslides in burned areas contribute large amounts of sediment. Landslides of various types also occur along the reservoir shorelines. These landslides are generally within the surface layer sediments, especially those that are somewhat poorly drained because of an admixture of finer grained sediment.

The lower Snake River downstream of Lewiston, Idaho annually transports approximately 3 to 4 million cubic yards of new sediments which have been eroded from its drainage basin. Approximately 100 to 150 million cubic yards of sediment have been deposited upstream of the four lower Snake River dams (mostly in Lower Granite reservoir) since Ice Harbor became operational in the early 1960s.

5.1.11 Other Baseline Conditions

Other human activities that have degraded aquatic habitats or affected native fish populations in the Snake River Basin include stream channelization, elimination of wetlands, construction of flood control dams and levees, construction of roads, water withdrawals, unscreened water diversions, agriculture, livestock grazing, urbanization, outdoor recreation, artificial fish propagation, fish harvest, and the introduction of non-native species (Henjum et al. 1994; Rhodes et al. 1994; Spence et al. 1996). In many watersheds, land management and development activities have: (1) reduced connectivity (i.e., the flow of energy, organisms, and materials) between streams, riparian areas, floodplains, and uplands; (2) elevated fine sediment yields, degrading spawning and rearing habitat; (3) reduced large woody material that traps sediment, stabilizes streambanks, and helps form pools; (4) reduced the vegetative canopy that minimizes the solar heating of streams; (5) caused streams to become straighter, wider, and either shallower or deeper than their historic or normative condition, thereby reducing rearing habitat and altering water temperature; (6) altered peak flow volume and timing, leading to channel changes and potentially altering fish migration behavior; and (7) altered floodplain function, water tables, and base flows (Henjum et al. 1994; Rhodes et al. 1994; Wissmar et al. 1994; Spence et al. 1996).

Although currently fragmented by the presence of dams, the mainstem Snake River provides habitat that may help to maintain interactions between populations in the tributaries. It currently provides for the foraging and overwintering of all ESA-listed Snake River salmonids except sockeye salmon (Table 17), and could provide some spawning habitat for SRF Chinook salmon.

Table 17. Absolute and Relative Quantification of Three Water Depth Habitats in the Lower Granite Reservoir, Snake River and Clearwater River During the Early to Mid-1980's

Pool Reach (RM)	Shallow (<20 ft) Acres (Percent)	Mid-Depth (20-60 ft) Acres (Percent)	Deep (>60 ft) Acres (Percent)	Total Acres (Percent of Total Pool or Reach)
SR107.4 – SR120.46	281 (8%)	1,241 (34%)	2,147 (57%)	3,669 (43%)
SR120.46 - SR146.33	983 (8%)	2,795 (58%)	1,017 (21%)	4,795 (57%)
SR107.4 – SR146.33	1,264 (15%)	4,036 (48%)	3,164 (37%)	8,464 (94%)
CR0.0 - CR4.4	349 (71%)	141 (29%)	0 (0%)	489 (6%)
SR107.4 - SR146.33 and R0.0 - CR4.4	1,612 (18%)	4,177 (47%)	3,164 (35%)	8,953 (100%)

Notes:
(1) Estimates calculated from U.S. Army Corps of Engineers cross section profiles.
(2) SR120.46 is the mid-reservoir section where the majority of the fine silt and sand material settles out due to increased rate of depth affecting the slowing rate of water velocity.

5.1.12 Turbidity

The turbidity standards in Washington and Idaho differ slightly. Washington regulations specify that turbidity shall neither exceed 5 nephelometric turbidity units (NTUs) over background levels when the background level is 50 NTUs or less nor have more than a 10 percent increase when background is more than 50 NTUs. The Idaho standard states that turbidity shall not exceed the background by more than 50 NTU instantaneously below the compliance boundary or by more than 25 NTU for more than 10 consecutive days.

Background turbidity data collected from the lower Snake River indicates that turbidity was lowest at the confluence of the Snake and Clearwater Rivers and increased farther downstream in the Snake River. Median turbidity values ranged from 2 to 4 nephelometric turbidity unit (NTUs) in the Snake River, well below Washington's 25 NTU background action limit. These measurements did not include sampling during periods of heavy runoff or heavy storm non-point source water discharge. The average background turbidity level in the Snake and Clearwater Rivers during the winter dredging period in 2006 was less than 5 NTU.

If sediment accumulated at boat basins, increased prop wash from recreational boating would stir up sediment and increase turbidity. Any adverse effects on ESA-listed fish from increased turbidity would be localized in the area where sediments were disturbed by prop wash. If the Corps closed boat basins affected by sediment accumulation, the effects on aquatic plants from prop wash would cease.

For fish and wildlife, maintenance of HMU irrigation intakes would have localized turbidity, which could have minor adverse effects on fish. Like boat basins, this effect would be localized and limited to the area surrounding the irrigation intake being maintained.

5.1.13 Chemicals of Concern

Sediment samples were collected from the federally authorized navigation channel within the Lower Snake and Clearwater Rivers, as well as the ports of Clarkston and Lewiston, during November 2012 and August 2013 to determine suitability for in-water disposal. The 2012 sediment characterization effort occurred at the Port of Clarkston Crane Dock. The August 2013 sampling template consisted of fifteen Dredge Material Management Units (DMMUs). The samples from both events were analyzed for the conventional parameters and chemicals of concern. All field sampling and laboratory analyses adhered to the protocols set forth in the approved sample analysis plans, the *Dredged Material Evaluation and Disposal Procedures*, and the *Sediment Evaluation Framework for the Pacific Northwest (SEF)*.

Analytical results for the DMMUs included:

- Conventional analyses of the samples showed that grain size was typically higher in the Clearwater River DMMUs relative to the DMMUs below the confluence in the Snake River. For the Clearwater DMMUs (7 – 11 and Port of Lewiston Grain Dock), the grain size averaged 95.8 percent sand. The DMMUs below the confluence were still relatively coarse, but had less sand, averaging 85 percent in the Federal Navigation Channel and 77.1 percent at the Port of Clarkston facilities. The substrate at the Port of Clarkston Crane Dock consisted of 59 percent sand and 37 percent gravel.
- The total organic carbon (TOC) content, an indicator of organic enrichment, averaged 0.4 percent at the Clearwater River DMMUs and 2.1 percent in the Snake River navigation channel. Sediment TOC was slightly higher at the Port of Clarkston facilities, averaging 2.5 percent.
- The concentrations of metals were below the relevant Screening Level (SL)1 levels in all DMMUs. This included selenium, which had been a chemical of concern in past characterization events.
- The levels of phthalates, pesticides, and PCBs were all reported principally as non-detected compounds, or where detected they were below the SL1 in all DMMUs. This included toxaphene, which was a special chemical of concern requested by the Washington Department of Ecology and the Washington Department of Fish and Wildlife. Other phenols and miscellaneous extractables that were not detected include 2-methylphenol, 2,4-dimethylphenol, pentachlorophenol, and betahexachlorocyclohexane. Dibenzofuran was reported as an estimated (J-flagged) value at DMMU 5, at a very low level and well below the corresponding SL1.
- DMMU Port of Clarkston (POC) Recreation Dock had not been sampled previously, necessitating the need for a larger suite of chemical analyses that included PAHs, chlorinated hydrocarbons, hexachlorobutadiene, and N-nitrosodiphylamine. The concentrations of all chemicals of concern were below the SLs.
- The concentrations of 4-methylphenol in six of the eight Snake River DMMUs (1, 2, 3, 5, 6, and the Port of Clarkston Grain Elevator) exceeded the SL1 guidelines, with values ranging from 340 ppb to 4,900 ppb. Phenol also exceeded SL1 guidelines in DMMU 6 where a

concentration of 170 ppb was determined. Benzoic acid, though not detected at concentrations greater than the SL1 guideline, was identified at an unusually high 890 ppb in DMMU 6. Additionally, the highest concentrations of these three constituents all occurred in DMMU 6, the one farthest upstream in the Snake River.

Additional sampling and analyses were completed in November 2013 as required by the Dredged Material Management Office (DMMO) based on the detection of 4-methylphenol, phenol, and benzoic acid. Six DMMUs were resampled and laboratory analyses consisted of the phenolic compounds and benzoic acid, as well as bioassay testing to further evaluate the suitability of the sediment from those DMMUs for open water disposal. The results of the measured conventional analyses were similar to those observed in the August-collected samples, with some notable differences. The TOC concentrations measured in the November DMMU 2, 3, and 6 samples were between 2 – 4.7 percent higher than the same samples collected in August. Grain size was generally similar, except at DMMUs 5 and 6 which had 25.6 and 17.8 percent higher percent fines, respectively, than the August samples. The samples submitted from the November collection confirmed the presence of 4-methylphenol at levels above the SL1 for DMMUs 1, 3, 5 and 6, but for DMMUs 2 and POC-Grain Elevator the reported levels were below the SL1. For DMMU 6, the phenol level in the August sample was reported above the SL1; for the November sample phenol was below the SL1.

The 10-day freshwater amphipod *Hyalella azteca* survival test and the 20-day freshwater midge *Chironomus dilutus* survival and growth test were completed on the six November 2013 DMMU composite samples and on two reference sediment samples. The results were:

- The 10-day freshwater amphipod mortality test indicated that all tested sediments (control, reference, and DMMUs) had mortality that was less than 5 percent - well below the one and two-hit criteria and considered to have passed relative to these guidelines.
- The 20-day freshwater midge mortality test demonstrated that all tested DMMU composite sediments had mortality that was less than that observed in the control sediment (18.8 percent); i.e., greater survival of the midge was observed in the test sediments relevant to the controls. Relative to the respective reference sediment, all tested DMMU sediments were within the range of ±3.8 percent. All test sediments were well below the one and two-hit criteria, and are considered to have passed relative to these guidelines.
- The 20-day freshwater midge growth test showed that all tested DMMU composite sediments had mean individual growth rates that were at least 80 percent of that observed in the control sediment, and at least 91 percent of that observed in the relevant reference sediment. In several cases the mean individual growth rates exceeded that observed in the control and reference sediments. All test sediments were well below the one and two-hit criteria, and are considered to have passed relative to these guidelines.
- The bioassay results were decisive for the suitability determination. For the two organisms and three end-points tested, the proposed dredge sediments passed the Dredged Material Management Program biological guidelines. The sediments were considered suitable for in-water disposal after taking into consideration all of the testing results.

The Corps also had the 4-methylphenol and phenol results reviewed by the Corps' Engineer Research and Development Center (ERDC) to evaluate their potential toxicity and bioaccumulation in the lower Snake River. The first technical memo focused on the environmental sources and occurrence of the compounds. The evaluation indicated that both chemicals occur in the environment from natural microbial degradation and anthropogenic sources. Their chemical properties enable them to sorb only modestly to organic particulates in water and sediment and they prefer to remain in the dissolved state. Due to their low affinity to bioconcentrate from water into fatty tissues, a well as the endogenous metabolism that occurs within aquatic organisms, these compounds display minimal bioaccumulation through food webs to higher trophic level fish such as steelhead and salmon. There currently are no national aquatic life water quality criteria for phenol or 4-methylphenol in the U.S. The second ERDC evaluation focused on a comparison of the results from three models (DREDGE, STFATE, and RECOVERY) to water concentration screening levels suggested by National Marine Fisheries Service (NMFS) (1.35 mg/L for 4-methylphenol and 0.07 mg/L for phenol). The DREDGE model was used to simulate sediment re-suspension and contaminant release at the dredging site. The results predicted that the total contaminant concentrations at the dredging site would be less than 0.1 percent of the NMFS criteria, assuming worst-case conditions at a downstream mixing zone boundary 150 ft from the dredge. The STFATE model was used to evaluate the short-term fate of dredged material during open water placement. These results showed that at anticipated river velocities of 0.2 and 0.4 ft/sec the exposure concentrations would be less than five percent of the NMFS criteria at the conservative mixing zone boundary of 150 ft downstream. The RECOVERY screening model was used to assess the impact of contaminant transfer from the sediments to the overlying water after 6 months, 5 years, and 50 years. The results demonstrated that nearly all sustained exposure concentrations at the placement site after construction is completed would be less than 0.1 percent of the NMFS criteria. Based on the predicted water concentrations within the immediate area of dredging operations, dredged material placement, and above or within the bioactive zone of the constructed shoal following site construction, toxicity to fish and tainting of fish tissue is not expected. (USACE 2014: 404(b)(1))

5.2 Matrix of Pathways and Indicators (MPI)

NMFS uses the "Matrix of Pathways and Indicators" (MPI) (NMFS 1996) to summarize important environmental parameters and levels of condition for each (Table 18). USFWS adopted a similar strategy in 1997 based on NMFS' matrix. The NMFS matrix is divided into six overall pathways (major rows in the matrix):

- Water Quality.
- Channel Condition and Dynamics.
- Habitat Access.
- Flow/Hydrology.
- Habitat Elements.
- Watershed Conditions.

Each represents a significant pathway by which actions can have potential effects on anadromous salmonids and their habitats, and could be used for analyzing bull trout habitat as well.

Table 18. Checklist for Documenting Environmental Baseline and Effects of Proposed Action on Relevant Anadromous Salmonid Habitat Indicators

PATHWAYS	ENVIRONMENTAL BASELINE			EFFECTS OF THE ACTION		
Indicators	Properly Functioning	At Risk	Not Properly Functioning	Restore	Maintain	Degrade
Water Quality:						
Temperature			X		X	
Sediment			X		X	
Chem. Contam./Nut.		X			X	
Habitat Access:						
Physical Barriers		X			X	
Habitat Elements:						
Substrate			X		X	
Large Woody Debris			X		X	
Pool Frequency			X		X	
Pool Quality			X		X	
Off-Channel Habitat			X		X	
Refugia			X		X	
Channel Cond. & Dyn.:						
Width/Depth Ratio			X		X	
Streambank Cond.			X		X	
Floodplain Connectivity			X		X	
Flow/Hydrology:						
Peak/Base Flows			X		X	
Drainage Network Increase			X		X	
Watershed Conditions:						
Road Dens. & Loc.			X		X	
Disturbance History			X		X	
Riparian Reserves			X		X	
Watershed Name: Snake River Basin			Location: Ice Harbor Dam to Lewiston, Idaho			

5.3 Baseline Condition

The lower Snake River in the action area has been highly altered from its pre-dam condition. As a result many of the parameters below are “not properly functioning.”

Water Quality: Temperature – Water temperature in the lower Snake and Clearwater Rivers is not properly functioning. Dams on the Snake River have altered the water temperatures especially during summer and fall. Coldwater releases from Dworshak Dam reduce summertime water temperature in an attempt to create more favorable conditions for migrating juvenile salmonids. During winter, when the proposed action will occur, water temperatures are likely to be similar to historic conditions.

Water Quality: Sediment – Sediment in the Snake River is not properly functioning. Many factors contribute to the altered sediment processes. The aftereffects of forest fires contribute sand and silt to the river systems, especially from the Salmon River basin. While this is a natural process, the frequency of large fires may be on the increase due to years of fire suppression and climate change. Mainstem dams trap sand and larger sediments, especially in areas such as the Snake/Clearwater confluence where faster moving water which can carry sand meets the slackwater reservoir which cannot carry sand very well. Sand and any larger sediments are deposited in these areas in large amounts, causing problems for river navigation.

Water Quality: Chemicals of Concerns/Nutrients – The amount of chemicals of concern in the sediments within the action area place this attribute at risk. Various chemicals of concerns were detected within the sediments in some locations of the action area. However, modeling results showed that at anticipated river velocities the exposure concentrations would be less than five percent of the NMFS criteria at the conservative mixing zone boundary of 150 ft downstream. The modeling to assess the impact of contaminant transfer from the sediments to the overlying water after 6 months, 5 years, and 50 years demonstrated that nearly all sustained exposure concentrations at an example placement site after construction would be completed would be less than 0.1 percent of the NMFS criteria. Based on the predicted water concentrations within the immediate area of an example for dredging operations, dredged material placement, and above or within the bioactive zone of the constructed shoal following site construction, toxicity to fish and tainting of fish tissue is not expected.

Habitat Access: Physical Barriers – Physical barriers in the action area make this parameter at risk. A majority of migrating adult and juvenile salmonids can successfully pass the mainstem dams, but passage is sometimes delayed and some fish do not survive the unnatural conditions around the dams. In addition, the slack water reservoirs slow the migration of juveniles which can be detrimental to their survival.

Habitat Elements: Substrate – The substrate condition in the action area is not properly functioning. The dams have halted the bedload movement of most of the gravel and cobble once transported through the system. Sand and gravel bars have mostly been covered by the slackwater reservoir. A faster moving, natural river likely contained more areas of gravel and cobble substrate where higher quality food organisms for juvenile salmonids lived.

Habitat Elements: Large Woody Debris - is not properly functioning. The reservoir conditions make what little large woody debris is on the river nonfunctional as salmonid habitat. Most of the existing woody debris is high up on the shorelines or floats down the river and is trapped behind the dams.

Habitat Elements: Pool Frequency – Pool frequency within the action area is not properly functioning. The slackwater reservoir creates one large pool where many smaller pools intermixed with runs and riffles once occurred.

Habitat Elements: Pool Quality – The pool quality in the action area is not properly functioning. Cover in the pool is provided mainly by water depth. Nonnative species/competitors reduce the amount of quality habitat for salmonids even further.

Habitat Elements: Off-Channel Habitat – The amount of off channel habitat in the action area is not properly functioning. Off-channel habitat in the form of side channels and backwater areas are limited within the lower Snake River. Areas which once contained shallow water habitat are now covered by many feet of reservoir water.

Habitat Elements: Refugia – The amount of refugia in the action area is not properly functioning. This parameter is closely related to the limited amount of large woody debris, large particle size substrate and overhead cover now available in the lower Snake River. Refugia on the mainstem river is now provided mainly by water depth.

Channel Condition and Dynamics: Width to Depth Ratio – The width to depth ratio of the Snake River in the action area is not properly functioning. The width to depth ratio of the lower Snake River has been altered since construction of the dams.

Channel Condition and Dynamics: Streambank Condition – The streambank condition in the action area is not properly functioning. Some of the streambanks in the lower Snake River have been lined with riprap. This protects the banks from erosion, but reduces the amount of riparian vegetation that is able to grow along the river.

Channel Condition and Dynamics: Floodplain Connectivity – The floodplain connectivity in the action area is not properly functioning. Prior to construction of the Snake River dams, the river had a wide floodplain. With the presence of the dams and the controlled reservoir elevation, the floodplain is dramatically reduced in width.

Flow/Hydrology: Peak/Base Flows – The peak and base flows in the action area is not properly functioning. The Snake River's peak flow has declined since larger storage Dams were constructed. Likewise baseflow has been increased as stored water is released during dry months of the year.

Flow/Hydrology: Drainage Network Increase – The drainage network in the action area is not properly functioning. Cities and towns increase the amount of impervious surface which causes water to run off the land quicker than normal. Plowed agricultural fields do not retain as much water after storms than naturally vegetated land. Snow on clearcut forests may melt sooner causing higher peak flows and lower base flows.

