B O N N E V I L L E   P O W E R   A D M I N I S T R A T I O N

Clark Fork River Delta Restoration Project

Draft Environmental Assessment

January 2014

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Clark Fork River Delta Restoration Project

Draft Environmental Assessment

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Clark Fork River Delta Restoration Project

BUREAU OF LAND MANAGEMENT

US Army Corps of Engineers®
Seattle District

BONNEVILLE POWER ADMINISTRATION

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Chapter 1
Introduction

The Bonneville Power Administration (BPA) is proposing to provide partial funding towards a project put forward by the Idaho Department of Fish and Game (IDFG) to restore ***wetland*** and ***riparian*** habitat and reduce erosion in an area known as the Clark Fork River delta. This delta is located in Bonner County, Idaho at the confluence of the Clark Fork River and Lake Pend Oreille (Figure 1-1).

IDFG's Clark Fork River Delta Restoration Project (project) would involve installing shoreline erosion control measures, installing structures to redirect local water flow, raising islands, deepening channels, establishing vegetation, and controlling weeds at the Clark Fork River delta. IDFG has developed the project in cooperation with many partners, including BPA, Ducks Unlimited, U.S. Bureau of Land Management (BLM), the U.S. Army Corps of Engineers (Corps), Avista Corporation, Kalispel Tribe, U.S. Fish and Wildlife Service (USFWS), Natural Resource Conservation Service, Northwest Power and Conservation Council (Council), Idaho Conservation League, and Pend Oreille Basin Lake Commission. In addition to BPA, many of these project partners have been contributing, or are expected to contribute, funding for the project.

BPA prepared this Draft Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) (42 U.S. Code [USC] 4321 et seq.) and its implementing regulations, which require federal agencies to assess the impacts their actions may have on the environment. This Draft EA was prepared to determine if the project is likely to significantly affect the environment and warrant preparing an environmental impact statement (EIS), or whether it is appropriate to prepare a Finding of No Significant Impact (FONSI).

This chapter describes BPA's need to take action and the purposes that BPA seeks to achieve in addressing this need. The chapter also provides background information on the Clark Fork River Delta Restoration Project, identifies the agencies involved in the development of this EA, and summarizes the public scoping process and comments received.

1.1 NEED FOR ACTION

BPA needs to determine whether to provide funding to IDFG for portions of its proposal to restore and improve habitat in the Clark Fork River delta. The delta has been eroding at rates of about 10 to 22 acres per year (Martin et al., 1988; Parametrix, 1998; Ducks Unlimited, 2011). The restoration is proposed to reduce rates of erosion, reclaim wetland habitats, and improve habitat quality for fish, wildlife, and vegetation.

Although BPA would only provide partial funding toward the project, this EA examines the environmental effects of the entire project because BPA's funding would contribute to the entire project and not discreet portions. In addition, the BLM and Corps have decisions to make for the project (see Section 1.4) and can adopt this EA to meet their NEPA obligations.

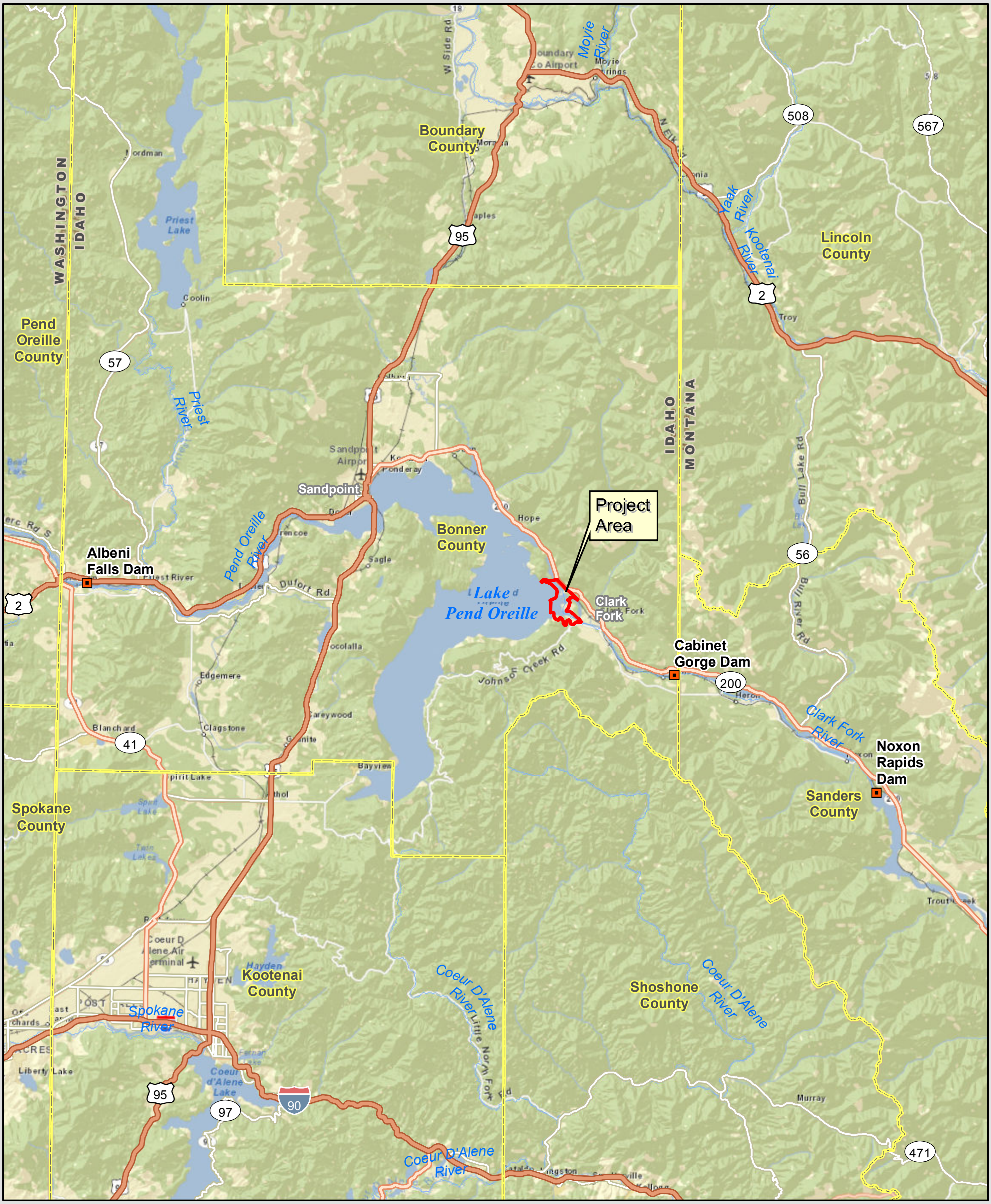
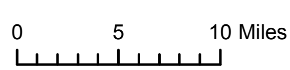


FIGURE 1-1:
Clark Fork River Delta Restoration Project



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1.2 PURPOSES

In meeting the need for action, BPA seeks to achieve the following purposes:

- Comply with applicable laws, regulations, and policies that guide the agency.
- Support efforts to mitigate for effects of Albeni Falls Dam on fish and wildlife and their habitats in the Clark Fork delta on the Pend Oreille River following the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act) (16 USC 839b[h][10][A]).
- Assist in carrying out commitments made by BPA to the State of Idaho to provide funding for erosion control and habitat restoration efforts related to Albeni Falls Dam.
- Minimize harm to natural or human resources and avoid jeopardy to Endangered Species Act (ESA) (16 USC 1531 et seq.)-listed species and destruction or adverse modification of designated critical habitat.

1.3 BACKGROUND

1.3.1 Federal Columbia River Power System and Albeni Falls Dam

The Federal Columbia River Power System (FCRPS) is a series of 31 dams on the Columbia and Snake Rivers that are owned and operated by the Corps and the U.S. Bureau of Reclamation (Reclamation). The FCRPS is jointly managed to address an array of treaty, statutory, and regulatory responsibilities. Albeni Falls Dam is part of the FCRPS, and is operated by the Corps; BPA markets and distributes the power generated from the FCRPS, including Albeni Falls Dam, pursuant to the Bonneville Power Act of 1937 (16 USC 832 et seq.) and other applicable statutes.

The Albeni Falls Dam began operating in 1955. The dam impounds and regulates the top 11.5 vertical feet of Lake Pend Oreille. The dam is operated for multiple purposes – flood control, power generation, navigation, recreation, and fish and wildlife conservation. Dam operations affect water levels of Pend Oreille River (a 27-mile section from the mouth of the river to the dam) and Lake Pend Oreille, as well as the lower 3 miles of the Clark Fork River and the lower reaches of some 20 miles of tributaries to the Pend Oreille and Clark Fork Rivers (see Figure 1-1).

Albeni Falls Dam is managed within a range of authorized maximum and minimum lake elevations, as measured at the U.S. Geological Survey (USGS) gage at Hope, Idaho. The authorized upper limit lake regulation level is 2062.5 feet, and the authorized lower limit lake regulation level is 2049.7 feet. In general, the lake is held higher in the summer primarily for recreational purposes, and is drafted by winter primarily for power and flood control purposes. The maximum is usually reached in June and maintained until September. The lowest lake levels are reached during the winter. Additional information on Lake Pend Oreille operations is available in the Albeni Falls Dam Flexible Winter Power Operations EA, Bonner County, Idaho, which is incorporated by reference into this EA (U.S. Army Corps of Engineers [USACE] and BPA, 2011).

The proposed Clark Fork River Delta Restoration Project would not affect ongoing lake level management. BPA and the Corps are working cooperatively with stakeholders regarding lake levels that would be needed to conduct environmental impact studies for this EA and to construct the project. Although lake levels would be drawn down for these actions, the levels would remain within normal operating ranges.

1.3.2 Other Dams Affecting Lake Pend Oreille

Upstream from Lake Pend Oreille are two non-federal dams – Cabinet Gorge Dam and Noxon Rapids Dam – located on the Clark Fork River. These two dams are owned and operated by Avista Corporation and contribute to water level fluctuations in the Clark Fork River as well as Lake Pend Oreille.

1.3.3 Habitat Losses

The habitat losses due to construction of the Albeni Falls Dam and the subsequent rise of water levels (inundation) of the Pend Oreille River included the loss of 6,617 acres of wetland habitat and the inundation of 8,900 acres of deep-water marsh (IDFG, 2010). Shallow water areas that produced high concentrations of waterfowl food plants were flooded (USFWS, 1960, in Martin et al., 1988). Prior to construction of the dam, the northern shores of Lake Pend Oreille were vegetated with highly productive and seasonally flooded wetlands, especially at the mouths of tributaries and rivers. Potential nesting sites and cover for a diversity of wildlife species were degraded because of a loss of vegetation and conversion of wetlands to open water. With the loss of wetlands, wildlife food from wetland plant species that had produced seeds, rootstocks, and vegetative parts were also lost (USFWS, 1960, in Martin et al., 1988). The Clark Fork River delta is one of the areas around the lake where these effects occurred.

In addition, habitat in the Clark Fork River delta has been affected by shoreline erosion, which has resulted from a variety of factors such as:

- Raised Lake Pend Oreille summer levels that result from operations of the Albeni Falls Dam, combined with high-energy wind-generated waves
- Loss of upstream bedload sediment supply due to the upstream Noxon Rapids and Cabinet Gorge Dams along the lower Clark Fork River
- Natural flooding during spring and early summer periods
- The presence of certain types of glacial lakebed sediment (Parametrix, 1998)

Specific to Albeni Falls Dam operations, the variations in Lake Pend Oreille water elevations due to dam operations contribute to erosion of delta shorelines, including the Clark Fork River delta. Because the shores are inundated during the spring and summer growing seasons, vegetation cannot grow and, therefore, is not present to protect lake banks from erosion. The Clark Fork River delta also is exposed to wave action associated with a long wind ***fetch*** across Lake Pend Oreille. When lake levels are low, during drawdown in late summer and early fall, wave action erodes poorly vegetated banks removing land and shoreline habitat. Roughly, 50 percent of functional delta wildlife habitat has been lost, and ongoing habitat losses are estimated at 8 to 12 acres per year (Council, 2002).

Habitat is also affected in the delta by Avista's Cabinet Gorge and Noxon Rapids dams. These dams impede sediment transport to the Clark Fork River delta, which prohibit development of delta landforms and protective lakeside beaches (Avista, 1999; Martin et al., 1988; IDFG, 2013a).

1.3.4 Ongoing Mitigation Efforts for Albeni Falls Dam

Under the Northwest Power Act (16 USC 839b[h][10][A]), BPA has an obligation to protect, mitigate, and enhance fish and wildlife and their habitats affected by the development and operation of the FCRPS. To assist in accomplishing this, the act requires BPA to fund fish and wildlife protection, mitigation, and enhancement actions consistent with the Council's Fish and Wildlife Program. Under this program, the Council makes recommendations to BPA concerning which fish and wildlife projects to fund.

The Council's Fish and Wildlife Program includes the Albeni Falls Wildlife Mitigation Project, an ongoing ecosystem-based effort to mitigate wildlife habitat losses that resulted from the construction of the dam. Under mitigation agreements supported by the Council, BPA has provided extensive mitigation for fish and wildlife affected by Albeni Falls Dam by funding IDFG, the Kalispel Tribe, the Coeur D'Alene Tribe, and the Kootenai Tribe of Idaho to acquire, improve, and manage over 13,384 acres of habitat to offset the 6,617 acres inundated by the dam. BPA's proposed funding for the Clark Fork River Delta Restoration Project furthers these mitigation efforts.

In addition, BPA and the State of Idaho are working together to consider and provide other mitigation for operational effects from Albeni Falls Dam. In 2012, BPA and the State of Idaho agreed that, among other things, BPA would provide additional funding to the IDFG for several projects, including evaluating erosion impacts and gravel placement for fish spawning, habitat restoration, and habitat acquisition. Funding for the Clark Fork River Delta Restoration Project would assist BPA in fulfilling commitments of the agreement.[1]

At the Clark Fork River delta, IDFG is already undertaking some project restoration actions with support from Avista. The Clark Fork River Delta Restoration Project would complement other ongoing restoration efforts in northern Idaho around Lake Pend Oreille and along the Pend Oreille and Clarks Fork rivers and in their associated deltas.

1.4 COOPERATING AGENCIES

1.4.1 U.S. Bureau of Land Management

BLM is a cooperating agency in the development of this EA because portions of the restoration activities would take place on BLM-managed land (see Figure 1-2). BLM would need to issue a Mineral Materials Permit and land use authorization permit.

The Federal Land Policy and Management Act requires that BLM manage public lands in accordance with applicable land use plans. BLM's *Coeur d'Alene Resource Management Plan* (BLM, 2007a) dictates management of the lands relevant to the project. The plan authorizes BLM to perform restoration work. It also provides direction for the management of riparian

[1] Letter from L. Bodi, BPA Vice President Environment, Fish and Wildlife, to J. Chatburn, Administrator Idaho Office of Energy Resources (October 28, 2011) and Office of Energy Resources letter from J. Chatburn, to L. Bodi, BPA (June 1, 2012).

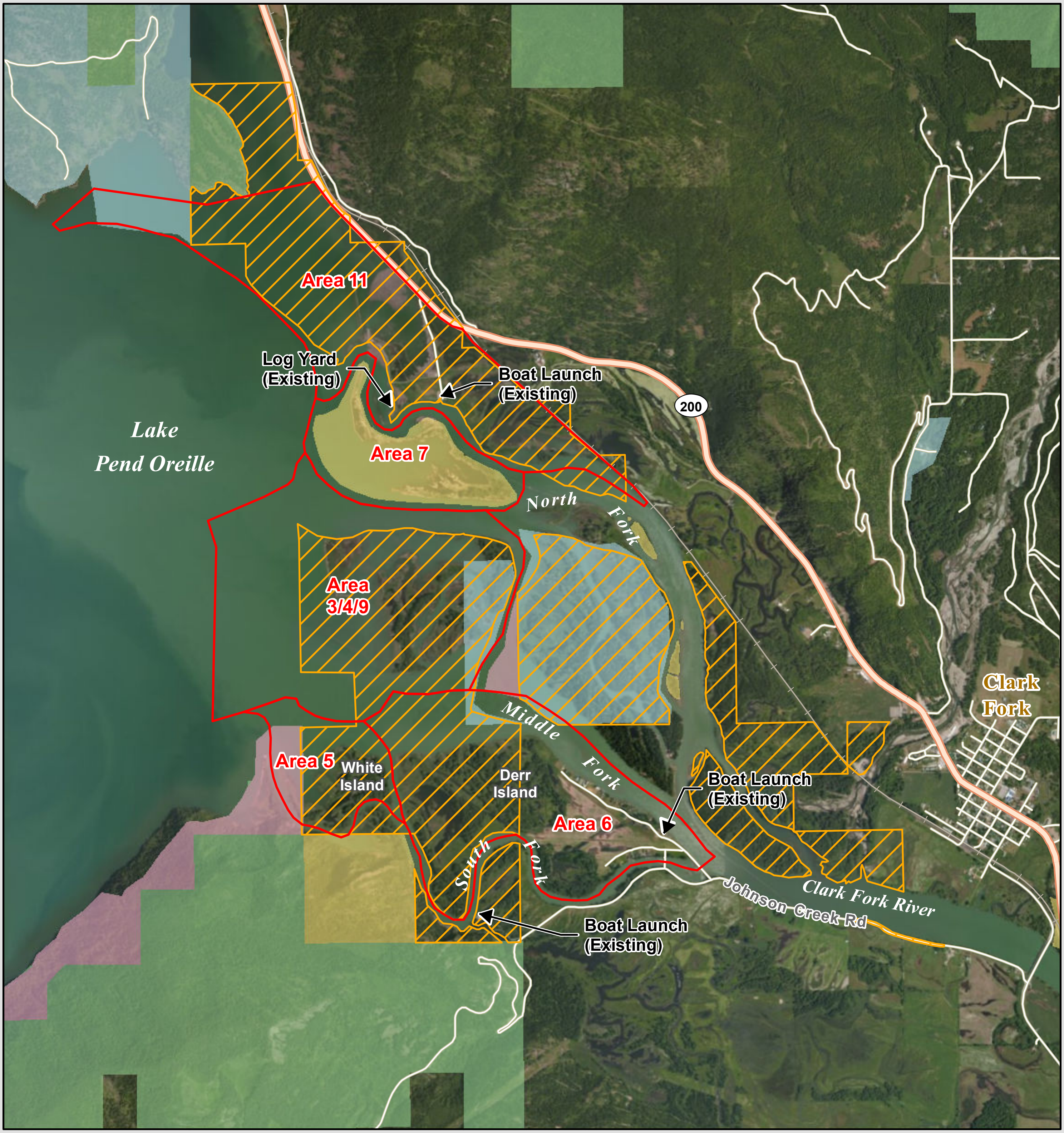


FIGURE 1-2: Land Ownership and Management Areas
Clark Fork River Delta Restoration Project
Bonner County, Idaho

Public Land Ownership (Source: State of Idaho)

- Bureau of Land Management
- Corps of Engineers
- United States Forest Service
- State Land
- Project Area
- Pend Oreille Wildlife Management Area

12/4/2013

0 0.5 1 Mile

habitats and includes management goals, objectives, and actions, such as, "Design[ing] and implement[ing] fish and wildlife habitat restoration and enhancement actions in a manner that contributes to the attainment of Riparian Management Objectives" (BLM, 2007a).

The BLM-authorized officer will decide whether to approve implementation of the components of the project proposed on BLM-administered lands. This is a general public land decision under authority specified in the Federal Land Policy and Management Act of 1976 as Amended, Section 302.

The BLM authorized officer will also decide whether to issue a free use permit to the IDFG to acquire mineral materials (rock for erosion control) from public lands, under authority of 43 Code of Federal Regulations (CFR) 3604.

Given its jurisdiction in making these related decisions, the BLM is a cooperating agency in the development of this EA to meet its obligations under NEPA.

1.4.2 U.S. Army Corps of Engineers

There are two Districts of Corps that have a role in this project, the Seattle District and Walla Walla District, and each have agreed to be cooperating agencies on this EA for different reasons given their respective roles and responsibilities. The Seattle District operates and maintains Albeni Falls Dam and leases portions of the proposed project area to IDFG (Figure 1-2). The Seattle District has determined that the proposed action would be consistent with the terms of Lease No. DACW67-3-84-4, which permits IDFG to use and occupy project lands for the purposes of fish and wildlife management and public purposes. Conditions of the license allow for improvements of various kinds and protection of the property from soil erosion.

The Walla Walla District has regulatory jurisdiction under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act and has its own obligations under NEPA as part of this decision-making process. Given their jurisdiction in making these related decisions, the Walla Walla District and the Seattle District will each independently review the analysis and conclusions in this EA and prepare their own NEPA decision document(s), to the extent appropriate or warranted.

1.5 PUBLIC INVOLVEMENT AND ISSUE SUMMARY

BPA, IDFG, the Corps, and BLM conducted public scoping outreach for the project in July and August 2013. On July 15, 2013, BPA sent a letter to people potentially interested in or affected by the project, including adjacent landowners, public interest groups, local governments, tribes, and state and federal agencies. The letter explained the proposal, the environmental process, and how to participate. Specific project notification was provided to known stakeholders, such as the Idaho Conservation League and the Pend Oreille Waterkeepers. The public letter was posted on the project website at http://www.bpa.gov/goto/ClarkForkRiverDelta.

BPA identified four tribes that have a potential interest in the project on their historic or current use of the land in the project area: the Kalispel Tribe of Indians, the Coeur d'Alene Tribe, the Confederated Salish and Kootenai Tribes, and the Kootenai Tribe of Idaho. BPA provided project information to and requested information from the consulting tribes, including information on potential cultural resources in the project area.

To help solicit comments and describe the project, a public scoping meeting was held in Sandpoint, Idaho, on July 31, 2013. The scoping comment period for the project began on July 15, 2013, and closed on August 19, 2013. The public was notified of the public meeting through local radio, local newspapers, flyers in the towns of Sandpoint and Clark Fork, and a digital newsletter.

Twenty-five people attended the scoping meeting. Comments were provided during the meetings and written comments were also received from 54 individuals and agencies. Comments received during the scoping period were considered in preparation of this EA and can be found in their entirety on the project website.

Comments were received on the following topics:

Proposed Action. Many comments were supportive of the goals of the restoration effort. Some commenters suggested that BPA should provide full funding of Clark Fork River delta restoration to expedite fulfillment of required mitigation for Albeni Falls Dam operations. There were also comments supportive of BPA providing additional funding to maintain the delta into the future.

Project. Several comments included requests that the timing of the restoration effort take place sooner rather than later to reduce erosion and improve habitat for fish and wildlife. Other commenters questioned whether enough time has been allotted to accomplish the restoration work and if there would be a potential need to extend the reservoir drawdown period.

Geology and Soils. Several comments raised questions about how the operations of Albeni Falls Dam contribute to soil erosion at the Clark Fork River delta. Other comments related to erosion control focused on the impacts of creating and managing islands and ponds in the soil backfill behind the breakwaters. One comment specific to the design of the project questioned if the foundation stabilization would be deep enough under and within the rock toe.

Vegetation and Wetlands. Some comments suggested that BPA explore funding the restoration of all of the delta habitat that has been lost, including wetlands and riparian areas. Other comments were more specific to the proposed project design, and questioned the use of vegetation to stabilize breakwaters. Several commenters raised concern about controlling invasive species including Eurasian watermilfoil and flowering sedge. One commenter suggested exploring options such as using goats to control invasives.

Water Resources. Some comments were supportive of pursuing an adaptive restoration strategy that allows for changes in natural hydrological processes.

Fish and Wildlife. Several comments brought up concerns about how the restoration effort would impact mammals, fish, common loons, swallows, western grebes, mergansers, and invertebrates.

Recreation Resources. Some comments raised questions about the ability to change water surface levels in Lake Pend Oreille to promote recreation, power production, and fish productivity.

Cultural Resources. Some comments raised concerns about Tribal participation in cultural reviews and related processes, and cultural resources information sharing. There was concern expressed regarding IDFG’s cultural sensitivity to Tribal interests in the delta.

Socioeconomics. Several comments raised concerns about the health of the delta and how the restoration effort would affect tourism, recreation, and the local economy. Other comments requested elimination of power-peaking practices of the Clark Fork River and Albeni Falls hydroelectric projects due to their effects on hydrological fluctuations.

These topics are addressed in the appropriate sections of this EA. BPA is releasing this Draft EA for review and comment. The Draft EA is posted on the project website (http://www.bpa.gov/goto/ClarkForkRiverDelta). During the review period, BPA will accept comments via the website, email, phone, and letter. After considering comments received during the review period, this EA will be revised, if necessary, and finalized, with a decision on how to proceed.

1.5.1 Issues Outside the Scope of this Environmental Assessment

Although comments were received regarding the impacts of managing Lake Pend Oreille surface levels to promote recreation, hydroelectric power production, and fish productivity, these topics are not carried forward for analysis in this Draft EA because they are beyond the scope of the proposed restoration of the Clark Fork River delta.

Chapter 2
Proposed Action and Alternatives

This chapter describes the Proposed Action, the No Action Alternative, and design alternatives considered but eliminated from detailed study. This chapter also compares the two alternatives by the project purposes and the potential environmental effects.

2.1 PROPOSED ACTION

Under the Proposed Action, BPA would provide partial funding for the Clark Fork River Delta Restoration Project; the BLM and Corps would grant appropriate permits and land use authorizations for the project; and IDFG would obtain additional funding from other sources and would implement the project.

The project would include protecting shorelines, redirecting local water flow, raising islands, forming channels, establishing vegetation, and controlling weeds.

The project is designed to help restore delta banks that have eroded on islands and shorelines; increase upland habitat; protect native riparian and wetland vegetation; and improve the quantity and quality of fish and wildlife habitat. The project would add habitat complexity with large woody debris; promote diverse native riparian vegetation growth such as black cottonwood, dogwood, and willow; reduce nonnative invasive reed canarygrass; and control other invasive species.

2.1.1 Project Areas

The Clark Fork River Delta Restoration Project is proposed where the Clark Fork River meets Lake Pend Oreille, about 3 miles west of Clark Fork, Idaho. Much of this delta is managed by IDFG as part of the Pend Oreille Wildlife WMA, which is divided into 13 management units (Figure 2-1). The project is divided into five project areas that generally correspond to management units of IDFG's Lake Pend Oreille Wildlife Management Area (WMA). The project areas are numbered to correspond with the WMA units as follows: Area 3/4/9, Area 5, Area 6, Area 7, and Area 11 (Figure 1-2). The following describes the five areas:

- **Area 3/4/9** is an un-named island at the center of the delta and includes the WMA unit 3 and a portion of units 4 and 9. The area is bound to the north and east by the Clark Fork River, to the south by the middle fork of the Clark Fork River, and to the west by Lake Pend Oreille. This area is mostly owned by Corps and managed by IDFG, with a small portion on the eastern edge owned by the State of Idaho.

- **Area 5** is White Island in the southern part of the delta. The area is bound to the north by the middle fork of the Clark Fork River, to the east edge by the south fork of the Clark Fork River, and to the west by Lake Pend Oreille. This area is part of the Pend Oreille WMA and is owned by the State of Idaho.

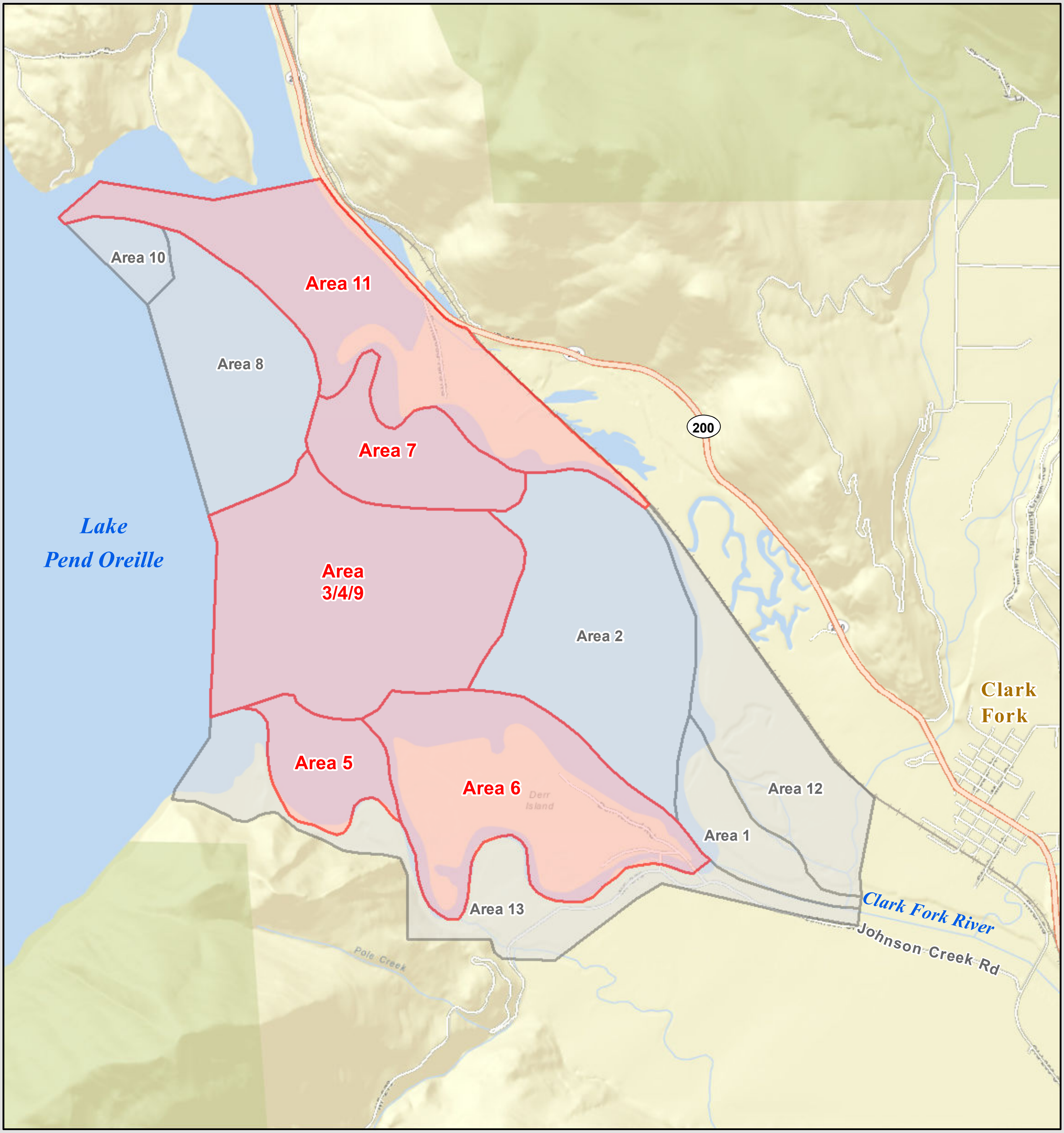


FIGURE 2-1:
Clark Fork River Delta Restoration Project Areas

Bonner County, Idaho

- Project Area
- Management Area

0 0.5 1 Mile

12/4/2013

- **Area 6** is in the southern part of the delta and is bound on the north by the middle fork of the Clark Fork River, to the south and west by the south fork of the Clark Fork River, and to the east by the Clark Fork River. The western portion of the Area is part of the Pend Oreille WMA–owned by Corps and managed by IDFG–and the eastern portion is privately owned.

- **Area 7** is bound on the north by the existing log sluice channel that diverts logs from the River before they can enter the lake, to the south by the Clark Fork River, and to the west by Lake Pend Oreille. Area 7 is part of the WMA and is owned and managed by BLM.

- **Area 11** is bound on the south by the log sluice channel, to the north by Lake Pend Oreille and to the west by land and State Highway 200 (Idaho 200). Area 11 contains a 106.6-acre log yard that is used to store logs diverted from the Clark Fork River, a parking area, and a boat ramp maintained by IDFG. This area is part of the Pend Oreille WMA, is owned by Corps, and is managed by IDFG.

2.1.2 Project Elements and Construction Actions

The project includes elements that would help restore the delta, as well as actions that are required to facilitate construction. The project elements and actions would be implemented in the various project areas as discussed in this section.

2.1.2.1 Restoration Elements

- **Bank Armor and Protection.** Shoreline erosion control structures, using various combinations of rock riprap, logs, soil, and plantings to lessen soil losses and encourage sediment deposition (Figure 2-2).

- **River Training Structures.** Angled in-channel rock walls with ***live cuttings*** that extend into channels (***bendway weirs***) and angled bank protection (***Longitudinal Peaked Stone Toe Protection***), to protect and redirect water flow away from islands and help lessen scouring of the shoreline (Figure 2-2).

- **Breakwaters.** Berms of rock, soil, and large woody debris (root wads of large trees) to create rough shoreline edges, break waves, reduce water velocities, help trap sediment, and enhance fish habitat (Figure 2-2).

- **Raising Islands.** Increasing height of partially submerged islands by using excavated rock and soil from the lake bottom, to provide year-round upland habitat and increase vegetation diversity.

- **Forming Channels.** Excavating fish-passable flow paths in river/lake bed adjacent to project areas to provide topographic and habitat diversity, and provide an onsite source of material for constructing breakwaters and raising islands.

- **Vegetation Establishment**. Planting native vegetation, such as black cottonwood, dogwood, and willow trees and seeding with native herbaceous vegetation.

- **Weed Control**. Treating noxious/invasive weeds to improve habitat.

Figure 2-2: Schematic Illustrations of Typical Bioengineered Restoration Structures

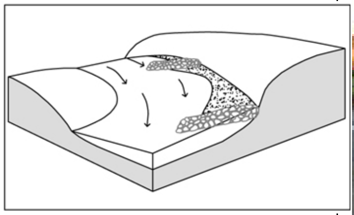
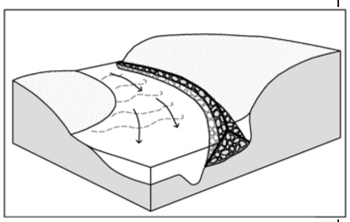
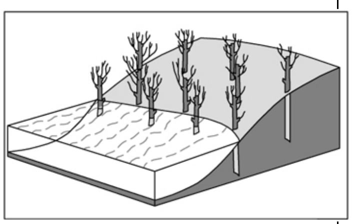
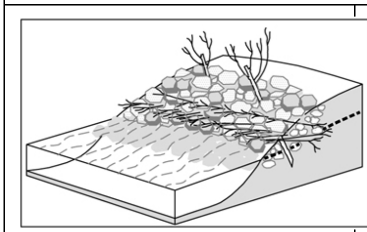
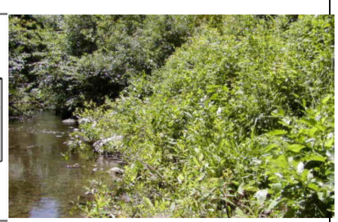
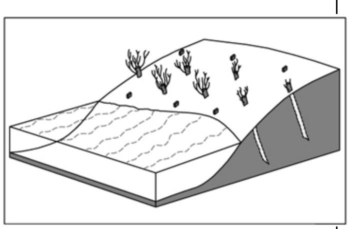
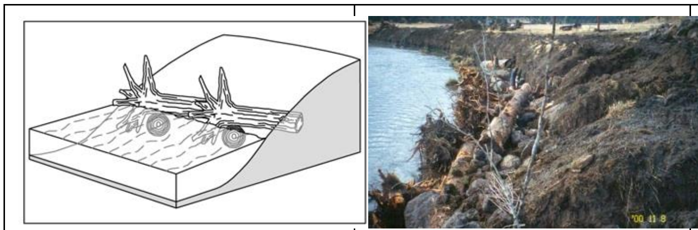
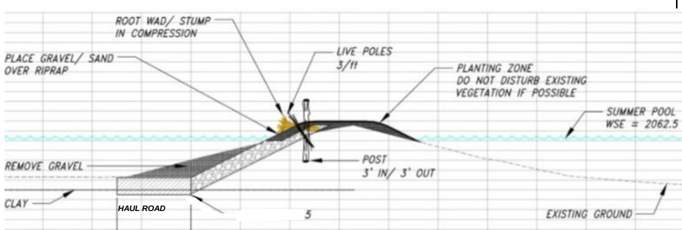
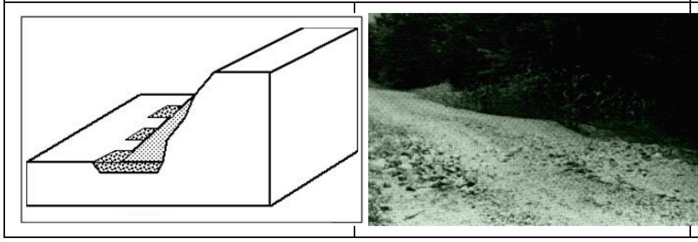
River Training Structures		
		**A. Bendway Weirs.** Discontinuous, re-directive structures, constructed of rock. Designed to capture and then safely direct the flow through a meander bend. Flat-crested and designed to be overtopped.
		**B. Longitudinal Peaked Stone Toe Protection**. Continuous bank protection consisting of rock riprap placed longitudinally at, or slightly streamward of, the toe of an eroding bank. Willows are installed between the soil bank and rock riprap. Used where erosion is due to wave wash, not downstream flow.
		**C. *Live Cuttings***. Deeply planted willow stems (live cuttings) to provide mechanical bank protection. Often combined with other river training structures. Dense arrays of posts or poles can reduce velocities near the bank or bed surface, and long posts or poles reinforce banks against bank slumps.
Bank Armor and Protection		
		**D. Vegetated Riprap.** A layer of stone ***armoring*** that is vegetated during construction, using pole planting, brush-layering, and live-staking techniques. Incorporates weighted toe for stability and soil backfill to raise islands.
		**E. Live Staking.** Installation of willow posts, and dogwood and willow poles on slopes to develop into bushy riparian plants. Referred to as **Joint Planting** when the stakes are inserted through riprap. May require soil backfill to attain finished grade. Temporary haul road may be incorporated along toe of slope.