Watershed Conditions: Road Density and Location – The road density and location within the action area is not properly functioning. The presence of roads in the watershed can cause large amounts of fine sediment to erode into the streams and rivers of the watershed.

Watershed Conditions: Disturbance History – The disturbance history of the action area is not properly functioning. Many factors have caused disturbance to the Snake River watershed. Agriculture, forestry, road building, and stream channel straightening/altering have had great impacts on the watershed.

Watershed Conditions: Riparian Reserves – The amount of riparian reserves within the watershed is not properly functioning. In the past riparian vegetation was removed along many sections of the Snake River and its tributaries.

6 EFFECTS OF THE ACTION

This section includes an analysis of general project-related effects of the proposed action, as well as specific effects on the species and PCEs of critical habitat. The actions selected for this programmatic consultation all have predictable effects regardless of where they are carried out in the District.

The PSMP is a long-term plan that forms the basis of the Corps' decision-making process for future sediment management activities needed to maintain and meet existing authorized project purposes of the LSRP. The PSMP is intended to be a proactive adaptive management plan, addressing both the immediate near term problems and anticipated future problems before they are critical and solutions become limited. The PSMP does not prescribe site-specific solutions. Rather, it provides a set of potential measures that may be applicable for sediment accumulation that interferes with existing authorized purposes of the LSRP and a framework for selecting those measures.

The Corps will select measures to effectively address problems in the least costly, environmentally acceptable manner, consistent with engineering requirements and in accordance with applicable laws and regulations. The PSMP will guide only those actions taken by the Corps within the project boundaries of the LSRP that are within the Corps' authority.

This proposed Federal action represents a programmatic decision. Any future implementation actions at the project level when site-specific decisions are made regarding navigation, recreation, fish and wildlife, or flow conveyance where the effects are not considered in this assessment would be subject to individual ESA consultations. These individual (tiered) consultations would then put the matter before interdisciplinary teams and biologists to duly analyze the potential impacts, and provide adequate protection for ESA-listed species and their habitat.

6.1 Approach to the Analysis

This consultation focuses on formal adoption of the PSMP. It also includes the potential effects associated with any future implementations actions that are quantifiable programmatically at the plan level to the greatest extent possible. It is also understood that implementation of future actions under the PSMP may require evaluation of site-specific potential effects, if the effects are in addition to what is considered at the plan level in this consultation. Proposed future actions under the PSMP that would require additional section 7 consultations would be tiered from this programmatic consultation.

The Corps developed an analytical approach using the management measures included at the plan level of the proposed action. These management measures are:

- Navigation and Other Dredging.
- Dredge to Improve Conveyance Capacity.
- Beneficial Use of Sediment.
- In-water Disposal of Sediment.
- Upland Disposal of Sediment.
- Bendway Weirs.
- Dikes/Dike Fields.
- Agitation to Resuspend.
- Trapping Upstream Sediments (in reservoir).
- Navigation Objectives Reservoir Operations.
- Reconfigure/Relocate Affected Facilities.
- Raise Lewiston Levee to Manage Flood Risk.
- Reservoir Drawdown to Flush Sediment.

The plan also identified which measures could be implemented under the action triggers to address sedimentation problems affecting each of the existing authorized purposes (Table 19). Under the action triggers, each management measure would be tailored to meet the needs for addressing the specific sedimentation issues relative to the potential sites affected for each existing authorized purpose. This means that the level of potential effects for each applicable management measure varies between actions for navigation, recreation, fish and wildlife, and flow conveyance.

Table 19. Management Measures Associated with Actions in Response to Triggers

		Existing Authorized Project Purpose Action Trigger							
		Navigation		Recreation		Fish and Wildlife		Flow Conveyance	
Management Category	Management Measure	Immediate Need	Future Forecast Need	Immediate Need	Future Forecast Need	Immediate Need	Future Forecast Need	Immediate Need	Future Forecast Need
Dredging and Dredged Materials Management	Navigation and Other Dredging	X	X	X	X	X	X		
	Dredge to improve Conveyance Capacity							X	X
	Beneficial use of Sediment	X	X	X	X	X	X	X	X
	In-water Disposal of Sediment	X	X	X	X	X	X	X	X
	Upland Disposal of Sediment	X	X	X	X	X	X	X	X
Structural Sediment Management	Bendway Weirs		X						
	Dikes/Dike Fields		X						
	Agitation to Resuspend			X	X		X		
	Trapping Upstream Sediments (in reservoir)		X						
System Management	Navigation Objectives Reservoir Operations	X							
	Reconfigure/Relocate Affected Facilities		X		X		X		
	Raise Lewiston Levee to Manage Flood Risk								X
	Reservoir Drawdown to Flush Sediment		X						X

Using this information, the Corps can describe effects of the action at the plan level, and effectively deconstruct the action to meaningfully refine the effects analysis. This method should allow the Corps to capture the potential effects of many of the possible future implementation actions to address maintenance needs in potential sediment accumulation problem areas using management measures for each action trigger. Anything not adequately captured, for whatever reason, will be consulted on individually, as described in Section 3.12 (Future Action-Specific Consultations). This method should also better inform the Services' jeopardy analyses.

6.2 Exposure Profile

In order to analyze exposure of potential effects of the proposed action, it must be determined if potential stressors could be produced as a result of the action, as proposed.

The Corps is proposing to implement management measures in waters containing both ESA-listed species and designated critical habitats, thereby making exposure of ESA-listed species and designated critical habitats to the proposed action reasonably certain to occur. The proposed action contains elements that, by their very nature, are likely to produce some stressors. Therefore, exposure of ESA-listed species and designated critical habitats to some amount of stressors is reasonably certain to occur, although minimized to the greatest extent possible through implementation of the proposed conservation measures.

Those species that are listed in the counties containing Corps lands, but that do not occur within the action area either spatially or temporally, have no potential to be exposed to potential stressors, and a "no effect" determination can be made for those species (Table 20).

Conversely a "may affect" determination must be made for those species that occur in spatial and temporal proximity of the proposed action in the action area (Table 20). Each species' "may affect" determinations are reflected in the sections below. Exposure to potential stressors will be reduced by the implementation of the proposed conservation measures.

If individuals are exposed to potential stressors, then an analysis of the response must take place to gauge the effect on the individual. For example, there could be a range of responses to the exposure, and variability in response, of action triggers to fish, depending on the management measure. An individual fish may respond directly or indirectly to exposure to stressors. Examples of response by species include physiological changes, or behavioral modification. Responses with critical habitat include alteration of spawning gravels or habitat alteration. Responses are a function of the likelihood of exposure, and the extent of that exposure to potential stressors, combined with reductions in that likelihood and extent due to conservation measures. Responses are specific to the type of stressors, and will be identified as such in each potential effect section.

The exposure profile combined with the response profile will determine the effect to the species and designated critical habitat. Potential effects will be minimized by the implementation of proposed conservation measures.

Upper Columbia River (UCR) spring Chinook ESU and UCR and Middle Columbia River (MCR) steelhead DPS boundaries do not include the Snake River. Though they could stray into the Snake River protection for them would then be provided by the ESA coverage for Snake River species.

Table 20. May Affect Determinations Based on Spatial and Temporal Proximity of the Species to the Proposed Action

Species	Species Determination	Critical Habitat Determination
	NMFS	
SR Spring/Summer Chinook	May Affect	May Affect
SR Fall Chinook	May Affect	May Affect
SR Sockeye	May Affect	May Affect
SRB Steelhead	May Affect	May Affect
MCR Steelhead	May Affect	No Effect
UCR Spring-run Chinook	May Affect	No Effect
UCR Steelhead	May Affect	No Effect
USFWS		
Bull trout	May Affect	May Affect
Pygmy rabbit	No Effect	None Designated
Canada lynx	No Effect	No Effect
Gray wolf	No Effect	None Designated
Ute ladies'-tresses	No Effect	None Designated
Spalding's' catchfly	No Effect	None Designated
Greater sage-grouse	No Effect	None Designated
Yellow-billed cuckoo	No Effect	None Designated
Washington ground squirrel	May Affect	None Designated
Umtanum Desert buckwheat	No Effect	No Effect
White Bluffs bladderpod	No Effect	No Effect

6.3 Effects on Listed Species

The proposed action may affect the species identified in Table 20 by causing physical, chemical, and biological changes to the environment. The effects of the proposed action are expected from the implementation of management measures as a result of action triggers that will occur between December 15 and March 1 or appropriate in-water summer work period.

These effects are detailed below in general effects that may occur as a result of implementing the types of activities in the plan, and are further refined into which general effects are associated with management measures that may be implemented for each action trigger to address sediment issues affecting each of the four existing authorized purposes of the LSRP. Each management measure discussion also contains any further detail needed to describe the effects associated with it.

The Corps anticipates that project-related effects will be similar for all Snake River listed fish species that may occur within the action area, including bull trout, and will therefore be analyzed collectively.

Because actions associated with structural sediment management measures and some system management measures involve many of the same effects such as in-water work, use of construction equipment, and localized substrate disturbance and increased turbidity, they will be discussed together in general.

6.3.1 General Program Effects

"General effects," described in detail in the following sections, may result as a part of any of the activities included as part of the proposed action. The general effects include:

- Elevated turbidity.
- Suspension of chemicals of concern.
- Entrainment and harassment .
- Disruption of benthic organisms (forage/prey).
- Indirect effects.

A list of each of the general effects will be included as part of the discussion of the effects of future implementation actions associated with management measures for each action trigger. This is important, because the level of potential effects for each applicable management measure varies between actions for navigation, recreation, fish and wildlife, and flow conveyance.

6.3.1.1 Elevated Turbidity

Above Background

Several of the PSMP measures have the potential to elevate turbidity levels during implementation. Dredging and disposal of dredged material will resuspend some fine sediment. Elevations in turbidity may also occur during construction of structures related to structural sediment management or system management. Construction or implementation of management measures under Structural Sediment Management (bendway weirs, dikes/dike fields, agitation to resuspend, reconfigure/relocate affected facilities) could disturb and suspend sediments although likely on a smaller scale than some of the dredging activities. Reservoir drawdown to flush sediment could also disturb and suspend sediments.

The management measures associated with dredging include mechanical dredging (for navigation, recreation, and flow conveyance) and hydraulic dredging (for recreation and HMU irrigation facilities when potential adverse effects to ESA listed fish are unlikely, and on a case-by-case basis). Dredging would occur in the winter in-water work window, although summer dredging may also be considered for other off-channel areas such as boat basins, swim beaches or irrigation intakes on a case-by-case basis.

Mechanical dredging has the potential to create turbidity primarily where the excavation is occurring and for at least 300 feet downstream depending on flow and the type and amount of sediment mobilized. Containment is not possible because of the extent of area, depth, and flow. It is expected that turbidity resulting from dredging and dredged material disposal would be intense in the immediate vicinity of the activity itself, but given the expected flow of 35,000 to 50,000 cfs (USGS 2013a; USGS 2013b) at the confluence of the Snake and Clearwater Rivers, turbidity would rapidly diminish with time and space. In addition, the width of the Snake River at the narrowest site is approximately 1,200 feet or twice the width of the monitoring zone.

As far as responses of ESA-listed fish from exposure to elevated turbidity, increased exposure to suspended sediment can be detrimental to juvenile salmon and steelhead by interfering with feeding and territorial behavior, and therefore reducing fitness of the affected fish (Berg and Northcote 1985). While low levels of turbidity and suspended sediment may not directly impact bull trout, the increased sediment input may affect prey for bull trout. The following effects of sediment are not specific to bull trout alone. All salmonids can be affected similarly.

For salmonids, turbidity elicits a number of behavioral and physiological responses (i.e., gill flaring, coughing, avoidance, increase in blood sugar levels) which indicate some level of stress (Berg and Northcote 1985; Bisson and Bilby 1982; Servizi and Martens 1992; Sigler et al. 1984). The magnitude of these stress responses is generally higher when turbidity is increased and particle size decreased (Bisson and Bilby 1982; Gregory and Northcote 1993; Servizi and Martens 1987).

The introduction of sediment in excess of natural amounts can have multiple adverse effects on bull trout and their habitat (Berry et al. 2003; Rhodes et al. 1994). The effect of sediment beyond natural background conditions can be fatal at high levels. Other salmonids are affected in the same way. No threshold has been determined in which fine-sediment addition to a stream is harmless (Suttle et al. 2004).

Specific effects of sediment on fish and their habitat can be put into three general classes, behavioral, sublethal, and lethal (Bash et al. 2001; Newcombe and Macdonald 1991; Waters 1995). NMFS used the USFWS methodology (2010) developed from Anderson et al. (1996) and Newcombe and Jensen (1996), to developed a measurement of the existing suspended sediment concentration levels (mg/L) and duration of time that sediment impacts would occur. NMFS used data available on the WDOE (WDOE 2013) website to determine a ratio of turbidity (NTU) to suspended solids (mg/L) to find the correlation between turbidity and suspended solids in the lower Snake River. Using data from 1991 to 2011 (N = 59) NMFS calculated that the turbidity to suspended solid ratio for the lower Snake River is 1 to 1.03 during the proposed months of in-water work. Table 21 describes the potential adverse effects to fish of increased turbidity levels (Anderson et al. 1996; Bash et al. 2001; Newcombe and Jensen 1996; U.S. Fish and Wildlife Service 2010).

Table 21. Summary of Expected Adverse Effects to Fish Resulting from Elevated Sediment Levels
(USFWS 2010; Bash et al 2001; Anderson et al. 1996; Newcombe and Jensen 1996)

Physiological	Behavioral	Habitat
Gill trauma; increased coughing; increased respiration rate[1]	Alarm reaction; Avoidance; Abandonment of cover[1]	Reduction in spawning habitat
Osmoregulation[1]	Territoriality[1]	Effect on hyporheic upwelling
Blood chemistry (increase in levels of stress hormones) [1]	Reduction in feeding rates and feeding success; increased exposure to predation[1]	Reduction in benthic invertebrate habitat
Reduced fitness; impaired growth and reproduction; increased susceptibility to disease; delayed hatching; reduced fish density; mortality[2]	Impaired homing and migration[1]	Damage to redds

[1] Behavioral and sublethal effects (USFWS 2010).
[2] Lethal and paralethal effects (USFWS 2010).

Using the USFWS (2010) severity of ill effects scores for juveniles, NMFS estimated what concentrations and durations of exposure would be required for juvenile and adults in the action area to begin to modify their behavior, or experience sublethal or lethal effects (Table 22).

Table 22. The Severity of Ill Effects Associated with Continuous Exposure to Excess Suspended Sediment over a Certain Number of Hours (hr) on Juvenile and Adult Salmonids
(Adapted from USFWS 2010 and Newcombe and Jensen 1996)

Description of Effect	**Concentration and Duration**
Behavioral: alarm reaction, abandonment of cover, avoidance response.	99 NTU 1 hour 40 NTU 3 hours 20 NTU 7 hours
Sublethal: Short-term reduction in feeding rates, respiratory impairment, impaired homing, moderate to major physiological stress, long-term reduction in feeding rate and success, poor condition	1097 NTU 1 hour 403 NTU 3 hours 148 NTU 7 hours
Lethal: Reduced growth rate, delayed hatching, reduced fish density, direct mortality to any life-stage, reduction in egg-to-fry survival, loss of spawning or rearing habitat.	5760 NTU 1 hour 2335 NTU 3 hours 1164 NTU 7 hours

Although elevated levels of turbidity may cause stress, Gregory and Northcote (1993) have shown that moderate levels of turbidity (35-150 NTU) accelerate foraging rates among juvenile Chinook salmon, likely because of reduced vulnerability to predators (camouflaging effect).

Sigler et al. (1984) found that a reduction in growth occurred in steelhead and Coho salmon when turbidity was as little as 25 NTUs. The slower growth was presumed to be from a reduced ability to feed; however, more complex mechanisms such as the quality of light may also affect feeding success rates.

During the dredging and disposal actions in 2005 and 2006, the Corps collected water quality data to monitor turbidity and other criteria in almost real-time (Dixon Marine Services 2006). At that time, the Corps used the water quality standards developed by the state of Idaho (for dredging in the Clearwater River at Lewiston, Idaho) and State of Washington Department of Ecology (WDOE) (for the dredging and disposal in the Snake River in Washington). The state of Idaho limits instantaneous turbidity measurements to less than 50 nephelometric turbidity unit (NTUs) above background, or 25 NTU above background for 10 consecutive days. The Washington standards limit turbidity levels to 5 NTU above background when the background level is less than 50 NTU, and 10 percent over background when background exceeds 50 NTUs. Turbidity may exceed state water quality standards by a small amount, but only for brief periods of time (a few hours) as described below.

The average background turbidity levels in the Snake and Clearwater Rivers during the winter dredging period in 2005 and 2006 was less than 5 NTU. Data collected in 2005-2006 indicates that background turbidity was lowest at the confluence of the Snake and Clearwater Rivers and increased farther downstream in the Snake River. During dredging at the Port of Clarkston, at 300 feet downstream and 3 feet above the substrate, turbidity levels exceeded standards (greater than 5 NTU above background) by an average of 4.58 NTUs, 11.6 percent of the time; and at 3 feet below the surface, an average exceedance of 2.62 NTU occurred 1.8 percent of the time. At 600 feet downstream, the shallow probe turbidity values exceeded compliance 20 percent of the time by an average of 3.87 NTU and the deep probe exceeded compliance 35 percent of the time by an average of 5.84 NTU.

The results from 2005/2006 indicated that turbidity levels in most cases returned to background levels within an hour after cessation of work. The level of temporary exceedance is ***not likely*** to reach levels that would adversely affect fish, particularly in areas where these actions could occur (i.e. there would be a very large area of non-affected water in close proximity to dredging actions). However, the 2006 monitoring report states that during the operation to create the shallow water bench near Knoxway Canyon, operations had to cease for more than 10 hours because of elevated turbidity. The threshold for this operation was raised to 75 NTU in order to complete the project. This example also demonstrates how implementation of site-specific conservation measures limit the duration and intensity of activity-related effects.

Adult steelhead may hold in the Snake River during the winter, and adult bull trout may use the Snake River for FMO. However, their numbers are extremely low, and they prefer deeper water, outside areas that would be subject to dredging. There are also ample opportunities for any holding adults to quickly escape affected waters to nearby unaffected water. It is highly unlikely that any adults would remain near enough to the disturbance area to experience elevated turbidity effects.

Tiffan and Connor (2012) indicate that some juvenile salmonids, primarily SRF Chinook salmon, are expected to be in or near each location where dredging or disposal could occur during the in-water work period. These juveniles would likely be exposed to some level of the short-term effects of degraded water quality.

Adult or subadult bull trout may use the rivers/reservoirs to overwinter, but it is unlikely that juveniles would migrate from their natal streams to use the action area during the proposed work period.

The Corps used the five sites identified as potential dredging or disposal areas to provide an example for describing effects for a dredging and disposal scenario. To estimate the number of juvenile salmonids that may be in the dredging or disposal area, NMFS used the area to be monitored for each site, 600,000 square feet, and the densities Tiffan and Connor (2012) found in water less than 6 feet deep. According to Tiffan and Connor (2012), the grand mean density of SRF Chinook subyearlings at depths less than 6.5 feet in the spring and summer is 0.035 fish per 10.764 square feet. The grand mean density of SRF Chinook subyearlings at depths of 6.5 to 20 feet is 0.002 fish per 10.764 square feet. Using the 600,000 square foot monitoring area as the area of impact, depths are currently 7 to 14 feet in the dredge sites, thus the need for dredging, and greater than the 6.5 feet at the disposal site so the density of 0.002 fish per 10.764 square feet is used. This results in an estimate of 112 juvenile salmonids in each of the five disturbance sites, or 560 total juveniles within the four dredging sites are likely to experience harm from short-term increased in turbidity.

The Corps would implement a number of techniques to minimize turbidity effects resulting from project operations. First, the Corps would monitor turbidity levels and modify dredging operations to avoid prolonged negative effects (see Tables 21 and 22 above). Second, the Corps would implement dredging and disposal operations during a period when listed salmonids are not abundant.

Construction of the shallow water bench will start in shallow water adjacent to the shoreline and extend out toward deeper water. The material used will be predominantly sand with fine-grained silts. Testing of the effects of bottom-dumping dredged material showed the material tended to fall to the river bottom in a clump rather than disperse. The turbidity plume from the bottom-dumping would be mostly along the bottom of the river and wouldn't last long. Although some fish could be entrained by the falling material, fish that are present would likely move away and into unaffected water. The Corps would dispose of silts in a manner to limit their exposure to listed fish by keeping concentrations and durations within the values described in Table 23 within 900 feet downstream of the dredging or disposal area.

Disposal of dredged material (that is, deep water dumping of dredged material as opposed to beneficial use) 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 project. Potential effects of the dredged material placement operation on downstream migrating salmonids would be expected to vary depending on timing of the downstream migrations, amount of time the migrants spend in the affected areas, and use of the affected areas.

Table 23. Severity Scale of Excessive Suspended Sediment on Salmonids
(Table 1 from Newcombe and Jensen 1996).

Table 1 – Scale of the severity (SEV) of ill effects associated with excess suspended sediment on salmonids.

SEV	Description of Effect
	Nil effect
0	No behavioral effects
	Behavioral effects
1	Alarm reaction
2	Abandonment of cover
3	Avoidance response
	Sublethal effects
4	Short-term reduction in feeding rates; short-term reduction in feeding success
5	Minor physiological stress; increase in rate of coughing; increased respiration rate
6	Moderate physiological stress
7	Moderate habitat degradation; impaired homing
8	Indications of major physiological stress; long-term reduction in feeding rate; long-term reduction in feeding success; poor condition
	Lethal and paralethal effects
9	Reduced growth rate; delayed hatching; reduced fish density
10	0-20% mortality; increased predation; moderate to severe habitat degradation
11	> 20 – 40% mortality
12	> 40 – 60% mortality
13	> 60 – 80% mortality
14	> 80 – 100% mortality

In-water (deep water) disposal would be more likely to affect pelagically-oriented adults, and a greater number of juveniles, as they would more likely be occupying waters greater than 20 feet deep and greater than 80 feet from the shore.

Newcombe and Jensen (1996) developed a scale of severity from suspended sediment on salmonids. Table 23 (Table 1 from Newcombe and Jensen 1996) shows the scale. Based on the near-real time monitoring which allows rapid response to elevated turbidity levels and the low turbidity levels recorded during the Corps 2005/2006 dredging effort we estimate the severity level to be between 1 and 5.

Table 24 is also from Newcombe and Jensen (1996). This table links the severity levels with ESA effect determinations. For juvenile fish the applicable determination for a value of 5 (and higher) is "***likely to adversely affect***".

Table 24. ESA Effect Calls for Different Bull Trout Life Stages in Relation to the Duration of Effect and Severity of Ill Effect

Effect calls for habitat, specifically, are provided to assist with analysis of effects to individual bull trout

	SEV	ESA Effect Call [determination]
Egg/alevin	1 to 4 5 to 14	Not applicable - alevins are still in gravel and are not feeding. LAA - any stress to egg/alevin reduces survival
Juvenile	1 to 4 5 to 14	NLAA LAA
Subadult and Adult	1 to 5 6 to 14	NLAA LAA
Habitat	1 to 6 7 to 14	NLAA LAA due to indirect effects to bull trout

The monitoring program for the 2005/2006 dredging was designed to monitor parameters on a near real-time basis as dredging progressed. Water quality monitoring ensured the activities of dredging and disposal of sediments met the terms and conditions of the Water Quality Certifications specified by the States of Washington and Idaho and the ESA. The Port of Lewiston, Project 4000 did not experience any exceedance of turbidity levels according to Idaho state standards of 50 NTU above background station readings. The other monitoring stations saw very low exceedance above the 5 NTU standard. Table 25 shows the average turbidity values above 5 NTU for the 2005/2006 dredging and disposal work. The highest average turbidity was only 15 NTU.

Table 25. Average Turbidity Values above the WA State Water Quality Standard of 5 NTU

Lower Monumental Dam Project 1000						
Station	300		400		900	
Depth	Deep	Shallow	Deep	Shallow	Deep	Shallow
Total Project Hours	175	175	175	175	175	175
Exceedance Hours	3	0	35	24	27	25
Percent in Compliance	98.29%	100.00%	80.00%	86.29%	84.57%	85.71%
Average Turbidity Over	1.22	0.00	9.63	6.95	8.26	5.47

Lower Granite Dam Project 2000						
Station	300		400		900	
Depth	Deep	Shallow	Deep	Shallow	Deep	Shallow
Total Project Hours	6	6	6	6	6	6
Exceedance Hours	0	1	0	0	0	1
Percent in Compliance	100.00%	83.33%	100.00%	100.00%	100.00%	83.33%
Average Turbidity Over	0.00	1.03	0.00	0.00	0.00	1.93

Port of Clarkston WA Project 3000						
Station	300		400		900	
Depth	Deep	Shallow	Deep	Shallow	Deep	Shallow
Total Project Hours	851	851	851	851	851	851
Exceedance Hours	90	16	301	168	129	60
Percent in Compliance	89.42%	98.12%	64.63%	80.26%	84.84%	92.95%
Average Turbidity Over	4.58	2.62	5.84	3.87	4.62	3.86

Disposal Site Project 7000						
Station	300		400		700	
Depth	Deep	Shallow	Deep	Shallow	Deep	Shallow
Total Project Hours	1665	1665	1665	1665	1665	1665
Exceedance Hours	206	62	167	30	179	14
Percent in Compliance	87.63%	96.28%	89.97%	98.20%	89.25%	99.16%
Average Turbidity Over	3.73	2.45	3.53	2.46	4.68	2.83

The material to be removed below Ice Harbor Dam is larger gravel and cobble, mostly free of fines. It is reasonable to assume that materials at other navigation lock approaches would be similar. Removal of this material is not likely to create a turbidity plume downstream. Some Chinook, steelhead and a few bull trout may be found in these areas, but impacts will be minimal at this site.

Based on the data collected during dredging in 2005/2006 and the estimated levels and duration that would cause behavioral, sublethal or lethal effects; it is expected that turbidity levels within 300 feet of the dredge would increase to levels that will cause behavioral responses (alarm, avoidance, abandonment of cover) in adult and juveniles that are within the turbidity plume.

However, because of the width of the waterbody at each site, from approximately 1,300 feet to just over 2,000 feet, providing sufficient river area available for fish to move away from the plume and into better habitat, the effects of increased suspended solids are not likely to exceed the concentration and duration that will cause behavioral modifications.

For NMFS species, exposure of adults and juveniles to elevated turbidity in the immediate vicinity of dredging activities is reasonable to assume. For beneficial use of sediment, the numbers and distribution of adults, combined with the availability of unaffected water makes exposure extremely limited, and response to that exposure unlikely. An SEV of 3 or less would be expected. These factors combine to reduce the likelihood of adverse effects to adults to a level that is ***insignificant***.

For in-water disposal of sediment (in deeper waters), the numbers of adults will likely be higher, and the adults will likely be in the deeper waters, resulting in greater exposure to stressors, raising the level of potential adverse effects above what would be insignificant. Consequently, activities resulting in elevated turbidity above background levels for in-water disposal (in deeper waters) are ***likely to adversely affect*** adults.

For bull trout, a few individual adult bull trout may leave core areas (e.g., Asotin, Tucannon, Walla Walla) and enter the Snake River reservoirs in certain areas during the winter. However, their numbers are extremely low, and they would likely have a preference to deeper water, outside areas that would be subject to dredging. There are also ample opportunities for any adults to quickly escape affected waters to nearby unaffected water. It is highly unlikely that any adults would remain near enough to the disturbance area to experience elevated turbidity effects. The numbers and distribution of adults, combined with the availability of unaffected water makes exposure extremely limited, and response to that exposure unlikely. These factors combine to reduce the likelihood of adverse effects to adult bull trout to a level that is ***insignificant***.

For in-water disposal of sediment (in deeper waters), the numbers of adults will likely be higher, and the adults will likely be in the deeper waters, resulting in greater exposure to stressors, raising the level of potential adverse effects above what would be insignificant. Consequently, activities resulting in elevated turbidity above background levels for in-water disposal (in deeper waters) are ***likely to adversely affect*** adult anadromous species in the area (SRB steelhead primarily) and adult bull trout .

Exposure to effects of elevated turbidity in a dredging and disposal scenario would likely result in harm to juveniles in the vicinity of the dredging and disposal sites. An SEV of 5 or less would be expected. Consequently, activities resulting in elevated turbidity above background levels are ***likely to adversely affect*** approximately 112 juveniles at each dredging and disposal site.

SRF Chinook Redds

Suspended sediment can also have detrimental effects as it settles out from the water column. Sedimentation can: (1) bury salmonid eggs or smother embryos; (2) destroy, alter or displace prey habitat; (2) destroy, alter or displace spawning habitat (Spence et al. 1996). The effects of suspended sediment, deposited in a redd and potentially reducing water flow and smothering eggs or alevins or impeding fry emergence, are related to sediment particle sizes of the spawning habitat (Bjornn and Reiser 1991). Sediment particle size determines the pore openings in the redd gravel. With small pore openings, more suspended sediments are deposited and water flow is reduced compared to large pore openings. These effects would be relevant in areas where SRF Chinook spawn and incubate. There are areas where SRF may spawn in the action area, as described in this document.

Survival of eggs (SRF Chinook in the case of the proposed action) is dependent on a continuous supply of well oxygenated water through the streambed gravels (Anderson et al. 1996; Cederholm and Reid 1987). Eggs and alevins are generally more susceptible to stress by suspended solids than are adults. Accelerated sedimentation can reduce the flow of water and, therefore, oxygen to eggs and alevins. This can decrease egg survival, decrease fry emergence rates (Bash et al. 2001; Cederholm and Reid 1987; Chapman 1988), delay development of alevins (Everest et al. 1987), reduce growth and cause premature hatching and emergence (Birtwell 1999 *in* USFWS 2010). Fry delayed in their emergence are also less able to compete for environmental resources than fish that have undergone normal development and emergence (intra- or interspecific competition) (Everest et al. 1987). Sedimentation fills the interstitial spaces and can prevent alevins from emerging from the gravel (Anderson et al. 1996; Suttle et al. 2004).

Based on multiple years of surveys since 1993, no redds have been found within the navigation lock approaches of any of the lower Snake River dams (Dauble et al. 1999; Mueller 2009; Mueller and Coleman 2007; Mueller and Coleman 2008). However, since potential spawning habitat exists within LSRP tailraces, a potential dredging action in tailraces has the potential to disturb or harm eggs and alevins in redds if found to be present or downstream within the potential turbidity plume prior to or during the proposed dredging activities.

To prevent disturbance or harm to SRF Chinook redds, the Corps will conduct underwater surveys of the proposed dredging site and within 900 feet downstream of the navigation locks in November and the first two weeks of December prior to commencing dredging. Techniques similar to those used by Battelle from 1993 to 2008 will be employed (Dauble et al. 1996; Dauble et al. 1994; Dauble and Watson 1997; Mueller and Coleman 2007; Mueller and Coleman 2008). This technique has used a combination of a boat mounted underwater video camera tracking system to look at the bottom of the river to identify redds. Results of the surveys will be transferred to the Corps within 2 days of the survey dates in order for compilation prior to December 15, at which time the Corps can communicate results to NMFS for appropriate action. If no redds are located, then the Corps will proceed with proposed dredging within the boundaries of the surveyed template. If one or more redds are located within the proposed dredging template and such redds are verified with video, then the Corps will coordinate with NMFS to determine if dredging can proceed without harming or disturbing the redd(s) or needs to be delayed until fry are able to move out of the area.

The materials will be dredged in the navigation lock approaches as necessary at the LSRP dams, which, has the potential to destroy SRF Chinook spawning habitat. The only place in the LSRP SRF Chinook are likely to spawn are within the tailraces, which would not be identified as disposal areas. The sites where dredging would be most likely to create significant turbidity (i.e. confluence area and boat basin) are unsuitable for spawning. As described above, if redds are detected in the proposed dredging footprint, operations at that location will be suspended and NMFS will be contacted.

Exposure of SRF redds to turbidity plumes resulting from implementation of management measures would be reduced by action-specific conservation measures. Additionally, the potential areas for SFR spawning is limited in the action area to those areas previously identified. These factors combine to reduce the likelihood of adverse effects to SRF Chinook redds to a level that is ***insignificant***. Consequently, activities resulting in elevated turbidity above background levels are ***not likely to adversely affect*** SRF Chinook redds.

Summary

Overall, potential effects lead to a "***likely to adversely affect***" determination for SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye juveniles, and "***likely to adversely affect***" determination for adult SRB steelhead and bull trout.

6.3.1.2 Suspension of Chemicals of Concern

Disturbing benthic sediments during dredging, in-water disposal, or construction of structures related to structural sediment management or system management could mobilize and distribute chemicals of concern in the sediments. Containment of the sediments is not possible because of the extent of area, depth, and flow. The concentration of chemicals of concern in the water column could increase along with suspended sediments if the sediments in the action area contain elevated concentrations of chemicals of concern. This would increase the exposure of salmonids, and their prey species to these toxins. In addition, disturbance of the substrate could increase contaminant concentrations by resuspending particulates, thereby allowing more chemicals of concern to dissolve into the water column.

The Corps did not include elutriate tests (analyses of water samples from a sediment/water mixture after thorough mixing to evaluate the flux of chemical constituents in the sediment to the water) as part of the 2013 sediment sampling since the triggers identified in the SEF were not met. However, elutriate tests were completed in 1997 and 2011 for informational purposes. The results of these analyses demonstrated that the resulting concentrations of organic and inorganic in the water were either not detected or present in concentrations not considered detrimental to the aquatic environment.

Recent studies have shown that low concentrations of commonly available pesticides, herbicides, insecticides and fungicides, can induce significant sublethal effects on salmonids. Exposure to sublethal levels of chemicals of concern could result in effects on health and survival. NMFS

(2008b; 2009; 2010; 2011b; 2012) reviewed scientific literature and conducted analysis on the effects of more than 25 pesticides, herbicides, insecticides and fungicides on salmonids and identified a wide range of sublethal effects, including: impaired swimming performance, increased predation on juveniles, altered temperature selection behavior, reduced schooling behavior, impaired migratory abilities, and impaired seawater adaptation.

Bioaccumulation and related effects are also of concern, as pollutants can reach concentrations in higher trophic level organisms (e.g., salmonids) that far exceed ambient environmental levels (Meador et al. 2004; Meador et al. 2006b; Meador et al. 1995). Bioaccumulation may therefore cause delayed stress, injury or death as chemicals of concern move from lower trophic levels (e.g., benthic invertebrates or other prey species) to predators long after the chemicals of concern have entered the environment or food chain. The result is that some organisms may experience adverse effects of some chemicals of concern even while the regulatory thresholds are met when measured in surface water or sediments, although these may be more accurately described as indirect effects.

Other non-pesticide compounds that are common constituents of urban pollution and agricultural runoff also adversely affect salmonids. Exposure to metals, chlorinated hydrocarbons and aromatic hydrocarbons causes olfactory inhibition, immunosuppression and increased disease susceptibility (Arkoosh et al. 1998; Baldwin et al. 2003; Meador et al. 2006a; Sandahl et al. 2007; Sprague 1968). Ammonia is present in the aquatic environment due to agricultural run-off and decomposition of biological waste and can be toxic to fish, especially when the pH is relatively high (above 7.5) as is the case in the Snake River (Dixon Marine Services 2006). However, the ammonia concentrations determined during the 2005-2006 dredging indicates that levels remained below the current Environmental Protection Agency (EPA) standards (2009), Additionally, ammonia does not have bioaccumulation potential common to fat soluble organic compounds.

Based on this information, and the proposed conservation measures, the Corps will minimize the exposure of salmonids to chemicals of concern.

As far as the potential direct effects to bull trout, none of the chemicals of concern tested exceeded existing regulatory thresholds or other established water quality criteria. However, USFWS asserts that not all potential chemicals of concern in the action area were tested for, or are likely even currently known. USFWS also indicates that appropriate criteria have not been established for all potential chemicals of concern, and many may have as yet unknown effects on salmonids. USFWS believes that the available information indicates that effects to bull trout from potential chemicals of concern liberated during the proposed dredging and disposal operations would be indirect.

Conservation measures would also limit the potential for mobilization and distribution of chemicals of concern during disposal (beneficial use).

Given the results of the analyses, the current baseline information regarding chemicals of concern in the action area, the timing of the in-water work, and the known distribution of ESA-listed fish species in the action area, mobilization and distribution chemicals of concern from sediment disturbing activities is not likely to have direct effects on any of the species present in the action area. These factors combine to reduce the likelihood of adverse effects to a level that is ***discountable***.

However, given the information provided by NMFS and USFWS, indirect effects may conspire to have deleterious effects on these species. Given the known life histories for each of these species, along with the best available science, and combined with the frequency of actions that would disturb sediments, and the probable scale of future implementation actions, it is reasonable to assume that any single individual would not be present long enough for exposure to chemicals of concern to be in any quantities to cause any of the sublethal effects described above. Therefore, the likelihood of indirect adverse effects is at a level that is ***insignificant***.

Overall, potential effects lead to a "***not likely to adversely affect***" determination for SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye, and bull trout.

6.3.1.3 Entrainment and Harassment

Equipment

Entrainment of migrating and rearing fish by in-water work equipment occurs if fish are trapped during construction. The uptake of sediments and water by dredging machinery can cause injury or death. Direct effects from the use of a clamshell dredge are possible, but not very likely. Individual fish could be killed or trapped as the bucket is dropped into the river. The determination for this activity has been "likely to adversely affect" for the listed fish species in other assessments, but information from NMFS and USFWS has better informed the probability of this occurring. Harassment may also occur under certain circumstances during and following dredging, in-water disposal, or construction of structures related to structural sediment management or system management.