Figure 2-2: Schematic Illustrations of Typical Bioengineered Restoration Structures

	**F. Root wad and Tree *Revetments*.** Structures constructed from continuous and resistive interlocking tree materials. Primarily intended to resist erosive flows and add habitat diversity. May be incorporated in rock ***breakwater***.
	**G. Breakwater.** Breakwaters are riprap-protected gravel push-up berms to reduce wave energy at the lakeshore. Incorporates gravel and sand fill to attain desired height and to support willow posts and poles. Temporary haul road incorporated at gravel excavation zone.
	**H. Stone-Fill Trenches.** Rock-filled trenches placed at the base of a streambank to buttress and stabilize a streambank. Suitable for temporary haul roads. Surface is flush with ground and sediment accumulated in crevices.

Note:
Adapted from McCullah and Gray (2005)

2.1.2.2 <u>Construction Actions</u>

The following construction actions would be required.

- Staging areas – Temporary staging areas would be developed for construction materials storage; office and equipment trailer(s); contractor parking; portable toilets; refuse and recycling; and equipment fueling and maintenance (Figure 2-10). Stored materials might include erosion and sediment control materials, pipe, piles, root wads, tree stems, live cuttings, and plant stock. Up to 30 yards of gravel and quarry spoils for road maintenance could be stockpiled in the staging areas. Fueling and hazardous materials storage would occur within applicable spill containment measures. Staging areas would be protected with a stabilized construction entrance and fenced as a security measure. Three staging areas are planned, all within Area 11: (1) the existing 0.2-acre staging area at the intersection of Driftwood Yard Road (Access Road No. 1) with existing Access Road No. 2; (2) a new, temporary 2.7-acre staging area along Driftwood Yard Road between the existing Access Road No. 2 and the Clark Fork River Access Area (boat ramp); and (3) a new, temporary 0.2-acre staging area near the proposed barging site at the western terminus of the existing Access Road No. 2.
- Access roads – Access roads would be constructed to move dump trucks, backhoes, and equipment. Roads would generally be 16 feet wide and would include the following (Figures 2-3 through 2-5):

- – Existing road improvements – Approximately 1.6 miles of existing road would be improved by grading and resurfacing with gravel.
  - – Temporary road – Approximately 0.78 mile in Area 3/4/9, 1.5 miles in Area 7, 1.1 miles in Area 11, and 2.06 miles in Areas 5 and 6 of temporary road would be constructed by grading and gravelling. Activities would include placing geotextile fabric and adding gravel approximately 4 inches deep. These roads would be removed and the land restored following construction.
  - – Culvert drainage – Four 38-inch-diameter 30-foot-long culvert drainage crossings would be built to help access Areas 5 and 6, if required. Four temporary 36-inch-diameter by 30-foot-long culvert drainage crossings would be installed to access Area 3. These culverts would be removed and the land restored following construction.

- Temporary barge-loading dock – A 50-foot-by-30-foot temporary dock would be constructed of sheet piling filled with riprap and topped with 12 inches of gravel-pit material. A vertical retaining wall where the barges would dock would be installed. The temporary sheet piles would be vibrated into place and removed in a similar fashion. The riprap fill material would be left in place following dock removal and used as permanent bank protection.
- Log boom – An existing pile-anchored log boom would be removed and replaced (up to nine piles, probably wooden).
- Temporary floating bridge – An approximately 190-foot-long-by-45-foot-wide string of barges would be installed for equipment access across deep water anchored by pilings.
- Use of pile-driving impact or vibratory hammers – Modifications to the Corps log boom would involve removal of current piles by breaking them off or cutting them away. Replacement piles would be installed. The temporary bridge and log boom work would be done using impact or vibratory hammers. The piling would most likely be 10-inch diameter or smaller steel and would be vibrated into place.
- Hauling protection rock by barge and placing rock in water using a trackhoe or barge-mounted crane.
  - Floating silt curtains – Following construction activities, floating silt curtains may be installed at the open outlet area to the lake. The purpose of these curtains would be to contain turbidity and trap silt and sediment within the disturbed area while the lake gradually rises in the spring. Silt curtains would not be installed across flowing water channels.

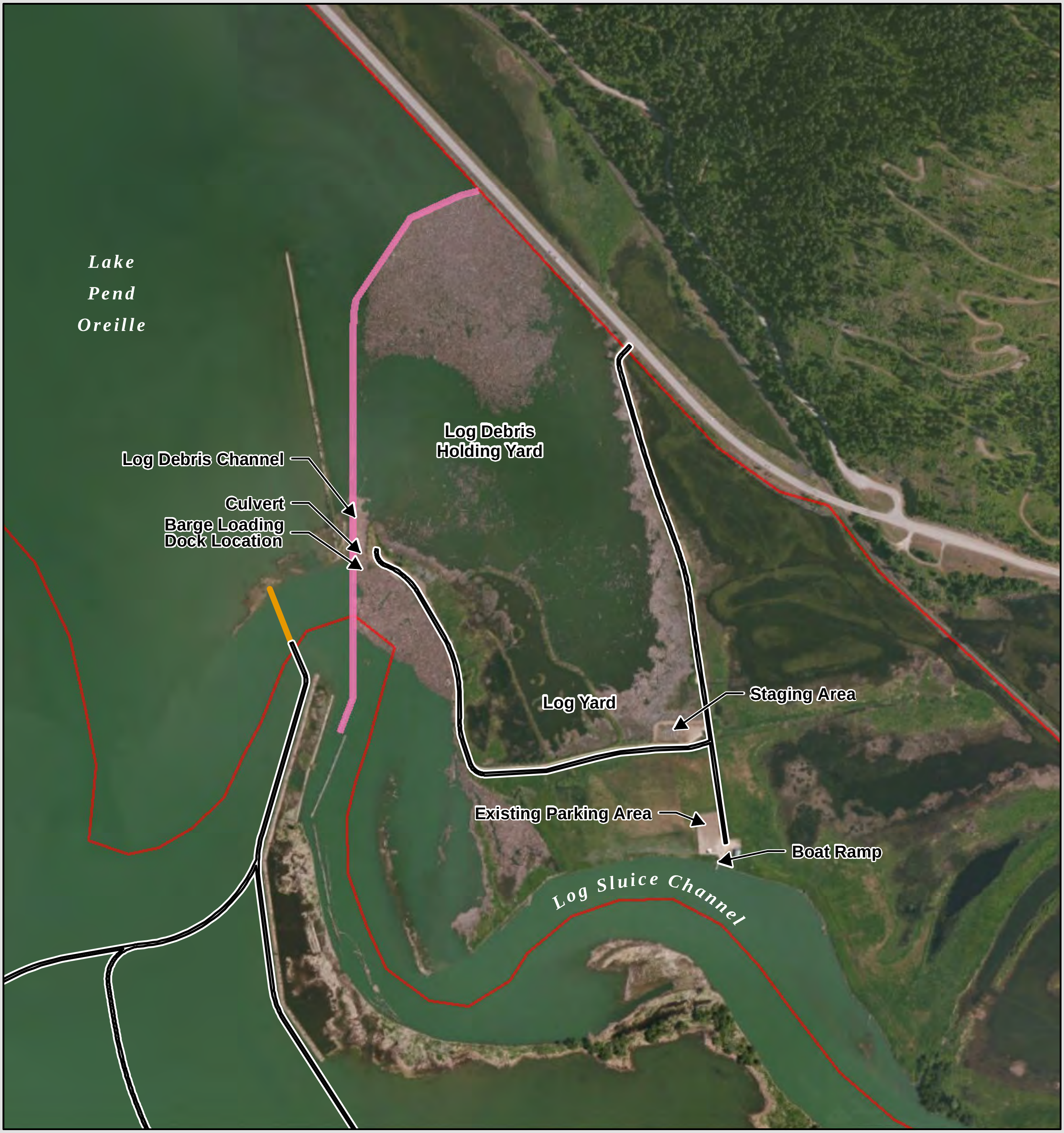


FIGURE 2-3: Access Road through Area 11 to the Barge Loading Area
Clark Fork River Delta Restoration Project
Bonner County, Idaho

Project Area
Road/Site Access
Barge Bridge Crossing
Existing Log Boom

0 200 400 800 Feet

1/10/2014

Adapted from 60% Design by Terragraphics, Inc. (2013), and 80% Design from Ducks Unlimited, Inc. (2013).

FIGURE 2-4: Access Routes for Areas 3/4/9, 7, and 11
Clark Fork River Delta Restoration Project
Bonner County, Idaho

Project Area — Road/Site Access

0 405 810 1,620 Feet

Adapted from 80% Design by Ducks Unlimited, Inc. (2013).

1/9/2014

FIGURE 2-5: Road Access Options for Areas 5 and 6
Clark Fork River Delta Restoration Project
Bonner County, Idaho

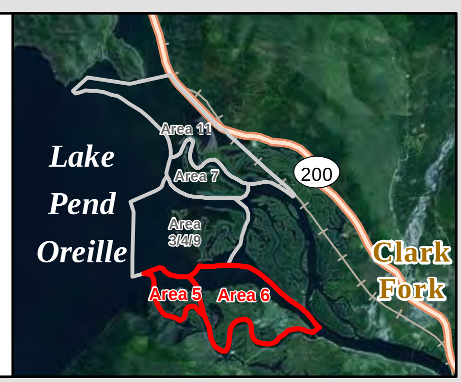
Project Area — Roads/Site Access

BONNEVILLE POWER ADMINISTRATION

0 500 1,000 2,000 Feet

1/9/2014

Adapted from 35% Design by Ducks Unlimited, Inc. (2013).



The types of equipment that would be used to construct the project could include backhoes, a trackhoe, excavators, a barge-mounted crane excavator, loaders, dozers, a farm tractor, a small crane, pickup trucks, dump trucks (conventional, tracked, and off-road), barges, conveyor, pile drivers, compressors, generators, water trucks, sweeper trucks, graders, and an earthmover.

2.1.2.2.1 In-water Work

Of the actions described above, the following actions would require in-water work:

- Excavation in lake/river for deepening channels and for materials used for island raising
- Barge work
- Placing rock stockpiles in shallow water from barges
- Rough placement of ***weirs*** from barges
- Log boom pile removal and replacement
- Possibly, installing piles to anchor barges
- Barge terminal construction
- Culvert installation for temporary road crossing(s)
- Installation and removal of erosion and sediment controls (for example, floating silt curtain, sediment fence)
- Possibly, installation of an earthen or gravel perimeter berm to prevent offsite sediment delivery from earth fill areas (the berm might not be constructed in water or at the edge of water)
- Possibly, excavation of gravel bar material from channels for breakwater backfill
- Possibly, channel excavation to allow barge access to temporary landing to rock quarry areas on BLM land, south of White Island

2.1.3 Project Elements and Actions by Area

The following sections describe the elements and actions that would occur by project area. Figures 2-6 through 2-10 show the project elements for each of the five areas. Detailed calculations of cut-and-fill volumes are shown in Appendix A. Table 2-1 shows the estimated material quantities for each restoration area.

2.1.3.1 Area 3/4/9

Area 3/4/9 is covered by relatively intact wetland vegetation and receives much wave-influenced lakeshore erosion at the western front and Clark Fork River-driven bank erosion at the southern side, and shifting gravel bars have been deposited where the lake and river meet. The west side is submerged for much of the year. Restoration activities would address shoreline erosion, bank stabilization, and habitat development (Figure 2-6). Project elements and actions in Area 3/4/9 would include:

- Constructing erosion protection along the northern, western, and southern boundaries of the island.
- Constructing 18 weirs along the northern shore and placing locked logs and minor slope protection between the weirs.
- Constructing 13 rock weirs along the southeastern bank that extend from the bank approximately 50 feet into the channel.
- Installing 6,000 feet of slope protection along the western edge by armoring the existing island slope with rock riprap, placing new rock breakwater (northwest), and using the existing gravel bar with additional rock.
- Incorporating riparian vegetation near the upper elevations and use logs with root wads embedded in the rock.
- Raising the ground elevation of 82 acres by about 4 feet, incorporating micro-topography diversity, and establishing native vegetation. The finished grade elevation would be 2064.5 to 2066.5 feet (Figure 2-6).
- Excavating about 597,305 cubic yards (CY) of material from 46.6 acres of the submerged side of Area 3/4/9 (includes 79,427 CY of contingency excavation). Finished grade of the excavated area would be 2045 to 2049 feet.

Access to Area 3/4/9 would be via a temporary 15-foot-wide at-grade road within the ***drawdown zone*** from Area 7. The Area 3/4/9 access roads probably would be constructed after November 1, 2014, when operation of Albeni Falls Dam lowers the lake level. The access road would be incorporated wherever possible into the final permanent erosion protection features, with only a minimal need to remove the placed materials.

2.1.3.2 Area 5 (White Island)

Area 5 is covered by relatively intact riparian vegetation. Restoration would address shoreline erosion, bank stabilization, and habitat protection (Figure 2-7). Project elements and actions in Area 5 would include:

- Retaining intact areas of cottonwood and cedar forest.
- Developing and extracting rock from an existing quarry and a talus slope borrow area on BLM-managed land south of Area 5. Dredging 5,300 CY of sediment from a channel between quarry sites (rock face) and Area 5 for barge access. Retaining existing trees and shrubs/bushes, as possible, on BLM land to visually screen quarries.
- Constructing a new linear rock breakwater about 2,600 feet long on the western half of the northern shoreline.
- Constructing 11 weirs, spaced at 250-foot intervals, along the northern shore and placing locked logs and minor slope protection between the weirs. Attaching the weirs into a new linear rock breakwater.
- Installing approximately 630 linear feet of vegetated rock slope protection in various locations of the island, including the western edge of the fill area.

FIGURE 2-6: Area 3/4/9 Project Elements

Clark Fork River Delta Restoration Project

Bonner County, Idaho

Project Area
Raise Islands
Form Channels
Bank Armor & Protection
Bendway
River Training
Road/Site Access

0 250 500 1,000 Feet

Adapted from 80% Design by Ducks Unlimited, Inc. (2013).

1/9/2014

FIGURE 2-7: Area 5 (White Island) Project Elements

Clark Fork River Delta Restoration Project

Bonner County, Idaho

Project Area
Raise Islands
Form Channels
Swale
Bendway
Bank Armor & Protection

0 250 500 1,000 Feet

Adapted from 80% Design by Ducks Unlimited, Inc. (2013).

1/9/2014

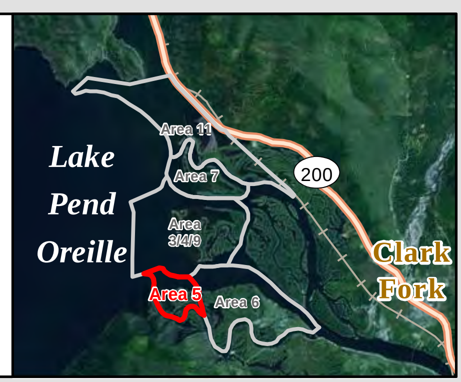
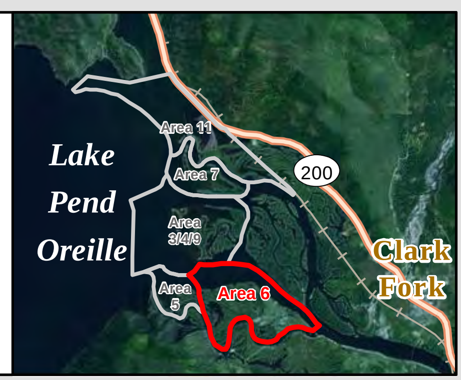


FIGURE 2-8: Area 6 (Derr Island) Project Elements

Clark Fork River Delta Restoration Project

Bonner County, Idaho

Project Area
Bendway
Bank Armor & Protection



0 300 600 1,200 Feet

1/9/2014

Adapted from 80% Design by Ducks Unlimited, Inc. (2013).

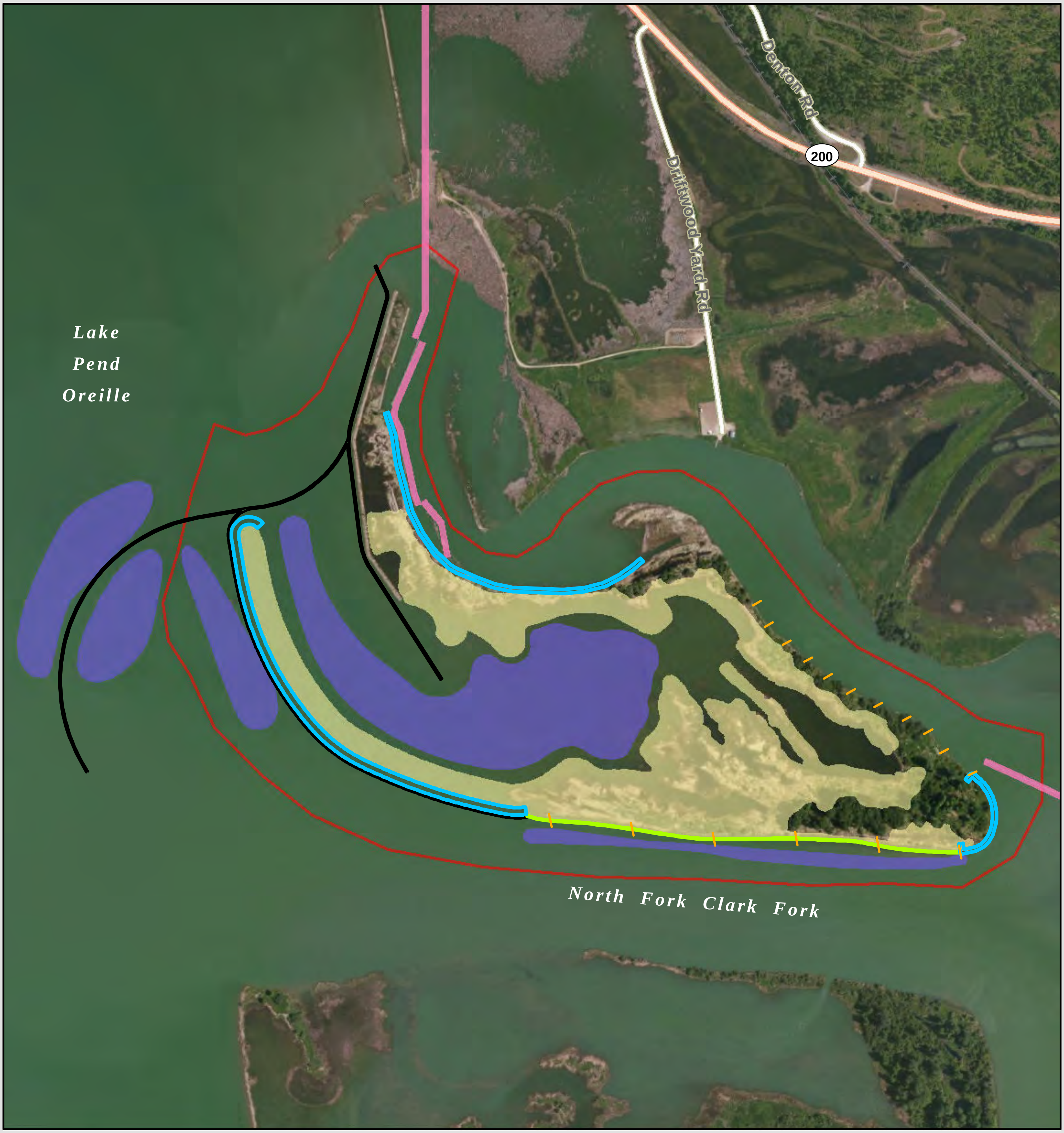


FIGURE 2-9: Area 7 Project Elements

Clark Fork River Delta Restoration Project

Bonner County, Idaho

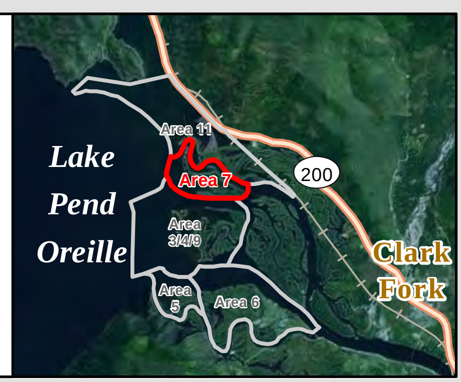
Project Area
Raise Islands
Form Channels
Existing Log Boom
Bendway
Bank Armor & Protection
River Training
Road/Site Access

N

BONNEVILLE POWER ADMINISTRATION

0 250 500 1,000 Feet

1/9/2014



Adapted from 80% Design by Ducks Unlimited, Inc. (2013).

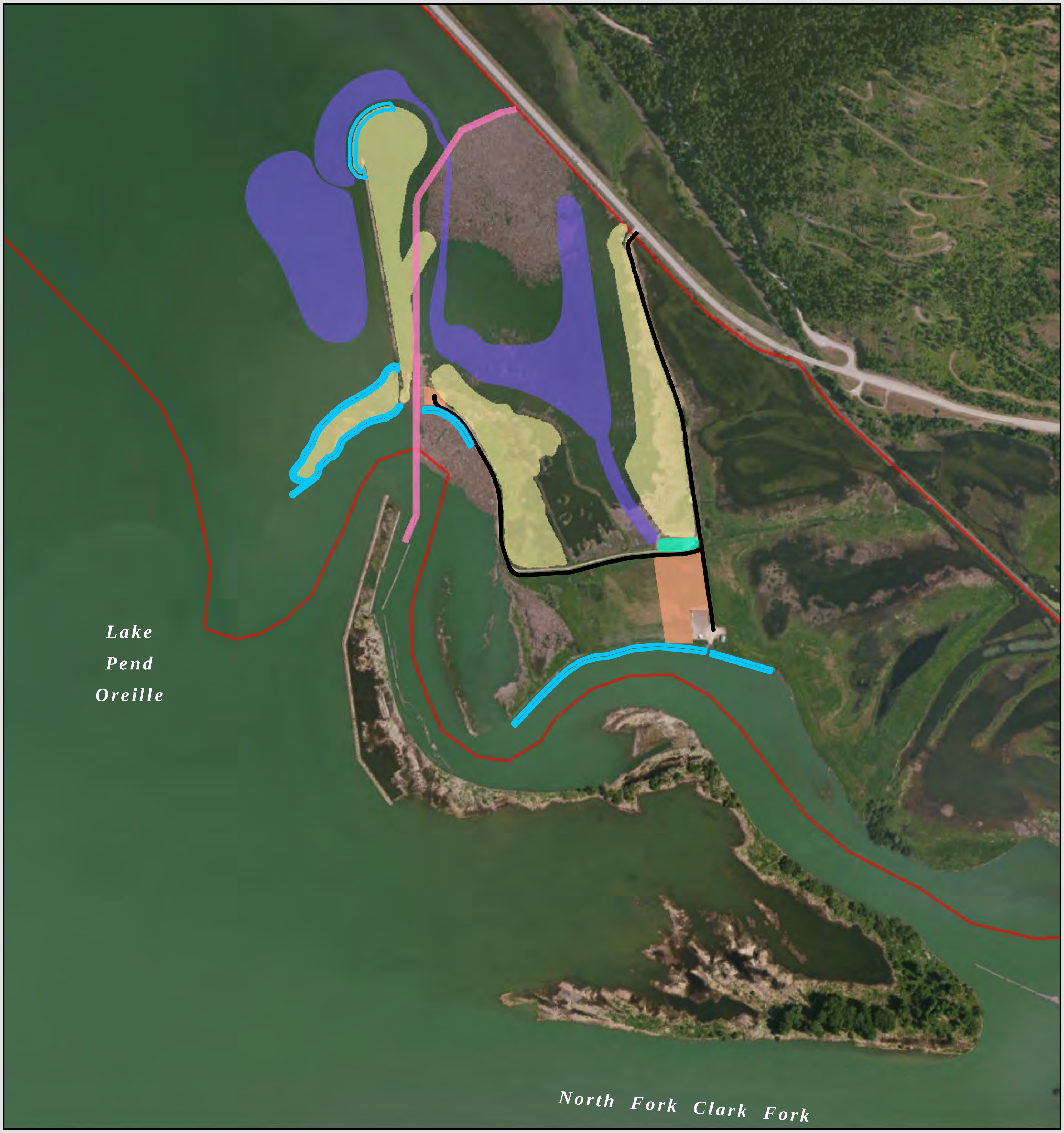


FIGURE 2-10: Area 11 Project Elements

Clark Fork River Delta Restoration Project

Bonner County, Idaho

- Project Area
- Raise Islands
- Form Channels
- Existing Staging Area
- Proposed Staging Area
- Existing Log Boom
- Bank Armor & Protection
- Road/Site Access

0 250 500 1,000 Feet

Adapted from 80% Design by Ducks Unlimited, Inc. (2013).

1/9/2014

Table 2-1 Estimated Material Quantities by Project Area

Items	Units	Total	Access Roads	Area 3/4/9	Area 5	Area 6	Area 7	Area 11
Earth fill	Cubic yards	1,047,290	–	517,877	89,640	–	270,244	169,529
Riprap	Tons	187,470	10,883	43,916	50,815	37,628	30,777	13,451
Gravel cobble	Tons	3,540	–	3,540	–	–	–	–
Filter/overtop gravel	Tons	13,449	–	5,950	740	–	4,128	2,631
Trees with root wads	Each	697	–	351	102	130	114	–
Willows	Each	91,613	–	28,976	8,440	9,120	22,510	22,567
Willow posts	Each	3,090	–	350	520	660	593	967
Dogwood	Each	56,916	–	18,330	6,460	6,600	11,860	13,666
Concrete blocks	Each	395	–	122	80	102	91	–
Seeding	Acres	179	–	82	10	–	58	29
Trees/shrubs for island fill	Acres	169	–	82	–	–	58	29
Geotextile	Square yards	23,068	13,327	4,472	–	–	5,270	–
Culverts	Linear feet	120	120	–	–	–	–	–

- Raising the ground elevation of 9.8 acres by about 5.5 feet. The finished grade elevation would be 2064.5 feet (Figure 2-7).
- Excavating approximately 253,218 CY of material from 19.4 acres of the submerged side of Area 5. The finished grade of the excavated area would be 2045 to 2049 feet.

Access to Areas 5 and 6 (White and Derr Islands) could be achieved by several methods (still to be determined), but examples include using existing roads and barges.

Road Access. An existing access road begins just before the Johnson Creek boat launch. This 4,000-foot-long existing access road would be improved by IDFG prior to the project. Two temporary channel crossings would be added and additional access roads then constructed to get to the shorelines to be protected. This system would allow land-based access and transportation of materials. The land-based access would be advantageous for completing the project during the winter months, when low water conditions occur.

Barge Access. The use of barges is also practical with two possible rock sources located close to the work areas. Using a barge system would require completing the work during the summer months when high water levels occur. Excavators could work off the barge or from the shoreline. In this method, rock for weirs would be placed during summer full pool, and earth fill for the rock berms and trees/shrubs would be placed during the subsequent winter drawdown.

2.1.3.3 Area 6 (Derr Island)

Area 6 (Derr Island) is dominated by riparian vegetation interspersed with emergent wetland areas. Restoration activities would address shoreline erosion, bank stabilization, habitat development, and habitat protection (Figure 2-8). Project elements and actions in Area 6 would include:

- Retaining intact areas of cottonwood and cedar forest.
- Placing up to 3,300 linear feet of bank armor protection using vegetated rock riprap protection along the northern shore.
- Constructing 15 weirs along the northern shore and placing locked logs and minor slope protection between the weirs. These weirs will work in sequence with the weirs installed for White Island (Area 5), as both shorelines run as a continuous riverbank.
- Controlling reed canarygrass and other riparian plantings in many of the lower interior areas.

Area 6 would be accessed by the same barge routes as are described for Area 5 (Section 2.1.3.2).

2.1.3.4 Area 7

Area 7 is similar to Area 3/4/9, with severe lakeshore erosion at the western side and active bank erosion at the southern side. Restoration activities would address shoreline erosion, bank stabilization, and habitat development (Figure 2-9). Project elements and actions in Area 7 would include:

- Constructing bank armor protection along the northern, western, and southern boundaries using Longitudinal Peaked Stone Toe Protection.
- Constructing nine rock weirs along the northern shore, extending weirs about 30 feet into the channel.
- Constructing approximately 3,000 feet of bank armor protection along the southern shore using vegetated rock riprap along with the construction of rock weirs and additional armor protection consisting of locked logs and rock between the weirs.
- Raising the ground elevation of 52.8 acres by about 3 feet, incorporating micro-topography diversity, and establishing native vegetation. The finished grade elevation would be 2064.5 to 2066.5 feet (Figure 2-9).
- Excavating about 542,294 CY of material from 55.2 acres of the submerged side of Area 7 (includes 271,643 CY of contingency excavation). The finished grade of the excavated area would be 2049 feet, an increased depth of 6 to 12 feet to help ensure fish passage between the lake and river.

Access to Area 7 would be via a temporary floating bridge system constructed across the log sluice channel from the barge docking area to Areas 3/4/9 and 7. The floating bridge would be assembled from a string of flattop barges. From the temporary floating bridge crossing, access roads would be constructed with rock and geotextile materials in the drawdown zone. These access roads would be incorporated wherever possible into the final permanent erosion protection features, with only a minimal need to remove placed materials.

2.1.3.5 Area 11

Area 11 has upland herbaceous grasslands and wetlands, as well as the log yard, parking lot, and boat ramp. Restoration activities would address shoreline erosion, bank stabilization, and habitat development (Figure 2-10). Project elements and actions in Area 11 would include:

- Collecting accumulated large woody debris from the log yard for restoration activities.
- Constructing approximately 1,600 linear feet of bank armor protection on the shoreline of the lake at the forefront of the delta.
- Constructing approximately 2,400 linear feet of Longitudinal Peaked Stone Toe Protection along the northern bank of the log sluice channel. The protection would use about 1 to 2 tons of rock per linear foot, have a sinuous alignment with varied and scalloped edges, and would incorporate large woody debris.
- Deeply planting live willow poles near the landward edge of the Longitudinal Peaked Stone Toe Protection.
- Planting riparian vegetation (black cottonwood, maple, dogwood, and willow) within about 1 to 2 feet of the full summer pool water surface level of 2062.5 feet and above.
- Incorporating spillover pools and herbaceous plantings behind the bank armor to dissipate energy and provide shallow pools for waterfowl foraging.
- Treating upland and bank surfaces to remove reed canarygrass and other weeds by (1) mowing prior to the onset of flowering, (2) herbicide treatment, (3) deep tillage, and (4) vegetating with native plants.
- Raising the ground elevation of about 29.2 acres that currently are below the 2062.5-foot elevation by about 1.5 feet to at least the 2064-foot elevation, with some variation in height. Roughening finish grades and incorporating woody material. The finish grade elevation would be 2064.5 to 2066.5 feet (Figure 2-10).
- Excavating about 390,582 CY of material from 33.1 acres of the submerged side Area 11 (includes 227,869 CY of contingency excavation). Finished grade of the excavated area would be 2045 to 2049 feet, an increased depth of 7 to 13 feet.

Access to Area 11 would be from an existing gravel road that runs from Idaho 200, then south along the existing Driftwood Yard Road to the boat launch. IDFG anticipates improving the existing road independent of the proposed project. Improvements would involve installing a culvert, filling in potholes, and resurfacing with gravel. This would raise the road approximately 4 inches.

Three staging areas are planned, all within Area 11: (1) the existing 0.2-acre staging area at the intersection of Driftwood Yard Road (Access Road No. 1) with existing Access Road No. 2; (2) a new, temporary 2.7-acre staging area along Driftwood Yard Road between the existing

Access Road No. 2 and the Clark Fork River Access Area (boat ramp); and (3) a new, temporary 0.2-acre staging area near the proposed barging site at the western terminus of the existing Access Road No. 2. This 0.2-acre temporary staging area would be developed immediately south of the existing northernmost Corps breakwater for material (primarily rocks and logs) storage. The staging area would likely be installed during spring to accommodate the summer barging operation.

A temporary docking area for large barges would be developed to the southwest of the northern Corps breakwater near the staging area. The docking area would be created by raising about 2 acres to create a small peninsula that would be just above 2064.5-foot elevation.

An access roadway would be constructed over a channel from Area 11 to the docking area. During July and August, rock would be transported over the Area 11 access roadways and loaded onto barges to be deposited at Areas 3/4/9 and 7. To create this new roadway, geotextile fabric would be placed down and covered by approximately 15 inches of rock. Portions of this roadway would be used as a toe for bank and slope protection and in these areas would be dug in or placed on the surface.

2.1.4 Construction Sequencing

The schedule for construction of the project depends on the completion and outcome of the environmental review process. If the project is implemented, construction would likely begin in June 2014, with construction activities completed in April of the following year. Construction would be sequenced over three stages to accommodate changing water levels.

The main construction work window for project elements and actions in the delta is approximately October 15 to April 1. Once lake elevations reach approximately 2055 feet, equipment would have access and begin working in each work area. The lake would continue to recede to the 2051-foot level by November, when construction activities would be in dewatered areas.

2.1.4.1 First Construction Stage (June through September)

The first construction stage would be the production, delivery, and staging of Areas 3/4/9, 7, and 11 materials during the summer (likely June through September) during full pool. The staged materials would include large wood (logs and logs with root wads and branches), gravel, and rock riprap. The rock riprap would be barged to the approximate final location during full summer pool (likely July 1 to September 15) to expedite the second stage.

The first construction stage would proceed by generally following this sequence:

1. Mobilize equipment.
2. Construct site access improvements and barge launch improvements.
3. Temporarily modify the Corps log boom system near the barging launch, if needed. Three groups of piles supporting the log boom may need to be removed and later replaced.
4. Import rock from Hewett Rock Pit near Lightning Creek along East Spring Creek Road off Idaho 200 near Clark Fork.

5. Deliver materials to the primary staging area. Barge rock to structure and erosion control areas while the reservoir level is high (barge draft is about 4 feet).
6. Implement erosion and sediment control best management practices (BMPs), as needed.
7. Barge rock materials from primary to interior staging areas or close to final locations.

2.1.4.2 Second Construction Stage (October to April)

Project elements and actions at Areas 3/4/9, 7, and 11 would continue during the second (winter) construction stage (proposed for October to April), when the lake elevation is held at its lowest level. Reservoir drawdown can take at least 2 weeks. The second construction stage would generally follow this sequence:

1. Mobilize equipment.
2. Construct area access road improvements. These improvements would typically involve filling in potholes and resurfacing with gravel. Construct an access road for equipment. This would involve placing geotextile fabric and covering with approximately 15 inches of rock. Construct a 3-foot temporary culverted rock crossing across the channel that allows logs into Area 11 during dry conditions after the lake has been drawn down. Install a floating bridge to access Area 7.
3. Implement erosion and sediment control BMPs.
4. Move additional materials from staging areas to interior project areas.
5. Begin construction of erosion protection measures.
6. Concurrently begin construction of restoration fill activities (outer containment berm first).
7. Implement weed control practices.
8. Create micro-topographic relief upon final grading.
9. Install plants and transplant shrubs/trees.
10. Reclaim the site and seed disturbed areas.
11. Demobilize equipment, and install and remove selected BMP measures.

All erosional and restoration work at Areas 3/4/9, 7, and 11 is expected to take approximately 150 days.

2.1.4.3 Third Construction Stage

The third construction stages for Areas 5 and 6, and any remaining work, generally will follow this sequence:

1. Access and gather rock from the quarry on BLM land. The rock will be placed on a barge and transported to the staging area(s). Earth moving equipment will access the quarry from the barge using the existing road, which may require some brushing.
2. Deepen the water channel for barge access to the quarry sites, as required.
3. During summer full pool, barge rock to the rock staging areas to construct bendway weirs.

4. During winter drawdown, return to rock staging areas to complete the installation of river training structures and bank armor and protection engineered structures, as shown on Figure 2-2.

2.1.5 Environmental Design Features/Mitigation Measures and BMPs Included as Part of the Project

Environmental design features and mitigation measures are incorporated into the design of the project to help avoid and minimize the construction impacts of the project (see Table 2-2).

2.1.6 Construction Contingencies

Many factors may affect the project's design and construction schedule, such as comments received during the NEPA process, Lake Pend Oreille water elevations, and adverse weather conditions. In addition, BPA is only funding a portion of the project, so actions outside of BPA's funding may be delayed until additional funding is secured. Although BPA is not funding the entire project, this EA evaluates all actions proposed by IDFG at this time so that if other federal agencies provide funding, this EA may be used to satisfy any NEPA obligations.

To account for the possibility that ***borrow areas*** might be work-restricted because of unanticipated discoveries of protected resources, project plans show contingency borrow volumes in the event that some areas might be unavailable during construction (Brian Heck, Ducks Unlimited, personal communication [pers. comm.], 2013). Sediment material would be available at Area 3/4/9 (79,427 CY), Area 5 (163,577 CY), Area 7 (271,643 CY), and Area 11 (227,869 CY). However, the project would not generate any excess borrow material that would need to be exported or wasted onsite. Instead, contingency volumes of borrow material are identified to ensure that sufficient fill would be sourced if cultural resources or other constraints would be discovered at some of the excavation sites. The Clark Fork River Delta Restoration Project's cut and fill volume estimates show surplus borrow and confirm that sufficient cut volume would be available if some areas are constrained (Appendix A).

In the event that full funding is unavailable when construction begins, the following priorities would be assigned:

1. Bank armor and protection measures would take precedence over earth fill behind bank armor and protection measures.

2. Restoration of Areas 3/4/9 and 7 would take precedence over Area 11 because Area 11 would be relatively easier to access during subsequent construction seasons.

3. Restoration of Area 11 would take precedence over Areas 5 and 6 because the latter areas are less degraded than Areas 3/4/9, 7, and 11.

2.1.7 Performance Monitoring

The performance of the project would be monitored for at least 5 years after construction to ensure that restoration objectives are met. Corrective actions that involve minimal or no structural controls (for example, replanting vegetation, weed control) would be performed as recommended through performance monitoring and directed by appropriate natural resource agencies and landowners.

Table 2-2 Environmental Design Features/Mitigation Measures Included as Part of the Project[a]

Resource	Environmental Design Feature/Mitigation Measure
Geology and Soils	• Use sediment barriers such as fences, silt curtains, weed-free straw matting/bales, or fiber wattles, as necessary, in all work areas to minimize soil loss. • Use water trucks to apply water where needed daily to the construction area to minimize air-borne soil loss. • Cover stockpiled excess excavated materials to minimize loss of soil from stockpiles. • Reseed and plant disturbed areas with appropriate native species, and control weeds, following construction.
Vegetation and Wetlands	• Mark wetland habitats as avoidance areas on construction drawings and flag as no-work areas in the field prior to construction. • Reseed disturbed banks with native herbaceous grasses to prevent the spread of noxious weeds. • Wash all construction equipment prior to leaving the site to prevent the spread of noxious weeds. • Pull noxious weeds by hand or treat with herbicide approved for application in wetlands. • Plant portions of the riparian corridor with native shrubs. • Plant portions of islands dominated by reed canarygrass with willows, dogwoods, or other suitable species. • Reseed disturbed upland areas with appropriate native species following construction. • Plant shorelines with native shrubs and trees in areas where riparian shrubs and trees have been removed to accommodate construction equipment.
Water Resources	***General Environmental Design Features*** • Use sediment barriers such as fences, weed-free straw matting/bales, or fiber wattles, as necessary, in all work areas sloping toward the Clark Fork River or Lake Pend Oreille to intercept any surface flow that might transport sediment to the water bodies. • Stage construction equipment and materials landward of the top of the bank behind silt fencing that would designate grading and clearing areas. • Operate machinery, to the extent feasible, from the top of the bank along adjacent uplands and previously cleared areas. • Store construction fuel offsite and refuel equipment within temporary secondary containment in the staging area, no closer than 50 feet from water bodies. • Operate refueling areas using BMPs and equip these areas with appropriate spill containment systems. • Use water trucks to apply water where needed daily to the construction area for dust control.

Table 2-2 Environmental Design Features/Mitigation Measures Included as Part of the Project[a]

Resource	Environmental Design Feature/Mitigation Measure
	• Wash heavy equipment that may work below the ordinary high water mark (OHWM) elevation before it is delivered to the job site. • Inspect equipment to remove vegetation and dirt clods that may contain noxious weed seeds. • Inspect machinery daily for fuel or lubricant leaks. • Cover and stockpile excess excavated materials away from water bodies and flank with sediment fencing to minimize opportunity for fine sediment to be transported into water bodies. • Transport surplus excavated materials off site to an approved receiving location to be determined by the contractor and approved by BPA and IDFG. • Protect existing riparian/wetland vegetation, to the extent possible.
Fish and Wildlife	• Install interpretive signage, if desired, that includes facts on riparian-dependent wildlife species that may be present in the project vicinity. • Minimize the construction area, to the extent practicable. • No construction activities would occur during nighttime hours and prior to 30 minutes after dawn or continue any later than 30 minutes before dusk. • No construction will occur during the migratory bird breeding season. • Conduct work below the OHWM from approximately October 15 through April 1 as approved by IDFG. • Operate machinery for below-OHWM construction from the top of the streambank along adjacent upland areas, to the extent possible. • Conduct excavation for installation of the weir abutments and other similar features from the bank, or below the OHWM in the dry season, to the extent possible. • Retrofit hydraulically-operated equipment that may work below the OHWM with vegetable-based fluid in the hydraulic system. • Protect existing riparian/wetland vegetation, to the extent possible. • Install a wood block and bubble curtain for underwater sound attenuation prior to pile driving with an impact hammer, or use a vibratory hammer to reduce sound levels during pile driving.

Table 2-2 Environmental Design Features/Mitigation Measures Included as Part of the Project[a]

Resource	Environmental Design Feature/Mitigation Measure
Land Use and Recreation	• Notify recreational users of the schedule of construction activities and the potential effects on recreation activities, as follows: – Post notices in newspapers and websites, including the construction schedule and timing, availability of parking, and any areas that will be inaccessible. – Post two notifications: (1) during July when barges start operating and (2) prior to the start of the October work window below the OHWM. • Install signage at all public access points into the project area, including water access from Lake Pend Oreille and the Clark Fork River.
Cultural Resources	• Mark known cultural resource sites as avoidance areas on construction drawings and flag as no-work areas in the field prior to construction. • Prepare an Archaeological/Cultural Resource Inadvertent Discovery Plan. • Protect any unanticipated cultural resources discovered during construction as follows: – Stop all work; cover and protect find in place. – Notify IDFG Project Manager, BPA Cultural Resources Specialist, and Corps/BLM Archaeologists immediately. – Implement mitigation or other measures as instructed by BPA.
Aesthetics and Visual Resources	• Retain existing vegetation, when possible, to visually screen new disturbances, during construction. • Reseed and plant disturbed areas with appropriate native species, and control weeds, following construction.
Air Quality and Climate Change	• Use dust abatement measures (for example, watering trucks), and apply idling restrictions during construction to minimize impacts to recreational users. • Regularly inspect, maintain, and replace (if defective) mufflers and other emission control devices on all construction equipment. • Apply gravel or rock on access roads before and during construction to minimize dust. • Reduce the speeds (for example, 5 mph) of construction vehicles on access roads to minimize dust.
Noise	• Limit construction noise to normal daytime working hours. If construction is necessary during other times, such as at night, limit activities generating noise to those absolutely necessary.

Table 2-2 Environmental Design Features/Mitigation Measures Included as Part of the Project[a]

Resource	Environmental Design Feature/Mitigation Measure
Hazardous Waste	• Inspect machinery daily for fuel or lubricant leaks. • Have state-licensed applicators apply approved herbicides according to manufacturers' labels. • Do not use contaminated sediments in construction activities. • Dispose of non-hazardous wastes in approved landfills. • Dispose of hazardous wastes according to applicable federal and state laws.
Public Health and Safety	• Follow the approved safety plan for construction. • Confine vehicle fueling and maintenance to approved locations.
Transportation	• Place signs on Idaho 200 to alert motorists of construction work. • Use flaggers where needed at ingress and egress points to direct traffic and avoid vehicle conflicts.
Socioeconomics	• Use local labor and materials, to the extent practicable • Implement construction during winter to minimize effects to local tourism.

Note:
[a] Best Management Practices included in the *Biological Assessment for the Clark Fork River Delta Restoration Project* (IDFG, 2013a) are incorporated by reference into this EA.

2.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, BPA would not provide funding toward the Clark Fork River Delta Restoration Project; the BLM and Corps would not grant appropriate permits and land use authorizations for the project; and IDFG would not be able to construct the project as described. In addition, BPA would not use the project to help satisfy its wildlife mitigation obligations under the Northwest Power Act.

Under the No Action Alternative, IDFG would likely pursue smaller scale restoration activities with non-federal funding, but the extent of those activities would be dependent on the ability to find additional funding or funding partners. If restoration does not occur, shorelines of the Clark Fork River delta would continue to erode. The loss of delta wetland habitat would likely continue at about 10 to 22 acres per year along the lakefront, and approximately 5 feet per year of bank recession resulting in degradation and loss of fish and wildlife habitat (Parametrix, 1998; Martin et al., 1988; Gatto and Doe, 1987).

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

This section describes design alternatives that were considered and the reasons they were eliminated from detailed study.

2.3.1 Extending Breakwaters or Using Pile Breakwaters

A design alternative of extending breakwaters farther into the lake was considered by a working group to address the potential that future deep water restoration efforts might be limited once breakwaters were constructed. It was determined that, as the length of a breakwater increased, the breakwater height and width also would need to be increased, as well as the depth of the water where the breakwater would be built. Overall costs would increase and incorporating low-water equipment access roads into longer breakwater structures and placing rock from barges into deeper water would be logistically difficult. Because material and construction logistics costs were substantially greater and the design would not substantially increase project environmental benefits, this design alternative was eliminated from further consideration.

Another design alternative of using pile-driven structures, also known as pile breakwaters, pile jetties, or pile dikes, was considered to reduce wave energy, while capturing sediment on the wave-protected side. However, USFWS determined that underwater noise generated from the extent of pile driving required for this alternative could be harmful to ESA-listed bull trout in the lake, so this design alternative was eliminated from further consideration. In addition, the size (greater than the 10-inch diameter recommended by USFWS) and number (hundreds) of pilings needed to withstand the generated wave action would result in the creation of habitat for bull trout predators. Related to this concern, other pile-driving activities (associated with the project) would be mitigated through the implementation of measures listed in Table 2-2.

2.3.2 Delta Erosion Control

In 2001, Avista Corporation proposed two options for mitigating impacts to the delta resulting from the continued operation of the Cabinet Gorge and Noxon Rapids Projects through the Clark Fork Delta Habitat Protection and Mitigation Program (IDFG, 2001). The two mitigation options were: (1) erosion control and (2) habitat acquisition, enhancement, and protection. IDFG preferred the habitat acquisition, enhancement, and protection option, which in part led to the Clark Fork River Delta Restoration Project.

The Delta Erosion Control option addressed ongoing erosion in the Lake Pend Oreille area and continued loss of wildlife habitat. Avista Corporation's erosion control mitigation proposal is described in detail in two reports on the erosion problems in the Clark Fork River Delta: *Report on Feasibility of Erosion Stabilization, Pend Oreille Delta* and *Shoreline Stabilization Guidelines, Clark Fork Projects* (Findlay Engineering, 2000a and 2000b, respectively). The feasibility report identified causes of erosion, major areas of erosion, potential treatment alternatives, and costs of treatment (Findlay Engineering 2000a). It also identified areas where erosion was attributed to wind wave erosion, flood current undercutting, undercutting during all currents (including during low lake elevations), and sites where erosion was caused by a combination of these causes. The report also provided a "conceptual erosion control measures layout" and a gross estimate of cost to implement erosion control. At that time, the cost was estimated to be $6,450,000, or $4,300 per acre.

IDFG found that the Delta Erosion Control option would be difficult to implement (because of competing interests for management of Lake Pend Oreille), uncertain in effectiveness, and very expensive (IDFG, 2001). Since 2000, the severity of shoreline erosion has increased and locations of priority restoration sites have shifted such that the Delta Erosion Control option is only partially applicable today. Therefore, parts of the Delta Erosion Control option that remain applicable today were incorporated into the project and evaluated in this EA.

2.4 COMPARISON OF ALTERNATIVES

Table 2-3 compares how well the alternatives meet the project purposes as defined in Section 1.2. Table 2-4 summarizes and compares the potential environmental consequences of the alternatives. See Chapter 3, *Affected Environment and Environmental Consequences*, for a full discussion of environmental consequences.

Table 2-3 Comparison of the Proposed Action and No Action Alternative by Project Purposes

Purpose	Proposed Action	No Action Alternative
Comply with applicable laws, regulations, and policies that guide the agency.	Would be consistent with applicable laws, regulations, and policies.	Would be consistent with applicable laws, regulations, and policies.
Support efforts to mitigate for effects of Albeni Falls Dam on fish and wildlife and their habitats in the Clark Fork Delta on the Pend Oreille River following the Northwest Power Act (16 USC 839b[h][10][A]).	Would support the mitigation efforts called for in the Northwest Power Act by enhancing fish and wildlife habitat in the Pend Oreille drainage basin.	Would not provide enhanced fish and wildlife habitat in the Pend Oreille drainage basin.
Assist in carrying out commitments made by BPA to the State of Idaho to provide funding for erosion control and habitat restoration efforts related to Albeni Falls Dam.	Would meet the commitments made by BPA to the State of Idaho by providing partial funding to IDFG for the Clark Fork River Delta Restoration Project. The project would install erosion control and bank stabilization measures, and restore fish and wildlife habitat.	Would not meet some of the commitments made by BPA to the State of Idaho. Erosion control and bank stabilization features would not be installed, and fish and wildlife habitat would not be restored.
Minimize harm to natural or human resources and avoid jeopardy to ESA-listed species and destruction or adverse modification of designated critical habitat.	Would have temporary impacts associated with construction, but would have long-term beneficial effects on ESA-listed bull trout and bull trout critical habitat.	Would not have construction-related impacts, but ongoing impacts of erosion, including critical habitat loss, would continue.

Table 2-4 Summary and Comparison of the Potential Environmental Consequences of the Alternatives

Resource	Proposed Action[a]	No Action Alternative
Geology and Soils	• Construction activities would result in temporary erosion or soil loss. • Raised ground surfaces would result in an increase of sheltered soil resources at elevations available for vegetative growth. • Reduced exposure to erosive forces would result in positive long-term soil impacts. • Placement of woody debris would have a beneficial effect on soil resources by reducing shoreline and streambank scour and promoting sediment deposition.	• Short-term soil erosion or loss from construction activities would not occur. • Soil surfaces would not be sheltered, erosive forces would not be reduced, streambank scour would not be reduced, and sediment deposition would not occur—resulting in continuation of the current soil loss trend through scour and erosion.
Vegetation and Wetlands	• Short-term construction impacts would be low as most construction zones are sparsely vegetated or are dominated by invasive plants. • Newly created island surfaces where land is currently submerged would increase the extent of native plant communities, including wetlands. • Existing wetlands would be converted from sparsely vegetated to partially vegetated or vegetated. • Integration of woody materials into breakwaters and riprap slopes would help establish forested and scrub-shrub wetland/riparian areas where they do not currently exist. • Creation and protection of above-water areas along the shorelines and interior areas would increase available habitat for special status plant species. • Reduced erosion and scouring wave action would curtail the ongoing loss of vegetation through erosion; increase and protect native plant communities; and promote the growth and development of shallow water emergent marshes similar to those historically found in the area. • Weed control and replanting treated areas with native vegetation would increase native plant cover, species diversity, and promote habitat complexity. • The creation of palustrine wetlands with interspersed upland islands, incorporating micro-topographic complexity (small mounds and depressions), would increase habitat complexity and vegetation diversity.	• There would be no impacts associated with construction. • Existing shorelines would continue to erode, contributing to the further degradation and loss of vegetation and wetlands. • Deep-water aquatic vegetation would continue to be favored, while plants adapted to shallow water would be inhibited. • Large areas of reed canarygrass and other noxious and invasive weeds would not be treated and new weedy areas would likely become established, further decreasing native species diversity. • Shrub and tree seedlings would face continued competition from nonnative vegetation for sunlight, nutrients, and water. • Habitat complexity would continue to decline due to continued loss of native plant species diversity.

Table 2-4 Summary and Comparison of the Potential Environmental Consequences of the Alternatives

Resource	Proposed Action[a]	No Action Alternative
Water Resources	• Construction activities would result in temporary water quality impacts, such as sediment plumes and water temperature increases, from vegetation removal. • Erosion protection measures would reduce the potential for wave action to erode banks, thus decreasing suspended-sediment concentrations. • Establishment of vegetation would reduce the input of sediment into surface water and improve water quality. • Large woody debris would disrupt flow (reduce velocity) and redirect flow away from the islands, reducing erosion and suspended sediment in the system. Woody debris would also trap sediments, removing them from adjacent water bodies.	• Construction impacts to water resources would not occur. • Existing water quality impacts (e.g., increased suspended sediment) would continue as delta shorelines, island areas, and streambanks erode.
Fish and Wildlife	• Short-term adverse effects to fish, other aquatic organisms, and wildlife may occur from construction activities, including impacts from noise, light, and vehicle collisions. • Pile-driving activities would generate underwater noise, which could kill or alter the behavior of fish. These impacts would be reduced by implementing sound-dampening mitigation measures (e.g., installing a wood block and bubble curtain or using a vibratory hammer). • No construction or ground disturbance is anticipated to occur during nesting of migratory birds, waterfowl, or raptors. Noise related to mobilization of vehicles prior to construction activities (June through September) may temporarily disturb the nesting of birds.	• Impacts to fish and wildlife from construction activities would not occur. • Habitat conditions for bull trout, other ***salmonids***, and wildlife would continue to degrade from erosion. • Continued declines in water quality and loss of refugia would negatively impact bull trout and other salmonids. • Nonnative plants would continue to invade wildlife habitats, reducing quality/complexity.

Table 2-4 Summary and Comparison of the Potential Environmental Consequences of the Alternatives

Resource	Proposed Action[a]	No Action Alternative
Land Use and Recreation	• The Driftwood Yard Road and the Clark Fork River Access Area would be temporarily closed to the public during the construction period. • Public access to shoreline or interior island areas would not be allowed during construction. • For construction safety, waterfowl hunting within the delta islands would not be allowed from approximately May to April. • The conservation and recreation habitat area would increase by approximately 169 acres. • The increase in habitat area would benefit recreation that depends upon fish and wildlife, such as hunting, bird watching, wildlife photography, and fishing. • Channels created by excavating flow paths through island interiors would be deeper than adjacent areas, and their depth would improve use by boaters during low-pool conditions—particularly in Areas 3, 7, and 11.	• There would not be temporary construction-related loss of public access, recreational use, or waterfowl hunting. • The land available for conservation or recreation, including hunting, bird watching, wildlife photography, and fishing, would not increase. • Deeper channels would not be created and boating would continue to be limited in shallow water areas. • Shallow-water boating hazards, such as sand bars, would remain at full pool
Cultural Resources	• Loss of site integrity from wave energy and erosion, and its potential effect on cultural resources, would decrease. • If unanticipated sites were discovered during construction, sites could be impacted; however, stop work, notification, and mitigation requirements would lessen potential impacts.	• Site integrity, and cultural resources, would continue to be threatened by erosion processes.
Aesthetics and Visual Resources	• Temporary construction activities would be visible by the public from the waters of Lake Pend Oreille, the waters of the delta, and Idaho 200. • Shoreline erosion protection measures would be aesthetically and visually beneficial as erosional trends are reversed, and would provide a diverse, naturally-appearing shoreline with visual complexity and variety. • Decreasing the areas of island inundation would benefit aesthetic and visual qualities by adding habitat for viewing.	• There would not be short-term visual impacts from construction. • During high pool elevations, continued island erosion would yield less visual diversity. • During low pool elevations, eroded areas would become gravel bars or mudflats with less visual appeal.

Table 2-4 Summary and Comparison of the Potential Environmental Consequences of the Alternatives

Resource	Proposed Action[a]	No Action Alternative
Air Quality and Climate Change	• During construction, equipment would temporarily emit carbon monoxide, nitrogen dioxide, sulfur dioxide, and particulates because of tailpipe emissions; and dust emissions may increase from disturbed ground and traffic on paved and unpaved roads. • Construction would accelerate rates of soil organic matter decomposition and carbon emissions to the atmosphere in the short term to be offset through long-term accumulation through sediment deposition. • The potential effects of climate change on soil erosion would be greater without the slope protection and bank stabilization measures proposed for this project.	• Temporary construction-related emissions would not occur.
Noise	• Noise impacts would be temporary and moderate for the noise receptors within 2,000 feet of construction, and low to none for noise receptors farther than 2,000 feet from activities.	• Temporary construction-related noise impacts would not occur.
Hazardous Waste	• Petroleum products (such as gasoline, diesel fuel, motor oil, and hydraulic fluid) and other hazardous fluids (such as anti-freeze) may temporarily leak in small quantities from vehicles and equipment during construction.	• No small temporary, localized releases of hazardous materials from construction equipment would occur.
Public Health and Safety	• The potential for injuries associated with hazardous construction activities would temporarily increase. • The potential for motor vehicle accidents could temporarily increase due to construction traffic.	• No construction-related injuries or motor vehicle accidents would occur.
Transportation	• Construction activities would increase vehicular traffic on Idaho 200 and East Spring Creek Road during the construction period. • Idaho 200 travelers would experience traffic delays over the short term during construction. • Access to Driftwood Yard Road would be limited to construction-related vehicles during construction.	• There would not be a construction-related increase in traffic or traffic delays. • Driftwood Yard Road would remain open and improved.

Table 2-4 Summary and Comparison of the Potential Environmental Consequences of the Alternatives

Resource	Proposed Action[a]	No Action Alternative
Socioeconomics	• BPA's investment would have an ***economic multiplier effect*** on Bonner County and the vicinity through increased labor expenditures and acquisition of construction materials/supplies. • There would be a beneficial effect on the community from improved fishing, hunting, and recreation opportunities, attracting additional visitors, and having them stay for longer periods of time. • Loss of land through erosion would be greatly reduced, protecting property.	• No socioeconomic impacts associated with construction would occur. • Erosion of the delta would continue, potentially negatively affecting tourism and the local economy.

Note:
[a] Level of impact that would be expected to result after implementation of appropriate mitigation.

Chapter 3
Affected Environment and Environmental Consequences

3.1 INTRODUCTION

This chapter evaluates the potential impacts of the project and the No Action Alternative on human and natural resources to determine whether either alternative has the potential to cause significant environmental effects. For each resource, sections describe the existing environment that could be affected by the alternatives and the potential environmental consequences of the alternatives. Mitigation is addressed in Section 2.1.5, *Environmental Design Features/Mitigation Measures and BMPs Included as Part of the Project*.

Cumulative impacts are also evaluated. Cumulative impacts are impacts that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Table 2-4 summarizes the impacts for the Proposed Action and the No Action Alternative.

3.1.1 General Setting

The Clark Fork River delta is the largest area of contiguous wetland complex in the Pend Oreille system (BPA/Northwest Power Planning Council/Columbia Basin Fish and Wildlife Authority, 2001). The Clark Fork River delta is located at the mouth of the Clark Fork River, at Mile 139.5 of the Pend Oreille River, in Bonner County, Idaho. The delta forms where the Clark Fork River enters Lake Pend Oreille, about 3 miles west of Clark Fork, Idaho. The delta extends roughly 4 miles downriver from the town of Clark Fork and is roughly 3 miles wide where the delta meets Lake Pend Oreille.

Prior to regulated water levels, spring and early summer Lake Pend Oreille elevations reflected tributary flows carrying runoff from a watershed that encompasses more than 22,000 square miles. Pre-dam lake elevations typically rose sharply in spring, peaked in June, and then rapidly receded from seasonally flooded shoreline areas. These areas were especially productive for wildlife because of riparian trees and shrubs, wet meadow, emergent marsh, and submerged macrophytes plant communities. Islands and complex landforms at stream and river mouths were relatively stable because of heavy vegetation growth that stabilized soils, and protected them from wave action.

Following construction of Albeni Falls Dam, a high lake level was maintained through the spring and summer growing seasons for recreational purposes and drafted by winter for flood control and power purposes. The Albeni Falls Dam uses a portion of the Pend Oreille River and the top 11.5 feet of Lake Pend Oreille as its reservoir. Every year the lake level is held at a maximum elevation of 2062.5 feet between June and September, and then lowered either to 2051 feet or to 2055 feet during the winter. High lake levels through the spring and summer growing seasons inundated areas that were formerly seasonally flooded. This simplified vegetative communities and removed protective riparian and wetland vegetation, leaving poorly vegetated mudflats exposed during winter and shorelines dominated by nonnative reed canarygrass (Martin et al., 1988).

Reduced occurrence of protective and stabilizing shoreline and ***littoral*** vegetation exposed islands, and landforms at the mouths of streams and rivers to accelerated erosion caused by wave action, sloughing, and river flows. Sites in the subbasin where ongoing losses are of concern include the Clark Fork River delta, Pack River delta, Strong's Island, and the mouths of Priest River, Hoodoo Creek, Hornby Creek, and Carr Creek.

At elevated summer lake levels, wind-generated waves erode shoreline soils over a much longer period than would have occurred naturally. This type of erosion is especially important where shoreline is exposed to wind waves generated over a very long wind fetch (Parametrix, 1998). The calculated wind fetch for Lake Pend Oreille is 5.8 miles (Ducks Unlimited, 2013).

Shoreline sloughing occurs when saturated soils on steep shorelines are left unsupported following lake-elevation drawdown in September. This type of erosion is accelerated by river flows that cause undercutting at the soil/water interface. Measured river flow velocity is approximately 0.5 foot per second in the northern delta, but ranges from 2.5 to 5.0 feet per second in the southern delta.

Land area loss is compounded in the Clark Fork River delta because of the influence of upstream dams that impede sediment transport and discharge peaking flows to the delta area during the period of natural low, stable flow (Parametrix, 1998; Findlay Engineering, Inc., 2000a). These hydroelectric dams are operated by the Avista Corporation (Cabinet Gorge and Noxon Rapids Dams). Construction of Cabinet Gorge Dam in 1952 effectively shut off the ***bedload*** sediment supply from upstream sources, and removed some of the suspended sediment (Parametrix, 1998). This altered sediment balance prevents establishment of channel mouth bars and a protective lakeside beach.

3.1.1.1 Drainage Area

The Upper Pend Oreille Subbasin drainage (1,225 square miles) encompasses all of Lake Pend Oreille and its tributaries, including 9.3 miles of the Clark Fork River upstream to Cabinet Gorge Dam, and the Pend Oreille River and its tributaries down to the Albeni Falls Dam on the Pend Oreille River. The Clark Fork River is Montana's largest river in terms of stream discharge, with an average annual stream flow of 22,230 cubic feet per second (cfs) near Cabinet, Idaho, a few miles upstream of the mouth at Lake Pend Oreille. Lake Pend Oreille is the largest and deepest natural lake in Idaho. The glacial lake basin is deep and steep-sided with a mean depth of approximately 538 feet and depths in some areas that exceed 1,150 feet.

The majority of the inflow to Lake Pend Oreille comes through Cabinet Gorge and Noxon Rapids Dams located on the Clark Fork River. During low flow (non-runoff) season, Avista operates the dams for hourly peaking, but these projects do not affect lake levels.

The Clark Fork River is the principal tributary to Lake Pend Oreille. Other major tributaries to the lake include the Pack River, Trestle Creek, Granite Creek, and Gold Creek. Priest River drains into the Pend Oreille River about 5 miles upstream of the Albeni Falls Dam. Numerous perennial and intermittent streams also enter at various points around the lake and impounded river reaches. Another major tributary to the system is Lightning Creek, which enters into the Clark Fork River towards the upstream end of the Clark Fork River delta. The Pend Oreille River is the only surface outflow from Lake Pend Oreille. In addition, Lake Pend Oreille is hydrologically connected and contributes to the Spokane Valley-Rathdrum Prairie Aquifer at the lake's southernmost end (Figure 2-1).

3.1.1.2 Topography/Geomorphology

The Upper Pend Oreille Subbasin is shaped by the Selkirk Mountains to the west, the Cabinet Mountains to the north, and the Bitterroot Mountains to the east. During the ancient Precambrian period more than 600 million years ago, shallow seas inundated northern Idaho. Sediments of clay, silt, and sand settled out of ***brackish*** waters as seas retreated, subsequently altered, and began to fold and fault. In the last few million years, the subbasin was substantially altered by major glacial events in the late Pleistocene Period. Glacial advances resulted in highly dissected watersheds with high stream density, shallow soils, and subsoil compaction of glacial tills. Groundwater seeps and springs are prevalent in tributaries draining the Cabinet and Bitterroot Mountains to the north and east of Lake Pend Oreille reflecting the more recent geology.

The parent rocks of soils developed from the Precambrian Belt Supergroup weather to a preponderance of coarse fragments (60 to 70 percent), fine silts, and a small amount of gravel and sand. When these soils are eroded and transported by natural or human causes into high-gradient mountain streams (Rosgen B or ***steeper***) the fine silts are transported rapidly downstream out of the system, while the coarse fragments remain as bedload [Rosgen, 1994]). This bedload is transported locally within the channel during channel forming events (2-year discharge events). If erosion has been accelerated, the excess bedload fills pools and triggers additional bank cutting. Generally, streams on the northern and eastern sides of Lake Pend Oreille tend to be more productive and have much less fine sediment than streams draining the granitic soils of the Selkirk Mountains. Streams flowing from the Cabinet and Bitterroot Mountains are more likely to have limited bedload; whereas, streams flowing from the granitic watersheds of the Selkirk Mountains may have fine sediment limiting habitat conditions. Migratory fish are precluded from several tributaries, or portions of tributaries, by natural waterfalls found throughout the basin.

3.1.1.3 Climate

Northern Idaho and the project area have characteristics typical of mountain/continental climates with prevailing weather coming from the west, bringing air masses from the Pacific with high moisture content and moderate temperatures. Because the mountain ranges are perpendicular to the prevailing weather, the air masses are forced to rise and cool, dumping moisture as rain or snow on the mountains and causing the adjacent valleys to be much drier. Summers are generally warm or hot in most valleys and much cooler in the mountains (highs around 60 to 80 degrees Fahrenheit [°F]). Summers are also relatively dry. Winter storms pass over the area from November through March and may cause a wet winter season. Winters are typically cold (lows of 15 to 25°F) and long with a deep, continuous snowpack normally covering all but the lowest elevations from December through April (Tetra Tech, Inc., 2007).

Average precipitation varies greatly with latitude, elevation, and local physiography. Average annual precipitation is 33 inches in Sandpoint at the northern end of Lake Pend Oreille and exceeds 49 inches in the surrounding mountains (Tetra Tech, Inc., 2007). Only 11 to 18 percent of annual precipitation falls during the summer (July to August). In winter, precipitation falls mainly as snow, averaging 88 inches per year. Annual runoff is produced mostly by melting snow in April and May. Depending on elevation and location, more than half of the precipitation can come as winter snow with November, December, and January usually being the wettest months (Tetra Tech, Inc., 2007). More than half of the snowpack becomes available for snowmelt-generated runoff as temperatures increase in the spring. The area is subject to mid-winter and spring rain-on-snow events. Peak streamflow events result from both rain and rain-on-snow events.

The main body of Lake Pend Oreille seldom freezes in winter; however, shallow areas in the northern end of the lake freeze over in some years.

3.2 GEOLOGY AND SOILS

3.2.1 Affected Environment

The study area for soils and geology encompasses the construction footprint, where soils and sediments may be disturbed or augmented. This would include borrow areas for which soils or sediments would be excavated, stockpile areas, rock pits, and areas where soils and rock would be placed as a design element.

3.2.1.1 Regional Geology

The delta is located at the eastern side of the Purcell Trench, in the Clark Fork Valley between the Cabinet and Coeur d'Alene Mountains. The Purcell Trench is a north-south trending trough that extends southward from Canada. The Clark Fork River enters the study area from the east. The Clark Fork Valley trends west-northwest and was eroded along a fault zone that is dominated by the Hope Fault and includes multiple subsidiary block faults (the most prominent of which is the Sugarloaf Fault, which roughly parallels the Hope Fault). The Hope Fault extends towards Thompson Falls, Montana, and was likely last active during Eocene time (56–34 million years ago). However, a number of historical earthquake events were felt southeast of the study area along this fault near Trout Creek and Thompson Falls, Montana (Burmester et al., 2004). The Packsaddle Fault runs in a north-northeast direction under the site.

The Cabinet and Coeur d'Alene Mountains were formed by transformed sedimentary rock of the Belt-Purcell Supergroup, interspersed with rock rich in magnesium and iron, and granitic rocks that were formed far below the earth's surface. Belt Supergroup units consist primarily of very thick layers of siltite, quartzite, and argillite rock, and are highly deformed by folding and faulting in the area, especially near the delta (Burmester et al., 2004; Lewis et al., 2008).

Sediments in the Clark Fork drainage, along the valley walls and below high mountain amphitheater-like valleys, are from glaciation and catastrophic floods of glacial Lake Missoula sometime between 2,588,000 to 11,700 years ago. This ice-dammed lake reached a maximum elevation of 4260 feet in the Clark Fork Valley and blew out numerous times. The delta is on a plain formed where the Clark Fork River enters Lake Pend Oreille. It is formed by mixed alluvium and deltaic deposits of the Clark Fork River. These materials consist primarily of soft clayey silt that are underlain at depth by late glacial outwash, till, or Missoula Flood deposits. The fine-grained deltaic sediments were deposited in slack water by a low-gradient river. Numerous shifting channels, meanders, and oxbows formed during delta construction. On the lake side of the delta, wave action and changing lake levels have formed barrier beaches.

These sediments thicken rapidly farther into the lake where the lake bottom deepens (Burmester et al., 2004). The lake's sediment distribution preceded construction of Albeni Falls Dam (Parke, 2007).

Near the town of Clark Fork, there is a large alluvial gravel deposit in the floodplain of Lightning Creek. This deposit was formed by high discharge spring snowmelt and heavy storm runoff events. The thick gravel fragments of this alluvial deposit, which overlay the easternmost Clark Fork delta, are from surrounding mountains and reworked glacial and flood deposits. In addition, a layer of gravels and sands was deposited in the area by Lake Missoula, and gravel bars were deposited in the valley by the catastrophic Missoula Floods and during glacial advances and retreats.

Geologic Hazards. Geologic hazards that exist near the delta include inactive faults, landslides, and slope instability. Although landslides are present in the region, no landslides are mapped within the vicinity of the delta or its adjacent mountain slopes. Because the delta is a flat topographic feature, slope instability on a large scale is not present at the site. However, local zones of slope instability have been noted along island and shoreline banks where erosion of the ***toe of riverbank*** slopes has resulted in undermining and oversteepening of bankslopes. These localized instabilities are predominantly a result of erosional processes, and are discussed further in Section 3.2.1.3, *Contemporary Erosional Processes and Geomorphology*.

Earthquake Hazards. Shaking hazards in the vicinity of the delta include earthquakes, soils susceptible to loss of strength when wet, and the potential for settling and landsliding following an earthquake. Historical earthquakes have occurred in the region, including a magnitude 4.2 event that occurred in 1942 (located approximately 15.5 miles southwest of the delta). Earthquakes with magnitudes ranging from 5.0 to 5.4 occurred near Wallace, Idaho, in 1957 (approximately 62 miles south of the Clark Fork River delta). Other events have occurred in northwestern Montana roughly 93 to 112 miles from the delta in 1945 and 1952, each with a magnitude of 5.5. Another event in 2001 occurred near Spokane (approximately 62 miles from the delta), with an associated magnitude of 3.4.

Historical events notwithstanding, the earthquake frequency of the north Idaho region is relatively low. Low magnitude events, such as the historical examples listed above, have an associated low probability of triggering instability of delta sediments.