The probability of entrainment is largely dependent upon fish densities, the likelihood of fish occurring within the dredging prism, dredging depth, the entrainment zone, location of dredging within the river, equipment operations, time of year, and the species' life stage. As previously discussed, few ESA-listed fish are likely to be present in the action area during dredging. In addition, the limited dredging area compared to the total area of the river available for fish to move into when the disturbance starts at each site lowers the likelihood of fish entrainment. Adult steelhead and bull trout will likely be scared away from the dredging activity, so the likelihood of one being trapped or killed is unlikely. Juvenile fish are also likely to avoid the immediate area around the dredge. The same scenario holds for the sediment removal work below Ice Harbor Dam, except adult upper and middle Columbia steelhead may also be present. There is very low likelihood any adult fish will be impacted by the dredging work.

The numbers and distribution of adults, combined with the availability of unaffected water makes exposure extremely limited, and response to that exposure unlikely. These factors combine to reduce the likelihood of adverse effects from equipment to a level that is ***insignificant***.

Overall, potential entrainment and harassment effects lead to a "***not likely to adversely affect***" determination for SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye, and bull trout.

Sound

In-water activities would also generate underwater sound pressure levels that could elicit responses in some fish (Hastings and Popper 2005). The intensity of the sound pressure levels from PSMP management activities can be quite variable. However, sound pressure levels are generally in the range of 112 to 160 dB. These sound intensities may influence organism behaviors or perceptions, but would be unlikely to cause physiological damage (Hanson et al.2003).

The proposed action is not expected to generate sound pressure levels (SPLs) capable of killing ESA-listed fish. However, around-the-clock dredging activities could have some cumulative and behavioral effects to listed salmon and steelhead in the Clearwater River and Snake River in close proximity to dredging operations if activities exceed 150 dB RMS. It is likely that individuals will move away from pile driving activities. Fish exposed to these SPLs might alter feeding while they seek suitable habitat.

As previously mentioned, the numbers and distribution of adults (salmon, steelhead, and bull trout), combined with the availability of unaffected water makes exposure extremely limited, and response to that exposure unlikely. These factors combine to reduce the likelihood of adverse effects to adults to a level that is ***insignificant***. Exposure to effects of noise from in-water work activities would likely result in some harassment to juvenile Chinook or steelhead in the vicinity of the worksite. Consequently, in-water work activities are ***likely to adversely affect*** juveniles in close proximity to work site at times when sound generated by in-water work activities exceed 150 dB RMS.

Overall, potential effects lead to a "***likely to adversely affect***" determination for SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye, and bull trout.

Disposal

In-water disposal of material could entrain or bury migrating and rearing fish. Fish may be trapped or buried in the sinking cloud of sediment and be unable to escape. It is likely to disperse as it is introduced into the water column. Settling velocities are likely to be slow enough that the very few fish that are near the area could move away.

As previously discussed, the distribution of ESA-listed fish species in the action area limits the exposure to the stressor. Recent studies (Tiffan 2013; Tiffan and Connor 2012) show that very few juveniles use the shallow water bench area in the winter, and even fewer were within 80 feet of the shoreline or in water less than 20 feet deep by late fall or early winter. The few that Tiffan and Connor detected within 80 feet of the shoreline spent less than an hour in the area before moving downstream into deeper water and downstream. Additionally, fish near the disposal areas would have ample time to move away from moving sediment.

Disposal of dredged material 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 project. Potential effects of the dredged material placement operation on downstream migrating salmonids would be expected to vary depending on timing of the downstream migrations, amount of time the migrants spend in the affected areas, and use of the affected areas.

The Corps has committed to a number of conservation measures to reduce the probability of entrainment occurring during dredge operations. The areas below navigation locks identified for actions will be surveyed for SRF Chinook redds prior to the dredging work. If redds are identified, work at the site will stop and NMFS will be contacted for further coordination prior to continuation of dredging activities.

The numbers and distribution of adults, combined with the availability of unaffected water makes exposure extremely limited, and response to that exposure unlikely. These factors combine to reduce the likelihood of adverse effects from equipment to a level that is ***insignificant***.

Overall, potential effects lead to a "***likely to adversely affect***" determination for SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye, and bull trout.

Upland disposal would not be limited in timing, and would have to meet state water quality standards if there would be effluent. This does have the potential to create a ***may affect*** scenario, but the effects would be minimized to the greatest extent possible through compliance with the Clean Water Act, reducing the exposure of any effluent that would enter the river. Because the Corps cannot completely eliminate potential effects at the plan level, the exposure to these stressors is ***likely to adversely affect*** SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye, and bull trout.

Chemicals from Equipment Operation

Operation of equipment requires the use of fuel and lubricants, which, if spilled into the channel of a waterbody or into the adjacent riparian zone, can injure or kill aquatic organisms. Petroleum-based chemicals contain poly-cyclic aromatic hydrocarbons (PAHs), which can be acutely toxic to salmonids at high levels of exposure and can cause lethal and sublethal chronic effects to other aquatic organisms (Neff 1985). Because of the nature of operating large equipment near water or on a barge, which is floating on the river, an accidental discharge could occur.

Accidental releases of diesel fuel, lubricants, hydraulic fluid, and other chemicals of concern contained in heavy equipment could potentially result in acute negative impacts to fish, invertebrates, and aquatic habitat. In addition, long-term effects could also result if a spill was not properly remediated. All over-water construction vessels would be fueled at existing commercial fuel docks. Such facilities have existing spill prevention systems in place that would be adequate to avoid spills or immediately address any accidental spills that might occur. Equipment will be inspected and cleaned prior to any instream work. The only potential sources of contaminants at the construction sites would be the construction equipment itself (lubricating oils and fuel).

A spill would affect SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye, and bull trout. However, implementation of standard BMPs associated with this type of work reduces the likelihood of a spill to a level that is not reasonably certain to occur. Because of implementation of the BMPs, chemical contamination is *discountable*, and, therefore "*not likely to adversely affect*" any ESA-listed species.

Summary

Overall, potential effects lead to a "***likely to adversely affect***" determination for SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye, and bull trout.

6.3.1.4 Disruption of Plankton and Benthic Organisms (Forage/Prey Base)

As discussed previously, the PSMP actions involve in-water work activities. The temporal extent of disruptions to benthic feeding during and following dredging, in-water disposal, or construction of structures related to structural sediment management or system management could last from a few weeks to a few months. For future actions to address navigation, plankton communities would not be affected by navigation objective reservoir operations.

Benthic and epibenthic organisms at a dredge site would likely suffer some level of mortality because of dredging. Recovery of the benthic invertebrates would occur within a few months. If dredged material is placed in-water for beneficial use some benthic organisms may survive the transfer and placement of dredged material to a new location.

Plankton and benthic organisms immediately downstream of a dredging site would likely be adversely affected due to increases in local turbidity and redeposition of suspended sediment. Increased suspended sediment can affect feeding of benthic and pelagic (open river) filter feeding organisms (Parr et al., 1998), and the settling of the suspended particles can cause local burial, affect egg attachment, and modify benthic substrate. Adverse effects would be minor and localized. Some minor changes in the species composition and relative abundance of the benthic fauna are likely, because of combined effects of changes in substrate conditions as well as water currents from increasing the depth in the dredged area.

In-water placement of dredged material creation of shallow-water habitat can increase the abundance and availability of benthic macroinvertebrates. With the exception of oligochaete worms, density of benthic organisms decreases with depth (Pool and Ledgerwood 1997). Currently, greater than 90 percent of the habitat in Lower Granite reservoir is considered either mid-depth (20 to 60 feet) or deep water (greater than 60 feet) (Tiffan and Hatten 2012). Therefore, by raising the river bottom in some places to less than 20 feet deep through placement of dredged material, macroinvertebrate abundance and diversity could be enhanced at sites where habitat is created with dredged material.

Benthic species with planktonic larval stages or species that move into the water column from the substrate (e.g., Corophium species and chironomids) are expected to rapidly recolonize an in-water dredged material placement site within a few weeks. Less mobile species such as oligochaete worms would be expected to recolonize within a few months (Seybold and Bennett 2010; Bennett et al., 1990, 1993a, 1993b). Studies have determined that the dredged material placement site at Knoxway Bench (RM 116) has been quickly colonized by benthic macroinvertebrates, and the total density of invertebrates was consistently high during both fall and spring (Seybold and Bennett 2010). Thus, placement of dredged material for in-water habitat creation would have no lasting adverse effects on populations of benthic species. Other beneficial use of dredged material that involved in-water placement would be likely to have similar effects on plankton and benthic organisms, if it involved placement in similar locations and quantities. Beneficial use of dredged material that involves upland placement would be unlikely to have direct effects on plankton or benthic organisms.

During construction activities, benthic invertebrates within the construction zones would either be displaced or suffer mortality. Mobile organisms such as crayfish could escape construction activities, while immobile organisms living in the substrate would be killed. Their loss would be of a short-term nature because the area of impact would be repopulated rapidly by organisms such as larvae of mayflies, caddis flies, and midge larvae that drift with the stream current and readily recolonize disturbed areas.

Distance of prey capture and prey capture success both were found to decrease significantly when turbidity was increased (Berg and Northcote 1985; Sweka and Hartman 2001; Zamor and Grossman 2007). Waters (1995) states that loss of visual capability, leading to reduced feeding, is one of the major sublethal effects of high suspended sediment. Increases in turbidity were reported to decrease reactive distance and the percentage of prey captured (Bash et al. 2001; Klein 2003; Sweka and Hartman 2001). At 0 NTUs, 100 percent of the prey items were consumed; at 10 NTUs, fish frequently were unable to capture prey species; at 60 NTUs, only 35 percent of the prey items were captured. At 20 to 60 NTUs, significant delay in the response of fish to prey was observed (Bash et al. 2001). Loss of visual capability and capture of prey leads to depressed growth and reproductive capability.

The benthic invertebrate populations within the disturbed areas will be absent until the new surface layer is recolonized. The level of activity in the navigation channel and the berthing sites will influence the development of a healthy benthic community at the project sites, and the effects to benthic productivity and availability of prey items will last at least several months after in-water work is completed. Effects to the prey base are likely to have effects on juveniles rearing in the action area for a period of weeks to months following in-water work. The importance of the dredging sites as rearing areas for juvenile salmonids is somewhat limited because of the activity in the navigation channel and the berths. However, the disturbance to the benthic community will not alter feeding opportunities for salmonids in the river as a whole. Even if the benthic invertebrate population in the disturbed area is being used by juveniles, the disruption to this food source will cover a relatively small area, and will be limited to a few months after activities are completed (Barton and Dwyer 1997; Fowler 2004; Linton 1998).

The proposed action may alter the availability of macroinvertebrates to salmonids and steelhead during implementation actions and three to four months post construction. Drifting invertebrates from upstream are expected to recolonize the disturbed areas once the proposed project is completed. These changes are expected to maintain or increase the diversity of invertebrates over time, particularly in the new habitat created at the Knoxway Bench or other beneficial use sites, as the area is re-colonized. Therefore, the reduced prey base will only affect juvenile salmonids and steelhead for a period of a few months.

Macroinvertebrate numbers in the action implementation areas will decline due to the action. These areas are likely to repopulated within several months. This impact on prey items will cause a minor indirect effect on listed fish. This leads to a "***likely to adversely affect***" determination for SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye, and bull trout. Long-term effects from the beneficial use of sediments are anticipated to be ***beneficial*** to SRF Chinook, SRSS Chinook, SRB steelhead, and SR sockeye.

6.3.1.5 Indirect Effects

Juvenile salmonids, particularly sub-yearling fall Chinook, require the availability of interconnected shallow-water rearing habitat. Dredging deepens portions of the habitat while disposal in mid-depth areas can create more suitable salmon rearing habitat. In order to increase the likelihood of survival and recovery of the listed species, widespread habitat conditions in the action area need to improve.

For beneficial use, the dredged sediment could be used to construct a uniform sand-dominated substrate, gently sloping (2-percent cap over a 3- to 5-percent base), shallow-water habitat resembling a sand bar with features optimized for resting/rearing of outmigrating juvenile salmonids, and targeted towards SRF Chinook salmon production. While it may be possible to return to a disposal area and deposit more sediment in future years, the disposal bench will be designed so that it provides the maximum benefit possible with the quantity of dredged material available from the proposed alternative. Middle and Upper Columbia River steelhead and Upper Columbia spring Chinook will not be affected by the dredged material placement.

6.3.2 Effects of Action Trigger Management Measures

This consultation includes, and considers the effects of implementation of identified management measures associated with triggers for actions in the potential sedimentation problem areas (Table 3) as described in the proposed action portion of this document. Specific management measures that may be employed for each trigger are described in section 3.4.2 (Triggers for Action above). Table 19 (in section 6.1 above) summarizes these in tabular format.

The effects of the potential actions, as described adequately in the general effects sections. Any measure-specific information is included below, along with the general effects associated with each measure.

Any other (unknown) sites identified by monitoring not identified here will require review for potential further consultation, as described in section 3.12 (Future Action-Specific Consultations above). This process will determine the adequacy of the existing plan-level ESA consultation compliance with section 7(a)(2) for the implementation action.

The identified sites for fish and wildlife include all of the potential sites (irrigation intakes at HMUs). Therefore, maintenance of existing irrigation intakes at HMUs will require no further consultation. Relocation of these facilities has the potential to trigger additional review for ESA compliance.

Implementation of the Reconfigure/Relocate Affected Facilities measure generally involves too much uncertainty to identify enough information to adequately analyze potential effects of implementation actions.

For navigation, the following management measures may be employed:

- Navigation and Other Dredging.
- Beneficial use of Sediment.
- In-water Disposal of Sediment.
- Upland Disposal of Sediment.
- Bendway Weirs.
- Dikes/Dike Fields.
- Trapping Upstream Sediments (in reservoir).
- Navigation Objectives Reservoir Operations.
- Reconfigure/Relocate Affected Facilities.
- Reservoir Drawdown to Flush Sediment.

For recreation, the following management measures may be employed:

- Navigation and Other Dredging.
- Beneficial use of Sediment.
- In-water Disposal of Sediment.
- Upland Disposal of Sediment.
- Agitation to Resuspend.
- Navigation Objectives Reservoir Operations.
- Reconfigure/Relocate Affected Facilities.

For fish and wildlife, the following management measures may be employed:

- Navigation and Other Dredging.
- Beneficial use of Sediment.
- In-water Disposal of Sediment.
- Upland Disposal of Sediment.
- Agitation to Resuspend.
- Reconfigure/Relocate Affected Facilities.

For flow conveyance, the following management measures may be employed:

- Dredge to Improve Conveyance Capacity.
- Beneficial use of Sediment.
- In-water Disposal of Sediment.
- Upland Disposal of Sediment.
- Trapping Upstream Sediments (in reservoir).
- Raise Lewiston Levee to Manage Flood Risk.
- Reservoir Drawdown to Flush Sediment.

6.3.2.1 Dredging and Dredged Materials Management

The navigation channel and other areas where dredging would take place would be excavated to their authorized dimensions and the areas where the material is deposited (in-water) would become more shallow. These changes would cause temporary loss of benthic habitat and organisms at the dredging and dredged material placement sites.

The effects associated with dredging and disposal operations are the same as those described in detail in the General Program Effects section (above).

It is anticipated that dredging in the confluence area would require removal of up to 500,000 cy of material every 3-5 years. Other areas (recreation or fish and wildlife sites) are anticipated to require between 500-15,000 cy of removal every 3-9 years. Summer hydraulic dredging in recreation or fish and wildlife areas is not anticipated to reach the level of take, and is ***insignificant***.

Navigation and Other Dredging, and Dredge to Improve Conveyance Capacity

General effects include:

- Elevated turbidity.
- Suspension of chemicals of concern.
- Entrainment and harassment.
- Disruption of benthic organisms (forage/prey).
- Interference with normal migratory behavior.
- Indirect effects.

The effects from navigation and other dredging are described in detail in the General Program Effects section 6.3.5 above.

These shallow-water areas would be expected to have elevated water temperatures during the summer and would not likely have salmonid fish present. The material dredged from these sites would probably be disposed of at an upland location since the in-water disposal areas are located in the main river channel and may have salmonid fish present during the disposal activity.

Beneficial Use of Sediment

The beneficial use of sediment management could include several possibilities. For previous dredging material disposal actions, the Corps has beneficially used material to fill uneven ground at the Port of Lewiston and to create shallow water habitat for Snake River salmonids and other fishes. Shallow water habitat creation has been used several times by the Corps. Shallow water habitat is considered the most productive habitat in aquatic ecosystems (Wetzel 2001) and it is heavily used by juvenile Chinook during the spring and summer in the Snake River (Tiffan 2013; Tiffan and Connor 2012; Tiffan and Hatten 2012). (NMFS DRAFT BO) It has been demonstrated through many years of research and monitoring in and outside of the lower Snake River corridor that juvenile fall Chinook salmon prefer shallow, open, sandy areas along shorelines for rearing (Bennett et al., 1994, 1997, 2005; Connor et al. 2004; Tiffan and Connor 2012). (USACE 2012) There are numerous potential biological benefits of in-water sediment disposal for salmonids and other fishes. They include providing suitable resting, rearing, feeding, and predator avoidance habitat. Studies indicate that all of these benefits apparently exist at some level as predator abundances and predation rates are similar to natural, unaltered habitats, and juvenile salmonid fish usage is increased compared to other areas.

Currently, Lower Granite reservoir contains about 217 acres of rearing habitat less than six feet deep, when the flow is 143,000 cfs, which equates to about 2.2 percent of the reservoir area. Most rearing habitat is located upstream of Centennial Island at RM 120 and little exists in the lower half due to steep lateral bed slopes and unsuitable substrate along the shorelines. Without information on patch size or connectivity, even that low value of 2.2 percent is not necessarily helpful. As part of the 2005/2006 dredging action, the Corp used dredged material to build an estimated 3.7-acre shallow water habitat shelf, now called the Knoxway Bench, approximately one-half mile upstream of Knoxway Canyon for summer rearing juvenile fall Chinook salmon. Other sites may have the potential for beneficial use of sediments in future implementation actions.

Research and effectiveness monitoring showed that SRF Chinook salmon used the shallow-water habitat created with in-water disposal of dredged material including areas that surround Centennial Island (Lower Granite reservoir, near Snake RM 120). In some years, as many as 10 percent of the total sample of subyearling Chinook salmon from the Lower Granite reservoir originated from the habitat created by in-water disposal. Bennett reported that SRF Chinook salmon were most commonly collected over lower gradient shorelines with low velocities and sandy substrate, most represented by the opposing sand bars and the scalloped shoreline series of sand bars observed in the historical river (1944 and 1958 aerial photography on file at the Corps, Walla Walla District).

A recent study by Tiffan and Connor (2012) of four shallow water habitat areas (including Knoxway Bench) found wild fry and parr, hereafter, subyearlings, present from early spring through early summer, and parr were more abundant than fry. Water less than 6 feet deep was highly used for rearing by wild SRF Chinook salmon subyearlings during the spring and summer, while the six to 20 foot depth interval was more often used by hatchery SRF Chinook salmon subyearlings and SRSS and SRF Chinook salmon yearlings. Overall, mean spring and summer apparent density of wild subyearlings was over 15 times higher within the six feet or less depth interval than within the six to 20 foot depth interval. Tiffan and Connor (2012) also found that the density of wild subyearlings in shallow water habitat was negatively correlated with distance from the riverine spawning areas. Although a "sizeable portion" of SRF Chinook juveniles remained in the Snake River after the usual spring and summer migration, use of the shallow water habitat during fall and winter was severely limited. Radio telemetry data collected between November and March indicated that although many tagged fish passed the shallow water habitat study areas, relatively few fish entered them and the median time spent at given shallow water sites was less than 90 minutes. They also found that during the fall and winter, juveniles became more pelagically oriented, avoiding shallow or nearshore (within 80 feet) areas.