3.2.1.2 Soils

Prior to the glacial activity in the delta region that dominated the Pleistocene period, the soils beneath the modern delta formed from very fine-grained clay sediments that were deposited in a lacustrine (lake bed) environment. These sediments were found to be relatively stiff and resistant to erosion (Parametrix, 1998). Then during the glacial and post-glacial period following the Pleistocene period, coarser sediments were deposited at the delta during outwash periods and from contemporary river flooding, and mixed with additional lake bed deposits at the river/lake interface. These post-Pleistocene sediments are generally coarser than the pre-Pleistocene sediments, and more susceptible to erosion.

The predominant soil type within the delta is classified as Capehorn Silt Loam, which is characterized as a very deep, poorly drained soil with moderate permeability and seasonal groundwater table at a depth of 0-1.5 feet (U.S. Department of Agriculture [USDA], 1982). Outside of the delta area, either gravelly soils (near tributaries) or rock outcrops dominate the surface.

3.2.1.3 Contemporary Erosional Processes and Geomorphology

Wetland habitat in the delta has degraded in part because of erosion along shorelines of individual islands and streambanks. Many processes of erosion contribute to the loss of sediment within the delta, and these processes are linked to the local soils and geology.

Erosion is caused by many different sources, including waves (windborne and from watercraft), drawdown of the reservoir pool, scour from Clark Fork River currents, upward movement in soil during high water periods, groundwater, freeze-thaw processes, and rainfall splash (Gatto and Doe, 1987). The predominant erosional processes at work in Lake Pend Oreille are wind-wave erosion, freeze-thaw effects, groundwater-induced instability, and boat waves. Observed and anecdotal information suggests that annual delta island loss ranges from 8 to 12 acres per year in the delta (Parametrix, 1998).

The predominant landform of the delta was created immediately following the recession of Pleistocene glaciers, and likely has been eroding and downcutting ever since. This process was accelerated in the last approximately 58 years following completion of the Albeni Falls Dam and the subsequent reservoir-controlled hydrology that exists at the delta, and by the reduction in available sediment bedload within the Clark Fork River following completion of the upstream dams (Cabinet Gorge and Noxon Rapids) (Parametrix, 1998).

The prevalent erosional processes have persisted or accelerated because of the sediment-starved flow within the Clark Fork River combined with a higher and longer-duration lake pool elevation, which increases erosion by saturating soils and subjecting more soil area to wave erosion (Findlay, 2000a).

3.2.2 Environmental Consequences – Action Alternative

The project consists of constructing erosion protection structures to restore and enhance perimeters and interiors of islands and shoreline within the delta. Each measure consists of a variety of elements and actions (see Section 2.1.2, *Project Elements and Construction Actions*). This evaluation focuses on the potential effects on soils and geology that could result from implementation of the project.

3.2.2.1 Erosion Control and Restoration Measures

The project includes measures to protect delta shorelines and existing island areas from erosion.

Delta Shorelines. The project would impact geology and soils through several activities, such as excavation, importing rock material, slope construction, and grading. Earthen materials typically inundated at high pool would be excavated within the study area and used to raise existing islands. Raised ground surfaces would result in an increase of sheltered soil resources at elevations available for vegetative growth.

Riprap slope protection would reduce the potential for wave action to erode lakebed and banks, decreasing the rate of soil loss. The addition of rock to protect the slope toe would reduce erosion from freeze-thaw effects and groundwater seepage because slopes would be buttressed at the exposed shoreline slopes. Furthermore, higher ground elevations would result in less area that is susceptible to wave erosion at the perimeter of islands, and increase the amount of surface area that would be protected by vegetation.

Construction activities including excavation, embankment and slope construction, and grading would result in some temporary erosion or soil loss. In the short term, erosion and sediment control measures would be used during construction to control and manage temporary soil loss, accelerated sediment delivery to the lake, and elevated water turbidity. During construction, erosion protection and sediment control measures would reduce soils and geology impacts to low levels, depending on the area disturbed, site stability, weather, and other factors. These impacts would be temporary and would be mitigated through the BMPs discussed in Table 2-2. In the long term, impacts on soils and geology would be low because the area exposed to erosion would be reduced because of the project.

Existing Islands. The project would have short-term impacts on soils and geology because of construction-related excavation, earthwork, and construction of rock weirs: however, in the long term, erosion around the existing islands would be reduced at the toes of slopes. Erosion would also be reduced by armoring banks against wave action. Slope protection measures would buttress existing slopes and reduce the effects of freeze-thaw and groundwater seepage. Higher ground elevations at Areas 3/4/9 and 7 would result in less surface that would be susceptible to wave erosion at the perimeters of islands, and would increase the amount of surface area protected by vegetation. Temporary erosion control at existing islands would reduce negative short-term impacts on soil resources.

Excavation of soil borrow areas to form channels (for example, within Area 7) and development of rock sources (Area 5) would result in a displacement of soil and rock. These impacts would be minimized by implementing erosion and sediment control BMPs (such as earthen containment berms and silt curtains). These actions are not anticipated to increase soil instability or landslide hazards over the short term. Over the long term, proposed structural and soil improvements at existing islands would have beneficial impacts by sheltering soil and increasing soil cover, thus, reducing soil's susceptibility to erosion.

Rock Pits. Temporary erosion protection and sediment control measures at rock pits (such as rock-protected entrances, watering, and sweeping) would control erosion, and minimize track-out and dust generation in the short term. Channel improvement of the South Fork Clark Fork to provide sufficient draft for barge access to prospective rock sources south of Areas 5 and 6 during high pool would be performed when the area is dewatered during low pool. Thus, the impacts on soils and geology from rock pits would be low.

Haul Roads. Temporary access roads would be constructed of crushed rock to protect soils from displacement and compaction. Construction entrances would also be covered by rock to minimize the tracking of soils onto public roads. Thus, the impacts on soils and geology from haul roads would be low. Minor and temporary impacts to geology and soil from construction of a floating bridge system between Area 11 and Area 7 would result from activities including earthwork and grading; pile driving and removal within the log yard sluice channel; and potential construction of new temporary staging areas.

3.2.2.2 Restore and Enhance Edge and Interior Areas

The project includes measures to raise islands and shorelines, enhance wetland habitat diversity, and capture woody debris.

Raise Islands. Raising islands and delta shorelines to restore and enhance edge and interior areas would involve borrowing onsite from ground excavated to form fish-passable channels, primarily at Areas 3, 7, and 11. These areas would be raised to approximately 2064 feet, with topographic variation incorporated into the final grading. Altered topography would create stilled and backwater areas that would minimize long-term loss of soil from erosion and result in a net gain of soil.

Construction activities would temporarily create less stable soil surface conditions that would be susceptible to erosion. Restoration and enhancement of edge and interior areas would result in moderate short-term impacts to soils from construction activities. These impacts would be mitigated through the implementation of erosion and sediment control BMPs. In conjunction with the slope protection measures described above, slope instability along shoreline banks at the perimeter of raised areas would be reduced. Raising ground surfaces would not result in impacts to geologic or earthquake hazards in the delta vicinity.

In the short term, earthwork that disturbs and aerates onsite soils would likely accelerate rates of soil organic matter decomposition and carbon emissions to the atmosphere. However, soil carbon would accumulate over the long term through sediment deposition behind breakwaters and bendway weirs, reversing the present trend and changing the delta soils from a source of atmospheric carbon to a carbon sink where carbon builds up.

Enhance Wetland Habitat Diversity. Temporary impacts to soil and geologic resources may result from enhancing wetland habitat diversity through grading and earthwork, but these impacts would be temporary and dissipate over time as soil surfaces stabilize and wetland plants become established.

Capture Woody Debris. Placement and incorporation of dead woody material would help restore and enhance edge and interior areas. Stockpiled woody debris, including root wads, at the Area 11 log yard would provide a source of large wood. IDFG would import whole trees from forest thinning operations outside the delta, which would be placed on soil surfaces to increase roughness and promote sediment deposition. Passive woody debris capture would occur via directed river flows at Areas 3, 5, 7, and 11. Incorporation of woody debris would include locked logs between bendway weirs and root wads within stone toe protection measures.

Importation and placement of woody debris would temporarily impact soils, primarily as a result of equipment trafficking and soil excavation for anchoring. Over the long term, placement of woody debris would have a beneficial effect on soil resources by reducing shoreline and streambank scour and promoting sediment deposition. Large woody debris would reduce water velocity and direct flow away from the islands, further reducing delta erosion and scour. Anchored root wads would reduce the adverse effects of wave and boat wake erosion of shorelines. Placement of woody debris would trap sediment, further enhancing soil resources through accretion. Thus, the capture and incorporation of woody debris would have low impacts on soils and geology.

Erosion and sediment control BMPs would be used during construction activities to control and manage temporary soil loss, accelerated sediment delivery to the lake, and elevated water turbidity (see Table 2-2). The BMPs, combined with vegetation establishment, would provide long-term stabilized soil conditions. Overall, the impacts to geology and soils from the project would be low and include short-term effects resulting from construction activities.

3.2.3 Environmental Consequences – No Action

Under the No Action Alternative, BPA would not provide funding for the project and at least a portion of proposed restoration efforts would not be implemented in the Clark Fork River delta. Erosional processes at unfunded locations would continue at similar rates and losses of soil and geologic resources would continue.

3.3 VEGETATION AND WETLANDS

3.3.1 Affected Environment

The action area for vegetation, including wetlands, is those portions of Areas 3/4/9, 5, 6, 7, and 11 that would be affected by restoration and construction, as described in Section 2.1.2, *Project Elements and Construction Actions*. These areas contain vegetated wetlands and nearshore portions of Lake Pend Oreille, as well as some upland areas near human-made structures.

The majority of the Clark Fork River delta is wetland habitat. Historically, the delta was composed of tall wetland forests dominated by black cottonwood (*Populus balsamifera* subspecies [ssp.] *trichocarpa*) and western redcedar (*Thuja plicata*), and extensive scrub-shrub and herbaceous wetland areas. Shallow water conditions favored broadleaf arrowhead (*Sagittaria latifolia*) and various sedge species (*Carex* species [spp.]).

The construction of the Albeni Falls Dam altered native plant communities, and opened up habitat for noxious and invasive weed infestations. The annual regime of flooding and drawdown has also changed vegetation communities in the delta. Summer flooding converts much of the seasonal wetland and marsh habitat to open water, and winter drawdown favors aquatic species. Freshwater algal beds dominated by *Chara* spp. and *Nitella* spp. are found in deep off-shore areas between elevations 2022 and 2048 feet. Submerged vascular plant beds are found between elevations 2030 and 2050 feet in calm, backwater areas of the lake. Native species located here include northern watermilfoil (*Myriophyllum sibiricum*), coontail (*Ceratophyllum demersum*), elodea (*Elodea americana*), and leafy pondweed (*Potamogeton foliosus*). Nonnative species found here include curlyleaf pondweed (*Potamogeton crispus*) and the noxious weed Eurasian watermilfoil (*Myriophyllum spicatum*).

Freshwater shallow marshes existing today have largely developed since dam construction. These communities occur between about 2060 feet and the mean high-water line (2062.5 feet). Native cattails (*Typha* spp.) are found in the lower portions of this zone, but the invasive nonnative reed canarygrass (*Phalaris arundinacea*) occupies areas within about 2 feet of the high-water line. These areas are often dominated by reed canarygrass, although a few native sedges (*Carex* spp.) and rushes (*Juncus* spp.) may be intermingled. Populations of common tansy (*Tanacetum vulgare*) are found near the drier margins of the shallow marshes. The noxious weed flowering rush (*Butomus umbellatus*) also is found in this area. Wet meadows form a minor component of the delta vegetation, and extend above the reed canarygrass zone. These areas are composed largely of a mixture of native and nonnative bluegrasses (*Poa* spp.) and bentgrasses (*Agrostis* spp.), although reed canarygrass also is present.

Riparian areas remain relatively unchanged, although greatly reduced in size from pre-dam conditions. These areas are dominated by black cottonwood, along with shrub species tolerant of saturated soils, such as willows (*Salix* spp.).

Upland areas along roads and docks are vegetated primarily by nonnative species, such as common tansy, common mullein (*Verbascum thapsus*), and sweetclover (*Melilotus officinalis*). Native plants include showy milkweed (*Asclepias speciosa*) and ponderosa pine (*Pinus ponderosa*). Nonnative species, such as reed canarygrass and common St. Johnswort (*Hypericum perforatum*), dominate banks and shores, along with the occasional native black cottonwood.

3.3.1.1 Wetlands

Wetlands in the project area are composed of three types: palustrine emergent (PEM), palustrine scrub-shrub (PSS), and palustrine forested (PFO). Acreages for each wetland type are shown in Table 3-1.

Table 3-1 Areas of Wetland Types among Management Areas

Management Area	Wetland Area (acres)[a]			Total (acres)
	PEM	PSS	PFO	
Area 3/4/9	33	4	2	39
Area 5	3	0	1	4
Area 6	2	0	0	2
Area 7	32	1	1	34
Area 11	12	0	0	12
Totals	**82**	**5**	**4**	**91**

Notes:
[a] Totals are different because of rounding.
PEM = palustrine emergent
PFO = palustrine forested
PSS = palustrine scrub-shrub

3.3.1.2 Federal and State Listed Plants

The USFWS lists four plant species for this region as threatened, endangered, or ***candidate*** under the ESA: Macfarlane's four-o'clock (*Mirabilis macfarlanei*), Spalding's catchfly (*Silene spaldingii*), water howellia (*Howellia aquatilis*), and whitebark pine (*Pinus albicaulis*). While suitable habitat exists within the action area for water howellia, there are no records of occurrence here, and field surveys during June 2013 did not locate any populations (Cousins, pers. comm., 2013). No suitable habitat exists within the action area for the other three species and they are not discussed further in this EA.

IDFG maintains a list of rare and ***sensitive plant species*** for Bonner County, Idaho, which is the same list that BLM uses for rare plant management on its lands (IDFG, 2013b). Rankings for these plants are based on distribution and population levels, and range from S1 to S4, with S1 being critically imperiled, and S4 being apparently secure. Table 3-2 shows the 37 state-listed special status plants in Bonner County with ranks of S1 or S2.

Table 3-2 State Listed Plant Species that May Occur in Bonner County, Idaho, with Information on Habitat and Known Locations

Common Name	Scientific Name	State Rank[a]	Habitat	Known Occurrence within Project Area (X = Yes)
Bog-rosemary	*Andromeda polifolia*	S1	Acid bogs[d]	
Swamp birch	*Betula pumila*	S2	Swamps and fens in valleys up to the lower montane zone[c]	
Triangular-lobed boonwort	*Botrychium ascendens*	S1	Coniferous forests, wet and dry meadows, streambanks, pastures, roadsides, and ravines in moist decayed litter, and organic and rocky soil[b]	
Mountain moonwort	*Botrychium montanum*	S2	Deep litter of springy, mature western red cedar forests; also in riparian thickets, ***mesic*** meadows, and grassy trail edges[c]	
Stalked moonwort	*Botrychium pedunculosum*	S1	Moist or dry meadows, springs, stream terraces, coniferous forests, and forest edges[b]	
Northern moonwort	*Botrychium pinnatum*	S2	Shaded cedar forest[c]	
Least moonwort	*Botrychium simplex*	S2	Open montane meadows and grasslands, and roadsides and other disturbed habitats[c]	
String-root sedge	*Carex chordorrhiza*	S2	Wetlands, peatlands, ***sphagnum bogs***, and lakeshores[b]	
Bristly sedge	*Carex comosa*	S1	Marshes, lakeshores, and wet meadows[b]	
Bristle-stalked sedge	*Carex leptalea*	S2	Often fens, thickets, wet spruce or cedar forests, in valleys and montane areas[c]	X
Pale sedge	*Carex livida*	S2	Wet, organic soils of fens in the foothill and montane zones[c]	
Poor sedge	*Carex magellanica* ssp. *irrigua*	S2	Fens, bogs, shady wet meadows, shrub wetlands, and marshes, often growing in peat soil[b]	
Bulb-bearing water hemlock	*Cicuta bulbifera*	S2	Edges of marshes, slow-moving streams, lake margins, bogs, wet meadows, and shallow standing water[b]	X
Thorn cladonia	*Cladonia uncialis*	S1	On soil and mosses, and talus slopes with cold-air drainage[c]	X
Short-spored jelly lichen	*Collema curtisporum*	S2	Bark of black cottonwood in moist riparian forests, often in narrow sheltered valleys[c]	X
Crested shield-fern	*Dryopteris cristata*	S2	Wet meadows, cedar/spruce forested wetlands, open shrubby wetlands, ponds, and stream edges[b]	

Table 3-2 State Listed Plant Species that May Occur in Bonner County, Idaho, with Information on Habitat and Known Locations

Common Name	Scientific Name	State Rank[a]	Habitat	Known Occurrence within Project Area (X = Yes)
Green keeled cotton-grass	*Eriophorum viridicarinatum*	S2	Cold, usually calcareous swamps, bogs, fens, ponds, and wet meadows[b]	
Creeping snowberry	*Gaultheria hispidula*	S2	Sphagnum bogs, wet forests, and riparian meadows, particularly among areas of moist sphagnum and standing water in fir/spruce coniferous forests[b]	
Britton's dry rock moss	*Grimmia brittoniae*	S1	Vertical faces of shaded calcareous cliffs[e]	
Blueflag	*Iris versicolor*	S2	Marshy places, along roadsides, shores, and along mountains[f]	
Northern bog clubmoss	*Lycopodiella inundata*	S2	Sphagnum bogs, wet sandy places, and wetlands adjacent to lakes, marshes, and swampy ground[b]	
Groundpine	*Lycopodium dendroideum*	S2	Rock outcrops, talus, or boulder fields, often with significant moss and organic debris layer[b]	
Meesia	*Meesia longiseta*	S1	Calcareous fens and boggy woods[h]	
Northern beechfern	*Phegopteris connectilis*	S2	Mesic, western redcedar forests and shaded cliffs in the valley to subalpine zones[c]	
Braun's sword-fern	*Polystichum braunii*	S1	Moist places in boreal forests[g]	
Naked rhizomnium moss	*Rhizomnium nudum*	S1	Bottoms of steep, open slopes in the subalpine, where snow accumulates[k]	
White beakrush	*Rhynchospora alba*	S2	Sphagnum bogs and other wet places in lowlands and up to midmontane areas[d]	
Hoary willow	*Salix candida*	S2	Bogs, fens, shrub wetlands, and swampy areas in peat soils[b]	
Bog willow	*Salix pedicellaris*	S2	Sphagnum bogs, fens, and black spruce bogs[i]	
Pod grass	*Scheuchzeria palustris*	S2	Wet, organic soil of fens in the valley to montane zones, usually with Sphagnum moss[c]	
Peatmoss	*Sphagnum mendocinum*	S1	Submerged or floating in alder or coniferous swamps, sedge fens, raised bogs, and drainage ditches in ***mires***[j]	
Small twistedstalk	*Streptopus streptopoides*	S2	Dense, coniferous mid-montane woods[d]	

Table 3-2 State Listed Plant Species that May Occur in Bonner County, Idaho, with Information on Habitat and Known Locations

Common Name	Scientific Name	State Rank[a]	Habitat	Known Occurrence within Project Area (X = Yes)
Rush aster	*Symphyotrichum boreale*	S2	Lakesides, marshes, bogs, and fens, including calcareous bogs and fens, open peatland, and sedge-dominated open sphagnum bogs[b]	
Purple meadow-rue	*Thalictrum dasycarpum*	S1	Wet meadows, thickets, ditch and streambanks; plains and valleys to the montane zone[c]	
Short-style tofieldia	*Triantha occidentalis* ssp. *brevistyla*	S1	Wet meadows and fens, especially around lakes, streams and wet rock ledges, in the subalpine and alpine zones[c]	
Lichen	*Tuckermannopsis sepincola*	S2	On shrub twigs, especially those of *Betula*, in fens and bogs[c]	X
Bog cranberry	*Vaccinium oxycoccos*	S2	Sphagnum bogs[d]	

Notes:

[a] S1 = Critically imperiled: at very high risk of extinction because of extreme rarity (often five or fewer populations), very steep declines, or other factors.

S2 = Imperiled: at high risk of extinction or elimination because of very restricted range, very few populations, steep declines, or other factors.

[b] Washington Department of Natural History, 2011.

[c] Montana Natural Heritage Program, 2013.

[d] Hitchcock and Cronquist, 1973.

[e] Hastings and Greven, 2007.

[f] Henderson, 2002.

[g] Wagner, 1993.

[h] NatureServe, 2013.

[i] Argus, 2010.

[j] McQueen and Andrus, 2007.

[k] Wagner, pers. comm., 2013.

The Plant Element Occurrence database prepared by IDFG's Idaho Fish and Wildlife Information System indicates four species from the rare and sensitive plant species list as occurring within the affected area—bristle-stalked sedge (*Carex leptalea*), thorn cladonia (*Cladonia uncialis*), short-spored jelly lichen (*Collema curtisporum*), and an unnamed lichen (*Tuckermannopsis sepincola*) (IDFG, 2013c). An additional sensitive plant species, bulb-bearing waterhemlock (*Cicuta bulbifera*), was found during June 2013 field inventory. These species are discussed in detail in the following text.

Bristle-stalked sedge is ranked as imperiled (S2). This herbaceous perennial grows in small clumps connected by rhizomes (Montana Natural Heritage Program, 2013). Bristle-stalked sedge is often found in wet spruce or cedar forests, often on ***hummocks***. This species has been found in Area 11 and the vicinity.

Short-spored jelly lichen is ranked as imperiled (S2). It is typically found on the bark of black cottonwood trees in moist riparian forests. This species has been found in Area 6.

An unnamed lichen (*Tuckermannopsis sepincola*) is ranked as imperiled (S2) and is found on shrub twigs, particularly birch, in ***fens*** and bogs. This species has been found in Area 6.

Bulb-bearing water hemlock (*Cicuta bulbifera*) is ranked as imperiled (S2). This herbaceous perennial grows at the edges of marshes, slow-moving streams, lake margins, bogs, wet meadows, and in shallow standing water (Washington Department of Natural Resources, 2013). This species has been found in Area 3.

Thorn cladonia is ranked as critically imperiled (S1). This lichen is often found on soils or mosses, and on ***talus*** slopes with cold-air drainage. This species has been found in Areas 3/4/9, 5, 6, 7, and 11, and the vicinity.

Noxious and Invasive Species. The Idaho State Department of Agriculture maintains the list of designated noxious weeds for the State of Idaho (Idaho State Department of Agriculture, 2013). Plant species on this list are considered a top priority for removal and control. Previous surveys of the Clark Fork River delta have identified eight listed noxious species within the study area: spotted knapweed (*Centaurea stoebe*), Canada thistle (*Cirsium arvense*), orange hawkweed (*Hieracium aurantiacum*), oxeye daisy (*Leucanthemum vulgare*), butter and eggs (*Linaria vulgaris*), flowering rush, Eurasian watermilfoil, and yellow flag iris (*Iris pseudacorus*) (USACE and BPA, 2011; Cousins, pers. comm., 2013). IDFG has identified reed canarygrass and common tansy (*Tanacetum vulgare*) as invasive species that are a high priority for removal in the Clark Fork River delta (Cousins, pers. comm., 2013).

3.3.2 Environmental Consequences – Action Alternative

The Clark Fork River Delta Restoration Project includes erosion protection measures and edge and interior area restoration construction activities that would damage or destroy plants and wetlands in the short term, but would create conditions for establishing larger vegetated areas with more desirable and diverse native species composition.

3.3.2.1 Erosion Control and Restoration Measures

Delta Shorelines. Erosion protection measures include rock and wood-fortified breakwaters, bendway weirs, and vegetated riprap. Construction and installation of these structures would involve materials transport and excavation of the seasonal lake bottom. Materials would be transported across a temporary barge bridge in Area 11. Construction of this bridge would involve driving temporary piles within the drawdown zone and deepwater areas between the log yard and Area 11. The drawdown zone has sparse vegetative cover, and short-term impacts would be limited. Freshwater algal beds found in the deepwater zone would be severely disturbed during the pile driving. However, these impacts would be short-term. The piles would be removed at the project's completion, and the algal beds would quickly recover. No long-term impacts would occur as a result of the temporary barge bridge.

For the most part, wetlands would not be converted to uplands; however, many shoreline areas would shift from sparsely vegetated shallow water habitats to vegetated wetlands, and a few interspersed upland islands would be created for diversity. Rock materials would be transported and roughly placed during high water levels, and are expected to have a low impact on vegetation because most of the drawdown zone is sparsely vegetated.

In the short term, erosion protection measures would have a low impact on wetlands because wetlands generally would not be converted to uplands; however, the types of wetlands would shift from sparsely vegetated to partially vegetated or vegetated. In the long term, impacts on wetlands would be low because the areas behind protected delta shorelines are expected to fill with sediment deposits that would gradually be colonized by plants.

By integrating native materials into the design of breakwaters and riprap slopes, native woody species would become established along the shorelines and make interior surfaces more conducive for plant establishment. This would increase available habitat for special status plant species.

In the short term, the installation of breakwaters and vegetated riprap along delta shorelines would have a low impact on vegetation because few plants exist where erosion protection measures would be installed. Installation of breakwaters and vegetated riprap along delta shorelines would stabilize the shorelines and promote growth of native vegetation behind these structures. Existing islands would be reinforced with vegetated breakwaters, which would reduce scouring wave action and curtail the ongoing loss of vegetation through erosion. This would promote the growth and development of shallow water emergent marshes similar to those historically found in the area, as well as protect existing vegetation on the islands. In the short term, the breakwaters and vegetated riprap would have a low impact on vegetation because few plants exist where erosion protection measures would be installed. In the long term, wetlands and vegetation would respond positively because the areas exposed to erosion would be reduced and new sites for vegetation establishment would be provided because of the project.

Existing Islands. Protection and rebuilding of islands using bendway weirs and rock berms, and gravel from the stream bed, would provide stabilized islands less prone to scour. Most of the fill and borrow areas are sparsely vegetated. Relatively few aquatic plants occur in the riverbed because of scour, sediment deposition, and bedload movement; therefore, short-term impacts would be low. By stabilizing the islands riverbanks and reducing the scour potential of river flows, wetlands, native riparian plant communities, and special status plant habitats would be protected and likely remain at current levels.

3.3.2.2 Restore and Enhance Edge and Interior Areas

Raise Islands. Restoration and enhancement of the edge and interior areas would increase available habitat for native vegetation, including special status plant species, and reduce noxious and invasive weed cover. Currently submerged portions of delta islands would be raised through the addition of earth ***fill material***. Prospective fill and borrow sites on delta islands would be located where few desirable plant communities or trees exist. Incorporating micro-topographic complexity (small mounds and depressions) to these islands would increase habitat complexity and vegetation diversity, allowing for the growth of riparian and wetland plants. The frequently submerged areas may contain native and nonnative aquatic vegetation, which could be destroyed. Excavation of gravel from the delta bottom would occur during winter drawdown, which would limit the impact on submerged plants in the area because the plants would be dormant and would resprout. In addition, increasing the height and stability of these areas would promote the growth and development of woody vegetation, as well as increase potential wetland habitat. Fill material used in this process may contain viable native plant seed or plant fragments capable of vegetative regeneration, such as rhizomes, that would aid in vegetation reestablishment. Supplemental plantings and seedings would assist reestablishment of native vegetation in these areas. Acreages of each island to be planted with native shrubs, trees, and seeds include 82 acres in Area 3/4/9, 58 acres in Area 7, and 29 acres in Area 11.

Weed control efforts prior to, during, and post-construction would consist of mechanical and chemical methods of weed removal and native plantings along upland and bank line surfaces. Prior to the start of construction, areas of reed canarygrass would be removed using mowing and tilling to temporarily reduce vegetative cover and to limit the spread of this invasive species. Replanting these areas with native plants would increase native plant cover and promote habitat complexity. Post-construction monitoring and management would be implemented to control invasive species cover until native vegetation establishes dominance in the area.

In the short term, raising delta islands would have a low impact on wetlands and vegetation because wetlands would not be converted to uplands, earthwork would occur where relatively little desirable vegetation is present, and vegetation would be re-established naturally and through native seeding and planting. In addition, the Clean Water Act Section 404 permitting process would ensure no net loss of wetland functions or values.

In the long term, wetlands and vegetation would respond positively because the new ground surfaces would be available for native plant establishment and weeds would be controlled. Post-project monitoring would document the development of desirable riparian and wetland plant communities.

Enhance Wetland Habitat Diversity. Perhaps the most significant expected outcome of delta restoration would be the conversion of shallow water lacustrine wetlands to palustrine wetlands with interspersed upland islands. There are nearly 142 acres of lacustrine wetlands associated with Lake Pend Oreille, but relatively few shoreline emergent and riparian wetlands.

Incorporating micro-topographic complexity (small mounds and depressions) to these islands would increase habitat complexity and vegetation diversity, allowing for the growth of wetland plants interspersed with riparian plants. Earthwork would avoid areas of intact native plant communities, to the extent practicable. Excavation of sediments may unearth long-buried seeds or plant fragments capable of vegetative regeneration, such as rhizomes, improving chances for natural regeneration of native vegetative communities when spread on better-aerated wetland and upland ground. Therefore, the project would have a low impact on wetland habitat diversity in the short term. Furthermore, wetland habitat diversity would likely increase over the long term as vegetation develops on diverse, protected new soil areas and weed control promotes desirable plant compositions. Based on restoration monitoring by IDFG in the Pack River delta, the project could contribute to recovery of special status plant species (Cousins, pers. comm., 2013). See Table 2-2 for proposed environmental design features and mitigation measures to prevent wetland losses.

Manage Weeds and Invasive Plants. IDFG would evaluate the benefits and risks of vegetation treatment, including application methods; pesticides, carriers, and surfactants used; needed treatment buffers; and use of nonchemical weed control (for example, bio-controls, hand pulling). If management objectives can effectively be accomplished using nonchemical methods, then non-chemical methods are preferred.

Vegetation management would be consistent with BLM's Record of Decision and the approved *Coeur d'Alene Resource Management Plan* (BLM, 2007a) and the Coeur d'Alene Field Office *Programmatic Environmental Analysis for Vegetation Treatments* (BLM, 2010). Appropriate spatial and temporal buffers would be applied to avoid species exposure to harmful chemicals. Buffers are identified in the *2007 Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment* (BLM, 2007b).

See Table 2-2 for proposed environmental design features and mitigation measures to control weeds. Weed control measures prior to and during construction would be as follows:

- Upland and bank surfaces would be treated to control weeds such as reed canarygrass.
- Methods to control reed canarygrass would include mowing prior to the onset of flowering during the growing season prior to construction.
- At some areas, mowing would be followed by herbicide treatment. At other areas, deep tillage would be used.
- Wherever possible, reed canarygrass sod would be removed, flipped, and buried.

Weed control measures following construction may involve the following BMPs:

- Aggressively vegetate ground surfaces with native plants.
- Follow mowing with herbicide treatment.
- Where reed canarygrass threatens unoccupied habitat suitable for the threatened water howellia, appropriately apply a grass-specific herbicide.

Capture Woody Debris. Captured and strategically placed woody debris would encourage sediment deposition. In the long term, this would promote shallow marsh development, and potentially reduce the extent of deep-water habitat capable of supporting algal beds. In the short term, the impact of woody debris placement would be low because sparsely vegetated and invasive-species-infested plant communities and wetlands would be targeted by the project.

3.3.3 Environmental Consequences – No Action

Under the No Action Alternative, BPA would not provide funding for the project and only a limited number of restoration activities, if any, would take place. Existing shorelines would continue to erode where no restoration would be performed, contributing to the further degradation and loss of vegetation. Deep-water aquatic vegetation would be favored, while plants adapted to shallow water would be precluded. Large areas of reed canarygrass and other noxious and invasive weeds would not be treated. Shrub and tree seedlings would face continued competition from nonnative vegetation. Habitat complexity likely would continue to decline.

3.4 WATER RESOURCES

3.4.1 Affected Environment

The Clark Fork River delta is located at the confluence of the Clark Fork River with Lake Pend Oreille. The study area for water resources includes the lower Clark Fork River and Lake Pend Oreille.

3.4.1.1 Hydrologic Characteristics

The Clark Fork River flows from near Butte, Montana, to Lake Pend Oreille in Idaho and has a drainage area of more than 22,000 square miles. Upstream flows are regulated because the river passes through four reservoirs and over four power-generating dams prior to entering Lake Pend Oreille. Flows passing Cabinet Gorge Dam, located approximately 10 miles upstream of the lake, range from a minimum of 5,000 cfs to more than 50,000 cfs during peak runoff, as stipulated in the Clark Fork River Settlement Agreement (Avista, 1999). Mean annual flows below the dam, through the 2001 water year, were 22,548 cfs. Lightning Creek is the largest tributary to the Clark Fork River between Cabinet Gorge Dam and Lake Pend Oreille. Lightning Creek is susceptible to flashy flows driven by rain-on-snow events. Mean annual flows at the Lightning Creek gaging station, through the 2001 water year, were 411 cfs; however, peak flows of more than 6,000 cfs have been observed (Idaho Department of Environmental Quality [DEQ], 2007). Through a combination of mainstem flows passing Cabinet Gorge Dam, Lightning Creek flows, and other minor tributaries, the Clark Fork River contributes 92 percent of the inflow to Lake Pend Oreille (DEQ, 2007).

Lake Pend Oreille is the largest and deepest natural lake in Idaho. At full pool, the lake has a surface area of approximately 142 square miles a mean depth of 538 feet, a maximum depth of 1,150 feet, and more than 175 miles of shoreline (Fields et al., 1996; Rieman and Falter, 1976). Since the construction of Albeni Falls Dam in 1951, the lake has been operated as a reservoir. Lake levels during the summer (June through September) are held at a full pool elevation of 2062 feet, and then lowered to either 2051 or 2055 feet during the winter. As discussed in Chapter 1, *Introduction*, during the summer, fringe habitats like wetlands and marshes are converted to deeper open water habitats. During winter drawdown, an annual loss of delta islands is estimated to be 8 to 12 acres per year (Parametrix, 1998).

3.4.1.2 Water Quality

Pollutants of concern in the lower Clark Fork River include sediment, temperature, heavy metals (cadmium, copper, and zinc), and total dissolved gas (entrained atmospheric gases). Sediment and temperature are primarily of concern in the tributaries. The combination of glacially deposited sediments, timber harvest, and road construction create potential sediment issues, and fire and timber harvest have resulted in more open canopy conditions and associated stream warming. Metals and total dissolved gas issues exist in the mainstem river. Historical mining in the headwaters of the Clark Fork River in Montana resulted in deposition of heavy metals in the system, and some of these metals have moved downstream and continue to pose water quality risks throughout the basin (DEQ, 2007). Hydropower development upstream of the delta (for example, Cabinet Gorge Dam) resulted in altered flow and habitat conditions, including elevated levels of total dissolved gas that can potentially threaten aquatic species. Total maximum daily loads (TMDLs) have been developed for metals (cadmium, copper, and zinc) and total dissolved gas in the Clark Fork River and sediment and temperature in several tributaries (including Lightning Creek), and the lower Clark Fork River is listed as impaired for temperature on Idaho's list of threatened and impaired waters (DEQ, 2011).

Lake Pend Oreille is a nutrient-poor lake except for the shoreline areas in the northern basin of the lake, which have higher nutrient concentrations because of urbanization and suspended sediments delivered by the Clark Fork River (IDFG, 2013a). A TMDL exists for nutrients (phosphorus) in the nearshore area of Lake Pend Oreille, and the lake is listed as impaired for mercury on Idaho's list of threatened and impaired waters (DEQ, 2002; 2011). Banks along the main shoreline and islands in the delta are experiencing erosion because of excessive velocities during peak flows and wave action from the lake. This erosion leads to elevated suspended sediment concentrations in the delta and subsequent delivery to the lake.

3.4.1.3 Floodplains

The Federal Emergency Management Agency (FEMA) has assessed the Clark Fork River delta floodplain and determined that the 100-year base flood (a flood event that has a 1 percent chance in any year or a probability of occurring once every 100 years) elevation transitions from approximately 2077 feet near the City of Clark Fork to 2074 feet at Lake Pend Oreille (FEMA, 2013).

In addition, floodway boundaries are established for some areas of the delta; however, the established regulatory floodway ends just upstream of the project near the eastern boundary of Pend Oreille WMA Area 6, just downstream of the mouth of Lightning Creek and just upstream of White Island.

3.4.2 Environmental Consequences – Action Alternative

The project consists of erosion protection measures and measures to restore and enhance edge and interior areas within the Clark Fork River delta. This evaluation focuses on the potential water resources effects (for example, hydrology, water quality, and floodplains) that could result from implementation of the project.