While it appears that various depth intervals of the existing Knoxway Bench is providing some benefit to certain species and life-stages, during spring and summer, the use of the habitat is not consistent year round. That does not necessarily reduce its beneficial functions since shallow water habitat is not widely dispersed throughout the Snake River its rarity increases the importance of what little there is. The primary SRF Chinook spawning areas are upstream of Knoxway Bench where temperature during incubation and early rearing promotes diverse life history strategies among the different spawning aggregates (e.g., Grande Ronde River versus the Clearwater River) (Connor et al. 2002; Connor et al. 2003). Natural SRF Chinook salmon emergence and movement from the various spawning aggregates into the Lower Granite reservoir is a protracted event that extends from early spring until early fall. Thus, there is a large potential for natural subyearlings to use shallow water habitat complexes throughout the spring and summer.

The short-term effects of disposal for beneficial use to develop shallow water habitat (like at Knoxway) are expected to be ***insignificant*** as recent studies (Tiffan 2013; Tiffan and Connor 2012; Tiffan and Hatten 2012) have shown that juvenile ESA-listed fish do not use shallow or nearshore areas during the winter when the placement of fill material will occur. Based on the most recent information, the construction of habitat less than 6 feet in depth and mid-depth habitat is expected to contribute to improved rearing conditions during the spring and summer, for SRSS and SRF Chinook salmon juveniles and SRB steelhead juveniles.

Short-term construction-related effects warrant a "***not likely to adversely affect***" determination for SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye, and bull trout. Long-term effects from the disposal are anticipated to be ***beneficial*** to SRF Chinook, SRSS Chinook, SRB steelhead, and SR sockeye.

In-water Disposal of Dredged Materials

General effects include:

- Elevated turbidity.
- Suspension of chemicals of concern.
- Entrainment and harassment.
- Disruption of benthic organisms (forage/prey).
- Interference with normal migratory behavior.
- Indirect effects.

In-water disposal of dredged material is deep water dumping of dredged materials, as opposed to in-water placement for beneficial use. Effects of in-water dredged material disposal would be similar to those described above for in-water placement of dredged material to create habitat. Elevated turbidity would be expected to be on the upper end of the expected effects range, and would extend into some areas with deeper waters, as placement wouldn't be limited to shallower areas. In-water disposal of sediments would occur primarily in deep water and mid-depth areas of the Snake River where terrestrial species are not present. As a result, this measure would have no impact on terrestrial resources.

Upland Disposal of Dredged Materials

General effects include:

- Indirect Effects

Upland disposal of sediment would be a temporary activity and would not be continuous. Generally, areas identified for upland disposal would be limited to Corps lands, and would include sites that are heavily disturbed and provide little to no habitat value. Effects would be minor, short-term, and localized, as adjacent areas would still be available for foraging, feeding, and perching. Wildlife would return to the areas shortly after completion of the dredging and placement of sediment. Terrestrial wildlife should not realize long-term impacts by the upland disposal since no valuable habitat would be impacted. The dredge disposal sites could have a long-term benefit as the newly disposed sediment becomes naturally seeded and provides additional habitat.

Upland disposal does, however, have the potential to impact Washington ground squirrels or their burrows, depending on locations and the timing of the disposal. Assuming that the disposal would occur concurrent with, or soon after removal of sediments from the river in the in-water work period, individuals are not likely to be directly affected, except if buried in their burrows, as they would be dormant during the disposal.

Washington ground squirrel may be directly impacted from upland disposal through burying or destruction of any burrows that may exist on Corps lands in Columbia, Franklin, or Walla Walla counties. The likely placement areas would be in HMUs in those counties (Table 26). Implementation of conservation measures would minimize any potential impacts to the greatest extent practicable.

Table 26. HMUs within the Range of Washington Ground Squirrel

Habitat Management Units within extant range of Washington Ground Squirrel			
55 Mile	Ice Harbor	Lyons Ferry	Riparia
Alkali Flat	Ice Harbor North Shore	Lyons Ferry	Sargent
Ayer	John Henley	Magellon	Sixty Mile
Big Flat	Joso	Martindale	Skookum
Burbank Heights	Joso East	Nineteen Mile	Snake River
Charboneau	Lake Charlene	No Name	Texas Rapids
Couch Landing	Levy	No Name 2	Tucannon
Fishhook	Lost Island	Quarter Circle	Walker
Hollebeke			

6.3.2.2 Structural Sediment Management

Direct effects to aquatic resources from structural sediment management measures would largely result from in-water construction if those actions are required. The addition of structures within the river channel would alter flow and sediment transport patterns in the area influenced by the structures. This may include the construction of in-stream structures (bendway weirs, dike fields, or in-reservoir sediment trapping systems). For most structural sediment management measures, construction equipment would be used during implementation.

In-water structures would slightly alter the flow characteristics of the river channel, which may affect critical habitat for the ESA-listed salmon species that use the lower Snake River as a migratory corridor. Addition of structures within the river channel would alter localized flow patterns, depths, sediment, and disrupt or move local benthic communities. These changes would be within the vicinity of the constructed structures and may alter some of the specific routes within the river for migrating adult and juvenile salmon but would not impede their migrations.

The main effects of flow modification measures to the aquatic environment would be from changes in flow conditions, water levels, and sediment dispersion patterns.

For structural measures, there would be effects associated with construction, as well as any subsequent maintenance dredging for the structure.

Bendway Weirs

General effects include:

- Elevated turbidity.
- Suspension of chemicals of concern.
- Entrainment and harassment.
- Disruption of benthic organisms (forage/prey).
- Interference with normal migratory behavior.
- Indirect effects.

Construction of bendway weirs or dikes for navigation would adversely affect benthic organisms that inhabited the site prior to the beginning of construction. After construction, as sediment accumulates between the weirs, recolonization is likely to occur as discussed with dredging and dredged material placement operations. However, changes in the hydrology and sediment accretion could preclude the site from returning to its preconstruction benthic community. This could be beneficial in cases where the preconstruction conditions held poorly populated benthic communities. The accumulation of new sediment could allow the colonization of these areas and therefore benefit primary productivity and the food web.

Construction of bendway weirs or dikes for navigation would have little discernible effect on plankton in the reservoirs. Localized effects could include temporary displacement from the construction sites and potential reduced feeding ability from increased suspended sediment from construction and in water disposal.

Dikes/Dike Fields

General effects include:

- Elevated turbidity.
- Suspension of chemicals of concern.
- Entrainment and harassment.
- Disruption of benthic organisms (forage/prey).
- Interference with normal migratory behavior.
- Indirect effects.

The effects of constriction of dikes are described above with bendway weirs.

The construction of the dikes themselves would have less impact on the benthic community than the scouring of the river channel that would occur after the dikes are in place. These effects would include portions of the navigation channel scoured as a result of the dikes where benthic organisms reside. Changes in flow patterns for both bendway weirs and dikes could redistribute planktonic organisms to other areas, but little effect on abundance would occur. For non-mobile organisms such as benthic invertebrates and plants, the process would result in their dispersal with the agitated sediment, and deposition downstream. If the sediment contained organic materials in an anaerobic state, resuspension would increase the biological oxygen demand and depress dissolved oxygen (Johnson 1976).

Agitation to Resuspend

General effects include:

- Elevated turbidity.
- Suspension of chemicals of concern.
- Entrainment and harassment.
- Disruption of benthic organisms (forage/prey).
- Interference with normal migratory behavior.
- Indirect effects.

Effects of these measures on plankton and benthic organisms would be similar to those described above for navigation, but would likely be substantially less in scope due to the smaller areas affected (boat basins, area surrounding an irrigation intake) and quantities of sediments.

Agitation to suspend sediment would create turbidity, and agitated sediments would be transported away from the agitation site, potentially settling on aquatic plants in another location, and adversely affecting them.

Agitation to resuspend and reconfiguration, relocation, and closure of affected facilities would be considered by the Corps to address sediment that interferes with HMU irrigation intakes.

Trapping Upstream Sediments (In-Reservoir)

General effects include:

- Elevated turbidity.
- Suspension of chemicals of concern.
- Entrainment and harassment.
- Disruption of benthic organisms (forage/prey).
- Interference with normal migratory behavior.
- Indirect effects.

Trapping upstream sediments would require excavation (dredging) of an in-stream sediment basin where sediments could be trapped and stored. A sediment trap would need to be periodically dredged to remove accumulated sediments. Initial excavation and periodic dredging (and associated dredged material management) would have similar effects on plankton and benthic organisms as described for navigation dredging (USACE 2014).

Trapping upstream sediment would cause loss of aquatic plants if they were present within the sediment trapping area, initially during excavation and later during periodic dredging of the trap. Excavation, dredging, and dredged material management associated with development and maintenance of the trap would cause turbidity increases during those activities, which could have adverse effects on aquatic plants in surrounding areas.

For flow conveyance, the Corp would consider trapping upstream sediment, modifying flow regime to flush sediment, and raising the Lewiston levee to manage flood risk. Trapping upstream sediment and modifying flow regime to flush sediment would have the same effects as described for navigation above.

6.3.2.3 System Management

System management actions to maintain navigation would have differing effects on the aquatic environment. Plankton and benthic organisms would be affected most by drawing down the reservoir. Relocation of facilities could also affect benthic species by removal or burial. During modified flow regimes to flush sediments, submerged aquatic vegetation could be adversely affected by transported sediments scoured from the navigation channel burying plants. During construction activities associated with reconfiguring or relocating facilities, localized areas may experience submerged aquatic vegetation losses, but would not affect overall population assemblages.

Navigation Objective Reservoir Operation

This measure is part of the environmental baseline, as it is has already undergone formal section 7 consultation (FCRPS BO), and involves impacts of the past and present impacts of federal actions.

General effects include:

- Disruption of benthic organisms (forage/prey).
- Indirect effects.

Navigation objective reservoir operation could result in minor adverse effects on listed salmonid species by affecting juvenile passage survival through reservoirs due to maintenance of reservoir levels above MOP. Raising the operating pool above MOP would have a greater effect in the areas near the dams than it would further upriver due to the normal change in elevation moving upstream.

Reconfigure/Relocate Affected Facilities

Implementation of this measure generally involves too much uncertainty to identify enough information to adequately analyze potential effects of implementation actions. Implementation of any actions using this measure may require review for potential further consultation, as described in section 3.12 (Future Action-Specific Consultations above). This process will determine the adequacy of the existing plan-level ESA consultation compliance with section 7(a)(2) for the implementation action.

General effects include:

- Elevated turbidity.
- Suspension of chemicals of concern.
- Entrainment and harassment.
- Disruption of benthic organisms (forage/prey).
- Indirect effects.

Reconfiguring or relocating facilities could involve some in-water construction, such as at water intake structures, mooring facilities, and docks. In those instances, effects to the aquatic environment would be similar to those described for the in-water construction activities of the structural sediment management actions.

The actions to reconfigure or relocate affected navigation facilities would include the use of mechanized construction equipment and in-water work. Construction during the winter in-water work window would minimize the number of species and individuals temporarily displaced during the construction. Worksite isolation would be used as a minimization practice, consisting of several measures meant to decrease fish exposure to the effects of construction activities. Closure of navigation facilities would not affect fish, unless closure involved in-water work, in which case effects would be similar to those described for reconfiguring or relocating facilities.

Plankton and benthic communities would not be affected by land-based reconfiguring or relocating navigation-related facilities, but in-water construction associated with reconfiguring or relocating facilities would have turbidity and other effects associated with construction and described above for dikes. Closure of affected facilities would be unlikely to affect plankton or benthic organisms. Effects from reconfiguring, relocating or closing affected facilities would be localized in the area where in-water activities were undertaken. Relocation and reconfiguring affected irrigation intakes would have minor effects. Closure of affected facilities would not involve in-water work, and therefore would not affect plankton or benthic organisms.

In addition, reconfiguring, relocating, or closing affected facilities could be considered for recreation. Effects of these system management measures would be similar to those described above for navigation, but would likely be less in scope due to smaller facilities affected.

Raise Lewiston Levee to Manage Flood Risk

General effects include:

- Indirect effects

Raising the Lewiston levee would involve work next to Lower Granite reservoir, but would not include in-water work. As such, raising the Lewiston levee would not affect plankton or benthic communities. Only indirect effects such as disturbance related to sound from equipment could occur to ESA-listed fish species.

Reservoir Drawdown to Flush Sediment

General effects include:

- Elevated turbidity.
- Suspension of chemicals of concern.
- Entrainment and harassment.
- Disruption of benthic organisms (forage/prey).

- Interference with normal migratory behavior.
- Indirect effects.

The reservoir drawdown component of this alternative would have a temporary effect on terrestrial wildlife habitat, but would not affect ESA-listed terrestrial species. A drawdown would typically last a month. Terrestrial vegetation and wetland habitat would not experience severe effects because of the short duration of the drawdown.

Plankton and benthic communities could be affected by flow modifications used to flush sediments out of the federal navigation channel. Increasing flows to flush and transport sediment downstream and out of Lower Granite reservoir would carry some of the plankton community out of the reservoir as well, but populations would likely be replaced by incoming flows from upstream. Benthic organisms would be affected due to the dewatering of the shoreline.

Juveniles of the ESA-listed fish species would be swept more quickly downstream. Any adult salmonids might be moved downstream to some extent, but should be able to find refuge within the reservoir. Turbidity levels would likely be high, having some effect on all fish species.

6.4 Effects on Critical Habitat

The action area ends at the confluence of the Snake and Columbia rivers. UCR spring Chinook, UCR steelhead, and MCR steelhead critical habitat boundaries do not include the Snake River. The confluence of the Snake and Columbia is the boundary for critical habitat for these species, the Columbia River rearing/migration corridor. All of the migrating UCR Chinook and steelhead migrate through the corridor. All of the Yakima MPG of MCR steelhead use the corridor for migration, and could, along with some Umatilla/Walla Walla MPG steelhead, use the corridor for rearing or overwintering. It is anticipated that effects of the action would not extend into the Columbia River rearing/migration corridor. The proposed action will, therefore, have ***no effect*** on designated critical habitat for UCR spring Chinook, UCR steelhead, or MCR steelhead.

Additional detail relating to effects on critical habitat can be found in the Effects on Listed Species section (above).

The habitats directly affected by navigation dredging are generally deeper than the shallow habitats preferred by fall Chinook (depths less than 10 feet) and dredging effects would occur for a relatively short period of time. These sandy and silty portions of the riverbed would retain essentially their same characteristics after dredging. Because the area is used as a migratory corridor for ESA-listed anadromous salmon species, there is potential to affect designated critical habitat. However, dredging would not substantially change the cross-sectional areas of the river and, therefore, velocities would not change in areas used for salmon migration or degrade salmon migratory habitat.

6.4.1 SR Spring/Summer Chinook, SR Fall Chinook, and SR Sockeye

6.4.1.1 Spawning and Juvenile Rearing Areas

Access (sockeye): ***No effect***.

Cover/shelter: The only spawning habitat in the action area is below each of the Snake River dams, where SRF Chinook sometimes spawn. There is adequate depth in these areas which provides cover for both spawning and rearing Chinook. Some marginal SRF Chinook spawning habitat has been found downstream from the proposed dredging site below Ice Harbor Dam (Mueller and Coleman 2007, 2008). The proposed project will not change the amount of cover available below the dams. ***No effect***.

Food (juvenile rearing): See "Disruption of benthic organisms (forage/prey)" section in the General program Effects (above). Likely to adversely affect, but not likely to appreciably diminish the conservation value.

Riparian vegetation: ***No effect***.

Space (Chinook): The proposed action will not affect the amount of space available to ESA listed fish species. ***No effect***.

Spawning gravel: See "SRF Redds" section in the Elevated Turbidity section under General program Effects (above). ***Insignificant***.

Water quality: Suspended sediment is likely to affect critical habitat at each of the dredge and disposal sites for a distance of approximately 900 feet downstream and a lateral distance of 450 feet. The results of water quality monitoring during the 2005/2006 dredging indicate that water quality effects from turbidity are unlikely to occur outside the 900-ft x 450-ft zone. Water quality effects from chemicals of concern in the sediment are likely to occur within the same area affected by turbidity since the chemicals in the sediment are more likely to be bound to particles of organic materials that might be carried in suspension. Turbidity is used as a qualitative measure of suspended sediment concentrations, because it can be measured rapidly in the field, and the amount of turbidity is correlated with suspended sediment concentrations. ***Likely to adversely affect, but not likely to appreciably diminish the conservation value.***

Water temperature: ***No effect***.

Water quantity: ***No effect***.

6.4.1.2 Juvenile Migration Corridors

Cover/shelter: The proposed action will occur during winter when juvenile salmonids will not be migrating. The main cover feature in the Snake River is provided by water depth. There are occasions where summer dredging may also be considered for other off-channel areas such as boat basins, swim beaches, or irrigation intakes on a case-by-case basis (water temps above 73°F). These shallow-water areas would be expected to have elevated water temperatures during the summer and would not likely have salmonid fish present. There will be no measurable effect on cover from the proposed action. ***Insignificant.***

Food: See "Disruption of benthic organisms (forage/prey)" section in the General program Effects (above). ***Likely to adversely affect, but not likely to appreciably diminish the conservation value.***

Riparian vegetation: ***No effect.***

Safe passage: The proposed action will not affect safe passage through the downstream migration corridor. ***No effect.***

Space: There will be no effect on the amount of space available within the juvenile migration corridor. ***No effect.***

Substrate: See "SRF Redds" section in the Elevated Turbidity section under General program Effects (above). ***Insignificant.***

Water quality: Suspended sediment is likely to affect critical habitat at each of the dredge and disposal sites for a distance of approximately 900 feet downstream and a lateral distance of 450 feet. The results of water quality monitoring during the 2005/2006 dredging indicate that water quality effects from turbidity are unlikely to occur outside the 900-ft x 450-ft zone. Water quality effects from chemicals of concern in the sediment are likely to occur within the same area affected by turbidity since the chemicals in the sediment are more likely to be bound to particles of organic materials that might be carried in suspension. Turbidity is used as a qualitative measure of suspended sediment concentrations, because it can be measured rapidly in the field, and the amount of turbidity is correlated with suspended sediment concentrations. ***Likely to adversely affect, but not likely to appreciably diminish the conservation value.***

Water quantity: ***No effect.***

Water temperature: **No effect.**

Water velocity: ***No effect.***

Areas for growth and development to adulthood: ***No effect.***

Ocean areas – not identified: ***No effect.***

6.4.1.3 Adult Migration Corridors

Cover/shelter: The proposed action will have no effect on cover available to adult salmonids. ***No effect***.

Riparian vegetation: ***No effect***.

Safe passage: The proposed action will have no effect on safe passage for adult salmonids in the Snake River. ***No effect***.