3.4.2.1 Erosion Control and Restoration Measures

The project includes measures to protect delta shorelines and existing islands from erosion. Erosion protection measures consist of hard (rock and vegetation) or soft (wood and vegetation) structures.

Delta Shorelines. Erosion protection measures specific to the delta shorelines would be applied in Pend Oreille WMA Area 11, including 1,600 feet of slope protection on shoreline banks facing Lake Pend Oreille and 2,400 feet of river training structures (Longitudinal Peaked Stone Toe Protection) along the northern bank of the log sluice channel.

Erosion control measures specific to the delta shorelines would have a low to moderate impact on water resources. By installing more than 100,000 tons of riprap (including bendway weirs and large woody debris) along the shorelines, erodible areas would be armored or flows would be redirected away from shorelines, thus, altering the existing hydrologic characteristics of the delta. However, the riprap would reduce the potential for wave action to erode banks, thus, decreasing suspended sediment concentrations.

Construction activities are likely to result in some temporary water quality impacts such as sediment plumes and water temperature increases because of vegetation removal. These impacts would be mitigated through the measures discussed in Table 2-2 and, in the long term, water quality impacts would be reduced as plantings mature and recolonize the shorelines. Installation and removal of temporary features, like piles to support the floating bridge, would also introduce sediment into the water column. However, the mitigation measures identified in Table 2-2 would minimize impacts by limiting disruptive influences to a localized area. Therefore, potential water quality impacts are considered low.

Metals are unlikely to be affected by the project because the majority of metals in the Clark Fork River system originate in the upper reaches above the Noxon Rapids and Cabinet Gorge Dams where mining is prevalent. The slack water behind the dams would cause sediment to settle in the reservoirs; thus precluding it from entering the delta area.

Erosion control measures would have a moderate impact on floodplains in the short term because floodplain storage capacity would be reduced by installing more than 100,000 tons of riprap.

Erosion control measures would result in long-term alteration of floodplains by decreasing flood-storage capacity, but would not alter the course of floodwaters. Short-term impacts would result primarily from activities like installing more than 100,000 tons of riprap along the shorelines, vegetation removal, excavation of floodplains to raise island elevations, and construction of access roads. These activities would alter the existing hydrologic characteristics of the delta. Soil compaction could increase erosion, interfere with subsurface water flow in the floodplain, and hinder the capacity of the floodplain to dissipate water energy during floods. The addition of fill to the floodplain would incrementally reduce flood-storage capacity and could result in some alteration of flood flows. Removal of vegetation could also impact floodplain functions because vegetation can slow floodwaters and prevent erosion.

Long-term benefits of these activities to the delta would include reducing erosion and protecting existing floodplains, which would reduce the potential for erosion and decrease suspended sediment concentrations. In addition, implementation of BMPs would minimize the potential for impacts to floodplains. Therefore the impacts of the erosion control measures to water resources would be low to moderate.

Existing Islands. Erosion protection measures specific to the existing island areas would be applied in Areas 3/4/9, 5, 6, and 7, as described in Section 2.1.2, *Project Elements and Construction Actions*. For example, the bendway weirs would redirect flow away from the islands, reducing erosion and suspended sediment in the system. The impacts from these measures would be similar to the impacts discussed for Delta Shorelines, except that the volume of rock and backfill materials would be much less.

3.4.2.2 Restore and Enhance Edge and Interior Areas

The project includes measures to raise islands, enhance wetland habitat diversity, and capture woody debris.

Raise Islands. Raising islands is one of the measures intended to restore and enhance edge and interior areas. Raising islands would take place in Areas 3/4/9, 7, and 11, as described in Section 2.1.2, *Project Elements and Construction Actions*.

Raising islands to restore and enhance edge and interior areas would have low impacts to water resources because these actions would be isolated from surface water resources and BMPs would be implemented to stabilize surfaces and minimize impacts to suspended sediments and turbidity of water (see Table 2-2). Project impacts on water temperature would be low because riparian vegetation removal would be limited and replanted in most areas. Metal concentrations are unlikely to be affected because there are no known elevated concentrations in the onsite sediments that would be used as soil backfill.

The impact to floodplains resulting from raising islands is moderate because the roughly 884,785 CY of fill material would be excavated from local sources within the floodplain—in the river channels, gravel bars, and island interiors. Since the overall quantity of fill material in the floodplains would be unchanged (material is moved from one location to another), broad-scale water surface elevations across the delta would likely remain the same. These impacts would be reduced by the mitigation measures in Table 2-2.

Enhance Wetland Habitat Diversity. No permanent negative impacts to water resources would result from enhancing wetland habitat diversity because vegetation would mature over the long term, thereby stabilizing soil and trapping sediments. There may be temporary impacts during construction as soil and sediment may be disturbed. Implementation of mitigation/BMPs as shown in Table 2-2 would reduce these temporary impacts.

Capture Woody Debris. Capturing woody debris is one of the measures intended to restore and enhance edge and interior areas. Woody debris capture would take place in Areas 3/4/9, 5, 7, and 11, as described in Section 2.1.2, *Project Elements and Construction Actions*.

Capturing woody debris to restore and enhance edge and interior areas would have similar effects on water resources, including floodplains, as described for *Delta Shorelines* in Section 3.4.2.1, *Erosion Control and Restoration Measures*. Large woody debris would disrupt flow (reduce velocity) and redirect flow away from the islands, reducing erosion and suspended sediment in the system. Woody debris would also trap sediments, thus removing them from the system. Other water quality parameters, including temperature are not likely to be affected because woody debris would not produce much shade.

3.4.3 Environmental Consequences – No Action

Under the No Action Alternative, BPA would not provide funding for a portion of the project. Construction impacts to water resources from BPA-funded work would not occur, including impacts to delta shorelines, islands, and wetlands. Water quality and floodplain impacts would continue as delta shorelines and island areas erode.

3.5 FISH AND WILDLIFE

3.5.1 Affected Environment

The study area for fish is within the Clark Fork River Recovery Unit, lower Clark Fork Recovery Subunit of the USFWS Bull Trout Recovery Plan Area. The study area for wildlife extends approximately 2,000 feet outside of the construction boundary (primarily to account for potential impacts associated with noise).

3.5.1.1 Fish

The lower Clark Fork River (including the delta) and Lake Pend Oreille provide habitat for a variety of native and nonnative fish. Twelve native and 20 nonnative species are known to occur in the Pend Oreille Subbasin. Table 3-3 characterizes the location and status of fish species within the subbasin. Some native species include northern pikeminnow (*Ptychocheilus oregoninsis*), peamouth (*Mylocheilus caurinus)*, and redside shiner *(Richardsonius balteatus)* (IDFG, 2013d; DuPont and Bennett, 1993). The only native salmonids are westslope cutthroat trout (*Oncorhynchus clarki lewisi*), bull trout (*Salvelinus confluentus)*, pygmy whitefish (*Prosopium coulteri)*, and mountain whitefish (*Prosopium williamsoni)* (Tetra Tech, Inc., 2007; IDFG, 2013d).

Table 3-3 Fish Species Occurring in the Upper Pend Oreille Subbasin

Common Name	Scientific Name	Location	Abundance
Native Species			
Largescale sucker	*Catostomus catastomus*	Lake, River, Trib.	C/U
Longnose sucker	*Catostomus macrocheilus*	Lake, River, Trib.	C/U
Slimy sculpin	*Cottus cognatus*	Lake, River, Trib.	C/U
Torrent sculpin	*Cottus rhotheus*	Lake, River, Trib.	C/U
Peamouth	*Mylocheilus caurinus*	Lake, River	C/U
Westslope cutthroat trout	*Oncorhynchus clarki lewisi*	Lake, River, Trib.	C/S
Pygmy whitefish	*Prosopium coulteri*	Lake	U/U
Mountain whitefish	*Prosopium williamsoni*	Lake, River, Trib.	C/S-D
Northern pike minnow	*Ptychocheilus oregoninsis*	Lake, River	A/S
Longnose dace	*Rhinichthys cataractae*	Lake, River, Trib.	C/U
Redside shiner	*Richardsonius balteatus*	Lake, River, Trib.	C/U
Bull trout	*Salvelinus confluentus*	Lake, River, Trib.	A/S-I

Table 3-3 Fish Species Occurring in the Upper Pend Oreille Subbasin

Common Name	Scientific Name	Location	Abundance
Exotic/Introduced Species			
Black bullhead	*Ameiurus melas*	Lake, River	U
Brown bullhead	*Ameiurus nebulosis*	Lake, River	C/S
Lake whitefish	*Coregonus clupeaformus*	Lake	A/S
Northern pike	*Esox lucius*	Lake, River	C/I
Tiger muskie	*Esox lucius x Esox masquinogy*	Lake, River	O/D
Channel catfish	*Ictalurus punctatus*	Lake, River	O/D
Pumpkinseed	*Lepomis gibbosus*	Lake	C/S
Bluegill	*Lepomis macrochirus*	Lake	O/I
Burbot	*Lota lota*	Lake, River	O/D
Smallmouth bass	*Micropterus dolomieui*	Lake, River	C/I
Largemouth bass	*Micropterus salmoides*	Lake, River	C/S-D
Rainbow trout	*Oncorhynchus mykiss*	Lake, River	A/S
Kokanee salmon	*Oncorhynchus nerka*	Lake, River	C/I
Yellow perch	*Perca flavescens*	Lake, River	A/S
Crappie	*Pomoxis* spp.	Lake, River	C/S
Lake trout	*Salvelinus namaycush*	Lake	C/D
Brook trout	*Salvelinus fontinalis*	Trib.	C/I
Brown trout	*Salmo trutta*	Lake, River, Trib.	C/S
Walleye	*Sander vitreus*	Lake, River	O/I
Tench	*Tinca tinca*	Lake, River	C/I

Notes:
Trib. = The Clark Fork River is the largest tributary to Lake Pend Oreille. It drains the Clark Fork Riverwatershed, an area of approximately 59,324 square kilometers (Lee and Lunetta, 1990). The river contributes approximately 92 percent of the annual inflow to the lake (Frenzel, 1991) and most of the annual suspended sediment load. Tributaries to the Clark Fork below Cabinet Gorge Dam include Lightning Creek, Twin Creek, Mosquito Creek, and Johnson Creek. Pack River is the second largest tributary to the lake and is fed by a number of significant tributary watersheds, including Grouse Creek.

A = Abundant
C = Common
D = Declining
I = Increasing
O = Occasional
S = Stable
U = Unknown

Source: IDFG, 2013e table modified from table found in Entz and Maroney, 2001 (adjusted based on pers. comm. with C. Corsi/IDFG, 2013).

According to IDFG, spawning runs of mountain whitefish historically supported a significant commercial fishery on the lake for many years and accounts of spawning cutthroat and bull trout were common throughout Clark Fork tributaries until the early 1900s (IDFG, 2013f). Historical land use and management of Lake Pend Oreille and the Clark Fork River drastically altered its condition resulting in lasting impacts to bull trout habitat. Some of these include increased sediment in streams, increased peak flows, hydrologic and thermal modifications, loss of instream woody debris, compromised channel stability, and increased accessibility for anglers and poachers (DEQ, 2007). Timber harvest, mining, agriculture, and dams have contributed to altering the Pend Oreille basin and shifted fish types and abundance. The construction and operation of three dams (Thompson Falls, Cabinet Gorge, and Noxon Rapids) on the lower Clark Fork River have reduced water quality. An additional dam (Albeni Falls) manages releases from Lake Pend Oreille and during the summer months holds the lake level at full pool elevation. In the fall, water levels on the lake are drawn down as Albeni Falls releases water for flood control and system operation (Martin et al., 1988). Altered hydrologic function of the system has eliminated, degraded, or minimized shoreline and riverine fish habitat historically available to native salmonids in the Upper Pend Oreille River, the lower Clark Fork River, the delta, and Lake Pend Oreille.

The Clark Fork River delta has shifted from historical conditions as a result of water management strategies over the last century. Previously a braided riverine/***lotic*** system with densely vegetated and forested islands, the area transitions from exposed and eroded shorelines (that are sparsely vegetated) during the winter months, to an inundated ***lentic*** system with limited riverine or delta features in the summer (IDFG, 2013a). A shift in vegetation from forested islands to banks dominated by reed canarygrass has limited cover and thermal refugia available for fish. Sediment transport via the Clark Fork River and its tributaries has been reduced and limited recruitment of large woody debris occurs. Any wood transported into the delta through spring flushing flows is conveyed through booms to the log yard (Area 11) and disposed of through periodic burning. The condition in the delta is characterized by decreased water velocities, warmer temperatures, reduced cover, and habitat that are more conducive to nonnative species. Today, warmwater species in Lake Pend Oreille tend to be more prevalent in the nearshore areas that occur along the fringes of the lake and within the delta. Coldwater species such as trout and whitefish that historically may have found refuge in a lotic delta system now tend to occupy the deeper waters of the main lake. Those species that migrate through the delta, such as bull trout, now experience more aggressive and efficient predators and have less available refugia for avoidance.

Although bull trout and westslope cutthroat trout can be found in most of the lower Clark Fork River tributaries, declines in distribution and abundance of these species have been observed (USFWS, 2003). Bull trout are listed as threatened under the ESA (16 USC 1531 et seq.). Westslope cutthroat trout are listed as a state sensitive species with a rank of S3 (see Table 3-4) and are classified as a sensitive species by BLM (BLM, 2013). Kokanee salmon are listed as a state sensitive species with a rank of S3. All three of these species are described in detail in the following text. Table 3-4 presents state-listed aquatic animal species in Bonner County.

Columbia River Bull Trout. BPA prepared a biological assessment (BA) to evaluate the impacts of the project on bull trout (and other federally listed species) (IDFG, 2013a). The BA provides detailed information on the listing, status, and life history of bull trout in the lower Clark Fork River Subbasin and is incorporated by reference into this EA (IDFG, 2013a).

Table 3-4 Federal and State Listed Aquatic Animal Species that Occur in Bonner County

Common Name	Scientific Name	State Status	Federal Status	Known to Occur Within the Delta
Fish				
Kokanee	*Oncorhynchus nerka*	S3		Yes
Westslope cutthroat trout	*Oncorhynchus clarki lewisi*	S3		Yes
Bull trout	*Salvelinus confluentus*	S3	Threatened	Yes
Bivalves				
Western pearlshell	*Margaritifera falcate*	S3		Yes

Notes:

S1 = Critically imperiled: at high risk because of extreme rarity (often 5 or fewer occurrences), rapidly declining numbers, or other factors that make it particularly vulnerable to range-wide extinction or extirpation.

S2 = Imperiled: at risk because of restricted range, few populations (often 20 or fewer), rapidly declining numbers, or other factors that make it vulnerable to range-wide extinction or extirpation.

S3 = Vulnerable: at risk because of restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors that make it vulnerable to range-wide extinction or extirpation.

Threatened = Any plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which have been listed as threatened by the USFWS or the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service.

Columbia River bull trout were listed as threatened by the USFWS in 1998 (64 Federal Register [FR] 58909). One of the remaining core areas of bull trout distribution is the lower Clark Fork River in northern Idaho. To address this listing, the USFWS released a draft Bull Trout Recovery Plan in accordance with Section 4 of the ESA (USFWS, 2002). Each state within the historic range of bull trout has designated core areas, ***critical habitat*** units, and management directives. The Clark Fork River Recovery Unit (63 FR 31647) is one of 22 recovery units designated for bull trout critical habitat in the Columbia River basin. In addition, the Clark Fork Recovery Unit is the largest and one of the most diverse recovery units in the species' range, encompassing four recovery subunits (Upper Clark Fork, Lower Clark Fork, Flathead, and Priest) and including 38 existing core areas and about 150 currently identified local populations.

Bull trout are distributed throughout most of the large rivers and associated tributary systems within the Clark Fork River Recovery Unit. The Clark Fork and proximate tributaries provide migratory, foraging, rearing, and overwintering habitat for bull trout. Juveniles and adults may be present in the delta year-round, although most bull trout seek thermal refugia from high summer temperatures in nearby tributaries or the lake.

Bull trout can exhibit resident, fluvial (migrate between streams and larger rivers), or adfluvial (migrate between streams and lakes) life history strategies. Studies demonstrate bull trout in the Lake Pend Oreille system to be almost exclusively adfluvial (Panhandle Bull Trout Technical Advisory Team [PBTTAT], 1998). Channel stability, substrate composition, cover, water temperature, and migratory corridors are important for adult movements and for young bull trout rearing (Rieman and McIntyre, 1993). Deep pools with abundant cover (larger substrate, woody debris, and undercut banks) and water temperatures below 59°F are important habitat components for stream-resident bull trout in the Clark Fork River (Goetz, 1989). Watersheds generally must have these specific habitat characteristics for bull trout to successfully spawn and rear.

The lower Clark Fork River and the delta area are considered primarily a passage corridor for migratory bull trout. Bull trout in and around Lake Pend Oreille typically begin migrating into some of the larger tributaries in March and April, with an additional fall migration into the Clark Fork River and other tributaries occurring in August and September (Pratt and Huston, 1993; PBTTAT, 1998). Tagging efforts in the lower Clark Fork River demonstrate that adult bull trout migration (from Lake Pend Oreille to tributaries) occurs in late-September and October (Avista, 2001). Although some bull trout were found to enter the Clark Fork River from Lake Pend Oreille as early as January, most did not move into the river until at least April (Avista, 2002). Adult bull trout migrate primarily from dusk until dawn (McPhail and Murray, 1979; Swanberg, 1997; Downs et al., 2006). Juvenile (primarily 3- and 4-year class fish) out migration tends to occur during periods of increased flow.

Within the Clark Fork Recovery Unit, the historical distribution of bull trout is relatively intact, with some notable exceptions in the headwaters. While bull trout abundance has been reduced in northern Idaho and some remaining populations are highly fragmented, recent population estimates and redd count data show a stable or increasing population of bull trout in the Idaho portion of Lake Pend Oreille and Clark Fork subbasins (Ryan and Jakubowski, 2013). The lower Clark Fork River is one of the last remaining core areas of bull trout distribution in Northern Idaho and is designated as critical habitat for the species.

Westslope Cutthroat Trout. Westslope cutthroat trout are listed as a sensitive species by the BLM. The species is largely dependent on high-quality habitat for survival, including cold water, numerous deep pools, and stream beds that are relatively free of sediment (Quigley and Arbelbide, 1997). The most robust populations of westslope cutthroat trout occur in watersheds less influenced by roads or land management practices. Stocked nonnative species of cutthroat and rainbow trout can adversely affect westslope cutthroat trout through ***hybridization***. Migratory populations of this species are affected by the loss of viable habitat (Quigley and Arbelbide, 1997). Throughout much of its range, the westslope cutthroat trout has been replaced by the brook trout in small headwater streams. In streams where both species coexist, the cutthroat trout predominates in higher gradient ***reaches*** with higher water velocities (Griffith, 1988; as cited in Behnke, 1992).

Westslope cutthroat trout evolved to spawn in flowing waters that circulate dissolved oxygen through the ***redd***. Embryos need the most oxygen when their development is most rapid, which occurs just before hatching at a time of rising water temperatures. Most rivers during the spring have supersaturated levels of dissolved oxygen, which is more than adequate for developing trout eggs. The crucial figure, however, is oxygen concentration at the surface of the developing eggs, which depends on the permeability of the redd. When gravels become clogged by fine sediment, water flow through the redd is impeded and less dissolved oxygen reaches the embryos. Sediment accumulation in redds limits reproductive success in watersheds characterized by accelerated erosion (Behnke, 1992).

Distribution of cutthroat spawning areas is not well understood in the area (Pratt, 1996; DEQ, 2007). Pure strains of westslope cutthroat likely continue to exist throughout the basin, in headwater areas located above natural migration barriers such as Char Falls, Wellington Creek Falls, Rattle Creek Falls, and Johnson Creek Falls. Mature cutthroat trout are known to use the mainstem of the Clark Fork River (primarily as a migratory corridor), preferring areas with gravel substrates (Pratt, 1996). Overall, throughout the subbasin, the decline in cutthroat populations has been attributed to a legacy of road construction and timber harvest that impact stream stability and habitat; in Lake Pend Oreille, however, recent population estimates indicate that westslope cutthroat appear to be stable or increasing (Ryan and Jakubowski, 2013).

Kokanee. Kokanee are the resident form of sockeye salmon and occupy lakes throughout the Pacific Northwest. They feed on zooplankton and aquatic insect larvae and have a similar life history to sockeye, except that the adults stay in freshwater instead of migrating to the ocean. They may reach a length of 15 inches at maturity and spawn in smaller tributaries throughout the drainages they inhabit. They require cool clear water and connectivity of riverine and lake systems. Once redds have been developed, eggs remain in the gravel for up to 9 weeks and young may remain in the gravel for up to 3 weeks more. Today, kokanee are stocked in many areas and rear on natural food available in those watersheds. Many of the kokanee populations in Idaho have become self-sustaining (Wydoski and Whitney, 1979).

Kokanee dispersed into Lake Pend Oreille from Flathead Lake in Montana during the high winter flood of 1933. They quickly established a viable fishery and became a key prey item for bull trout. The kokanee population remained robust until the 1960s. Declines since that time have been attributed to growing populations of introduced predatory fish in the lake (Wahl et al., 2011; Maiolie and Elam, 1993; Paragamian and Ellis, 1994). Spawning habitat quality appears adequate to sustain the population, and periodic lake drawdowns allow wave action to redistribute substrates and replenish spawning gravels (Wahl et al., 2011).

Western pearlshell. The western pearlshell (*Margaritifera falcata*) has been documented widely in western North America. It ranges from Alaska and British Columbia south to California and east to Nevada, Wyoming, Utah, and Montana (IDFG, Undated). The western pearlshell has a black, elongate, and moderately thick shell (Henderson, 1929; Clarke, 1981, as cited in The Xerces Society for Invertebrate Conservation, Undated). This species inhabits cold creeks and rivers with clean water and sea-run salmon or native trout. Documented host fishes for western pearlshell include cutthroat trout, rainbow/steelhead trout, Chinook salmon, and bull trout. Freshwater mussels, including the western pearlshell, filter suspended solids, nutrients, and contaminants from the water column and collectively improve water quality by reducing turbidity and controlling nutrient levels.

Like other freshwater mussels in North America, threats to western pearlshell include impoundments and loss of host fish, channel modification from channelization, dredging and mining, restoration activities, water quality degradation, water diversions, livestock grazing in riparian areas, and the introduction of nonnative fish and invertebrate species.

Distribution of western pearlshell is not well known in the Clark Fork River drainage. The species was documented in Derr Creek in 2011 (approximately 5 river miles upstream of its confluence with the delta [IDFG, 2011]). Based on the habitat requirements of western pearlshell, it is unlikely they would occur in the project area.

Nonnative Species. Lake Pend Oreille supports a wide variety of introduced species, many of which have been stocked in the lake over the last century (IDFG, 2013e). The first known species stocked in the system was Lake Superior whitefish *(Coregonus clupeaformus)*. These were followed by lake trout *(Salvelinus namaycush)*, Kamloops rainbow trout *(Oncorhynchus mykiss),* and Arctic grayling *(Thymallus arcticus)*. Mysis shrimp (*Mysis relicta*) were also stocked in Lake Pend Oreille in an effort to enhance the kokanee population. Many of the warmwater species, in addition to brook trout (*Salvelinus fontinalus),* which have been known to compete and hybridize with bull trout, were stocked in the 1900s.

More recently, walleye *(Sander vitreus)* have been reported in Lake Pend Oreille, likely colonizing from reservoirs in Montana (IDFG, 2013f). The altered hydrology of the delta has created favorable habitat for smallmouth bass *(Micropterus dolomieui)*. Smallmouth bass and walleye are highly predaceous and growing populations could pose a threat to native populations of westslope cutthroat and bull trout because of their use of the delta as a migratory corridor. Lake trout are in steep decline as a result of an aggressive and ongoing lake trout suppression project managed by IDFG and aimed at reducing predation and other impacts on bull trout kokanee, cutthroat trout and rainbow trout (Donald and Alger 1993). The rainbow trout population is stable (Ryan and Jakubowski, 2013).

3.5.1.2 Wildlife

Lake Pend Oreille has historically been an important waterfowl migration and wintering area (Martin et al., 1988). Twenty-three species of waterfowl have been recorded for the area, most notable among these are the large concentrations of redhead ducks (*Aythya americana)* and canvasbacks *(Aythya valisineria)* (USACE, 1981). The shallow water areas of the delta produced waterfowl food plants, both emergent and submerged (USFWS, 1960; as cited in IDFG, 2013a). Mallards (*Anas platyrhynchos)*, common goldeneyes (*Bucephala* spp.*)*, and wood ducks (*Aix sponsa)* were the principal nesting species, but other species such as the Canada goose *(Branta americana)*, green-winged (*A. crecca),* cinnamon teal (*A. cyanoptera)*, and American wigeon (*Anas americana)* probably also nested in the area (USFWS, 1953; USACE, 1981).

Fall drawdown of the reservoir drains many areas that provide food for waterfowl, with a corresponding reduction in waterfowl use of the area in late fall and winter (USFWS, 1960; as cited in IDFG, 2013a). The drawdown areas are largely mudflats from December through April (USFWS, 1960; as cited in IDFG, 2013a). The anticipated new growth of vegetation along the lake shoreline had not established by 1960 and, as a result, waterfowl production in the Lake Pend Oreille area has been reduced from pre-Albeni Falls Dam levels. Brood counts in 1949, 1958, and 1960 indicated a 50 percent drop in duck production (USFWS, 1960; as cited in IDFG, 2013a).

Still, a variety of mammals, birds, amphibians, and reptiles use the delta during part or all of the year. Mammals include: (1) large mammals such as moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus leucurus*), black bear (*Ursus americanus*), and elk (*Cervus elaphus*); (2) furbearers such as beaver *(Castor Canadensis)*, long-tailed weasel (*Mustela frenata)*, muskrat (*Ondatra zibethicus)*, raccoon (*Procyon lotor),* coyote (*Canis latrans)*, and bobcat *(Lynx rufus)*; and (3) small rodents such as deer mouse (*Peromyscus maniculatus),* voles (*Microtus* spp.), shrews (*Sorex* spp.), and chipmunks (*Tamias* spp.). Beaver and muskrat populations are not robust because their denning areas become exposed during winter drawdown. Resident elk and white-tailed deer can regularly be found in the delta at all times of the year. Certain small mammals would be restricted to areas where burrows can be constructed. Marmots *(Marmota flaviventris)* have established a colony on the breakwater near Area 11 and cormorants (*Phalacrocorax auritus)* are using the pylons erected to build log booms near Area 11.

Birds are the most common type of wildlife in the delta. The delta is used by a variety of avian species including raptors, great blue heron (*Ardea herodias*), transient shorebirds, neo-tropical migrants, and a variety of land birds dependent upon riparian habitats (IDFG, 2013a). Ruffed grouse (*Bonasa umbellus)* and blue grouse (*Dendragapus obscurus)* are game birds that may use the drier portions and edges of the Clark Fork River Delta Restoration Project area. Perching birds such as blackbirds (*Euphagus cyanocephalus)* and marsh wren (*Cistothorus palustris*) nest in the deciduous riparian habitats around the delta.

The shallow wetland and shoreline areas provide important waterfowl habitat, particularly for nesting waterfowl. Species that may use this habitat for nesting include mallards, American wigeon, teal, coots (*Fulica americana*), pied-billed grebe (*Podilymbus podiceps*), and Canada geese. Shorebirds such as the spotted sandpiper (*Actitis macularius*) and the American Avocet (*Recurvirostra americana*) also nest in the area. The delta provides sites for breeding, wintering, and migrating (IDFG, 2013a). During spring and fall migrations, the delta supports thousands of waterfowl and common loons (*Gavia immer*). These waterfowl species include tundra swans (*Cygnus columbianus)*, Canada geese, redhead ducks, lesser scaups *(Aythya affinis)*, common goldeneyes, common mergansers (*Mergus merganser),* and mallards (Table 3-5). Ring-necked ducks (*Aythya collaris)* and American wigeon prefer the smaller wetland and beaver ponds, and likely breed throughout and on the delta areas. Both species occur in medium to large flocks in riverine and lake habitats during migration and winter. The breeding season for waterfowl, as well as for the migratory species described below, occurs during the spring and summer (March to August), and typically peaks in June.

In addition to the large number of migratory waterfowl that occur in the area, many other migrants have been recorded in the delta, including ***neotropical or obligate*** and ***facultative*** species. During mild winters, small numbers of the obligates may actually winter in Idaho. Migrants that have been documented as occurring in the project area include sparrows, swallows, blackbirds, horned lark (*Eremophilia alpestris)*, gray catbird (*Dumetella carolinensis)*, belted kingfisher (*Ceryle alcyon)*, double crested cormorant (*Phalacrocorax auritus)*, American pipit (*Anthus rubescens)*, Western sandpiper (*Calidris mauri)*, semipalmated plover (*Charadrius semipalmatus)*, black-necked stilt (*Himantopus mexicanus)*, and American robin (*Turdus migratorius).* Birds of prey are also common, including large nesting concentrations of osprey (*Pandion haliaetus*) (USACE, 1983). Bald eagles (*Haliaeetus leucocephalus*) winter in large numbers around the lake and there is one active breeding pair that nested on BLM lands in Area 7 in 2013 (Cousins, pers. comm., 2013). Northern harrier (*Circus cyaneus*) forage extensively in the marshes of the delta.

Habitat. Seven wildlife habitat types have been identified in the Clark Fork River Delta Restoration Project area. They include palustrine emergent marsh, shrub/scrub wetlands, palustrine forested wetlands, shrub and forested riparian, shallow water, and upland herbaceous. Most of the habitats with the exception of the forested and shrub-scrub wetland habitats are dominated by invasive species such reed canarygrass, tansy, flowering rush, and thistle. The invasive species have changed the quality of the habitat by displacing forage species and eliminating plant species diversity.

Table 3-5 Waterfowl Species in the Clark Fork River Delta, Lake Pend Oreille, and Pack River Delta[a]

Waterfowl Species		Mid-winter Surveys (all conducted January 3 to 10)			
Common Name	**Scientific Name**	**1998**	**1999**	**2003**	**2006**
Canada goose	*Branta canadensis*	310	1,060	1,345	512
Tundra swan	*Cygnus columbianus*	73	127	126	242
Wood duck[b]	***Aix sponsa***				
Gadwall	*Anas strepera*		50	200	
American wigeon	***Anas americana***	500	100	3,360	445
Mallard duck	***Anas platyrhynchos***	350	450	810	436
Canvasback	***Aythya valisineria***		35		
Redhead duck	***Aythya americana***	6,750	31,025	24,320	14,968
Ring-necked duck	***Aythya collaris***	50	270	700	
Scaup	*Aythya* spp.	1,520	10,520	1,390	2,400
Bufflehead	*Bucephala albeola*	20	50	217	115
Goldeneye	*Bucephala* spp.	150	65	369	121
Mergansers	*Mergus* spp.	350	247	935	897

Notes:

[a] Source: IDFG, 2013f.

[b] IDFG ***Priority Species*** in bold.

Federal Species. Three wildlife species protected under the ESA potentially occur in the vicinity of the project area; however, no critical habitat for these species is designated in or near the project area (IDFG, 2013a; USFWS, 2013).

Grizzly Bear (*Ursus arctos horribilis*)—*Endangered.* The proposed project area is adjacent to, but not within, the Cabinet-Yaak grizzly bear recovery zone where grizzly bears are present. The project area also is in proximity to the Selkirk grizzly bear recovery zone. No sightings of grizzly bears have been reported in recent times for the Clark Fork River delta. There are confirmed sightings of grizzly bears within 15 miles of the project area, and Montana has relocated a number of grizzly bears from the Northern Continental Divide subpopulation to the Spar Lake (less than 20 miles from the delta) and other areas in the Cabinet-Yaak recovery zone within the past 10 years. In the late 1990s, an adult female and two cubs were sighted at the lower reaches of Trout Creek in consecutive years. These sightings were unconfirmed (no tracks or scat were found). More recently (2007), Montana relocated an adult female and two cubs away from the nearby town of Noxon, Montana. Other sightings of grizzly bears were reported on Eagen Mountain and occasionally on the upper reaches of Rapid Lightning Creek. The latter sightings were in the spring, and no sightings have been reported within the past 9 years in those areas (IDFG, 2013a). In late 2013, a mature female bear wearing a global positioning system (GPS) collar was observed moving from Montana to Idaho, into the nearby upper reaches of the North

Fork of the Coeur d'Alene River subbasin. The Clark Fork River delta area is potentially an important linkage zone for grizzly bears and to the species for colonizing historic range.

Canada Lynx (*Lynx canadensis*)—*Threatened*. No records of lynx sightings are known for the delta area. There is only one unverifiable record of a lynx sighting in 1998 (Idaho Animal Conservation Database Observation 135488). Canada lynx demonstrate an affinity for high alpine forests that accumulate heavy snowpack over the winter. In the Intermountain West, they prefer spruce (*Picea* spp.)-subalpine fir (*Abies lasiocarpa*) and lodgepole pine (*Pinus contorta*) forests (Maser et al., 1981). Lynx are associated with dense forests at elevations above 3,937 feet, and they also use areas bordering dense forests (Koehler and Brittell, 1990). Because their populations are closely tied to snowshoe hare numbers, lynx can also be found in second growth forests when hares are numerous (DeVos and Matel, 1952). Numerous sightings have been recorded for the species throughout Northern Idaho, but no records exist for the Clark Fork River or delta area. Lynx may occur near the project area, but this is unlikely because of the presence of human activity and inadequate wildlife habitat cover for the species and its prey.

Wolverine (*Gulo gulo luscus)*—*Candidate*. In Idaho, the wolverine commonly travels downstream along small streams in winter. They also travel through riparian areas, meadows and timber stands (Bachman et al., 1990; as cited in IDFG, 2013a). As a consequence of this behavior, the species has been sighted near the Clark Fork River and it is possible that the species might disperse or travel through the project area. At most, this area might be used as a travel corridor between mountain ranges, or as dispersal habitat for young males or adult males in search of females. Use of the project area by wolverines, other than as transients, is not expected, and any use would be temporary.

State-Sensitive Species. A number of state-sensitive wildlife species listed for Bonner County have been reported within or near the area (IDFG, 2013b). The sensitive species are shown in Table 3-6 along with the state status, federal status, and BLM status of each species. A North American wolverine was observed to the south of the project area (approximately 3 miles). As discussed in previous text, this federal Candidate Species (S2 State Rank) travels long distances. Therefore, even though habitat is not expected to support resident or denning wolverines, they might move through the project area.

3.5.2 Environmental Consequences – Action Alternative

3.5.2.1 Fish

Although the proposed project activities are designed to improve aquatic habitat conditions for salmonids over the long term, short-term adverse effects to fish and other aquatic organisms may occur because of construction activities. The elevation for the lake would remain at 2051 feet over two winters so that project activities could occur. Recent research indicates maintaining the lake level at 2051 feet would not negatively impact kokanee. Historically, IDFG recommended maintaining the lake at 2055 feet to increase kokanee spawning habitat; however, a recent IDFG/University of Idaho study found that lake level does not provide the same benefit as predator control of lake trout does (Whitlock, 2013). Thus, the lake level needed to complete the project would not negatively impact kokanee.

Table 3-6 Sensitive Species Listed for Bonner County that Have Been Reported in or Near the Project Area

Scientific Name	Common Name	State Status	Federal Status	BLM Status	Known to Occur Within the Project Area
Actitis macularia	Spotted sandpiper	S3B, S4N			Yes
Aechmophorus occidentalis	Western grebe	S3B, S4N			Yes
Anas platyrhynchos	Mallard	S3B, S4N			Yes
Ardea herodius	Great blue heron	S5B, S5N			Yes
Aythya americana	Redhead duck	S2B			Yes
Branta canadensis	Canada Goose	S2B			Yes
Bucephala clangula	Common goldeneye	S2B			
Corynorhinus townsendii	Townsend's big-eared bat	S3		Type 3	Yes
Gavia immer	Common loon	S1B, S2N			Yes
Haliaeetus leucocephalus	Bald eagle	S3B, S4N			Yes
Histrionicus histrionicus	Harlequin duck	S1B		Type 4	Yes
Laridae	Gulls	S3B, S4N			Yes
Lynx canadensis	Lynx	S1	LT		Yes
Margaritifera falcata	Western pearlshell	S3B, S4N			Yes
Myotis lucifugus	Little brown bat	S5			Yes
Myotis volans	Long-legged myotis	S3?			Yes
Myotis yumanensis	Yuma myotis	S3?			Yes
Pandion haliaetus	Osprey	S5B			Yes

Notes:

State Ranking Codes:

S1 = Critically imperiled: at high risk because of extreme rarity (often 5 or fewer occurrences), rapidly declining numbers, or other factors that make it particularly vulnerable to range-wide extinction or extirpation.