Space: The proposed action will have no effect on the amount of space available to adult salmonids. ***No effect.***

Substrate: See "SRF Redds" section in the Elevated Turbidity section under General program Effects (above). ***Insignificant***.

Water quality: Suspended sediment is likely to affect critical habitat at each of the dredge and disposal sites for a distance of approximately 900 feet downstream and a lateral distance of 450 feet. The results of water quality monitoring during the 2005/2006 dredging indicate that water quality effects from turbidity are unlikely to occur outside the 900-ft x 450-ft zone. Water quality effects from chemicals of concern in the sediment are likely to occur within the same area affected by turbidity since the chemicals in the sediment are more likely to be bound to particles of organic materials that might be carried in suspension. Turbidity is used as a qualitative measure of suspended sediment concentrations, because it can be measured rapidly in the field, and the amount of turbidity is correlated with suspended sediment concentrations. ***Likely to adversely affect, but not likely to appreciably diminish the conservation value***.

Water quantity: ***No effect***.

Water temperature: ***No effect***.

Water velocity: In-water structures would slightly alter the flow characteristics of the river channel, which may affect critical habitat for the ESA-listed salmon species that use the lower Snake River as a migratory corridor. Addition of structures within the river channel would alter localized flow patterns, depths, sediment, and disrupt or move local benthic communities. These changes would be within the vicinity of the constructed structures and may alter some of the specific routes within the river for migrating adult and juvenile salmon but would not impede their migrations. In-water structures would be designed to minimize the creation of predatory habitat. ***Insignificant***.

The main effects of flow modification measures to the aquatic environment would be from changes in flow conditions, water levels, and sediment dispersion patterns. See "Structural Sediment Management" section in the Effects of Action trigger Management Measures (above).

6.4.2 SRB Steelhead

6.4.2.1 Freshwater Spawning Sites

Water quantity: There is no SRB steelhead spawning in the action area. ***No effect***.

Water quality: There is no SRB steelhead spawning in the action area. ***No effect.***

Substrate: There is no SRB steelhead spawning in the action area. ***No effect.***

6.4.2.2 Freshwater Rearing Sites

Water quantity: ***No effect***.

Floodplain connectivity: ***No effect***.

Water quality: Adult steelhead may be in the action area during the winter in-water work period. Suspended sediment is likely to affect critical habitat at each of the dredge and disposal sites for a distance of approximately 900 feet downstream and a lateral distance of 450 feet. The results of water quality monitoring during the 2005/2006 dredging indicate that water quality effects from turbidity are unlikely to occur outside the 900-ft x 450-ft zone. Water quality effects from chemicals of concern in the sediment are likely to occur within the same area affected by turbidity since the chemicals in the sediment are more likely to be bound to particles of organic materials that might be carried in suspension. Turbidity is used as a qualitative measure of suspended sediment concentrations, because it can be measured rapidly in the field, and the amount of turbidity is correlated with suspended sediment concentrations. However, there are also ample areas of unaffected water for adults to escape. ***Likely to adversely affect, but not likely to appreciably diminish the conservation value***.

Forage: See "Disruption of benthic organisms (forage/prey)" section in the General program Effects (above). ***Likely to adversely affect, but not likely to appreciably diminish the conservation value***.

Natural cover: ***No effect***.

6.4.2.3 Freshwater migration corridors

Free passage: ***No effect***.

Water quality: Adult steelhead may be in the action area during the winter in-water work period. Suspended sediment is likely to affect critical habitat at each of the dredge and disposal sites for a distance of approximately 900 feet downstream and a lateral distance of 450 feet. The results of water quality monitoring during the 2005/2006 dredging indicate that water quality effects from turbidity are unlikely to occur outside the 900-ft x 450-ft zone. Water quality effects from chemicals of concern in the sediment are likely to occur within the same area affected by turbidity since the chemicals in the sediment are more likely to be bound to particles of organic materials that might be carried in suspension. Turbidity is used as a qualitative measure of suspended sediment concentrations, because it can be measured rapidly in the field, and the amount of turbidity is correlated with suspended sediment concentrations. However, there are also ample areas of unaffected water for adults to escape. ***Likely to adversely affect, but not likely to appreciably diminish the conservation value.***

Water quantity: ***No effect****.*

Natural cover: ***No effect****.*

6.4.3 Bull Trout

The mainstem Snake and Clearwater Rivers are designated as foraging, migration, and overwintering critical habitat for bull trout. Few bull trout are expected to be in the action area during the proposed work, but winter is the most likely time of year for them to be found there.

Water quality: Adult bull trout may be in the action area during the winter in-water work period. Suspended sediment is likely to affect critical habitat at each of the dredge and disposal sites for a distance of approximately 900 feet downstream and a lateral distance of 450 feet. The results of water quality monitoring during the 2005/2006 dredging indicate that water quality effects from turbidity are unlikely to occur outside the 900-ft x 450-ft zone. Water quality effects from chemicals of concern in the sediment are likely to occur within the same area affected by turbidity since the chemicals in the sediment are more likely to be bound to particles of organic materials that might be carried in suspension. Turbidity is used as a qualitative measure of suspended sediment concentrations, because it can be measured rapidly in the field, and the amount of turbidity is correlated with suspended sediment concentrations. However, there are also ample areas of unaffected water for adults to escape. ***Insignificant.***

Migration corridors: The proposed action will have no effect on safe passage for adult salmonids in the Snake River, as there will be ample unaffected water for migration. Foraging habitats may be affected in localized areas of in-water work for a period, but other areas will remain unaffected. ***Insignificant.***

Food availability: See “Disruption of benthic organisms (forage/prey)” section in the General program Effects (above). ***Likely to adversely affect, but not likely to appreciably diminish the conservation value****.*

Instream habitat: The proposed project will have a minor effect on foraging, migration and overwintering habitat for bull trout while the work is occurring. The river is quite large and this type of habitat is not limited, so the effect on bull trout will be minimal. ***Insignificant.***

Water temperature: ***No effect.***

Substrate characteristics: There are no bull trout spawning areas in the action area. Bull trout in the Snake River feed on other fish and are likely not dependent on the substrate. ***Insignificant.***

Stream flow: In-water structures would slightly alter the flow characteristics of the river channel, which may affect critical habitat for the ESA-listed salmon species that use the lower Snake River as a migratory corridor. Addition of structures within the river channel would alter localized flow patterns, depths, sediment, and disrupt or move local benthic communities. These changes would be within the vicinity of the constructed structures and may alter some of the specific routes within the river for migrating adult and juvenile salmon but would not impede their migrations. ***Insignificant.***

The main effects of flow modification measures to the aquatic environment would be from changes in flow conditions, water levels, and sediment dispersion patterns. See "Structural Sediment Management" section in the Effects of Action trigger Management Measures (above).

Water quantity: The proposed project will have no effect on water quantity. ***No effect.***

Nonnative species: Several years of monitoring dredge disposal sites in the Snake River indicate that the often expressed concern that feeding habitat for predator fishes is increased has not been observed in Lower Granite reservoir (Seybold and Bennett 2010). In-water structures would be designed to minimize potential predator habitat. ***Insignificant.***

6.4.4 Summary

Overall, potential effects lead to a "***likely to adversely affect, but not likely to appreciably diminish the conservation value***" determination for SRF Chinook, SRSS Chinook, SRB steelhead, SR sockeye juveniles, and bull trout.

6.5 Effects Summary

The direct effects of the proposed action are expected from the in-water work that will occur between December 15 and March 1. Summer hydraulic dredging and similar work in recreation or fish and wildlife areas is not anticipated to reach the level of take, and is ***insignificant***.

Direct effects include: (1) a temporary reduction in water quality from increased suspended sediment, resulting in: levels above background levels; potential effects to SRF spawning areas and redds; and possible chemicals of concern; (2) entrainment and harassment from disturbance caused by use of equipment, sound, and disposal; (3) creation of shallow water habitat; and (4) disruption of benthic organisms (forage/prey base).

Indirect effects due to additional or larger barges using the berths to be dredged should not occur because no new construction, expansion, or improvement of a Port facility is proposed as part of the proposed action.

Tables 27-30 summarize the effects of the action.

Table 27. Effects on Listed Fish Species

Effects	NMFS	USFWS
Elevated Turbidity	LAA	LAA
Above Background	LAA	LAA
SRF Chinook Redds	Insignificant	n/a
Suspension of Chemicals of concern	Insignificant	Insignificant
Entrainment and Harassment	LAA	LAA
Equipment	Insignificant	Insignificant
Sound	LAA	LAA
Disposal	LAA	LAA
Creation of Shallow Water Habitat	Insignificant/Beneficial	Insignificant
Disruption of Benthic Organisms (Forage/Prey Base)	LAA	LAA

Table 28. Primary Constituent Elements (PCEs) of Critical Habitats Designated for Pacific Salmon and Steelhead Species Considered in this Document
(Except SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, and SR sockeye salmon)

Primary Constituent Elements		Effect
Site Type	**Site Attribute**	
Freshwater spawning	Substrate	NE
	Water quality	NE
	Water quantity	NE
Freshwater rearing	Floodplain connectivity	NE
	Forage	NE
	Natural cover	NE
	Water quality	LAA
	Water quantity	NE
Freshwater migration	Free of artificial obstructions	NE
	Natural cover	NE
	Water quality	LAA
	Water quantity	NE

Table 29. Primary Constituent Elements (PCEs) of Critical Habitats Designated for SR Spring/Summer Run Chinook Salmon, SR Fall-run Chinook Salmon, and SR Sockeye Salmon

Primary Constituent Elements		Effect
Site	**Site Attribute**	
Spawning and juvenile rearing areas	Access (sockeye)	NE
	Cover/shelter	NE
	Food (juvenile rearing)	LAA
	Riparian vegetation	NE
	Space (Chinook)	NE
	Spawning gravel	Insignificant
	Water quality	LAA
	Water temperature (sockeye)	NE
	Water quantity	NE
Juvenile migration corridors	Cover/shelter	Insignificant
	Food	LAA
	Riparian vegetation	NE
	Safe passage	NE
	Space	NE
	Substrate	Insignificant
	Water quality	LAA
	Water quantity	NE
	Water temperature	NE
	Water velocity	NE
Adult migration corridors	Cover/shelter	NE
	Riparian vegetation	NE
	Safe passage	NE
	Space	NE
	Substrate	Insignificant
	Water quality	LAA
	Water quantity	NE
	Water temperature	NE
	Water velocity	Insignificant

Table 30. Bull Trout PCEs

Bull Trout PCEs		Effect
1	Water Quality	Insignificant
2	Migration Habitat	Insignificant
3	Food Availability	LAA
4	Instream Habitat	Insignificant
5	Water Temperature	NE
6	Substrate Characteristics	NE
7	Stream Flow	Insignificant
8	Water Quantity	NE
9	Nonnative Species	NE

7 CUMULATIVE EFFECTS

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Cumulative effects, when combined with baseline effects and effects of the action, may increase the likelihood that the proposed action will result in jeopardy to a listed species, or in destruction or adverse modification of designated critical habitat.

Given the geographic scope of the action area, which encompasses numerous government entities exercising various authorities, an analysis of cumulative effects is difficult. There is some ability to project governmental actions to a certain extent, but the effects of private actions are the most uncertain. Most private actions directly involving the river will require Federal permits which Federalize the actions and make them subject to ESA compliance.

State and local governments may be faced with pressures from population growth and movement. Under these pressures, private landowners may convert their lands from current uses, or they may intensify or diminish those uses. Such population trends would place greater overall and localized demands on the action area, affecting water quality directly and indirectly, and the need for transportation and communication would likely increase proportionately. Based on the population and growth trends, cumulative effects are likely to increase.

One result of this is the significant pressure within the State of Washington to begin appropriating water directly from the Columbia and Snake Rivers and from local aquifers that may be hydraulically connected to the Columbia and Snake Rivers. Although the State withdrew the water of the mainstem Columbia and Snake Rivers from further appropriation in 1995, it reopened these rivers for further appropriation in 2002. It is difficult to predict long-term trends in water quantity and quality, but impacts are reasonably certain to continue on some level.

However, much of the land throughout the action area is likely to remain rural and used for agricultural purposes, as most arable lands have been developed and water resource development has slowed in recent years. Increasing environmental regulations and diversification in local economies has reduced some impacts that have been previously associated with water and land use by agriculture and extractive industries. For instance, Washington, Oregon and Idaho have all developed total maximum daily load restrictions (TMDL) for various water quality components, turbidity, temperature, pesticides, heavy metals and others in the Snake River and some of its tributaries (WDOE 2009 and 2010; IDEQ and ODEQ 2003). As these plans are carried out water quality should improve.

Additionally, the State of Washington's salmon recovery efforts have assisted with numerous projects to improve habitat for listed species. Ongoing studies and habitat enhancement projects conducted by the Snake River Salmon Recovery Board and Washington State Department of Fish and Wildlife (WDFW) to implement watershed plans and recovery plans are expected to continue.

8 DETERMINATIONS

The effect of the proposed action was evaluated based on the exposure and response to potential stressors. Each individual effect could result in an adverse effect to listed species or critical habitat. However, it is the combined determination for the proposed action overall, for each species and critical habitat, that is the ultimate determination that needs to be made. These determinations are based on findings in the exposure and response analyses.

A "***no effect***" determination was made for those species or critical habitats that are temporally or spatially separated from potential stressors of the action, and could, therefore, not be exposed to potential stressors of the proposed action. Those species that had a "may affect" determination after the exposure analysis went through the response analysis for each potential stressor.

A "***not likely to adversely affect***" determination was made for those species or critical habitats unlikely to have a response sufficient to reduce their individual performance, or for effects that were ***insignificant*** or ***discountable***. A "***likely to adversely affect***" determination was made for a species as a whole for those likely to have a response sufficient to reduce its individual performance.

The Corps has concluded that the proposed action ***may affect, and is likely to adversely affect*** SR spring/summer Chinook, SR fall Chinook, SR sockeye, SRB steelhead, and bull trout. The Corps has concluded that the proposed action ***may affect, and is likely to adversely affect*** their designated critical habitat, but is not expected to result in any alteration that appreciably diminishes the conservation value of critical habitat for listed species. Therefore, the Corps has concluded that the proposed action is ***not likely to destroy or adversely modify designated critical habitat***.

The Corps also concludes that the proposed action ***may affect, but is not likely to adversely affect*** MCR steelhead, UCR spring Chinook, UCR steelhead, and Washington ground squirrel.

Additionally, the Corps has determined that the proposed action will have ***no effect*** on pygmy rabbit, Canada lynx, gray wolf, Ute ladies'-tresses, Spalding's' catchfly, yellow-billed cuckoo, Umtanum Desert buckwheat, White Bluffs bladderpod, and greater sage-grouse, there will be ***no effect*** on Canada lynx, Umtanum Desert buckwheat, and White Bluffs bladderpod critical habitat.

The combined summary of species and critical habitat determinations is shown in Table 31.

Table 31. Summary of Determination of Effects on Listed Species and Critical Habitat

Species	Species Determination	Critical Habitat Determination
NMFS		
SR Spring/Summer Chinook	May Affect, Likely to Adversely Affect	May Affect, Likely to Adversely Affect
SR Fall Chinook	May Affect, Likely to Adversely Affect	May Affect, Likely to Adversely Affect
SR Sockeye	May Affect, Likely to Adversely Affect	May Affect, Likely to Adversely Affect
SRB Steelhead	May Affect, Likely to Adversely Affect	May Affect, Likely to Adversely Affect
MCR Steelhead	May Affect, Not Likely to Adversely Affect	No Effect
UCR Spring Chinook	May Affect, Not Likely to Adversely Affect	No Effect
UCR Steelhead	May Affect, Not Likely to Adversely Affect	No Effect
USFWS		
Bull trout	May Affect, Likely to Adversely Affect	May Affect, Likely to Adversely Affect
Pygmy Rabbit	No Effect	None Designated
Canada lynx	No Effect	No Effect
Gray wolf	No Effect	None Designated
Ute ladies'-tresses	No Effect	None Designated
Spalding's' catchfly	No Effect	None Designated
Yellow-billed cuckoo	No Effect	None Designated
Umtanum Desert buckwheat	No Effect	No Effect
White Bluffs bladderpod	No Effect	No Effect
Greater sage-grouse	No Effect	None Designated
Washington ground squirrel	May Affect, Not Likely to Adversely Affect	None Designated

9 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976, AS AMENDED

The consultation requirement of section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) directs federal agencies to consult with NMFS on all actions, or proposed actions that may adversely affect Essential Fish Habitat (EFH). Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that may be taken by the action agency to conserve EFH.

The Pacific Fishery Management Council (PFMC) designated EFH for Chinook salmon, Coho salmon, and Puget Sound pink salmon (PFMC 1999). The action area includes the following areas designated as EFH under the MSA for various life-history stages of Chinook and/or Coho salmon[18]:

- 17060103 – Lower Snake – Asotin is identified as currently accessible, but unutilized historic EFH for Chinook and Coho.
- 17060107 – Lower Snake – Tucannon River is identified as current EFH for Chinook and currently accessible, but unutilized historic EFH for Coho.
- 17060110 – Lower Snake River is identified as current EFH for Chinook and currently accessible, but unutilized historic EFH for Coho.
- 17060306 – Clearwater River is identified as current EFH for Chinook and currently accessible, but unutilized historic EFH for Coho.

9.1 Description of the Proposed Action

The proposed action is described in the ESA portion of this document.

9.2 Effects of the Proposed Action

Based on information and the analysis of potential adverse effects presented in the ESA portion of this document, the Corps concludes that the effects on Chinook and Coho salmon EFH are the same as those described in detail in the ESA portion of this document. The proposed action may result in short-term adverse effects on a variety of habitat parameters. Beneficial use of sediment to create shallow-water habitat also has beneficial effects.

[18] 17060108 – Palouse River has not been designated as EFH.

9.3 Proposed Conservation Measures

Conservation measures are listed in section 3.10. in the ESA portion of this document.

9.4 Conclusions by EFH

Based on the description of the proposed action, and the inclusion of conservation measures as an integral part of the proposed action, the Corps believes there will be some adverse effects to EFH, and any short-term adverse effects will be minimized by the proposed conservation measures. Therefore, the Corps has determined that the proposed action will result in adverse effects to EFH, albeit small-scale and short-term.

10 MIGRATORY BIRD TREATY ACT OF 1918, AS AMENDED

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.

10.1 Department of Defense Memorandum of Understanding

Executive Order (EO) 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds" directs federal agencies to avoid or minimize the negative impact of their actions on migratory birds, and to take active steps to protect birds and their habitat. This EO also requires federal agencies to develop Memorandum of Understanding (MOU) with the USFWS to conserve birds including taking steps to restore and enhance habitat, prevent or abate pollution affecting birds, and incorporating migratory bird conservation into agency planning processes whenever possible. The Department of Defense (DoD) has completed, and is currently implementing, their MOU with the USFWS.

The MOU describes responsibilities of the DoD and USFWS, including, but not limited to: emphasizing an interdisciplinary, collaborative approach to migratory bird conservation within the geographic framework of the NABCI Bird Conservation Regions; and striving to protect, restore, enhance, and manage habitat of migratory birds, and prevent or minimize the loss or degradation of habitats on DoD managed lands.

The responsibilities of the DoD under the MOU include, but aren't limited to: incorporation of comprehensive migratory bird management objectives in the preparation of DoD planning documents; use the NEPA process; incorporating conservation measures; identifying migratory birds likely to occur in the project area; assess and document the impact on the species; and use inventories and monitoring.

The following sections detail the District's implementation of the MOU.

10.2 Partners in Flight[19] Bird Conservation Regions (BCRs)

Bird Conservation Regions (BCRs) are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues. BCRs are a hierarchical framework of nested ecological units delineated by the Commission for Environmental Cooperation (CEC). The CEC framework comprises a hierarchy of four levels of eco-regions. At each spatial level, spatial resolution increases and eco-regions encompass areas that are

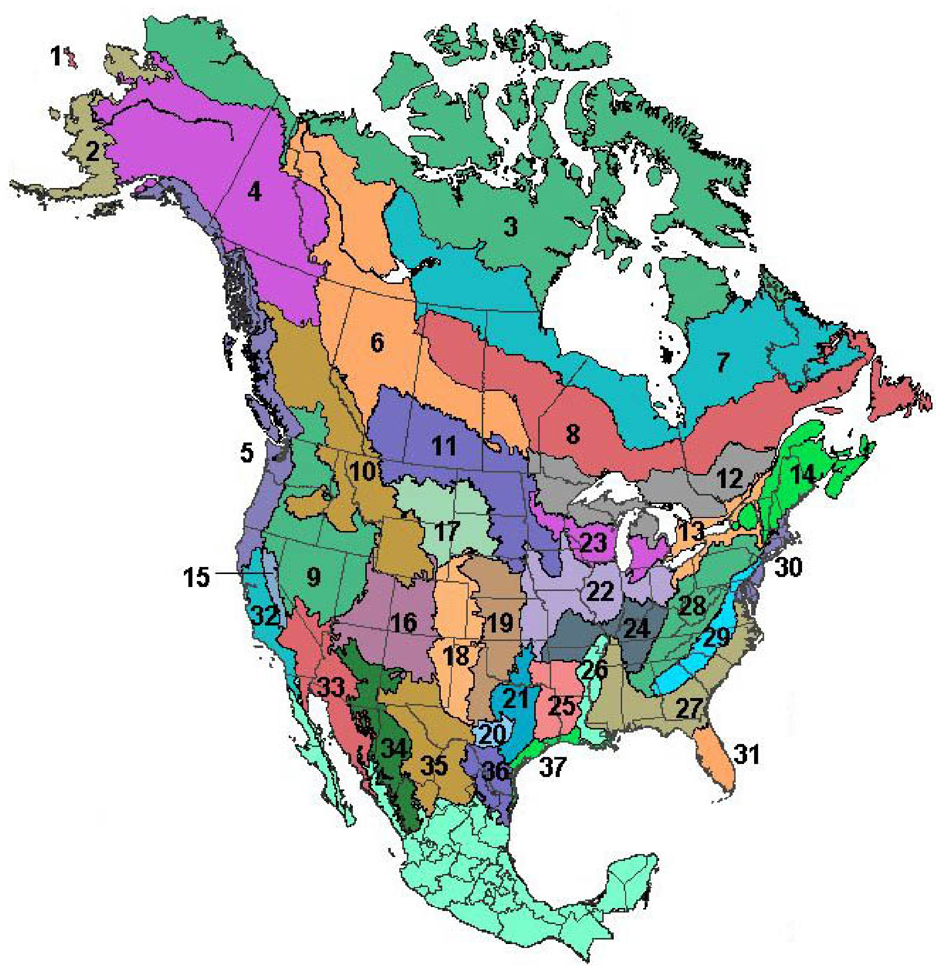
[19] More information on DoD PIF can be found here: http://www.dodpif.org/

progressively more similar in their biotic (e.g., plant and wildlife) and abiotic (e.g., soils, drainage patterns, temperature, and annual precipitation) characteristics.

A mapping team comprised of members from United States, Mexico, and Canada assembled to develop a consistent spatial framework for bird conservation in North America. The team's U.S. members met to apply the framework to the United States and developed a proposed map of BCRs. The map was presented to and approved by the U.S. North American Bird Conservation Initiative (NABCI) Committee during its November 1999, meeting. The map is a dynamic tool (Figure 18). Its BCR boundaries will change over time as new scientific information becomes available. It is expected that the map will be updated every three years[20].

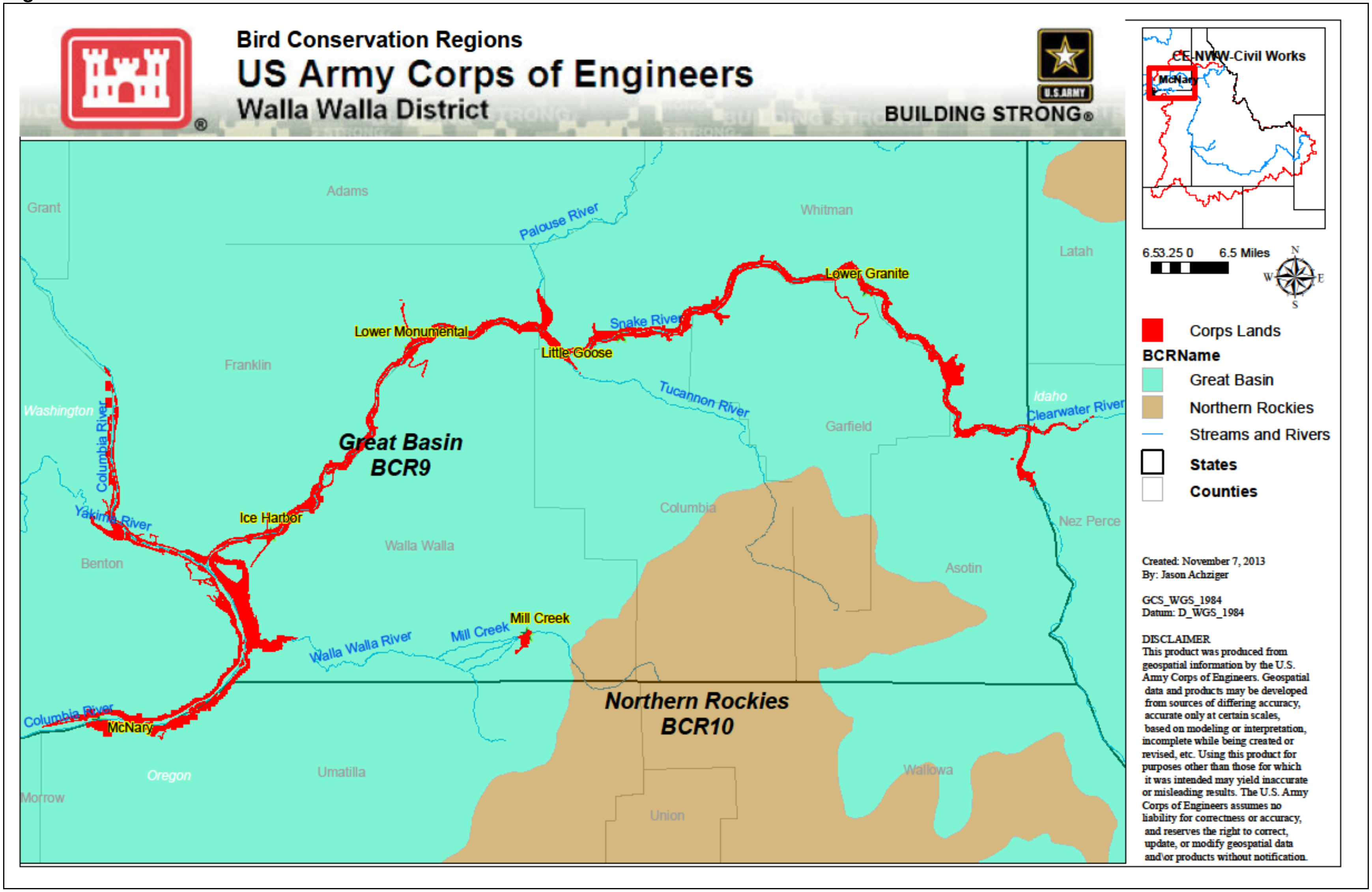
The overall goal of these BCR lists are to accurately identify the migratory and resident bird species (beyond those already designated as federally threatened or endangered) that represent our highest conservation priorities. BCR lists are updated every five years by the U.S. Fish and Wildlife Service. The proposed action is entirely within BCR 9 (Great Basin) (Figure 19).

Figure 18. BCRs



[20] More information on BCRs can be found at http://www.nabci-us.org/bcrs.htm

Figure 19. District Lands in Relation to BCR 9



10.3 Birds of Conservation Concern (BCC)

In December 2008, the U.S. Fish and Wildlife Service released The Birds of Conservation Concern Report (BCC) which identifies species, subspecies, and populations of migratory and resident birds not already designated as federally threatened or endangered that represent highest conservation priorities and are in need of additional conservation actions.

While the bird species included in *BCC 2008* (USFWS 2008) are priorities for conservation action, this list makes no finding with regard to whether they warrant consideration for ESA listing. The goal is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions. It is recommended that these lists be consulted in accordance with EO 13186.

In the DoD and USFWS MOU prepared in response to EO 13186, both parties shall:

> *Emphasize an interdisciplinary, collaborative approach to migratory bird conservation in cooperation with other governments, State and Federal agencies, and non-federal partners within the geographic framework of the NABCI Bird Conservation Regions, and strive to protect, restore, enhance, and manage habitat of migratory birds, and prevent or minimize the loss or degradation of habitats on DoD managed lands.*

This report should also be used to develop research, monitoring, and management initiatives. *BCC 2008* is intended to stimulate coordinated and collaborative proactive conservation actions among Federal, State, Tribal, and private partners. The hope is that, by focusing attention on these highest-priority species, this report will promote greater study and protection of the habitats and ecological communities upon which these species depend, thereby contributing to healthy avian populations and communities.

In addition to the BCC list, the USFWS lists "species of concern" in their ESA county species lists. Table 32 is a summary of the species of concern (SoC) in the action area.

Table 32. BCC Species and Species of Concern in BCR9 and the Action Area

List	Common Name	Scientific Name	Family
BCC and SoC	Bald Eagle	*Haliaeetus leucocephalus*	Accipitridae
BCC	Black Rosy-Finch	*Leucosticte atrata*	Fringillidae
BCC	Black Swift	*Cypseloides niger*	Apodidae
BCC	Black-chinned Sparrow	*Spizella atrogularis*	Emberizidae
BCC	Brewer's Sparrow	*Spizella breweri*	Emberizidae
SoC	Burrowing owl	*Athene cunicularia*	Strigidae
BCC	Calliope Hummingbird	*Selasphorus calliope*	Apodidae
BCC	Eared Grebe	*Podiceps nigricollis*	Podicipedidae
BCC and SoC	Ferruginous Hawk	*Buteo regalis*	Accipitridae
BCC	Flammulated Owl	*Psiloscops flammeolus*	Strigidae

List	Common Name	Scientific Name	Family
BCC	Golden Eagle	*Aquila chrysaetos*	Accipitridae
BCC	Greater Sage-Grouse	*Centrocercus urophasianus*	Phasianidae
BCC	Green-tailed Towhee	*Pipilo chlorurus*	Emberizidae
BCC	Lewis's Woodpecker	*Melanerpes lewis*	Picidae
BCC and SoC	Loggerhead Shrike	*Lanius ludovicianus*	Laniidae
BCC	Long-billed Curlew	*Numenius americanus*	Scolopacidae
BCC	Marbled Godwit	*Limosa fedoa*	Scolopacidae
SoC	Northern goshawk	*Accipiter gentilis*	Accipitridae
SoC	Olive-sided flycatcher	*Contopus cooperi*	Tyrannidae
BCC	Peregrine Falcon	*Falco peregrinus*	Falconidae
BCC	Pinyon Jay	*Gymnorhinus cyanocephalus*	Corvidae
BCC	Sage Sparrow	*Artemisiospiza belli*	Emberizidae
BCC	Sage Thrasher	*Oreoscoptes montanus*	Mimidae
BCC	Snowy Plover	*Charadrius nivosus*	Charadriidae
BCC	Tricolored Blackbird	*Agelaius tricolor*	Icterids
BCC	Virginia's Warbler	*Oreothlypis virginiae*	Parulidae
BCC	White-headed Woodpecker	*Picoides albolarvatus*	Picidae
BCC	Williamson's Sapsucker	*Sphyrapicus thyroideus*	Picidae
BCC	Willow Flycatcher	*Empidonax traillii*	Tyrannidae
BCC	Yellow Rail	*Coturnicops noveboracensis*	Rallidae
BCC	Yellow-billed Cuckoo	*Coccyzus americanus*	Cuculidae

10.4 Approach to Identify Migratory Bird Take Permit Triggers

The proposed action and implementation of future actions will be primarily conducted in the in-water work period (December 15 to March 1), which would not result in the take of any migratory birds or nests under the MBTA. However, if implementation actions occur within the nesting season, the potential for take may exist. Any potential take would likely be limited to upland disposal.

In accordance with EO 13186, the MOU between the DoD and the USFWS, and the guidance for implementing the MOU, the Corps is required to implement impact and avoidance measures as part of the proposed action to avoid or minimize impacts on migratory birds associated with projects.

The following is the District's Environmental Compliance Section (EC) standard operating procedure (SOP) for compliance with the MBTA. This will be employed by the EC to identify the need for a MBTA permit with any implementation actions:

1. Is the proposed action inside the nesting season (April 1-August 15)?
    a. An answer of "no" to #1 would result in a "no take" determination by the Corps.
    b. An answer of "yes" to #1 would result in moving to #2.
2. Are there active nests in the action area, or is there an inactive nest near other active nests or part of a colony? This answer is determined by direct survey and documentation by a qualified biologist.
    a. An answer of "no" would result in a "no take" determination by the Corps.
    b. An answer of "yes" would result a "may take" determination by the Corps, and moving to #3.
3. Can impacts (exposure to stressors that could induce nest failure) be avoided through modified project design, timing, or stressor-specific BMPs?
    a. An answer of "yes" would result in a "no take" determination by the Corps with the requirement that the appropriate BMPs be implemented and recorded in the project Environmental Commitment Checklist and Specifications.
    b. An answer of "no" would result in moving to #4.
4. Can impacts be minimized through modified project design or stressor-specific BMPs? Note that minimization of take is preferred to not minimizing take, but take is prohibited in all cases without permitting. Move to #5.
5. There is the potential for take. Will the action result in intentional or unintentional take?
    a. Intentional (aka direct) take: move to #6.
    b. Unintentional (aka indirect, incidental) take: move to #7.
6. Seek a MBTA take permit from local USFWS Permit Office. Move to #8.

    REGION 1: Hawaii, Idaho, Oregon, Washington

    U.S. Fish and Wildlife Service
    Migratory Bird Permit Office
    911 N.E. 11th Avenue
    Portland, OR 97232-4181
    Tel. (503) 872-2715
    Fax (503) 231-2019
    Email permitsR1MB@fws.gov

7. There is no provision in the MBTA for unintentional take. The compliance biologist shall contact the local USFWS Permit Office to coordinate further avoidance and minimization measures to the greatest extent possible. Due diligence shall be recorded, see 8.
8. Monitoring is required to determine extent and type of take (species affected, numbers of birds, numbers of eggs, numbers of nests, etc.).
9. Document everything.

10.5 Impact Avoidance and Minimization Measures

The MOU between USFWS and DoD indicates that the DoD will incorporate conservation measures, many of which have been already developed[21], and "may be directly applicable to DoD non-military readiness related activities; however, the appropriateness and practicality of implementing any specific conservation measure may have to be determined on a case-by-case basis." The District will also "[u]se base line surveys and knowledge of annual cycle of bird species known to occur on a site to avoid potentially harmful activities to habitats used for nesting, migration stopover, and nonbreeding" in accordance with the MOU.

Eggs and nestlings are the life stages of migratory birds that are most vulnerable to inadvertent taking through disturbance or destruction of nests, if activities are conducted in the nesting season near nests. Avoidance is the most effective means of minimizing these takes of migratory birds.

The District will employ the following impact avoidance and minimization measures to the greatest extent possible if activities occur within the nesting season:

- Survey upland disposal sites for active nests prior to activities within the nesting season.
- Avoid nest sites if possible.
- Observe a minimum 660 ft buffer around raptor nest sites, when possible, which is consistent with the USFWS Bale Eagle Guidelines (USFWS 2011).

10.6 MBTA Conclusion

Migratory birds are known to nest and occur on Corps lands, and some implementation actions may occur within nesting season. However, impacts (exposure to stressors) may be minimized through modified project design or stressor-specific BMPs. There will be ***no take*** for activities conducted outside the nesting season. Any action that occurs within the nesting season that may impact migratory birds (likely limited to upland disposal) would employ the District's SOP to avoid or minimize impacts, or obtain a MBTA permit when impacts leading to take are unavoidable.

[21] Example BMPs can be found at: http://www.partnersinflight.org/pubs/BMPs.htm

11 BALD AND GOLDEN EAGLE PROTECTION ACT OF 1940, AS AMENDED

The BGEPA prohibits the taking or possession of and commerce in bald and golden eagles, with limited exceptions. Take under the BGEPA includes both direct taking of individuals and take due to disturbance. Disturb is defined as: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior" (50 CFR 22.3). "In addition to immediate impacts, this definition also covers impacts that result from human-caused alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagles return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering" (USFWS 2011).

Refer to the Migratory Bird Treaty Act section of this document for details and a discussion of EO 13186, the DoD MOU and its implementation in the District.

11.1 Exposure of Eagles to the Action

The proposed action and implementation of future actions will be primarily conducted in the in-water work period (December 15 to March 1). Some activities (e.g. management measures associated with recreation and fish and wildlife) may occur outside the in-water work period.

Geospatial data obtained from Washington Department of Fish and Wildlife indicates that golden eagles do nest on Corps lands along the Snake River (WDFW 2013a), but bald eagles are not recorded as nesting in that database on Corps lands. However, bald eagles are known to nest in and near Corps managed lands along the Snake River in the District, and some are recorded in Corps geospatial data. Geospatial data from the Idaho Department of Fish and Game, obtained from the Conservation Data Center (now the Idaho National Heritage Program), does not show any golden eagles in the vicinity of the action area in Idaho, but does indicate observations of bald eagles (IDFG 2008).

The nesting season for bald eagles is from January 1 to August 31, and roosting season is from October 15 to March 15[22] (USFWS 2014). Nesting Season for golden eagles is from January 1 to August 31[23] (USFWS 2014).

Outside of the breeding season, bald eagles of all ages typically perch and forage near open water where food and tall trees for perching are available (USFWS 2014). Roosting bald eagles

[22] http://www.fws.gov/pacific/eagle/all_about_eagles/Bald_Eagles.html
[23] http://www.fws.gov/pacific/eagle/all_about_eagles/Golden_Eagles.html

would most likely be near treatment areas during winter, increasing the probability of exposure to potential stressors from the proposed action.