S2 = Imperiled: at risk because of restricted range, few populations (often 20 or fewer), rapidly declining numbers, or other factors that make it vulnerable to range-wide extinction or extirpation.

S3 = Vulnerable: at moderate risk because of restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors that make it vulnerable to range-wide extinction or extirpation.

S4 = Apparently secure: uncommon but not rare; some cause for long-term concern because of declines or other factors.

S5 = Secure: common, widespread, and abundant.

Table 3-6 Sensitive Species Listed for Bonner County that Have Been Reported in or Near the Project Area

Notes (Continued):
State Designation Modifiers:
B = Breeding: conservation status refers to the breeding population of the species.
N = Non-breeding: conservation status refers to the non–breeding population of the species.
? = Inexact or uncertain: denotes inexact or uncertain numeric rank.
Federal Designation:
LT = Listed threatened
BLM Designation:
Type 3 = regional/state imperiled species
Type 4 = Idaho peripheral species

No blasting would occur as a result of the project, and any required pile driving would occur in dewatered areas or the sound levels would be dampened with a wood block or bubble curtain to minimize sound impacts.

Bull trout and other native and nonnative fish are known to occur in the project area at multiple life stages (PBTTAT, 1998; IDFG, 2013a). Construction activities are anticipated to begin in June and extend through April. The schedule for major earthwork would coincide with the period the water surface elevation in the delta would be at its lowest and bull trout, as well as westslope cutthroat trout, are unlikely to be in the area. No spawning of kokanee, bull trout, or westslope cutthroat trout is known to occur in the action area and would, therefore, not be anticipated to be affected as a result of construction activities.

The potential for effects to fish associated with the project would be primarily related to Erosion Control and Restoration measures that involve in-water work. These are described primarily in delta shoreline measures.

The Clark Fork River Delta Restoration Project BA describes the anticipated effects to primary constituent elements (PCEs) for bull trout from the project (IDFG, 2013a). The PCEs for bull trout include habitat complexity, migratory corridors, forage base, water temperature, water quality, water quantity, and nonnative species. The effects of the project would not reduce, retard, or impair any of the PCEs for bull trout and would likely improve many of them over the long term. Overall, the project should improve many PCEs, including habitat complexity and water quality.

3.5.2.1.1 Erosion Control and Restoration Measures

Noise, delivery of sediment into the water, and introduction of invasive species all have the potential to occur under construction activities associated with erosion control and restoration measures. Although some temporary adverse affects are likely to occur as a result of construction activities, in general these measures would be beneficial to native fish over the long term.

Delta Shorelines. Pile-driving activity would occur in association with stabilizing delta shorelines. The pile-driving activities of the project would generate underwater noise. Sound waves generated by percussive pile driving can affect fish in several ways (for example, altered behavior, physical injury, or mortality). These effects depend on the intensity and characteristics of the sound; the duration; the distance and location of fish in the water column relative to the sound source; the size and mass of the fish; and the fish's anatomical characteristics (Yelverton et al., 1975). Larger fish, such as adult salmonids, would be less affected by underwater noise disturbance than smaller fish. Listed bull trout that may be in the area during construction would likely be adults and would be greater than 2 grams in weight, further reducing potential impacts to listed species (ICF Jones & Stokes and Illingworth and Rodkin, Inc., 2009). In addition, bull trout in the area would not be stationary, especially during pile driving, and would be expected to avoid construction noise, further minimizing and reducing any potential effects. A wood block or bubble curtain would be installed (prior to the driving of piles) to further reduce the effects on fish of noise and vibration associated with pile-driving activities. With the mitigation measures (listed in Table 2-2) in place, impacts to bull trout and other fish from noise and vibration associated with pile driving would be low.

Use of construction equipment has the potential to introduce invasive species into the aquatic environment if not mitigated or managed appropriately. The introduction of invasive aquatic species into freshwater systems like the Pend Oreille River and Lake Pend Oreille can lead to deleterious effects to the aquatic ecosystem. Plant species such as Eurasian watermilfoil (*Myriophyllum spicatum*) and European water chestnut (*Trapa natans*) are examples of nonnative aquatic plants that have spread widely into palustrine systems throughout the United States. These plants outcompete native aquatic plants and can greatly accelerate ***eutrophication***. They can also choke the water body and impact aquatic plants and animals. Once nonnative shellfish (like the zebra and quagga mussels) are introduced, they proliferate rapidly and overtake water bodies, displacing native species and disrupting the food chain. There are no known reports of these mussels in the state of Idaho (Idaho State Department of Agriculture, 2012), but construction vessels transported to the project area represent potential vectors for the introduction of invasive aquatic species to the Pend Oreille River and Lake Pend Oreille. The introduction of invasive species to this system could lead to ecosystem changes that might have deleterious effects on bull trout and their habitat. However, introductions are avoidable by implementing mitigation measures such as cleaning of equipment. Mitigation measures (listed in Table 2-2) would make it unlikely that project activities would result in the introduction of invasive aquatic species into the Clark Fork River and Lake Pend Oreille because construction vessels would be washed and inspected prior to arrival in the project area. No effects related to the introduction of aquatic invasive species would be anticipated to occur under the project.

Increased levels of sediment, which could occur during delta shoreline measures, can have adverse effects on salmonids and their habitat, as well as on other aquatic species in the area. Rearing habitats can be filled with deposited sediment and interstitial spaces between cobbles (which are important winter rearing habitats) can become degraded or lost (Kelsey et al., 1981). Deposition of sediment in the same manner over recently spawned redds can also cause mortality of fertilized eggs or embryos still in the substrate. Turbidity may increase physiological stress, result in physical injury (for example, gill abrasion), and potentially displace rearing juvenile fish (Bisson and Bilby, 1982). Juvenile salmonid avoidance of turbid waters may be one of the most important effects of suspended sediments (DeVore et al., 1980; Birtwell et al., 1984; Scannell, 1988). Although adult and larger juvenile salmonids can better tolerate higher concentrations of suspended sediments, chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Bjornn and Reiser, 1991; Redding et al., 1987; Lloyd, 1987; Servizi and Martens, 1991).

Direct effects that could occur to fish and other aquatic organisms under the project include decreased water quality and incidental ***take*** from construction activity in or near the water. The primary risk to ESA-listed fish and other aquatic species associated with this work is mobilization of sediment, which could result in a short-term decrease in water quality and subsequent indirect effects on fish (for example, displacement) and established redds (for example, clogging of interstitial spaces required to transfer oxygen to developing eggs) until disturbed areas are stabilized and revegetated. Either occurrence could harm fish through behavioral stress or egg failure.

Although not anticipated, the potential for bull trout and westslope cutthroat trout at various life stages to occur in the project area does exist. Application of BMPs and conservation measures would minimize impacts from sediment, but some measure of sediment is still likely to enter the water. Aquatic organisms (including those identified as state and federally sensitive) that are present may, therefore, experience short-term habitat and water quality degradation because of increased turbidity in the project area. Primarily warmwater or introduced species would likely be present in the area. Salmonids such as bull trout, westslope cutthroat trout, and kokanee would not be anticipated to be in the area during construction or to have spawned in areas that may be potentially affected by deposition of sediment as a result of construction. If salmonids such as bull trout are migrating through the area during construction, they would likely experience minimal effects from construction activities and be displaced relatively quickly. Any other aquatic organisms in the project area during construction may also be temporarily disturbed or displaced as a result of noise or other activities associated with construction. Application of BMPs (see Table 2-2) would minimize impacts from sediment, but the physical action of working in the water may still displace individuals. These organisms would, however, be anticipated to return to the project area following cessation of construction activities.

In addition to the direct effects described above, indirect effects to fish and aquatic organisms from the project as a whole might include a shift in habitat to a more channelized system with increased thermal refugia and large woody debris, cover, and complexity, which is favorable to species like bull trout. This transition in ecosystem function could displace some warmwater species and reduce spawning habitat available for these species. In turn, predation on juvenile bull trout and kokanee by such species would likely be reduced in the delta.

Although the proposed project has the potential to adversely affect Columbia River bull trout, westslope cutthroat trout, or other valued fish resources in the delta and potentially modify bull trout critical habitat over the short term, in the long-term, the project would benefit the delta and native fisheries as a whole.

Existing Islands. Similar construction activities and in-water work would be implemented to address project elements associated with stabilizing existing islands. As a result, the impacts would be similar to those described above for delta shorelines.

3.5.2.1.2 Restore and Enhance Edge and Interior Areas

Raise Islands. Construction activities to raise islands would occur primarily in the dry (2047.9-foot lake level), as described in Section 2.1.4, *Construction Sequencing*. Although some risk of sediment releases into waters might occur, these would be mitigated through the implementation of BMPs (see Table 2-2) and would reduce impacts to fish. There is limited risk of effects to fish related to noise and invasive species, although these impacts would be less than those described above for delta shorelines.

Enhance Wetland Habitat Diversity. Some construction activities similar to those used to stabilize delta shorelines would be implemented to enhance wetland habitat. As a result, the impacts would be similar to those described above for delta shorelines.

3.5.2.2 Wildlife

There would be temporary and permanent effects on wildlife resulting from implementation of the project. Disturbances would be direct or indirect, depending on the timing and location of the impact.

There would likely be no impacts to ESA-listed wildlife (lynx, grizzly bear, and wolverine) because they are infrequent visitors to the delta and would not be expected to be in the area during construction. No construction would take place near active bald eagle nests. Protection of forested areas would preserve habitat for bats, wood ducks, and numerous migratory birds and cavity-nesting resident birds. Mobilization of equipment would occur during times that migratory birds may be breeding (June through September). Although noise from vehicles has the potential to disturb breeding birds, no construction activities would take place during this time and noise levels from moving vehicles would likely not permanently displace breeding birds from their nest sites. Late summer and winter construction should avoid the breeding season disturbance to Bald Eagles and Osprey. There is one Bald Eagle nest located on the south side of Area 7. This nest was active in 2013. The *Coeur d'Alene Resource Management Plan* addresses Bald Eagles in Action SS 1.1.5 (1) – "Conserve mature riparian forests (i.e., cottonwood galleries) in suitable habitat to maintain their integrity for use by Bald Eagles." Additionally, activities near Bald Eagle nests are addressed in Action SS 1.1.5 3(b) – "Avoid implementing activities within ½ mile of bald eagle nest sites during the breeding season (February 1–July 31)." The implementation of this project is in conformance with Action SS 1.1.5 (1). If the project is not implemented, it is likely that this nest site, as well as potential nest sites elsewhere in Area 7, will erode away. In an effort to avoid disturbance to this Bald Eagle pair, implementation of work near the nest in Area 7 will begin early in the construction period, in hopes that work can be completed before the nesting season begins. If construction cannot be completed prior to February 1, this pair may be disturbed during the implementation phase. Because water levels dictate when and where construction must occur within the project area, disturbance to this pair may be unavoidable. However, every effort will be made to complete construction in this area of the delta prior to February 1. Great blue heron and other sensitive waterfowl would have improved foraging and nesting conditions following construction. Thus, impacts to wildlife, including migratory birds, would be low to moderate depending on when construction would be completed.

3.5.2.2.1 Erosion Control and Restoration Measures

Wildlife use is closely tied to the habitat upon which they depend. Therefore, any changes in habitat distribution or quality, whether beneficial or adverse, are likely to affect wildlife. In general, improvements to existing habitat or creation of new habitat would result in beneficial effects. Conversely, loss of habitat or degradation of existing habitat would result in adverse effects. Exclusion of wildlife from an area during temporary disturbances would usually be a temporary adverse impact.

Delta Shorelines. Direct effects to wildlife would be short term and would include impacts from construction activity including noise, light, and vehicle collisions. Loud noise would startle wildlife in the vicinity of the construction areas. This is more likely to affect avian wildlife flying through or resting in the area and small mammals, amphibians, and reptiles that cannot easily move away. The amphibians, reptiles, and some small mammals would be hibernating or ***brumating*** during the winter construction period and, therefore, would avoid this impact. If construction is conducted during nighttime periods, light may affect the ability of wildlife to sleep or roost, resulting in disturbance or displacement. Wildlife species, particularly those that are ground-based, may be directly impacted through collisions with vehicles. Medium to large mammals, which have the ability to move greater distances, would be expected to vacate the area during the construction period, thereby avoiding most impacts. However, vehicle collisions could still occur with medium and large mammals. Erosion control structures would be constructed in areas that are currently eroding. Therefore, although these effects are permanent, these activities would not result in a loss of occupied wildlife habitat and would result in improved habitat over time.

Existing Islands. The project would also stabilize existing habitat areas to prevent habitat loss from wave erosion. Establishment of woody vegetation as part of the erosion control measures would create additional native shrub and forested nesting and foraging habitat for migratory and other birds, raptors, mammals, amphibians, and reptiles that is not as common in the project area. Reducing the loss of shoreline habitat will also protect existing habitat and slow the current habitat loss from erosion.

3.5.2.2.2 Restore and Enhance Edge and Interior Areas

Raise Islands. In addition to the effects described in Section 3.5.2.2.1, mammals, amphibians, or reptiles hibernating or brumating in areas to be filled or excavated would experience mortality. Because winter construction would be predominately in areas that were flooded during the summer and fall months, it is unlikely that wildlife would be using these areas to hibernate or brumate, so this impact would be low.

Loss of habitat could occur from filling or constructing new habitat. Filling activities are expected to take place in locations that are currently mudflats during drawdown or underwater at full pool—low-value habitat.

In addition, the project is creating year-round habitat in areas that were once submerged The areas would be raised to elevation 2064.5 or 2066.5 feet, compared to the 2062.5-foot full pool water surface elevation. Approximately 169 acres above 2064 feet would be created, increasing available wildlife habitat. Native herbaceous and woody species would be established on the 169 acres. The herbaceous, non-flooded habitat would provide high-quality nesting and foraging habitat for waterfowl (the most common wildlife group) where none currently exists. Non-flooded habitats would also provide areas for small mammals to dig burrows, leading to population increases, which would improve foraging opportunities for raptors and owls and other predators.

Enhance Wetland Habitat Diversity. The project would also stabilize existing habitat areas to prevent habitat loss from wave erosion and remove invasive plants such as reed canarygrass to improve habitat. Prevention of habitat loss and improvement of invasive plant-dominated habitat would maintain and improve nesting and foraging habitat for migratory and other birds, raptors, mammals, amphibians, and reptiles.

3.5.3 Environmental Consequences – No Action

3.5.3.1 Fish and Wildlife

Under the No Action Alternative, BPA would not provide funding for a portion of the project and construction impacts from BPA-funded actions would not occur. Habitat conditions for bull trout and other salmonids, as well as wildlife, in the delta would continue to degrade from erosion. Continued declines in water quality and loss of refugia would also negatively impact bull trout and other salmonids in the project area. Invasive plant species would persist in dominating the herbaceous and shrub plant communities and would provide seed to spread to new locations within and outside the delta. Waterfowl nesting and foraging habitat would remain limited and continue to decline.

3.6 LAND USE AND RECREATION

3.6.1 Affected Environment

The action area for land use and recreation consists of areas within 0.5 mile of the project. The following text highlights land ownership, land use, and land management direction for lands in the action area and provides an overview of recreational use in the study area.

3.6.1.1 Land Ownership

As depicted on Figure 1-2, land ownership in the study area includes the federal government, the state, and private interests. Federally owned lands are managed by the Corps (as part of the Albeni Falls Hydroelectric Project), BLM, and U.S. Forest Service (USFS) (the Idaho Panhandle National Forest). State lands include those managed by IDFG and the Idaho Transportation Department (Idaho 200). Private land is owned by a variety of parties.

The majority of the Pend Oreille Wildlife Management Area (WMA) land was leased to the IDFG by the Corps in 1956 as partial mitigation of impacts associated with the construction of the Albeni Falls Hydroelectric Project. Over time, additional land was leased to IDFG from Corps. WMA lands within the greater delta vicinity consist of 1,728 acres. Currently, some or all of Areas 3/4/9, 6, and 11 are the Corps lands that have been leased to IDFG. IDFG has purchased Area 5 from other parties to increase the size of the WMA. BLM manages federal lands at Area 7. The USFS manages the Idaho Panhandle National Forest, the closest boundary of which is approximately 0.5 mile south of the Clark Fork River. Private land is scattered throughout the action area. The eastern half of Area 6 (Derr Island) is privately owned, as is island land between the Middle and North Forks of the Clark Fork River.

3.6.1.2 Land Use

Several facilities associated with the Albeni Falls Hydroelectric Project are located within the action area. They include the Area 11 woody debris drift yard (the Clark Fork River Drift Yard or log yard) and a series of log booms within the Clark Fork that direct woody debris to the log yard and out of the lake. Conservation is a major land use in the study area—lands devoted to conservation include the Pend Oreille WMA and BLM parcels. Conservation lands also support recreational activities that are described under Section 3.6.1.4, *Recreation*. Several scattered residential areas are located within the study area to the east of the delta islands. Approximately

20 residences on Derr Island are located along the Middle Fork, and approximately 6 residences have been built along the South Fork. These residences are located on private roads. Several residences are also located on White Island and are only accessible by water. Virtually all of the residences on Derr and White Islands have docks or ramps that provide access to the waters of the delta. A private launch and storage area is located on Derr Island. Additional land uses in the study area include grazing and hay production near the log yard and timber harvest. Although timber harvest is allowed (and zoned) by Bonner County on some of the forested hillsides north and south of the study area, recent harvest activity is not readily evident.

3.6.1.3 Land Management

Bonner County. The *Bonner County Comprehensive Plan and Revised Code* directs land use on private lands in Bonner County (Bonner County, 2013). Zoning districts have been assigned to lands in the county, including those located within the project area. The lands where the project would be located are designated Rural 5 (5-acre minimum lot size) and Rural 10 (10-acre lot size). Areas north of Idaho 200 and south of Areas 5 and 6 (and beyond delta islands) have been zoned by Bonner County as Agriculture/Forestry 10 (minimum 10-acre lots) and Agriculture/Forestry 20 (minimum 20-acre lots).

Bureau of Land Management. The *Coeur d'Alene Resource Management Plan* (RMP) and Record of Decision contains goals for the management of resources and lands that fall under the jurisdiction of BLM's Coeur d'Alene Field Office (BLM, 2007a). The RMP includes all BLM lands within Bonner County, including the action area. The RMP does not contain specific directives for the several parcels of BLM-managed land located in the action area, but does provide general Field Office-wide goals and management direction for various resources (see Section 4.11, *Resource Management Plan Conformance*).

Idaho Department of Fish and Game. IDFG manages the Pend Oreille WMA and developed the *Pend Oreille Wildlife Management Area Management Plan* (management plan [IDFG, 1999]). The WMA is managed to protect wildlife habitat and provide public access for hunting, fishing, and other outdoor recreational activities (IDFG, 1999). The IDFG has focused its habitat management efforts at the WMA on waterfowl production and the protection of wetland areas for migrating birds. The management plan directs IDFG to identify locations with erosion problems and explore potential erosion control methods. Management goals that pertain to recreation include providing wildlife-related recreation access, maintaining access facilities, and conducting waterfowl checks in the Clark Fork River delta during the opening weekend of duck hunting season. The management plan also directs IDFG to maintain or improve existing boat access sites and acquire additional sites as funding becomes available.

3.6.1.4 Recreation

The action area serves as a transition between the open-water, large-lake, recreational experiences found at Lake Pend Oreille and the river-oriented recreation found along the Clark Fork River upstream of the delta. Lake Pend Oreille is a major regional recreation resource and provides a multitude of water-oriented recreation opportunities as well as land-based activities on adjacent lands. The section of the Clark Fork River between the delta and the Cabinet Gorge Dam (approximately 9 miles upstream) is composed of a single river channel (and several small islands) that flows through the Clark Fork Valley. This entire section of the river (and the delta) is a no-wake zone and is popular for fishing, kayaking and canoeing (Boating the Inland NW, 2013). The section of the river upstream of the study area can be accessed by nonmotorized boats at the Clark Fork Access Site managed by Avista, and at the Clark Fork Fish Hatchery and launch operated by IDFG. The delta and delta resorts have paved launches from which boats can be launched into the Clark Fork upstream of the delta (Boating the Inland NW, 2013).

The islands, channels, sloughs, beaches, and associated habitat types found in the Clark Fork River delta offer recreational experiences that are different from those found at Lake Pend Oreille and the upstream portion of the Clark Fork. A popular guidebook that features trips for canoes and kayaks (*Paddle Routes of the Inland Northwest*) includes a route through the delta among its list of 50 water routes located in inland Washington, Oregon, Idaho, Montana, and British Columbia (Landers and Hansen, 2008). The book describes a route through the delta (through Area 3) and notes that during low pool conditions (or during periods when the pool is being lowered) watercraft movement along the route can be challenging because of shallow water, exposed mudflats, and the difficulty of finding channel with water deep enough for watercraft to navigate. In addition, shallow-water boating hazards such as stumps and gravel bars are present within the Clark Fork River delta. At full pool, some of the hazards are less visible (or not visible) compared to low pool conditions, when they can be more easily seen.

Public access to the waters of the delta is possible from several nearby locations, although two (the Clark Fork River access area facility and the Johnson Creek Access Area) are most used because of their proximity to the delta and the quality of their facilities. The three access facilities within the study area are described in Table 3-7 and shown on Figures 2-3 (Access Road through Area 11 to the Barge Loading Area), 2-4 (Access Routes for Areas 3/4/9, 7, and 11), and 2-5 (Road Access Options for Areas 5 and 6).

Table 3-7 Recreation Access Areas and Facilities in the Study Area

Access Facility	Description	Notes
Clark Fork River Access Area	Two concrete boat ramps, a launching dock, portable toilets, IDFG storage building, and a large parking area for approximately 20 vehicles and boat trailers. Closest facility for motorized launching to Idaho 200.	In the delta on the north channel of the Clark Fork River near the Area 11 log yard. Co-managed by Corps and IDFG. Camping allowed, but no camping facilities.
Johnson Creek Access Area	Two concrete boat ramps, a launching dock, portable toilets, and picnic table. Unpaved parking accommodates approximately 12 vehicles.	Co-managed by Corps and IDFG. Areas near this facility contain numerous songbirds, osprey in summer, bald eagles in the winter, a year-round variety of waterfowl, and a nearby blue heron rookery (Idaho Scenic Byways, 2013). A popular launch point for boaters going to Long Beach (on Lake Pend Oreille)—an area directly below the Green Monarchs (a well known landmark that is an escarpment plunging from Jakes Mountain down to the shores of Long Beach). Camping allowed, but no camping facilities.
Denton Slough Boat Launch	Unpaved boat launch, portable toilet, unpaved parking that accommodates approximately six vehicles. Difficult to launch from during low pool conditions.	Approximately 1 mile northwest of the closest edge of the Clark Fork River Drift Yard.

There is one other public facility (a small campground, dock, and toilet) that provides access to the islands and shorelines of the WMA. No other formal camping or day-use facilities exist. With the exception of seasonal closures related to nesting and other wildlife concerns, access by the public to the lands and shorelines of the WMA is permitted, and people disembark on the islands and shorelines to recreate. IDFG does not keep records of this type of use, people likely use these areas for various types of recreational activities that occur in the WMA, such as those described in the following text.

In addition to flat-water boating, fishing is a popular activity within the study area. Rainbow trout, bull trout, cutthroat trout, lake trout, and brown trout; kokanee; northern pike; mountain whitefish; smallmouth and largemouth bass; crappie; yellow perch; bullhead catfish; and pumpkinseed can be found in Lake Pend Oreille and some parts of the Clark Fork (IDFG, 2013d).

Most hunting in the vicinity of the study area is for waterfowl and occurs within the WMA or nearby waters, although some deer and elk hunting also takes place in the delta. The complex river channels, sloughs, open water, uplands, and variety of wetlands attract migrating and wintering waterfowl in large numbers. Species that are hunted include Canada geese, American widgeon, redheads, mallards, common goldeneye, and bufflehead duck (IDFG, 2013f). Some hunting that occurs on the WMA takes place from shore, but many hunt from boats. Waterfowl hunting (ducks and geese) in the study area typically occurs between mid-October and late January (IDFG, 2013g).

The greatest numbers of waterfowl are present at the WMA during the fall, with maximum counts usually occurring in November and December (IDFG, 1999). The fall is the time of year when waterfowl hunting takes place (prior to the drawdown of Lake Pend Oreille) and is also a popular time for bird watching and wildlife photography. During the spring migration, bird watching and wildlife photography also occurs throughout the WMA. In addition to game birds, nongame birds that attract bird watchers/wildlife photographers include eagles, osprey, a variety of other raptors, blue herons, and other species.

The WMA management plan provides use estimates from the years 1989 to 1998 (IDFG, 1999). The average annual use estimate for the entire WMA was approximately 39,600 visits, with a low of approximately 32,300 (1997), and a high of approximately 48,700 (1996). An average of approximately 17,500 people per year were estimated to have used the Johnson Creek Access Area during that time frame (IDFG, 1999). The number of hunters using the Clark Fork River delta during opening weekend of hunting during the years 1994 to 1997 ranged from 68 to 85, with an average of 79 (IDFG, 1999).

Sightseeing is also a popular recreational activity in the vicinity of the Clark Fork River delta and action area. The portion of Idaho 200 that passes through the northern part of the action area is part of the Pend Oreille Scenic Byway, which is an officially recognized scenic route of the Idaho State Scenic Byway program. The scenic byway follows Idaho 200 from U.S. 95 to the Montana border. The Clark Fork River and delta is identified as a “special attraction” by the Idaho Scenic Byway program, meaning it has notable scenic value (Idaho Scenic Byways, 2013).

3.6.2 *Environmental Consequences – Action Alternative*

3.6.2.1 Erosion Control and Restoration Measures

During the summer (from June to September,) the production, staging, and delivery of materials (large wood, gravel, and rock riprap) related to construction would occur. Riprap would be barged to the approximate final locations where it would be placed during the full-pool construction period of July 1 to September 15. Driftwood Yard Road, the road used by the public on Area 11 to access the Clark Fork River Access Area and parts of Area 7 by water, would be the main access road from Idaho 200 during construction. It would provide access to a series of temporary construction access roads and a staging area (near the Clark Fork River Access Area and along Driftwood Yard Road). During the construction period, the public would not be able to use Driftwood Yard Road and the Clark Fork River Access Area. The Johnson Creek Access Area and the Denton Slough Boat Launch would be available to the public during the construction period, and most recreational users would likely use these facilities to access areas in the delta that would remain open during construction. Although construction would likely increase use of the two facilities, the sites have adequate capacity to accommodate the additional use.

Construction of the project would have no temporary impacts on land ownership, land use, and land management. In addition, constructing erosion protection measures along the shorelines of White and Derr Islands (Areas 5 and 6), including constructing 150-foot-long weirs at angles to the shorelines of White and Derr Islands to stabilize their shorelines, would not convert adjacent lands to other uses after the completion of construction and would not require land acquisition.

Construction would have temporary impacts on the recreational use of parts of the action area because the Clark Fork River Access Area would remain closed until construction was complete. Recreational activities such as fishing from boats on the waters of the Clark Fork River delta, flat-water boating, and bird watching and wildlife photography from boats would likely continue to occur during construction outside of a construction area safety buffer. Access to the shoreline or upland areas where construction would occur would not be allowed. Most earthmoving and pile-driving activity would occur during the fall/winter low pool period (October through April), which overlaps with waterfowl hunting in the study area (between mid-October and late January). Because of construction safety concerns, waterfowl hunting within the delta islands during May to April would not be allowed. Because these impacts would be temporary, the impact on recreation is considered low.

3.6.2.2 Restore and Enhance Edge and Interior Areas

Conversion of approximately 169 acres in and near Areas 3/4/9, 7, and 11 from non-wetland mudflat or lake bottom to marshes, wetlands and upland areas would not alter existing land ownership or land management. The conversion of the approximately 169 acres of mudflat or lake bottom would be consistent with the existing land uses of adjacent areas that are primarily used for conservation and recreation. The project would increase the amount of acreage used for these activities by approximately 169 acres. In addition to creating approximately 169 acres of additional habitat, the project would reduce the existing rate of erosion that has been eliminating wetland and upland areas; decreasing wildlife habitat; and negatively impacting recreational activities that depend on, or are enhanced by, wildlife. The new habitat would benefit recreational activities that depend upon wildlife such as hunting, bird watching and wildlife photography, and fishing.

Creating new habitat would require erosion protection measures, the enhancement of edge and interior areas, the raising of some parts of delta islands, and the capture of woody debris along the shoreline of parts of the action area. These measures would, after several years, create a delta area with a generally natural appearance. The natural-appearing shoreline and islands would be appreciated by some recreationists, especially when compared to less attractive conventional riprap treatments that are present on some shoreline areas in the study area (see Section 3.8, *Aesthetics and Visual Resources*). In addition, the material removed from onsite borrow areas would be used to supply fill for restoring and enhancing edge and interior areas, raising islands, and creating channels through the island complex. The channels would be deeper than adjacent areas, and their depth would allow use by boaters (particularly by flat-water recreationists) during low-pool conditions—particularly in Areas 3/4/9, 7, and 11.

Constructing erosion protection measures along the shorelines of Area 3/4/9 and White and Derr Islands (Areas 5 and 6) and the long-term stabilization of these shorelines would be beneficial to land owners and to adjacent land use above the shorelines by improving access. The bendway weirs would be visible to boaters at low water, but would not extend far enough into the waters of the delta at high water to block navigation or create navigation hazards. Therefore, impacts on land use and recreation from the project would be low.

3.6.2.3 Consistency with Comprehensive Plans

The project would be consistent with the *Bonner County Comprehensive Plan* (Bonner County, 2013) and the zones in which it would be located. The project is located within zones that are part of the Rural District designation. This designation allows a number of uses that would be compatible with rural character, including tourism and recreation uses. The project would support and be beneficial to tourism and recreation. The Rural District designation also encourages creating open space and protecting environmental features while enhancing recreational opportunities, and the project is consistent with this goal.

The project would be consistent with the *Pend Oreille Wildlife Management Area Management Plan* (IDFG, 1999) because it helps IDFG protect wildlife habitat and identify locations in the WMA that have erosion problems and explore potential erosion control methods.

3.6.3 Environmental Consequences – No Action

Under the No Action Alternative, BPA would not provide funding for portions of the project and no construction impacts tied to BPA funding would occur. Land use would remain unchanged, but Areas 3/4/9, 7, and 11 would likely continue to erode, as would the shorelines of Areas 5 and 6. Wildlife habitat would be lost, which could decrease wildlife-related recreation within the WMA and the rest of the action area. Recreational activities that depend upon fish and wildlife would be impacted because the abundance of fish and wildlife frequenting the delta would decline as the delta erodes. In addition, shallow-water boating hazards (for example, stumps, gravel bars) would remain for recreational boaters at full pool when the hazards would not be visible—rock structures would not be constructed by pushing up existing shallow gravel bars that are not visible at low water.

3.7 CULTURAL RESOURCES

Cultural resources include things and places that demonstrate evidence of human occupation or activity related to history, architecture, archaeology, engineering, and culture. Historic properties, as defined by 36 CFR 800, the implementing regulations of the National Historic Preservation Act (NHPA; 16 USC 470 et seq.), are a subset of cultural resources that consists of any district, site, building, structure, artifact, ruin, object, work of art, or natural feature important in human history that meets defined eligibility criteria for the National Register of Historic Places (National Register).

The NHPA requires that cultural resources be inventoried and evaluated for eligibility for listing in the National Register and that federal agencies evaluate and consider effects of their actions on these resources. Cultural resources are evaluated for eligibility in the National Register using four criteria commonly known as Criterion A, B, C, or D, as identified in 36 CFR Part 60.4(a–d). These criteria include an examination of the cultural resource's age, integrity (of location, design, setting, materials, workmanship, feeling and association), and significance in American culture, among other things. A cultural resource must meet at least one criterion to be eligible for listing in the National Register.

Historic properties include pre-contact resources that predate European contact and settlement. Traditional cultural properties (TCPs) are properties that are eligible for inclusion in the National Register because of their association with the cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community (Parker and King, 1998).

The area of potential effects (APE; defined in 36 CFR 800.16[d]) for cultural resources includes Areas 11, 7, 3/4/9, 5 and 6. Laws and regulations protecting cultural resources are discussed in more detail in Chapter 4.

3.7.1 On-Going Management of Cultural Resources

Within the Clark Fork River delta, cultural resources are managed according to a Historic Properties Management Plan (HPMP) that details resource management actions and priorities in compliance with provisions of an FCRPS System-Wide Programmatic Agreement (SWPA) (USACE, 2008). Actions include monitoring of erosion at specific sites, minor data recovery of threatened features at archaeological sites, bank stabilization for erosion control, and curation of recovered data. The study area for the HPMP is defined as the geographic area within which historic properties could be either directly or indirectly affected by Albeni Falls Dam operations for all authorized present and foreseeable future purposes on federal fee lands and other real property where the U.S. Government has a current or future legal interest, and nonfederal lands where Albeni Falls Dam operations cause an adverse effect. Generally speaking, this is Lake Pend Oreille and the Pend Oreille River upstream of Albeni Falls Dam, between elevation 2051 feet and 2080 feet, or the limits of fee parcels taken for recreation and wildlife management purposes.

Site evaluation or mitigation work to assess whether affected sites are eligible for the National Register, or to determine effects of a proposed project, typically is performed during low winter water surface elevation (a water level below 2051 feet).

3.7.2 *Affected Environment*

3.7.2.1 Affected Historical Communities

The following information provides context for the historic development of the Clark Fork River delta area, and portrays the following groups of people as they appeared in the mid-19th century. At and immediately following contact with Euro-American cultures, Native American societies were significantly altered as a result of population losses from exotic diseases, encroachment on territory and resources, and partial assimilation into European culture. Lake Pend Oreille lies within the traditional historical territories of the Kalispel, Kootenai, Salish, and Coeur d'Alene Tribes.

The Clark Fork River delta lies along an important east-west trade route, the Pend Oreille River connecting the Columbia River plateau people with those tribes further east. Early European-influenced fur-trade development was evident in the Lake Pend Oreille area as early as 1809, when David Thompson established the North West Company Kullyspel House depot. Local oral tradition places this depot immediately north of Memaloose Island (Gunter, 2013), however it is likely that was closer to an Upper Kalispel band's winter village at Ellisport Bay (Lyons, 2013). The close proximity to the Clark Fork River and Pack River deltas provided access to important local trade routes to the Kootenai River and Clark Fork River basins and also provided reliable encampment locations where traders would reprovision.

The mid-1800s brought increased involvement of the Federal government in the area evident in the designation of the Washington Territory (circa [ca.] 1840-1860). Ethnographic sources describe how Hudson's Bay Company's large freight-boats ascended from the lower end of Lake Pend Oreille to the Horse Plains (Lyons, 2013). Other descriptions report that native populations in the Clark Fork River delta vicinity were located on a principal provisioning route between Fort Okanogan/Fort Colville to Hudson's Bay Company's interior forts in the Rocky Mountains (Lyons, 2013). The Hudson's Bay Company distributed trade goods from their Fort Vancouver post, and this greatly impacted the indigenous populations in the region who were actively engaged in the fur trade or provided support in the forms of portage and labor of the trade trains navigating the watershed. The Clark Fork River delta vicinity likely had an important role for traders traveling to markets and outposts.

3.7.2.2 Traditional Cultural Resources

The Clark Fork River delta area is characterized by geological features, plant and animal communities, and waterways that are important to traditional Native American use. Cultural resources likely associated with one or more of these activities have been identified within the project area and other similar areas in close proximity to Lake Pend Oreille. Oral traditions of the Kalispel Tribe, documented in the 1930s (Smith, 1936-1938), describe the traditional use of the Clark Fork River delta and surrounding Lake Pend Oreille area.

Prior to European settlement in the area, the Clark Fork River delta and Denton Slough (approximately 2 miles north along the shore of Lake Pend Oreille from the delta) provided favorable winter habitat for deer and other game species. These areas were used seasonally as resources became available, and were considered unreliable for winter encampment due to limited accessibility to food and game. The Clark Fork River delta was particularly important as a location for harvesting bull trout ascending the Clark Fork River. The principal winter village of the Upper Bands of the Kalispel was located in Ellisport Bay, farther northwest from Denton

Slough. Economically speaking, broad distinctions could be made between Upper and Lower Kalispel Bands in terms of their winter provisioning behaviors. The lower valley had more favorable winter deer habitat, while families living east of Sandpoint, Idaho, had a higher dependence upon native trout and mountain white fish.