Many golden eagles breeding south of 55°N are not migratory, so they may be present year-round. However, golden eagles tend to nest in areas with little accessibility for humans (Kochert et al. 2002), reducing their exposure. Migrant golden eagles from northern latitudes (such as Canada and Alaska) can be found in the northwestern U.S. during the winter months. Golden eagles generally hunt in open spaces such as grasslands and shrublands in the winter, but are also known to hunt waterfowl in wetland areas and scavenge on carrion when it is available (USFWS 2014), making exposure to the action outside of nesting season possible.

Implementation actions associated with the proposed action may expose bald and golden eagles to project-related stressors. In accordance with EO 13186, the MOU between the DoD and the USFWS, and the guidance for implementing the MOU, the Corps is required to implement impact and avoidance measures as part of the proposed action to avoid or minimize impacts on migratory birds associated with projects.

11.2 Approach to Identify Eagle Take Permit Triggers

Take under the BGEPA includes: "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb" (16 U.S.C. 668c; 50 CFR 22.3)"[24]. No nest used by an eagle may be destroyed without a permit, active or inactive, and nests may not be possessed. Take that is associated with, but not the purpose of, an activity (sometimes unofficially referred to as "incidental take") may be permitted under the BGEPA (50 CFR 22.26)[25].

It is assumed that the action will not result in the destruction of eagle nests.

The following is the District's Environmental Compliance Section (EC) standard operating procedure (SOP) for compliance with the BGEPA. This will be employed by the EC to identify the need for a BGEPA permit with any implementation actions:

1. Is the proposed action inside the nesting season (January 1-August 31) or the roosting season (October 15-March 15)?
    a. An answer of "no" to #1 would result in a "no take" determination by the Corps.
    b. An answer of "yes" to #1 would result in moving to #2.
2. Are there eagle nests or roosting sites in the action area?
    a. An answer of "no" would result in a "no take" determination by the Corps.

[24] http://www.fws.gov/migratorybirds/mbpermits/regulations/BGEPA.PDF
[25] This permit is available only if take cannot be practicably avoided. It covers disturbance and "incidental" take. This permit is intended for programmatic activities where the activities are: 1) reoccurring; 2) the precise location of the programmatic activity and the precise method of implementing the activity may be unknown, and; 3) disturbance as a result of the activity is likely. The agency must have conservation measures in place up-front to minimize the take to greatest extent possible. In other words, the agency has done everything possible to avoid or minimize the take, leading to the conclusion that the take is unavoidable.

   b. An answer of "yes" would result a "may take" determination by the Corps, and moving to #3.
3. Can impacts (exposure to stressors) be avoided through modified project design or stressor-specific BMPs?
   a. An answer of "yes" would result in a "no take" determination by the Corps.
   b. An answer of "no" would result in moving to #4.
4. Can impacts be minimized through modified project design or stressor-specific BMPs? Move to #5.
5. There is the potential for take. Will the action result in intentional or unintentional take? If yes to either, move to #6.
6. Seek a non-purposeful BGEPA take permit (50 CFR § 22.26[26]) from local USFWS Permit Office.

   REGION 1: Hawaii, Idaho, Oregon, Washington

   U.S. Fish and Wildlife Service
   Migratory Bird Permit Office
   911 N.E. 11th Avenue
   Portland, OR 97232-4181
   Tel. (503) 872-2715
   Fax (503) 231-2019
   Email permitsR1MB@fws.gov

7. Document everything.

11.3 Impact Avoidance and Minimization Measures

To avoid disturbing nesting bald eagles and their young the USFWS recommends implementation of the following.

Maintain a buffer of at least 660 feet (200 meters) between project activities and eagle nests (including active and alternate nests). If a similar activity is closer than 660 feet, then maintain a distance buffer as close to the nest as the existing tolerated activity.

Maintain established landscape buffers that screen the activity from the nest.

The following are additional management practices that can be used to benefit bald eagles. These recommendations are designed to protect and preserve bald eagle habitat.

- Avoid to the greatest extent practicable conducting work during dawn and dusk hours
- Wait to the greatest extent practicable to begin activity until later in the breeding season when chances of disturbance are lessened

[26] http://www.fws.gov/pacific/eagle/permit_types/non_purposeful_take.html

11.4 BGEPA Conclusion

Both bald and golden eagles are known to nest and overwinter on Corps lands where implementation actions may occur, and some actions may occur within nesting or roosting seasons. However, impacts (exposure to stressors) will be avoided to the greatest extent practicable. Any action that occurs within the nesting or roosting season that may impact eagles would employ the District's SOP to avoid or minimize impacts, or obtain a BGEPA permit when impacts leading to take are unavoidable.

12 CONCLUSION

The U.S. Army Corps of Engineers (Corps) proposes to adopt and implement a Programmatic Sediment Management Plan (PSMP) for managing sediment within the lower Snake River system to meet the authorized project purposes that are affected by sediment deposition. The affected purposes of the Lower Snake River Projects (LSRP) are commercial navigation, recreation, fish and wildlife conservation, and flow conveyance. This document analyzes the potential impacts to federally protected species and habitats that may occur from adoption of the PSMP, and any known or projected effects of future implementation actions. Managing problem sediments is an important part of maintaining the LSRP, pursuant to the authorities. The Corps has historically maintained:

- The Federal navigation channel at the congressionally authorized depth of 14 feet deep and 250 feet wide.
- Access and use of Corps managed recreation facilities.
- Irrigation water intakes for Corps maintained irrigated habitat management units (HMUs).
- Flow conveyance through the Lewiston levee system consistent with ER 1105-2-101.

Additionally, when dredging actions can be simultaneous with meeting needs of Ports and the Ports contract (fund) the Corps to provide the service, the Corps has also maintained access to the ports and Port berthing areas.

The PSMP implementation process involves problem sediment identification, triggers for action, actions in response to triggers and the planning process for actions for evaluating measures/actions to address sediment that interferes with existing authorized project purposes.

Decisions to pursue sediment management measures will be based on review of monitoring reports and feedback from the Corps' Engineering and Construction and Operations Divisions. Action will be taken (implementation of management measures) when information indicates a need (trigger) for immediate or future sediment management to address sediment accumulation that could interfere with existing authorized project purposes of the LSRP.

The way in which the Corps responds to triggers will differ based on the existing authorized project purpose and the two trigger levels. Measures implemented to address both immediate need and future forecast need shall be the least cost, technically feasible and environmentally acceptable, in accordance with Corps regulations (33 CFR 335-338 and Engineer Regulation 1105-2-100). Below is stated the process and description of actions to be taken for both immediate need and future forecast need for each of the four existing authorized project purposes. The process identified below for both immediate and future forecast needs is stated (generally) in the order such actions will be implemented to manage problem sediment.

Project-specific applied measures will also be monitored for compliance with applicable environmental regulations and requirements. Specific monitoring requirements and protocols will be identified in the environmental compliance documentation associated with NEPA, ESA, CWA, and NHPA compliance. Specific requirements or protocols may be established based on the selected measure and its site-specific application.

Development and identification of future actions under the PSMP (both immediate need and future forecast need actions) will use the NEPA review planning process tiered from the PSMP EIS. This consultation focuses on formal adoption of the PSMP. It also includes the potential effects associated with any future implementations actions that are quantifiable programmatically at the plan level to the greatest extent possible. It is also understood that implementation of future actions under the PSMP may require evaluation of site-specific potential effects, if the effects are in addition to what is considered at the plan level in this consultation. Proposed future actions under the PSMP that would require additional consultations would be tiered from this programmatic consultation.

This document contains the Corps analysis of effects of the action for the Endangered Species Act (ESA), Magnuson-Stevens Fishery Conservation and Management Act (MSA), Migratory Bird treaty Act (MBTA), and the Bald and Golden Eagle Protection Act (BGEPA).

The Corps' analysis of effects pursuant to section 7(a)(2) of the ESA concluded that the proposed action ***may affect, and is likely to adversely affect*** SR spring/summer Chinook, SR fall Chinook, SR sockeye, SRB steelhead, and bull trout. The Corps has concluded that the proposed action ***may affect, and is likely to adversely affect*** their designated critical habitat, but is not expected to result in any alteration that appreciably diminishes the conservation value of critical habitat for listed species. Therefore, the Corps has concluded that the proposed action is ***not likely to destroy or adversely modify designated critical habitat***.

The Corps also concludes that the proposed action ***may affect, but is not likely to adversely affect*** MCR steelhead, UCR spring Chinook, UCR steelhead, and Washington ground squirrel

Additionally, the Corps has determined that the proposed action will have ***no effect*** on pygmy rabbit, Canada lynx, gray wolf, Ute ladies'-tresses, Spalding's' catchfly, yellow-billed cuckoo, Umtanum Desert buckwheat, White Bluffs bladderpod, and greater sage-grouse, there will be ***no effect*** on Canada lynx, Umtanum Desert buckwheat, and White Bluffs bladderpod critical habitat.

The analysis of effects on essential fish habitat (EFH) pursuant to section 305(b) of MSA resulted in the Corps' determination that there will be some adverse effects to EFH, and any short-term adverse effects will be minimized by the proposed conservation measures. The Corps determined that the proposed action will result in ***adverse effects*** to EFH, albeit small-scale and short-term.

The Corps identified conditions that would lead to determinations of ***no take*** or conditions where the Corps would need to seek permits under the MBTA and BGEPA, as well as impact avoidance and minimization measures, in accordance with Executive Order (EO) 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds" and the Memorandum of Understanding between DoD and USFWS required by the EO.

The Corps has also detailed a process in this document for identifying the need for future (tiered) consultations for future implementation actions.

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Lower Snake River Programmatic Sediment Management Plan Environmental Impact Statement

Biological Assessment

Appendix A

General Timing, Frequency, Duration, Magnitude, and BMPs for Each Management Measure That May Be Employed as a Result of an Action Trigger

Prepared by:

U.S. Army Corps of Engineers
Walla Walla District

July 2014

Table 33. Navigation

			Management Categories												
			Dredging and Dredged Materials Management					Structural Sediment Management				System Management			
Triggers			Navigation and Other Dredging	Dredge to improve Conveyance Capacity	Beneficial use of Sediment	In-water Disposal of Sediment	Upland Disposal of Sediment	Bendway Weirs	Dikes/Dike Fields	Agitation to Resuspend	Trapping Upstream Sediments (in reservoir)	BASELINE**Navigation Objectives Reservoir Operations	Reconfigure/Relocate Affected Facilities	Raise Lewiston Levee to Manage Flood Risk	Reservoir Drawdown to Flush Sediment
Navigation	Immediate Need	Employed	X		X	X	X					X			
		Timing	Dec 15-Mar 1		Dec 15-Mar 1	Dec 15-Mar 1	Dec 15 - Mar 1					during the juvenile salmonid outmigration season (typically from April through August, but as late as October in Lower Granite Reservoir), and at varying levels within each reservoir's 3 or 5-foot operating range through the rest of the year.			
		Frequency	3-5 years		3-5 years	3-5 years	3-5 years					Annually			
		Duration	75 days		75 days	75 days						5-7 months			
		Magnitude	6000-7200 cy/day total quantities up to 500,000 cy for a maintenance action		6000-7200 cy/day	6000-7200 cy/day	6000-7200 cy/day					above MOP and even at the upper end of the operating range year-round as needed			
		BMPs										FCRPS BiOp			
	Future Forecast Need	Employed	X		X	X	X	X	X		X	X	X		X
		Timing	Dec 15-Mar 1		Dec 15-Mar 1	Dec 15-Mar 1	Dec 15 - Mar 1	Dec 15-Mar 1	Dec 15-Mar 1		Dec 15-Mar 1	during the juvenile salmonid outmigration season (typically from April through August, but as late as October in Lower Granite Reservoir), and at varying levels within each reservoir's 3 or 5-foot operating range through the rest of the year.	In-water work : Dec 15 - Mar 1 Upland work: appropriate construction season		late April through late June
		Frequency	3-5 years		3-5 years	3-5 years	3-5 years	1 time per site	1 time per site		Dredged Annually	Annually	1 time per site		1 time
		Duration	75 days		75 days	75 days	75 days	1 year per site	1 year per site		75 days	5-7 months	1-3 years		6 weeks
		Magnitude	6000-7200 cy/day total quantities up to 500,000 cy for a maintenance action		6000-7200 cy/day	6000-7200 cy/day	6000-7200 cy/day				250,000-350,000 cy	above MOP and even at the upper end of the operating range year-round as needed			

Table 34. Recreation

			Management Categories												
			Dredging and Dredged Materials Management					Structural Sediment Management				System Management			
Triggers			Navigation and Other Dredging	Dredge to improve Conveyance Capacity	Beneficial use of Sediment	In-water Disposal of Sediment	Upland Disposal of Sediment	Bendway Weirs	Dikes/Dike Fields	Agitation to Resuspend	Trapping Upstream Sediments (in reservoir)	BASELINE**Navigation Objectives Reservoir Operations	Reconfigure/Relocate Affected Facilities	Raise Lewiston Levee to Manage Flood Risk	Reservoir Drawdown to Flush Sediment
Recreation	Immediate Need	Employed	X		X	X	X			X		X	Facility would be closed		Ancillary result of drawdown for navigation or flow conveyance
		Timing	Dec 15 - Mar 1 or during summer window if appropriate		Dec 15 - Mar 1 or during summer window if appropriate	Dec 15 - Mar 1 or during summer window if appropriate	Dec 15 - Mar 1 or during summer window if appropriate			Dec 15 - Mar 1 or during summer window if appropriate		during the juvenile salmonid outmigration season (typically from April through August, but as late as October in Lower Granite Reservoir), and at varying levels within each reservoir's 3 or 5-foot operating range through the rest of the year.	Any time		late April through late June
		Frequency	3-9 years		3-9 years	3-9 years	3-9 years			3-9 years		Annually	Indefinite		1 time
		Duration	Several days		Several days	Several days	Several days			75 days		5-7 months	Indefinite		6 weeks
		Magnitude	1,000–15,000 cy		1,000–15,000 cy	1,000–15,000 cy	1,000–15,000 cy			500-1500 cy		above MOP and even at the upper end of the operating range year-round as needed			
		BMPs				No in-water disposal in summer						FCRPS BiOp			
	Future Forecast Need	Employed	X		X	X	X			X		X	X		
		Timing	Dec 15 - Mar 1 or during summer window if appropriate		Dec 15 - Mar 1 or during summer window if appropriate	Dec 15 - Mar 1 or during summer window if appropriate	Dec 15 - Mar 1 or during summer window if appropriate			Dec 15 - Mar 1 or during summer window if appropriate		during the juvenile salmonid outmigration season (typically from April through August, but as late as October in Lower Granite Reservoir), and at varying levels within each reservoir's 3 or 5-foot operating range through the rest of the year.	In-water work and upland work in appropriate construction season		
		Frequency	3-9 years		3-9 years	3-9 years	3-9 years			3-9 years		Annually	1 time per site		
		Duration	Several days		Several days	Several days	Several days			Several days		5-7 months	1 year		
		Magnitude	1,000–15,000 cy		1,000–15,000 cy	1,000–15,000 cy	1,000–15,000 cy			500-1500 cy		above MOP and even at the upper end of the operating range year-round as needed			

Table 35. Fish and Wildlife

			Management Categories												
			Dredging and Dredged Materials Management					Structural Sediment Management				System Management			
Triggers			Navigation and Other Dredging	Dredge to improve Conveyance Capacity	Beneficial use of Sediment	In-water Disposal of Sediment	Upland Disposal of Sediment	Bendway Weirs	Dikes/Dike Fields	Agitation to Resuspend	Trapping Upstream Sediments (in reservoir)	BASELINE**Navigation Objectives Reservoir Operations	Reconfigure/Relocate Affected Facilities	Raise Lewiston Levee to Manage Flood Risk	Reservoir Drawdown to Flush Sediment
Fish and Wildlife	Immediate Need	Employed	X		X	X	X			X			X		
		Timing	Summer irrigation season		Summer irrigation season	Summer irrigation season	Summer irrigation season			Summer irrigation season			Summer irrigation season		
		Frequency	7-15 years		7-15 years	7-15 years	7-15 years			7-15 years			annually		
		Duration	Several days		Several days	Several days	Several days			Several days			Several hours		
		Magnitude	100-1000 cy		100-1000 cy	100-1000 cy	100-1000 cy			<500 cy					
		BMPs											Routine O&M		
	Future Forecast Need	Employed	X		X	X	X			X			X		
		Timing	Summer irrigation season		Summer irrigation season	Summer irrigation season	Summer irrigation season			Summer irrigation season			Outside of summer irrigation season		
		Frequency	7-15 years		7-15 years	7-15 years	7-15 years			7-15 years			1 time per site		
		Duration	Several days		Several days	Several days	Several days			Several days			Several days - several months		
		Magnitude	100-1000 cy		100-1000 cy	100-1000 cy	100-1000 cy			<500 cy					

Table 36. Flow Conveyance

			Management Categories												
			Dredging and Dredged Materials Management					Structural Sediment Management				System Management			
Triggers			Navigation and Other Dredging	Dredge to improve Conveyance Capacity	Beneficial use of Sediment	In-water Disposal of Sediment	Upland Disposal of Sediment	Bendway Weirs	Dikes/Dike Fields	Agitation to Resuspend	Trapping Upstream Sediments (in reservoir)	BASELINE**Navigation Objectives Reservoir Operations	Reconfigure/Relocate Affected Facilities	Raise Lewiston Levee to Manage Flood Risk	Reservoir Drawdown to Flush Sediment
Flow Conveyance	Immediate Need	Employed		X	X	X	X				X				
		Timing		Dec 15-Mar 1	Dec 15-Mar 1	Dec 15-Mar 1	Dec 15 - Mar 1				Dec 15-Mar 1				
		Frequency		annually	annually	annually	annually				Dredged Annually				
		Duration		75 days	75 days	75 days	75 days				75 days				
		Magnitude		1 million cy/yr for first 10 yrs, 350,000-500,000 cy/yr afterwards	1 million cy/yr for first 10 yrs, 350,000-500,000 cy/yr afterwards	1 million cy/yr for first 10 yrs, 350,000-500,000 cy/yr afterwards	1 million cy/yr for first 10 yrs, 350,000-500,000 cy/yr afterwards				250,000-350,000 cy				
		BMPs													
	Future Forecast Need	Employed		X	X	X	X							X	X
		Timing		Dec 15-Mar 1	Dec 15-Mar 1	Dec 15-Mar 1	Dec 15 - Mar 1				Dec 15-Mar 1			Outside of summer recreation season, if possible	late April through late June
		Frequency		annually	annually	annually	annually				Dredged Annually			1 time	1 time
		Duration		75 days	75 days	75 days	75 days							1 year	6 weeks
		Magnitude		1 million cy/yr for first 10 yrs, 350,000-500,000 cy/yr afterwards	1 million cy/yr for first 10 yrs, 350,000-500,000 cy/yr afterwards	1 million cy/yr for first 10 yrs, 350,000-500,000 cy/yr afterwards	1 million cy/yr for first 10 yrs, 350,000-500,000 cy/yr afterwards				250,000-350,000 cy			Raise levee up to 3 feet in selected areas	