The Clark Fork River delta was an important source of bull trout or "char" as bull trout was called in the 1930s (Lyons, 2013). Different methods were used to catch trout – nighttime seining (holding a net between two canoes and trapping fish that were caught), another known as the torchlight method, as well as the use of fencing placed across streams to guide fish into weirs. Seining was often used during spring, when there was an increase in water flow, which improved navigability within the delta (Smith, 1936-1938:371-372).

3.7.2.3 Archaeological Resources

Background research was conducted to help better understand traditional use of this area and to identify the presence of cultural materials that could be affected by the project. According to these studies, there are 394 known pre-contact and historic archaeological sites and other cultural resources upstream of Albeni Falls Dam at Lake Pend Oreille, and all are important to the region's Indian tribes (Table 3-8; USACE, 2008). Also present are two ***Archaeological Districts*** proposed for listing in the National Register— the East Pend Oreille Lake Rock Art District and the Upper Pend Oreille River Archaeological District.

Twenty-four previous cultural resources surveys have taken place within one mile of the Clark Fork River delta to identify cultural resources in the area. A total of 17 previously recorded sites have been identified within the APE – 6 pre-contact sites (those dating to the period before European contact in the area), 9 historic sites (those dating to the period after European contact), and 2 sites containing materials dating to both periods (multi-component). The pre-contact sites typically consist of fire-cracked rock scatters (rock broken by fire such as a campsite or hearth) with some containing chipped stone tools and rock debris. Historic sites consist of refuse scatters (can dumps, old farm equipment, homestead debris, etc.) representing residential and/or agricultural activities.

The pre-contact cultural materials identified in these sites support historic and ethnographic documentation indicating that the Clark Fork River delta and surrounding area were used for spring and fall fishing camps. The various fishing methods used within these waters – seining, torchlight/spear fishing and stranding weirs suggests the utilization of nearby narrow side channels. Historic cultural materials suggest agricultural development and residence on both Derr and South Channel Islands. Additionally, obsolete portions of the Corps drift yard boom system are old enough to be considered historic, however, it has not been evaluated to determine its eligibility to the National Register.

Nearly 82 percent of the known sites around Lake Pend Oreille are located between elevation 2062.5 and 2051 feet. The sites within this elevation range all have been degraded to varying extents (mostly severe) by erosion that occurs as a result of Albeni Falls Dam operations (USACE and BPA, 2011). This assessment is based on comparing records of surface inspections at all non-petroglyph sites during field inventory and information from monitoring reports dating from the mid-1980s to the present with the results of evaluations at 45 sites with similar slope, fetch, and soil erodibility characteristics (USACE and BPA, 2011). Sites within the drawdown zone at the Clark Fork River delta are in similar condition (BPA, USACE, and Reclamation, 1995).

Table 3-8 Summary of Known Sites in the Area of Potential Effects (APE)

Site No.	Site Type	Category	No Action	Proposed Action
10BR123	Midden, fire-cracked rock	Pre-contact	No effect	No effect
10BR124	Midden, fire-cracked rock	Multi-component	No effect	No effect
10BR417	Mine	Historic	No effect	No effect
10BR579	Ovens, fire-cracked rock	Pre-contact	No effect	No effect
10BR580	Fire-cracked rock and lithic debris	Pre-contact	No effect	No effect
10BR653	3 concentrations of fire-cracked rock; evidence of looting previously reported in 2007	Pre-contact	No effect	No effect
10BR654	Nine stumped piers lying in a shallow art with an assortment of historical residential debris	Historic	No effect	No effect
10BR657	Historic debris scatter containing green, brown and clear glass bottle fragments, wire nails, a cow bone and a ceramic insulator	Historic	No effect	No effect
10BR658	Historic Debris	Historic	No effect	No effect
10BR660	Fire-cracked rock	Pre-contact	No effect	No effect
10BR748	Historic debris consisting of clear and opaque blue and brown bottle glass and amethyst glass fragments, white porcelain fragments, and mason jar lids	Historic	No effect	No effect
10BR762	Piers	Historic	No effect	No effect
10BR941	Ovens, fire-cracked rock	Pre-contact	No effect	No effect
10BR964	Fire-cracked rock & Historic Debris	Multi-component	No effect	No effect
17-4929	Clark Fork Bridge	Historic	No effect	No effect
17-18230	Johnson Creek Bridge	Historic	No effect	No effect
10BR969	Northern Pacific Railroad	Historic	No effect	No effect
CFD 1[a]	Concentration of fire-cracked rock	Pre-contact	No effect	No effect
CFD 2[a]	Concentration of fire-cracked rock	Pre-contact	No effect	No effect
CFD 3[a]	Concentration of fire-cracked rock	Pre-contact	No effect	No effect

Table 3-8 Summary of Known Sites in the Area of Potential Effects (APE)

Site No.	Site Type	Category	No Action	Proposed Action
CFD 4[a]	Concrete and gravel debris; woven wire, chain, steel hoop – remnants likely related to a structure dating to pre-Albeni Falls Dam	Historic	No effect	No effect
CFD 5[a]	Two distinct hearth-like features of fire-cracked rock	Pre-contact	No effect	No effect
CFD 6[a]	Debris pile containing cobbles, an eye-bolt, ungulate tibia, railroad spike, strap iron, brown bottle glass fragments and wire nails	Multi-component	No effect	No effect
CFD 8[a]	Concentration of fire-cracked rock	Pre-contact	No effect	No effect
CFD 9[a]	Historic debris consisting of a creosote-soaked log boom cross tied with twined steel cable and chain, decked with planking and fixed with wire nails and spikes. Likely drifted or moved from original location.	Historic	No effect	No effect

[a] Denotes new sites identified during spring/winter 2013 survey.

Bold = previously recorded sites identified during spring/winter 2013 surveys

3.7.3 Environmental Consequences – Action Alternative

To determine how the project would affect cultural resources, if present, cultural resources staff at the Kalispel Tribe conducted background research and pedestrian surveys of all areas where ground-disturbing activities would take place and that were accessible at the summer lake level elevation (2062.5 feet) and at the winter lake level elevation (2051 feet) (Lyons, 2013). During the course of these surveys, 12 sites were identified – 8 new sites and 4 previously recorded sites. The remaining 13 previously recorded sites in the APE could not be accessed during the field surveys due to water level or ground surface condition.

Known cultural sites in the delta would be avoided and protected from filling and excavating associated with restoration work. Cultural sites inadvertently discovered during construction would be addressed by an Archaeological/Cultural Resource Inadvertent Discovery Plan. Corps and BPA would monitor project impacts on sites that are or may be eligible for the National Register.

In the short term, the project would have a low impact on known cultural resources because these sites would be avoided. In the long term, impacts to cultural resources would decline because sites in the delta would be stabilized against further soil erosion. Specifically, the amount and rate of delta shoreline erosion is expected to decrease due to the stabilization of shorelines by plantings and the construction of breakwaters and bendway weirs that would protect and decrease wave energy and erosion.

3.7.4 Environmental Consequences – No Action

Under the No Action Alternative, BPA would not provide funding for the project and no BPA-funded construction impacts would occur. Incremental erosion would continue to occur along the shoreline under No Action. This affects cultural resources by focusing wave energy and erosion on different parts of a given site potentially eroding artifacts or other cultural material.

Whether damage actually could occur as a result of No Action at any given site depends on the site's elevation, beach slope, sediments, and fetch and reach factors. New damage on glyphs at rock art sites at lake elevations between 2051 and 2056 feet probably is the most likely impact.

The No Action Alternative is unlikely to significantly change or accelerate the adverse effect of existing Albeni Falls Dam operations on cultural resources for two reasons. First, sites within the APE have very little, if any, archaeological integrity; the zone between 2051 and 2056 feet has been subjected to these severe erosional forces for nearly 60 years, with the possible exception of some glyphs at some of the rock art sites on Lake Pend Oreille. Second, any difference in erosional effects under the No Action Alternative, compared to what has already occurred over the past 60 years, is likely to be slight or undetectable. The Corps and BPA would continue to rely on monitoring programs already in place to assess impacts on sites that are or may be eligible for the National Register, focusing primarily on rock art sites. Adverse effects would continue to be addressed and described in the Albeni Falls Dam and Pend Oreille Lake Project's HPMP, but tailored to the specific problem at each site (USACE, 2008). The overall effect of the No Action Alternative is within the analysis and conclusions reached by the FCRPS SOR EIS (BPA, USACE, and Reclamation, 1995) and Record of Decision (BPA, USACE, and Reclamation, 1997).

3.8 AESTHETICS AND VISUAL RESOURCES

3.8.1 Affected Environment

The action area for aesthetics and visual resources is composed of areas from which actions associated with the project would be seen by the general public or nearby residents. This area (the viewshed) extends approximately 1 mile beyond the boundaries of the project. The viewshed includes much of the portion of the Pend Oreille WMA located within the Clark Fork River delta, mainland areas to the north (including Idaho 200) and south, and some residences to the southeast of the project situated along the channels of the Clark Fork.

Generally, the action area has an undeveloped and natural appearance and character (see Appendix B). The visually complex Clark Fork River delta has a very different visual character than expansive Lake Pend Oreille or the contained canyon of the Clark Fork River valley upriver from the delta. The portion of Idaho 200 that passes through the northern part of the action area is part of the Pend Oreille Scenic Byway, which is an Idaho State Scenic Byway. The Clark Fork River and delta is identified as a special attraction on the website for the Idaho Scenic Byway program, meaning it has notable scenic value (Idaho Scenic Byways, 2013).

Several human-made features in the action area are visible, but do not dominate views. These features include the Area 11 drift yard (the Clark Fork River Drift Yard or log yard), a series of log booms within the Clark Fork River that direct woody debris to the log yard, and riprap breakwaters constructed by the Corps. The log yard is the most visible human-made feature because of its proximity to Idaho 200 and its size. The dimensions of widest parts of the oblong-shaped log yard are approximately 2,500 feet by 1,100 feet. The amount of the log yard covered by floating woody debris (harvested prior to entering Lake Pend Oreille) varies by year. Where stored, woody debris almost completely covers the water surface. Log booms are linear elements that parallel the Clark Fork at a number of locations. They are composed of a series of vertical poles that are connected by horizontally placed logs. Two breakwaters are located north and south of the main Clark Fork channel that discharges into Lake Pend Oreille. Both of the breakwaters appear as low, linear features composed of rock riprap colonized to varying degrees by vegetation.

The appearance of the action area varies considerably by lake elevation. At full pool (between June and September) islands in the delta are surrounded by water (in river channels, sloughs, small side channels and interior depressions/ponds) and have little adjacent exposed shoreline (see photographs in Appendix B). Most of the shorelines consist of marshy herbs, willow, and cottonwood. Interior portions of the islands contain willow and other shrubs. ***Riverward***, conifers such as Douglas-fir, grand fir, western redcedar, western white pine, and ponderosa pine, are present (IDFG, 1999). Areas with cottonwood and conifers are distinctive because the tall vertical presence of the trees contrasts with the overall horizontal nature of the waters and shorelines of the delta. The tops of the breakwater structures located near Area 11 can be seen as linear features during high pool conditions.

During the winter, the pool is lowered to either the 2055- or the 2051-foot elevation. During periods of low pool elevation, extensive areas of mud flats are exposed and there is a stark contrast in color and texture between the vegetated areas, and surrounding exposed mudflats. During low pool elevation, more of the log booms' vertical poles can be seen, as can the two riprapped breakwaters.

Views within the action area are generally restricted by vegetation growing on the shorelines and island interiors, as well as on adjacent mainland areas. The clearest views of the project for the general public are from the waters of Lake Pend Oreille and the delta, parts of Idaho 200 (which is elevated above the delta), sections of the Driftwood Yard Road (and its side road), and the Clark Fork River Access Area. Potential viewers of the project from within the study area consist primarily of recreational users and people travelling on Idaho 200, although some residential viewers have views of part of the project. Recreational users are assumed to have high visual sensitivity to the aesthetic or visual environment because, for many types of recreation, the visual quality of the outdoor setting is an important component of the experience. Different types of people travel along Idaho 200 and have different viewing sensitivities. However, views from the portion of Idaho 200 that passes through the action area are limited to moving views because no pull-over areas exist. Some locals use Idaho 200 to travel and commute back and forth along Lake Pend Oreille, others are people passing through the area, and some are sightseers following the Pend Oreille Scenic Byway. Except for sightseers (who are assumed to have high viewing sensitivity), motorists are considered to have moderate to low sensitivity to the aesthetic or visual environment because they are focused on the road and have short viewing durations of an area as they pass by.

Approximately 26 residences are located on the northeast side of Derr Island (near Area 6) and several others are found on the southeast side of White Island (Area 5). None of these residences have views of Areas 3/4/9, 5, 7, 8, or 11, but some likely have views of the south side of Areas 2 and 3/4/9, and some may have views of Area 6, where channel improvements associated with the project would be located. Residents are considered to have high viewing sensitivity because of their familiarity with the landscape and long viewing duration. This is especially true for residents who have chosen to live in scenic areas such as those along the northeast side of Derr Island.

All of Area 7 is located on BLM-managed land. Similarly, the prospective rock sources south of Area 5 are located on BLM land. BLM's Coeur d'Alene RMP assigned Visual Resource Management (VRM) objectives to all BLM lands managed under the RMP (BLM, 2007a; see Section 4.11, *Resource Management Plan Conformance*). VRM objectives identify the degree of change that can occur on BLM land and still be consistent with the intent and management direction of the applicable RMP (BLM, 1986). The VRM assigned to these lands is Class II. The management directive for Class II lands is to retain the existing character of the landscape. The level of change to the characteristic landscape from an action on BLM land should be low to be consistent with Class II lands.

Bonner County does not have regulations or ordinances related to or concerned with the visual or aesthetic quality of the action area, including the existing Hewett Rock Pit at Lightning Creek (Bonner County, 2013).

3.8.2 Environmental Consequences – Action Alternative

The project consists of erosion protection measures and measures to restore and enhance edge and interior areas within the delta. Each measure consists of a variety of elements and this evaluation focuses on the potential impacts to aesthetic and visual resources that could result from implementation of the project.

3.8.2.1 Erosion Control and Restoration Measures

During the summer (from June to September), the construction of temporary access roads, as well as the production, staging, and delivery of materials (large wood, gravel, and rock riprap) would be seen to some degree from a few locations within the action area: Idaho 200, waters of the delta, parts of Lake Pend Oreille, and possibly some residences on Derr Island. Construction activities and equipment would also potentially be seen from these locations during the winter/fall construction period. Because the public would not be allowed access to areas where these activities would take place, and because a safety buffer around construction locations would be established, views of these activities would generally be limited to the waters of Lake Pend Oreille, the waters of the delta, and Idaho 200. Where the activities would be seen by the public, they would be seen for a limited amount of time, and their impacts on aesthetic and visual resources would be temporary and considered low.

The project includes measures to protect both delta shorelines and existing island areas from erosion. River training structures and erosion protection structures consist of various combinations of gravel, rock, vegetation, and wood (see Figure 2-2 for depictions of the erosion measures described below). Many of the measures proposed for the project were used in the Pack River delta restoration project. Photographs of several Pack River delta restoration areas are included in Appendix B and can be viewed as examples of how the project would likely appear nearly 5 years after completion. The placement of large woody material and vegetation along the shoreline and within the islands of the Pack River delta restoration area create an aesthetically and visually complex area that, nearly 5 years after restoration, appears “non-engineered” and natural to the observer.

Delta Shoreline and Existing Islands. Erosion protection measures specific to the delta shorelines would be applied in Pend Oreille WMA Areas 3/4/9, 7, and 11. Those measures would consist of vegetated and wooded riprap slope protection curving along the lake face of the delta slope.

Several erosion protection measures specific to the vegetated areas of existing islands would be applied in Areas 3/4/9 through 7. They would include retaining existing vegetation, installing bendway weirs (with the incorporation of large woody debris), and minor slope protection at all areas; minor slope protection measures at Areas 3 and 7; rock berm slope protection at Area 5; and Longitudinal Peaked Stone Toe Protection at Area 7. Similar to the delta shorelines, these measures, along with revegetation efforts, would result in a diverse, naturally appearing shoreline that would have visual complexity and variety when viewed by recreational users and by residents on Derr Island (if visible).

At Area 11, measures would consist of Longitudinal Peaked Stone Toe Protection following along the northern bank of the log sluice channel. Woody debris would be captured along the lake over time. Large woody debris would be incorporated into Longitudinal Peaked Stone Toe Protection, which would visually break up the even and lineal appearance of the toe protection (although much of the toe protection components would only be seen when pool elevations are low). The presence of large woody debris along the shoreline of Area 11 would help visually break up the uniform appearance of the protection measures and, along with vegetation growing adjacent to and within the shoreline areas of Area 11, result in a shoreline that would have visual complexity and variety and a more natural appearance. The shoreline erosion protection measures for Area 11 would be beneficial from an aesthetic and visual resource perspective because it would prevent the area from eroding. It would also improve the appearance of Area 11 for recreational users in the Clark Fork River Access Area and the waters of the delta or Lake Pend Oreille, and for people driving on Idaho 200.

3.8.2.2 Restore and Enhance Edge and Interior Areas

Raise Islands. Raising the elevation of islands in the delta and increasing their acreage is one of the measures intended to restore and enhance the edge and interior areas of the islands. This would require placing fill material in low lying areas and shorelines and increasing the acreage of Areas 3/4/9, 7, and 11 by 169 acres. Restoring the size of islands within the Clark Fork River delta would be consistent with the historical and existing delta character and would benefit the delta’s aesthetic and visual qualities by adding additional areas of island habitat to view. Enhancing the shorelines and interiors by creating areas of different elevations, forming channels (establishing interior waterways or ponds), and introducing a variety of woody debris would increase aesthetic and visual interest. Adding fill material along the existing breakwaters would allow vegetation to be planted next to the breakwaters and reduce their linear appearance.

Enhance Wetland Habitat Diversity. Enhancing habitat diversity would result in creating more aesthetically and visually interesting areas that would be viewed by all the viewer types previously mentioned. Some of the more visually interesting areas in the action area are found in areas where there are a variety of habitat types. The planting and vegetation management at the islands and shorelines would provide habitat diversity as well as increase the presence of wildlife in the action area, both of which would have positive impacts on aesthetic and visual resources.

In addition, while in the short term project impacts on aesthetic and visual qualities would be negative and moderate while exposed ground surfaces remained bare of vegetative cover, the long-term impact would be positive and low by retaining those qualities at some places and improving them at others.

3.8.2.3 BLM Visual Resource Management (VRM) Objectives.

Visual contrast rating exercises were conducted for BLM lands in the project area to analyze potential visual impacts of the proposed project and activities. Exercises were conducted from critical viewpoints such as commonly traveled routes and likely observation points.

Key viewpoints for Area 7 were determined to be Idaho 200 and boater viewpoints from Lake Pend Oreille. Short-term visual contrasts resulting from the project on Area 7 were rated as "weak" to both land and vegetation because the degree of contrast due to changes to land and vegetation from the project could be seen but would not attract attention from most common vantage points. Long term visual contrasts were rated as "none" because contrast changes would not be visible or perceived from most common vantage points.

The rock source area is only visible from short distances due to the terrain to the south and the dense trees and shrub cover to the east, north, and west. Recreational boaters and kayakers in the river channel between the rock source area and Area 5 are the most likely to view the rock source area. The short-term visual contrasts resulting from the project on the rock source area were rated as "weak" to both land and vegetation because the degree of contrast due to changes to land and vegetation from the project could be seen but would not attract attention from most common vantage points. Long-term visual contrasts were rated as "none" because contrast changes would not be visible or perceived from most common vantage points. "Weak" to "none" contrast ratings are acceptable levels of impact in VRM Class II lands. This classification retains the existing characteristic landscape. The level of change in any of the basic landscape elements due to management activities should be low and not evident. These ratings for the proposed project comply with the *Coeur d'Alene Resource Management Plan* (BLM, 2007a).

3.8.3 Environmental Consequences – No Action

Under the No Action Alternative, no restoration would be funded by BPA, and the islands, shorelines, and streambanks not receiving restoration actions would likely continue to erode. This would result in less visual diversity within the delta during high pool elevations as eroding island shorelines, entire islands, and streambanks would become more inundated. During high pool conditions, the delta would slowly change from complex delta to open water that would appear to be an extension of the eastern part of Lake Pend Oreille. During low pool elevations, eroded locations would expand with additional mudflats and exposed gravel bars. The experience of travelling though the delta to recreate and sightsee would change, depending upon how much shoreline eroded, how many island areas were lost, and how the river channel redeposited materials or cut banks within the delta area.

3.9 AIR QUALITY, NOISE, HAZARDOUS WASTE, AND PUBLIC HEALTH AND SAFETY

3.9.1 Air Quality

3.9.1.1 Affected Environment

The air quality action area is northern Idaho. The U.S. Environmental Protection Agency (EPA) and DEQ have responsibility for air quality in Idaho. Under Sections 108 and 109 of the Clean Air Act (42 USC 4701 et seq.), EPA has established National Ambient Air Quality Standards (NAAQS) to protect the public from air pollution. These standards focus on criteria pollutants, which are pollutants of particular concern for human health and the environment.

DEQ's monitoring network measures the levels of five of the six ambient air criteria pollutants identified by the Clean Air Act (lead is not monitored). These five criteria pollutants are:

- Particulate matter
- Carbon monoxide
- Nitrogen dioxide
- Sulfur dioxide
- Ozone

The project area is located in Bonner County in the northern Idaho panhandle. DEQ publishes a daily air quality index (AQI) number for each county. A "Good" AQI value indicates the air quality is satisfactory and air pollution poses little or no risk to public health. In the most recent Idaho Air Quality Monitoring Report, more than 96 percent of days in Bonner County and surrounding areas had a Good AQI (DEQ, 2012).

The main pollutant of concern in the area is ***particulate matter***. A small section of Bonner County in the northwest corner of Lake Pend Oreille called Sandpoint was classified as nonattainment for particulate matter less than or equal to 10 microns in diameter (PM_{10}) under the Clean Air Act in 1997. In 2011, DEQ submitted a *PM_{10} Limited Maintenance Plan and Redesignation Request* to EPA to redesignate the area to attainment status. In April 2013, EPA approved in part the maintenance plan and redesignated the Sandpoint area to attainment for PM_{10} (EPA, 2013).

3.9.1.2 Environmental Consequences – Action Alternative

The project is not expected to have long-term adverse air quality impacts. However, during construction, equipment would emit carbon monoxide, nitrogen dioxide, sulfur dioxide, and particulates as a result of tailpipe emissions and cause dust emissions from disturbed areas and along paved and unpaved roads. Non-road construction vehicle engine exhaust emissions have been identified by the EPA as a significant contributor to air pollution throughout the U.S. This section analyzes the anticipated impacts to air quality in association with construction vehicle engine exhaust and construction activities that would contribute dust for the project. In addition, the contribution of ***greenhouse gas (GHG)*** emissions that would be generated by equipment during construction is discussed.

Method for Determining Estimated Emissions. An estimate of total emissions to complete the project was determined using estimates of construction and operational activities and current emission factors and methods. The emissions associated with the project are expected to be localized and temporary as a result of construction emissions, off-road vehicles, on-road vehicles (including worker commuting), and dust from earth-moving and grading activities. Emission calculations for each of the potential sources are described in this section.

Data on construction equipment usage, scheduling, and construction employment were estimated using available data.

Off-Road Construction Equipment. Criteria pollutant emissions would result from the use of diesel fueled construction vehicles for the project. Equipment usages were assumed based on the Tier 4 emission standards developed for the project area from the *Exhaust and Crankcase Emission Factors for Non-road Engine Modeling for Compression-Ignition* for non-road criteria emission factors along with total fuel consumption were used to calculate emissions for the project (EPA, 2010).

The estimated emissions from GHGs were determined using fuel usage and emission factors from the Revised 1996 Intergovernmental Panel on Climate Change *Guidelines for National Greenhouse Gas Inventories* (Intergovernmental Panel on Climate Change [IPCC], 1996). These emission factors are in grams of pollutant per kilogram of fuel. The fuel density from the *Exhaust and Crankcase Emission Factors for Non-road Engine Modeling* was used along with the brake specific fuel consumption by horsepower category to determine the GHG emissions. Because each GHG has a different ***global warming potential*** (***GWP***), the ***carbon dioxide equivalent (CO_2e)*** is also reported. The CO_2e was determined by multiplying the sum of all of the GHG emissions by the global warming potential for the gas. The GWPs for the pollutants of concern for the project are: carbon dioxide = 1, methane = 21, and nitrous oxide = 310.

The emission factors for the air toxics emissions were taken from *Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations* and used to estimate combustive emissions from diesel powered construction equipment (U.S. Air Force [USAF] IERA, 2003). The brake specific fuel consumption and fuel density were used to convert horsepower hours to gallons of fuel used.

On-Road Vehicles. The emission estimates from on-road vehicles include haul trucks bringing materials to the site and workers commuting to the project area. For on-road vehicles, the distance for each trip was estimated and the assumed miles per gallon for the vehicle were used to determine the emissions. Commuter emissions were calculated using the same emission factors as on-road vehicles. The total commuter miles traveled were estimated for 25 employees making a 10-mile trip twice daily. To account for ride sharing, the total commuter mileage was multiplied by 0.8.

For vehicles operating onsite, the same method as off-road construction vehicles was applied because the emissions for these trucks are based on horsepower rather than vehicle miles traveled.

Criteria emission factors for on-road vehicles were obtained from the California Air Resources Board's EMission FACtors (EMFAC) 2007 v.2.3 model for 2014 (Air Resources Board, 2007). Emission factors were based on running exhaust emissions at 25 miles per hour (mph). PM_{10} emission factor includes tire and brake wear and particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$) emission factor is assumed to be 92 percent of PM_{10} emission factor by convention.

The greenhouse gas emission factors used were from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks* for 1990-2005 (EPA, 2007). The emission factors were assigned by fuel type used.

Air toxic emission factors from the *Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations* were used to determine estimated air toxic emissions (USAF IERA, 2003). The emission factor was in grams of pollutant per gallon of fuel used, so the total fuel use was determined using estimated mileage totals and assumed fuel efficiency factors (USAF IERA, 2003).

Particulate Matter. Emissions of particulate matter ($PM_{2.5}$ and PM_{10}) occur during earth-disturbing activities. A 100 percent level of control for fugitive emissions was assumed because earth moving activities are expected to occur during the winter and spring under snow and periodic rainfall.

Some particulate matter in the form of dust and exhaust emissions still would be emitted during construction. However, no violations of air quality standards would be expected, and the anticipated emissions impact would be below the threshold values for PM_{10} and $PM_{2.5}$ (15 tons per year and 10 tons per year, respectively) as identified in the Idaho Air Rules Section 006.

The estimated total emissions from the project are summarized in Table 3-9. The estimated emissions from the project are low for criteria pollutants, GHGs, and air toxic pollutants for several reasons. When the project is complete, all construction related emissions are expected to cease.

The project is scheduled to last approximately 1 year, with preparation for construction including hauling material to the site over the first 6 months and construction activities for the following 6 months. All earthwork activities are expected to occur in winter and spring when the regional weather patterns should minimize fugitive emissions from ground-disturbance activities. In addition, water or sweeper trucks would be used to further control fugitive dust. Because the construction and other project emissions would be temporary and localized in nature, they are not expected to have an adverse impact on air quality in northern Idaho. Therefore, the impacts on air quality from the project would be low.

3.9.1.3 Climate Change

Climate change could alter precipitation patterns and river hydrology. This could result in potential increases in the magnitude and duration of flow events, alter the timing of snowmelt, increase flow regimes, and changes lake levels. Increases in velocities and erosive forces along streambanks and shorelines and impacts on water temperatures also could likely occur. All of these factors could influence physical sites and biological communities - affecting species assemblages, timing, and use of the delta, and could also lead to changes in noxious and invasive weed cover.

The potential effects of climate change on soil erosion probably would be greater without the slope protection and bank stabilization measures under the project. The creation of micro-topographic complexity and the establishment of more diverse species assemblages would buffer shifting site conditions that might arise through climate change or other external ecological or hydrological factors.

Table 3-9 Fuel Consumption and Annual Pollutant Emissions under the Project

		Hauling Materials to Project Site	Restoration Construction at Project Site	Project Total
Fuel		**Consumption (gallons)**		
	Fuel Use	92,523	650,051	742,574
Pollutant		**Emissions (tons/year)**		
Criteria pollutants	Volatile organic compounds	0.069	0.205	0. 274
	Carbon monoxide	0.927	3.964	4.891
	Nitrogen oxides	0.477	0.727	1.20
	Sulfur oxides	0.001	0.001	0.002
	PM_{10}	0.024	0.022	0.046
	$PM_{2.5}$	0.022	0.020	0.042
Greenhouse gas pollutants	Carbon dioxide	146.07	736.94	883.01
	Nitrous oxide	0.024	0.158	0.182
	Methane	0.006	0.046	0.052
	CO_2e	153.77	786.75	940.53
Air toxic pollutants	Acetaldehyde	0.00004	0.00033	0.00038
	Acrolein	0.00006	0.00042	0.00047
	Benzene	0.00053	0.00401	0.00455
	1,3-Butadiene	0.00002	0.00014	0.00016
	Formaldehyde	0.00067	0.00505	0.00573
	Naphthalene	0.00005	0.00035	0.00039
	Polyaromatic hydrocarbons	0.00009	0.00069	0.00078
	Toluene	0.00023	0.00173	0.00196
	Xylenes	0.00017	0.00125	0.00141

3.9.1.4 Environmental Consequences – No Action

If no construction activity occurs in the project area, there would be no construction-related emissions, and air quality in the region would remain similar to current conditions.

3.9.2 Noise

3.9.2.1 Affected Environment

Noise is defined as unwanted sound. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Noise can be measured in several different ways depending on the source of the noise, the receiver, and the reason for the noise measurement.

Audible noise is measured in ***decibels*** on the A-weighted scale. The ***A-weighted sound pressure level*** on a decibel (dBA) scale describes sound that corresponds to human perception. Table 3-10 shows the relative A-weighted sound pressure levels of common sounds measured in the environment and in industry for various sound levels.

Decibels on the A-weighted scale cannot be directly added arithmetically; that is, 50 dBA + 50 dBA does not equal 100 dBA. When two sources of equal level are added together the result will always be 3 dB greater; that is 50 dBA + 50 dBA = 53 dBA and 70 dBA + 70 dBA = 73 dBA. If the difference between the two sources is 10 dBA, the level (when rounded to the nearest whole decibel [dB]) will not increase; that is 40 dBA + 50 dBA = 50 dBA and 60 dBA + 70 dBA = 70 dBA.

The action area for noise consists of any area within the vicinity of the project that could be affected by noise from construction. There would be no noise from the project after construction.

Sensitive noise receptors consist of several homes located on Derr Island. The closest home to areas of construction is located approximately 1,200 feet away. Additional sensitive noise receptors in the action area could consist of recreational users along the shoreline of the Clark Fork River. Fishing occurs along the shorelines in summer when the lake is in full pool. In winter, when the lake level drops, the shoreline areas are dewatered and the only fishing would be in the main river channels fed by the Clark Fork River. The existing gravel access road from Idaho 200 to the boat launch at the Clark Fork River Access Area would be used to access Area 11 during construction. Fishing areas would be blocked or restricted at the in-water work location while work is occurring. For example, floating silt curtains, or log booms, or in winter the floating (barge) bridge would restrict recreational users from entering work areas.

Existing noise sources consist of traffic along roads on Derr Island, Driftwood Yard Road, and Idaho 200, and train traffic on the Northern Pacific Railway line. Background noise levels in rural areas such as those in the action area are roughly 45 dBA during the day and 35 dBA at night (EPA, 1971).

No federal regulations apply to noise generated by the project. Idaho has not established statewide limits on noise levels from construction equipment. Similarly, Bonner County has not established a noise control ordinance that limits noise emissions except for the state limits on motorboats.

Table 3-10 Common Activities and Associated Noise Levels

Noise Source at a Given Distance	Sound Level (dBA)[a]
Civil defense siren (100 feet)	130
Jet takeoff (200 feet)	120 110
Pile driver (50 feet)	100
Ambulance siren (100 feet)	90
Freight cars (50 feet)	84
Pneumatic drill (50 feet)	80
Freeway (100 feet)	70
Vacuum cleaner (10 feet)	60
Department store; light traffic (100 feet)	50
Large transformer (200 feet)	40
Soft whisper (5 feet)	30 20 10

Notes:

[a] A-Weighted Sound Level in Decibels (dBA).

Source: Beranek, 1988.

3.9.2.2 Environmental Consequences – Action Alternative

One of the more recent and complete compilations of construction equipment noise is the Roadway Construction Noise Model (RCNM) (Federal Highway Administration, 2006). Noise levels from Table 1 in the RCNM User's Guide are shown in Table 3-11 for the equipment anticipated to be used during the project. All listed noise levels are maximum A-weighted sound pressure levels at a reference distance of 50 feet.

Work boats would be used to maneuver barges. The noise level from work boats is 72 dBA at a reference distance of 50 feet (Borough of Poole, 2004).

The intensity of sound attenuates, or diminishes, by about 6 dBA as distance doubles (Federal Transit Administration, 2006). Review of the table of construction equipment noise levels indicates that, with the exception of pile driving, the loudest equipment generally emits noise in the range of 80 to 90 dBA at 50 feet. The types and numbers of construction equipment near any specific receptor location would vary over time. Individual equipment operating in the construction zone could be discernible above ***ambient noise*** up to 2,000 feet away from the construction zone. The closest residences are at least 1,200 feet away from the construction zone.

Table 3-11 Construction Equipment Noise Levels

Construction Equipment	Noise Level (dBA)[a]
Backhoe	80
Compressor (air)	80
Crane	85
Dozer	85
Dump truck	84
Excavator	85
Generator	82
Grader	85
Impact pile driver	95
Loader	80
Pickup truck	55
Tractor	84

Notes:

[a] Specified A-weighted sound pressure level (L_{max}) at 50 feet.

Source: Federal Highway Administration, 2006.

Therefore, temporary construction noise could be discernible at the closest offsite residences. Pile driving would occur near Area 11, located more than 1 mile from the residences. Therefore, noise from pile driving would not be discernible at the residences. Because fishing areas would have limited access during construction and there would be a safety buffer around construction areas limiting access to boaters, construction noise should not be discernible to recreational users. Therefore, the impacts on noise from the project would be temporary and would be considered moderate for the noise receptors within 2,000 feet of construction, and low to none for noise receptors farther than 2,000 feet from project actions.

Construction noise would be limited to normal daytime working hours. If construction is necessary during other times, such as at night, activities generating noise would be limited to those absolutely necessary.

3.9.2.3 Environmental Consequences – No Action

Under the No Action Alternative, BPA would not provide funding for portions of the project and construction impacts associated with this funding would not occur. Existing noise sources from residences and vehicular and railroad traffic would continue. Recreational use of the Clark Fork River would also continue, similar to existing conditions. Therefore, there would be no change from current levels of noise under the No Action Alternative, which would continue to be low.

3.9.3 Hazardous Waste

3.9.3.1 Affected Environment

This section describes potential hazardous materials and substances that may be generated or encountered during the construction of the project. The action area for hazardous waste is the delta. There are no known hazardous waste occurrences in the delta.

3.9.3.2 Environmental Consequences – Action Alternative

3.9.3.2.1 Hazardous Materials and Substances

Leaks and Spills. Construction equipment would be required to complete the project and to create the associated supporting infrastructure. Types of construction equipment expected to be operated during the project are backhoes, trackhoes, barge-mounted cranes, excavators, loaders, dozers, farm-type tractors, small cranes, pickup trucks, dump trucks, barges, conveyors, pile drivers, compressors, generators, water trucks, sweeper trucks, and earthmovers. Construction equipment contains petroleum products, such as gasoline, diesel fuel, motor oil, and hydraulic fluid, and other hazardous fluids such as anti-freeze. Equipment leakage may lead to the release of small quantities of these substances into the environment.

Herbicide Treatment. EPA-approved, species-specific herbicide treatment may be required during the construction, operation, and maintenance of the project. Herbicide treatment can result in the release of toxic substances into the soil, surface water, and groundwater of the delta area. In addition, wildlife and project personnel may be exposed to the herbicide during application and run-off.

Pre-Contaminated Materials. Releases of hazardous substances to the environment may occur when contaminated media, such as soil and gravel, are used for construction or backfill materials. As stated in Section 3.4.1.2, *Water Quality*, DEQ established TMDLs in the Clark Fork River mainstem for cadmium, zinc, and copper. Mainstem river sediments are not known or expected to be contaminated, so excavation would not result in releases of these metals to the environment.

Waste. Nonhazardous waste would be generated during construction, operation, and maintenance of the project. The primary waste stream would be solid waste generated from clearing, excavation, and grading activities performed during construction of temporary access roads. Additional nonhazardous waste may include scrap construction materials, used piling, household trash, and used tires. All nonhazardous waste would be collected, stored, and disposed of properly (offsite). Small quantities of hazardous waste, such as solvents, adhesives, and cleaners, may be generated during construction of the project and would be disposed of according to applicable federal or state law.

Failure of Infrastructure. Failure of temporary falsework and work containment structures, such as coffer dams and temporary stream crossings, may occur during construction of the project and cause release of hazardous substances, such as those mentioned above.

3.9.3.2.2 Existing Sites of Environmental Concern

In general, the release of hazardous substances to the environment and exposure to project personnel may occur when existing sites of contamination are encountered during construction activities. These sites include leaking underground storage tank sites, Superfund sites, and former facilities currently or formerly permitted by the EPA or other regulatory agencies. No existing sites of environmental concern have been identified where project construction activities would occur.

3.9.3.2.3 Potential Effects on Resources

Potential effects on resources are as follows:

- Contamination of soil, surface water, and groundwater from hazardous substances generated or used by equipment during construction
- Contamination of personnel from transport, storage, use, or disposal of hazardous substances
- Contamination of plants and wildlife from transport, storage, use or disposal of hazardous substances

Thus, with the implementation of a comprehensive health and safety plan and the impact minimization measures aimed at hazardous substance release prevention (see Table 2-2), the impacts of the project are expected to be low.

3.9.3.3 Environmental Consequences – No Action

Under the No Action Alternative, BPA would not provide funding for portions of the project so no use or generation of hazardous substances or waste would occur from construction activities. Existing recreational, residential, and commercial activities would continue near the delta and would likely continue to generate small amounts of hazardous waste (e.g., boat fuel or oil leakage; pesticide use; and disposal) at current levels.

3.9.4 Public Health and Safety

3.9.4.1 Affected Environment

The action area for public health and safety is the project site. The affected environment includes recreation site users, residents, Tribal members, and visitors to the delta. Vehicular and boat traffic levels at the project site are generally low, with higher traffic volumes during summer months associated with recreation. Public access by vehicle is limited to Driftwood Yard Road and the boat ramp parking area maintained by IDFG at Area 11. All waterways in the delta are likely navigable.

3.9.4.2 Environmental Consequences – Action Alternative

Potential health and safety impacts of the project would include the following:

Construction activity hazards. Risk of injury to workers is associated with the use of heavy equipment, working near high-voltage lines, working in water, and exposure to hazardous materials such as fuels during access road construction and earthwork, and placement of structures. Work around water would be inherently dangerous, and risk of drowning would increase because worker mobility would be restricted while equipment is moving.

Heavy equipment safety. Work around heavy equipment would be inherently dangerous. Saturated soil may lack strength to support heavy loads, and could lead to unplanned equipment movements.

Potential fuel spills. Fuel spills could occur where off-road vehicles are fueled.

Traffic entering and leaving the project site. Construction trucks and vehicles entering or leaving the project site from and to Idaho 200 could increase safety hazards for vehicles and travelers using the road. Safety hazards related to construction traffic on Idaho 200 would be greatest during the summer months when highway use is greater. However, the impact would be low because road use would be within the design capacity of the roadway and the level of daily vehicle trips would be approximately 85 to 175 during construction.

The proposed Clark Fork River Delta Restoration Project could expose non-workers to increased health and safety risks for a short time during construction, such as dust inhalation. These risks would go away once construction ends. The short-term impacts would not be expected to strain the existing health and safety infrastructure or greatly increase risks to recreationists or visitors. Mitigation measures would help minimize the potential health and safety risks to workers and the public (see Table 2-2).

3.9.4.3 Environmental Consequences – No Action

Under the No Action Alternative, BPA would not provide funding and portions of the project would not be built. The potential risks to public health and safety associated with the project would not occur.

3.10 TRANSPORTATION

3.10.1 Affected Environment

The transportation action area was determined to be as follows:

- Driftwood Yard Road (access road to the project site).
- An approximately 3.2-mile segment of Idaho 200 between Driftwood Yard Road and the Hewett Rock Pit at Lightning Creek, approximately 3.2 miles south of Driftwood Yard Road.
- An approximately 500-foot segment of East Spring Creek Road, immediately north of Clark Fork, that provides access to the rock pit.

The following describes the affected environment for these roadways of interest in the action area.

3.10.1.1 Driftwood Yard Road

Driftwood Yard Road is located in the Pend Oreille WMA Area 11 and at milepost (MP) 51.35 on Idaho 200. It provides access to the project site and the WMA from Idaho 200. Driftwood Yard Road is gravel, approximately 14 feet wide, and approximately 0.5-mile in length. The road starts at Idaho 200 and ends at a parking lot and boat ramp on Lake Pend Oreille. IDFG and Corps have no recorded traffic volumes for this roadway. The road is owned and maintained by Corps and leased by IDFG.

3.10.1.2 Idaho 200

Idaho 200 starts at U.S. Highway 95 (US 95) in Ponderay and ends at the Idaho/Montana border, approximately 33 miles. Idaho 200 runs through the cities of Ponderay, Kootenai, Hope, East Hope, and Clark Fork in Bonner County.

Idaho on the Move, the long-range transportation plan for Idaho, designates Idaho 200 as a Rural Minor Arterial (Idaho Transportation Department [ITD], 2010). The designation is defined as a regional corridor that is meant to provide mobility within regions of the state and includes more moderate speeds, medium distance trip service, moderate through-traffic volumes, and moderate commercial vehicle flows.

Idaho 200 in the action area is two 12-foot travel lanes with shoulder widths that range between 1 and 5 feet wide. No center-turn lane or median is present. Idaho 200 is not part of the National Highway System or Strategic Highway Network, but is a designated National Scenic Byway by the U.S. Department of Transportation.

An ITD traffic recorder is on Idaho 200 at MP 35.98, approximately 6.2 miles east of the Idaho 200 junction with US 95 in Sandpoint, and approximately 18.5 miles west of Driftwood Yard Road. Average daily traffic (ADT) volumes were collected from this traffic recorder for the most recent 12 months and most recent 5 calendar years of available data. Table 3-12 illustrates the ADT over the previous 12 months. The 12-month ADT on Idaho 200 over previous 12 months was approximately 3,500 vehicles.

Table 3-13 illustrates the average annual ADT for the previous 5 years. Since 2008, ADT on Idaho 200 has slightly decreased. In 2012, the annual ADT on Idaho 200 was 3,390 vehicles.

3.10.1.3 East Spring Creek Road

East Spring Creek Road is located at MP 54.54 on Idaho 200 immediately north of Lightning Creek and the community of Clark Fork. It is owned and maintained by Bonner County. No traffic volumes for the road are recorded in the plan. East Spring Creek Road provides access to rural residential and commercial land uses, including a rock quarry (Hewett Rock Pit) north of the road at the intersection with Idaho 200.

Table 3-12 Idaho 200 at MP 35.98 ADT, Previous 12 Months of Available Data

Month	Average Daily Traffic
June 2012	3,750
July 2012	4,760
August 2012	5,800
September 2012	3,950
October 2012	3,360
November 2012	2,910
December 2012	2,650
January 2013	2,410
February 2013	2,700
March 2013	2,890
April 2013	3,070
May 2013	3,690
12-Month Average	**3,500**

Note:
Source: ITD, 2013.

Table 3-13 Idaho 200 at MP 35.98 Annual ADT, Previous 5 Years

Year	Average Annual Daily Traffic
2008	3,800
2009	3,710
2010	3,640
2011	3,440
2012	3,390
5-Year Average	**3,600**

Note:
Source: ITD, 2013.

3.10.2 Environmental Consequences – Action Alternative

The project would not require additional rights-of-way or permitted access to accommodate project construction, operation, or maintenance.

Transportation effects of the project would be limited to increased traffic trips to haul materials and allow access to the project site during the construction period (see below). The project would not require upgrades or expand the capacity of any of the roadways in the study area. For this reason, travel times and traffic safety conditions in the study area would not change after construction. Therefore, the project would have low impacts to transportation during construction and no effects after construction.

3.10.2.1 Idaho 200

General use of Idaho 200 would not be limited during construction. The project would increase traffic on Idaho 200 from delivery of construction equipment and materials and construction worker access to the project site from Idaho 200 throughout the construction period (June to April). A majority of traffic generated on Idaho 200 for construction worker access and delivery of miscellaneous construction equipment and materials would be from the west (from Sandpoint).

The number of daily construction trips generated by the project would vary throughout the construction period. Peak construction traffic on Idaho 200 would occur between June and September. During this time period, in addition to construction worker access and the general delivery of construction equipment and other materials, rock material would be hauled between a rock quarry off East Spring Creek Road (at MP 54.54, immediately north of Clark Fork) and Driftwood Yard Road in Area 11 (MP 51.35). Because the rock quarry is located north of Clark Fork, construction vehicles carrying haul would not enter the town of Clark Fork.

Table 3-14 illustrates the approximate construction traffic during this peak construction traffic period (May to September). Table 3-15 illustrates the increase in Idaho 200 traffic during the peak construction period (May to September).

Table 3-14 Approximate Construction Traffic during Peak Construction Traffic Period (May to September)

Traffic Type	Number of Trips	Notes
Truck traffic to/from rock quarry	110 trips per day[a]	55 trips from rock quarry to Driftwood Yard Road and 55 trips from Driftwood Yard Road to rock quarry
Construction worker traffic to/from site	80 trips per day[b]	40 trips to Driftwood Yard Road and 40 trips from Driftwood Yard Road
Miscellaneous construction traffic to/from site	20 trips per day[b]	10 trips to Driftwood Yard Road and 10 trips from Driftwood Yard Road
Total Daily Construction Trips	**Approximately 210 daily construction-related trips**	

Notes:

[a] The amount of rock hauled from the quarry to Area 11 would be approximately 100,635 tons. Assuming one cubic yard (CY) weighs 1.65 tons, and a 10-CY truck carries 16.5 tons of riprap, there would be approximately 6,100 truckloads from the quarry to Area 11 between May and September. Assuming 21 construction work days per month over 5 months, the average number of trips per day between the rock quarry and Driftwood Yard Road would be approximately 55 trips per day.

[b] General assumption based on anticipated construction activities.

Table 3-15 Approximate Increase in Idaho 200 Traffic during Peak Construction Traffic Period (May to September)

Idaho 200 ADT Volume (May to September 2012 Average)	Approximately 4,400 vehicles
Approximate Traffic Volume During Construction Activity Hours	Approximately 3,520 vehicles
Approximate Increase in Daily Traffic from Construction Activities	Approximately 210 vehicles
Approximate Percent Increase in Daily Traffic from Construction Activities	Approximately 6 percent

As illustrated in Table 3-14, ADT on Idaho 200 was approximately 4,400 vehicles between May and September 2012. According to ITD traffic recorder data, approximately 80 percent of the ADT volumes occur between 7 a.m. and 5 p.m., or approximately 3,520 vehicles. Assuming Idaho 200 traffic volumes between May and September are similar to traffic volumes between May and September 2012, the project would increase the traffic on Idaho 200 by approximately 6 percent near Driftwood Yard Road. The percent increase in daily traffic from construction activities would be lower north and south of Driftwood Yard Road because construction-related traffic would be coming from different directions on Idaho 200 (to/from the west for the majority of construction worker and miscellaneous construction traffic, and to/from the east for rock quarry traffic). After September, truck trips to and from the rock quarry would substantially decrease. Construction worker access and miscellaneous construction-related traffic (material delivery and equipment mobilization and demobilization) would continue through the end of the construction period (April).

The increased use of Idaho 200 by construction-related vehicles (equipment mobilization, trucks delivering materials, and construction workers) would have a short-term direct effect to highway travelers from brief and infrequent traffic delays. The increase in construction-related traffic on Idaho 200 would represent an increase in daily traffic volumes compared to its existing use. This increase is not expected to adversely degrade traffic operations or safety, and the roadway condition would not be degraded after construction because the construction-related trips would be spread throughout the workday. For these reasons, transportation impacts would range from low to moderate.

To minimize potential transportation effects on Idaho 200 during construction, traffic control signs would be posted on Idaho 200 to alert motorists of trucks turning to and from Driftwood Yard Road and East Spring Creek Road. The construction schedule would also be posted in local newspapers and websites.

3.10.2.2 Driftwood Yard Road

IDFG anticipates implementing maintenance improvements to the existing gravel road during spring prior to beginning construction of the project in June. The improvements would accommodate project construction-related vehicles.

Access to Driftwood Yard Road would be limited to construction-related vehicles. The existing parking lot and boat launch would be not accessible to the general public during construction, and therefore, there would be no transportation effect on Driftwood Yard Road to general traffic. For information on the recreation impacts from the closure of Driftwood Yard Road during construction, see Section 3.6, *Land Use and Recreation*. After construction, access to Driftwood Yard Road including the parking lot and boat launch for recreational and maintenance activities would resume. Thus, the impacts from the project on Driftwood Yard Road would be low.

3.10.2.3 East Spring Creek Road

A rock quarry at the intersection of Idaho 200 and East Spring Creek Road would provide rock material for the project between June and September. Access to the quarry is provided on East Spring Creek Road. Under the project, trucks would transport rock material from the quarry and would only use the west end of East Spring Creek at the intersection of Idaho 200 for the turning movement to/from the quarry and to/from Idaho 200. As shown in Table 3-14, approximately 55 truck trips would be made to the quarry, and approximately 55 truck trips would be made from the quarry. This increased use of East Spring Creek Road (approximately 110 truck trips per day) between June and September by construction vehicles would increase traffic on East Spring Creek Road and would represent an increase in daily traffic volumes compared to the road’s existing use. However, because of the low traffic associated with East Spring Creek, this traffic increase is expected to have a low transportation impact on East Spring Creek Road.

3.10.3 *Environmental Consequences – No Action*

Under the No Action Alternative, BPA would not provide funding and no transportation impacts from BPA-funded construction would occur. As a result, no improvements would be made to Driftwood Yard Road.

3.11 SOCIOECONOMICS

The action area for socioeconomics is the area within 0.5 mile of the project.

This area is where most of the direct impacts during construction and operation would occur. The larger geographic area of Bonner County was also identified as the economic study area because it is at the county level where most of the economic benefits may manifest, including spending on goods and services from the workers and the materials and equipment to construct the project.

3.11.1 *Affected Environment*

The project is located in the Clark Fork River delta in the eastern area of Lake Pend Oreille within unincorporated Bonner County, Idaho. Clark Fork is the closest community and is approximately 1 mile east of the project. Sandpoint, the largest city in Bonner County, is located about 13 miles to the northwest. Few people live within the 0.5-mile action area because of its location in a river delta with limited access points and public land ownership (see Section 3.6, *Land Use and Recreation*, for information on the public land ownership). The project area has limited access by road, and some areas are only accessible by boat. No businesses are located in the project area, and the only community resources are three boat launches (see Section 3.6, *Land Use and Recreation*) and a dock and day use area west of Area 5. The nearest public services are the Bonner County Sherriff's Department in Sandpoint and the Clark Fork Fire Department in Clark Fork. These services would respond to calls in the project action area.

3.11.1.1 Population and Housing

Table 3-16 presents information on the demographics of several towns in Bonner County from the latest U.S. Census data. From 2000 to 2010, Bonner County grew at a higher rate (11 percent) than the nearby communities (Sandpoint at 7.8 percent, Hope at 8.9 percent, and Clark Fork at 1.1 percent). Within the 0.5-mile action area, the majority of the population is located in Area 6 on Derr Island.

3.11.1.2 Employment and Income

The major employment industries in Bonner County are located within or around Sandpoint and include Bonner General Hospital, Litehouse Industries, and Coldwater Creek. Tourism is also a very important year-round industry within the Clark Fork River delta because it provides numerous recreational opportunities, including hunting, fishing, boating, and wildlife viewing in the summer. As a result of these opportunities, local businesses depend on tourists, hunters, and the local residents that use the delta and the surrounding area. In 2011, the Leisure and Hospitality industry represented 12 percent of the jobs in Bonner County—the fourth highest percentage after Trades, Utilities, and Transportation (22 percent); Government (19 percent); and Manufacturing (15 percent) (Idaho Department of Labor, 2013). As shown in Table 3-15, the median household income for residents in the action area is similar to the larger areas of Sandpoint and Bonner County, and larger than the nearby communities of Hope and Clark Fork.

Table 3-16 Demographic Characteristics

	Action Area	Clark Fork	Hope	Sandpoint	Bonner County
Total population	37	536	86	7,365	40,877
Median age	63.5	45.5	47.0	38.8	45.8
Minority population	2 (5.4%)	29 (5.4%)	1 (1.2%)	478 (6.5%)	2,271 (5.6%)
Low-income population[a]	5.3%	21.1%	31.4%	19.5%	15.2%
Households[a]	20	260	34	3,215	17,100
Median household income[a]	$43,000	$28,920	$23,750	$41,851	$42,989

Notes:
[a] Information is at the Census Block Group level. For the Action Area, this includes a larger geographic boundary beyond the 0.5-mile action area boundary.
Source: U.S. Census Bureau, 2013.

In addition, the unemployment rate in Bonner County has dropped to 9.9 percent for 2012 after reaching a high of 12.1 percent in 2010 (Idaho Department of Labor, 2013).

3.11.1.3 Environmental Justice

Executive Order 12898—Federal Actions to Address Environmental Justice in ***Minority Populations*** and ***Low-income Populations*** (collectively, ***environmental justice populations***) states that each federal agency shall identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority and low-income populations. The Executive Order further stipulates that agencies conduct their programs and activities in a manner that does not have the effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination because of their race, color, or national origin.

For the purpose of Executive Order 12898, minority populations include all people of the following origins: African-American, American Indian and Alaskan Native, Native Hawaiian or Other Pacific Islander, and Hispanic (of any race). Low-income populations are populations that are at or below the poverty line, as established by the U.S. Department of Health and Human Services.

Table 3-16 provides information on the minority and low-income populations in the action area compared to the surrounding cities and Bonner County. The minority population concentrations are similar to the other areas and the minority population is much smaller than the nonminority population in all areas identified in Table 3-16. The low-income population concentrations within the action area are much smaller than the cities in the surrounding area and Bonner County.

3.11.2 Environmental Consequences – Action Alternative

BPA would contribute partial funding towards the Clark Fork River Delta Restoration Project, which could cost approximately $11 million.

3.11.2.1 Erosion Control and Restoration Measures

Construction activities are not anticipated to result in any changes to population trends in the action area or Bonner County because much of the project occurs in areas with no permanent population and a high percentage of publicly owned areas. BPA's funding could have an economic multiplier effect on Bonner County and the vicinity. If construction workers were from outside of the immediate area, they would require temporary lodging. Because most construction employment would be outside of the busier summer tourist season, sufficient lodging opportunities would likely be available. Most workers would likely stay in Sandpoint because of the number of hotels and motels. Construction of the proposed project would likely result in short-term beneficial economic effects as construction workers spend money locally. In addition, the purchase of materials to construct the project would also benefit the local economies. Although beneficial, the positive impact BPA's funding and the economic multiplier effect is anticipated to be small and temporary.

Although rock hauling and in-water construction would occur during summer, most construction labor would occur during the drawdown of Lake Pend Oreille and outside of the primary summer tourist season. If construction overlaps typical hunting opportunities in the delta, some short-term impacts could potentially occur, such as loss of income from area retailers and commercial businesses that provide goods and services to hunters. However, the delta is one of many areas in the region that provide hunting opportunities, and the impacts would be limited to one season. Therefore, economic impacts on businesses that support hunting would be low.

Because a large portion of the earth fill requirements would be satisfied by using onsite soils and sediments, the number of truck trips for earth hauling would be minimal. By reducing the number of truck trips for earth fill and using barges to move rock in other areas, public services are not anticipated to be impacted by increased congestion on local roadways during construction.

3.11.2.2 Restore and Enhance Edge and Interior Areas

The project is not expected to impact future population trends for communities located around the Clark Fork River delta because: (1) existing populations are sparse, (2) actions would occur on publicly owned land, and (3) no residents, businesses, or community resources would be displaced. The project is anticipated to have a beneficial effect on the local tax base by improving fishing, hunting, and recreation opportunities after the project is complete because additional visitors may be attracted to the area or stay in the area for longer periods.

Operation of the project would not change public services in the area because no increase in permanent population would occur.

3.11.2.3 Environmental Justice

As shown in Table 3-16, the population within the project area is primarily nonminority and non-low-income. In addition, there is a lack of population in much of the project area and the areas adjacent to the action area.

During construction, the area adjacent to the delta would experience short-term disturbances, including noise and exhaust from construction equipment and activities, and traffic delays from construction traffic.

All persons, regardless of race or income, would experience the same impacts associated with construction in the action area. However, these impacts are expected to be low because there are few residences and businesses located adjacent to the delta. Therefore, construction of the project would not result in long-term disproportionately high and adverse effects on environmental justice populations.

The project would also result in a number of beneficial effects for all populations—including potential economic benefits from construction activities and the potential for additional tourism resulting from restoration of the delta.

Other benefits include improvements in the delta ecosystem and decreased land loss from erosion. Beneficial effects for tribes with usual and accustomed areas include improvements in fishing and hunting opportunities in the delta area, and protection under the Corps' *Historic Properties Management Plan* (USACE, 2008). Tribal employment may benefit from cultural resources inventories, monitoring, and mitigation.

3.11.3 Environmental Consequences – No Action

Under the No Action Alternative, BPA would not provide funding and no socioeconomic impacts from BPA-funded construction would occur. Without the improvements, erosion of the delta would continue and potentially have a negative effect on the area's tourism, fish and wildlife resources, and local economy.

3.12 CUMULATIVE IMPACTS ANALYSIS

Cumulative impacts are the impacts on the environment that result from the incremental impact of the project when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

This section describes existing development from past actions in the vicinity of the proposed project, as well as present and reasonably foreseeable future development in the project area. The geographic area considered for cumulative impacts to natural and physical resources includes the Pend Oreille Basin, primarily the lower Clark Fork River, the delta, Lake Pend Oreille, and wetland, riparian, and upland areas adjacent to these water bodies. In some cases related to socioeconomic resources, the area considered for cumulative impacts may extend to all of Bonner County. Potential cumulative impacts also are analyzed and described. The past, present, and reasonably foreseeable future actions provide the context in which to assess the cumulative impacts of these actions in combination with the project.

3.12.1 Past Actions

The nature and extent of resource management efforts that has resulted from past actions in the vicinity of the project area is largely described earlier in this chapter in the "Affected Environment" sections for each resource. In addition to ongoing hydroelectric operations, past actions that have adversely affected natural and human resources in the delta include logging, agriculture, road development, residential development, and mining.

Ducks Unlimited, IDFG, Avista Corporation, Corps, and others partnered under a North American Wetlands Conservation Act grant in 2008 to restore wetland habitat in the Pack River delta. The goal of the Pack River restoration project was to increase geomorphic and vegetative diversity in the Pack River delta that was lost due to past anthropogenic land-use practices and alterations to the hydrology of Lake Pend Oreille caused by Albeni Falls Dam. This restoration project was part of a larger effort to protect and improve key riparian, wetland, and associated upland habitats in the lower Clark Fork River/ Lake Pend Oreille watershed. BPA partnered in the restoration project effort by funding a pilot study to test the performance of a new breakwater technology for possible future mitigation efforts in the Clark Fork River delta.

3.12.2 Current and Reasonably Foreseeable Future Actions

Current actions are those projects, developments, and other actions that are currently underway, because they are either under construction or occurring on an ongoing basis. Reasonably foreseeable future actions generally include those actions formally proposed or planned, or highly likely to occur based on available information. Various sources, including local, state, and federal agency websites and city and county staff, were consulted to obtain information about any current and potential future development in the project vicinity. The following describes these current and reasonably foreseeable future actions.

- The Clark Fork River delta restoration complements recent efforts by the Pend Oreille County Public Utility District No. 1 to implement mitigation measures associated with the Box Canyon Hydroelectric Project. Box Canyon mitigation efforts are coordinated with the Box Canyon Technical Committee and are associated with settlement agreement terms and conditions for the 1997 amended license of Box Canyon Dam (86 FERC 61,200 [1999]).

- The Clark Fork River Delta Restoration Project is also coordinated with the Clark Fork Settlement Agreement for the Cabinet Gorge and Noxon Rapids Hydroelectric Projects owned and operated by Avista Corporation (Avista, 1999). The Clark Fork Settlement Agreement includes a specific protection, mitigation, and enhancement measure for the Clark Fork River delta. The protection, mitigation, and enhancement measure calls for coordination with and potential funding for the project to implement erosion control measures in the delta.

- The Albeni Falls Wildlife Mitigation Project funded by BPA through the Council's Fish and Wildlife Program includes collaboration with the Inland Northwest Land Trust and the Kaniksu Land Trust to identify and refer landowners interested in pursuing conservation easements on lands in northern Idaho. The project is also coordinated with other nonprofit conservation organizations such as the Rocky Mountain Elk Foundation, Ducks Unlimited, Trout Unlimited, The Nature Conservancy, Vital Ground, and The Conservation Fund to provide acquisition and restoration expertise on an as-needed basis.

- The Kalispel Tribe, Coeur D'Alene Tribe, and Kootenai Tribe of Idaho are also partners in the Albeni Falls Wildlife Mitigation Project. BPA implements the project through long-term wildlife agreements with the IDFG, Kootenai Tribe of Idaho, and Coeur

D'Alene Tribe. The Kalispell Tribe and BPA have additional commitments in a 2012 Columbia Basin Fish Accord.

- The USDA Farm Bill programs are also likely to result in actions complementary to the project and improved ecosystem functions in the Clark Fork River delta. Those program include the following:
  - Wildlife Habitat Incentives Program
  - Continuous Conservation Reserve Program
  - Conservation Reserve Program
  - Wetland Reserve Program
  - Environmental Quality Incentive Program
- Timber harvesting and associated road construction occur throughout the watershed. These activities contribute sediment to the Clark Fork River, as does runoff from past fires. USFS is proposing to conduct tree salvage adjacent to USFS Road No. 278 near the west side of Derr Island (Area 6). (Hixsom, pers. comm., 2014).
- The project would also help address erosion abatement and land restoration from the operation of Albeni Falls Dam, which was called for in the *Upper Pend Oreille Subbasin TMDL* (DEQ, 2001).

3.12.3 Cumulative Impacts Analysis

The following subsections describe the cumulative effects that the project, in combination with the past, present, and reasonably foreseeable future actions identified above, would have on the various environmental resources discussed in this EA. Cumulative impacts from the combination of these actions could occur for each of the environmental resources. Overall, the project in combination with past, present, and reasonably foreseeable future actions would result in low to moderate cumulative impacts to all assessed resources.

3.12.3.1 Geology and Soils

The geographic area considered for cumulative impacts on soils and geology includes the Pend Oreille Basin. The past, present, and reasonably foreseeable future actions that could cumulatively affect soils and geology are habitat restoration actions and continued hydroelectric dam operations as well as land-disturbing operations such as road construction, agriculture, mining, and housing development.

The project would have low cumulative effects on soils and geology because project earthwork would occur during winter, and most land-disturbing operations by others in the geographic area would occur during the extended summer timeframe. Furthermore, environmental design features/mitigation measures described in Table 2-2 would ensure that cumulative impacts of the project on geology and soils would be low.

3.12.3.2 Vegetation and Wetlands

The geographic area considered for cumulative impacts on vegetation and wetlands includes the Pend Oreille Basin. The past, present, and reasonably foreseeable future actions that could cumulatively affect vegetation and wetlands are habitat restoration projects in the Pend Oreille

Basin, as well as continued hydroelectric dam operations and Area 11 log yard improvements by the Corps.

The project may cumulatively affect vegetation and wetlands during construction because there would be other actions impacting vegetation and wetlands during the same general timeframe as project construction. The project, when considered with past, present, and future habitat restoration projects in the Pend Oreille Basin, could contribute to reestablishment of special status plant species and control invasive plant species. Environmental design features/mitigation measures described in Table 2-2 would ensure that cumulative impacts from the project on vegetation and wetlands would be low.

3.12.3.3 Water Resources

The geographic area considered for cumulative impacts on water resources includes the lower Clark Fork River and Lake Pend Oreille. The past, present, and reasonably foreseeable future actions that could cumulatively affect water resources include logging, road construction, and habitat restoration projects, as well as continued hydroelectric dam operations. These actions would occur during the same general timeframe as project construction.

The project would likely cumulatively impact water resources through sediment discharges and vegetation removal from construction actions. Environmental design features and mitigation measures described in Table 2-2 would ensure that cumulative impacts from the project on water resources would be low.

3.12.3.4 Fish and Wildlife

The geographic area considered for cumulative impacts on fish and wildlife resources includes the Pend Oreille Basin. Past and present development and other activities have had a cumulative impact on fish and wildlife and their habitats in the lower Clark Fork River (including the delta) and Lake Pend Oreille. The clearing and conversion of land for logging, agriculture, and rural development, as well as operation of hydroelectric projects, have resulted in the loss of fish and wildlife habitat. The project would cumulatively affect fish and wildlife mainly through temporary construction disturbance and vegetation removal. The project would help create thermal refugia and recruit large woody debris, creating habitat favorable to ESA-listed species such as bull trout. It would also create, improve, and prevent the loss of wildlife habitat from erosion. Therefore, the project would have a low cumulative impact on fish and wildlife.

3.12.3.5 Land Use and Recreation

The geographic area considered for cumulative impacts on land use and recreation resources includes the Pend Oreille Basin. Land use and recreation in the vicinity of the delta and the portion of the northeast corner of Lake Pend Oreille near the delta have incrementally changed because of past and present development, and this trend is expected to continue. However, there would be no cumulative impacts from the project on land use because land use is not expected to change in the action area. The project would have a low cumulative impact on recreation because of temporary disruptions during construction from road and boat launch closures and delays, and hunting, boating and wildlife viewing limitations. However, recreation opportunities are expected to improve as delta habitats are restored and as conditions improve throughout the WMA.

3.12.3.6 Cultural Resources

It is likely that cultural resources in the project's APE have been cumulatively affected by past and present development activities, as well as erosion from the operation of Albeni Falls Dam, wind, and waves from summer recreational boaters. They may continue to be affected by other reasonably foreseeable future projects in the APE (including ongoing agriculture, timber harvest, recreation, mining, and hydroelectric operations) that have the potential to disturb previously undiscovered cultural resources. The project would likely have a low cumulative impact on historic properties because, although no historic properties and archaeological resources are known to occur in the APE, there may be unknown cultural resources that are discovered during construction. Implementation of the mitigation measures described in Table 2-2 would reduce the potential for construction activities to cumulatively impact unknown cultural resources in the APE. In the long term, the project may protect some cultural resources from further erosion.

3.12.3.7 Aesthetics and Visual Resources

The geographic area considered for cumulative impacts on aesthetics and visual resources includes the Clark Fork River delta and Lake Pend Oreille. The aesthetics and visual resources of the delta have changed because of past and present development, including hydroelectric operations, and this trend is expected to continue. The cumulative impact to aesthetics and visual resources resulting from the project is expected to be low as vegetation matures, producing a less-engineered shoreline that would have visual complexity, variety, and a more natural appearance.

3.12.3.8 Air Quality and Climate Change

The geographic area considered for cumulative impacts on air quality and climate change includes the lower Clark Fork River and Lake Pend Oreille. Vehicular traffic, agricultural activities, timber harvesting, and commercial and residential facilities in the project area have all contributed to air quality impacts and GHG emissions. These emission sources would continue to occur. The combustion emissions and dust generation from the project are expected to have a temporary and localized air quality impact. However, given the low level of emissions from the project, the incremental impact on air quality and climate change would be low to moderate. Therefore, the cumulative impact from the project on air quality and climate change would be low.

3.12.3.9 Noise

Within the project area, the predominant sources of noise are rural residences, recreationists, and vehicular and railroad traffic. These sources of noise would continue to occur. However, since noise travels, the geographic area considered for cumulative impacts from noise includes the lower Clark Fork River and Lake Pend Oreille (approximately 2,000 feet from the project area boundary). Cumulative noise impacts could occur when there is noise from more than one noise source at approximately the same time. When combined with the existing noise sources, the project is expected to have a low to moderate cumulative impact on noise because noise impacts would be temporary, and would likely only extend 2,000 feet from construction activities. For noise receptors within 2,000 feet of construction (e.g., residences, recreationists), the impact would be moderate when combined with other noise sources, but would cease after construction ended.

3.12.3.10 Hazardous Waste

The geographic area considered for cumulative impacts on hazardous waste includes the lower Clark Fork River and Lake Pend Oreille, including wetland, riparian, and upland areas in the project area. Past and ongoing land use activities at the delta include timber harvest and associated logging roads, agriculture, residences, and a nearby campground. These activities likely created small amounts of industrial and household hazardous waste. Because the effects of the project would be mitigated through safety and mitigation measures (Table 2-2) aimed at reducing the risks from exposure to and release of hazardous materials, the cumulative impacts on hazardous waste are expected to be low.

3.12.3.11 Public Health and Safety

The geographic area considered for cumulative impacts on public health and safety includes the lower Clark Fork River and Lake Pend Oreille. Within the project area, the main potential risk to public health and safety is the increased potential for injuries associated with hazardous construction activities and motor vehicle accidents. Because the effects of the project would be mitigated through safety and mitigation measures (see Table 2-2) aimed at reducing the risks from operating heavy equipment and vehicles and exposure to hazardous materials, the cumulative impacts on public health and safety are expected to be low.

3.12.3.12 Transportation

The area analyzed for cumulative impacts on transportation has been defined as a 0.5-mile radius of the Clark Fork River delta. The main sources of traffic in this area are residential, recreational, and railway, and these sources are expected to continue. Because the effects of the project would be mitigated through safety and mitigation measures aimed at reducing the impacts from increased traffic and traffic delays within the area (see Table 2-2), the cumulative impacts on transportation are expected to be low to moderate.

3.12.3.13 Socioeconomics

The geographic area for cumulative impacts on socioeconomics is Bonner County, Idaho. Cumulative impacts on socioeconomics would occur if other construction projects occurred simultaneously with the project, such as residential development, logging, or road construction.

The project would likely not result in any changes in population. Thus, there would be no cumulative impact on population levels, public facilities, and social services. Because the employment and income associated with the delta construction activities would be temporary and limited in duration, the project would likely not contribute to noticeable long-term economic benefits (employment, income, tax revenue) or demand for housing in communities near the delta. In addition, because the project would not disproportionately affect any low-income or minority populations, there would be no cumulative impacts on the environmental justice population.

Socioeconomic benefits of the project, when combined with other fish and wildlife mitigation projects, including other BPA-funded projects, could combine for cumulative positive socioeconomic benefits. These would include increased recreation opportunities, particularly hunting and fishing. Jobs created at other fish and wildlife mitigation project sites would combine with jobs created by the project to temporarily improve employment opportunities in the region. Thus, the cumulative impacts from the project on socioeconomics would likely be low.

Chapter 4
Environmental Consultation, Review, and Permit Requirements

This chapter addresses statutes, implementing regulations, and executive orders applicable to the project.

This EA is being sent to tribes, federal agencies, state agencies, and state and local governments as part of the consultation process for the project. Persons, tribes, organizations, and agencies consulted are included in the list in Chapter 5, *Tribes, Individuals, Organizations, and Agencies Consulted*.

4.1 NATIONAL ENVIRONMENTAL POLICY ACT

This EA was prepared pursuant to regulations implementing NEPA (42 USC 4321 et seq.), which requires federal agencies to assess the impacts that their actions may have on the environment. NEPA requires preparation of an EIS for major federal actions significantly affecting the quality of the human environment. BPA prepared this Draft EA to determine if the project would create any significant environmental impacts that would warrant preparing an EIS, or whether it is appropriate to prepare a FONSI.

4.2 WETLANDS, FLOODPLAINS, AND WATER RESOURCES

As part of the NEPA review, U.S. Department of Energy NEPA regulations require that impacts on floodplains and wetlands be assessed and alternatives for protection of these resources be evaluated in accordance with Compliance with Floodplain/Wetlands Environmental Review Requirements (10 CFR 1022.12) and Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands). An evaluation of impacts of the project on floodplains and wetlands is discussed briefly below and in more detail in Section 3.4, *Water Resources*, of this EA.

Wetland and waterway management, regulation, and protection are addressed in several sections of the Clean Water Act, including Sections 401, 402, and 404. The various sections applicable to the project are discussed below.

4.2.1 Clean Water Act Section 401

A federal permit to conduct an activity that causes discharges into navigable waters is issued only after the State of Idaho certifies that existing water quality standards would not be violated if the permit were issued. DEQ would review the project's Section 402 and Section 404 permit applications for compliance with Idaho water quality standards and grant certification if the permits comply with these standards.

4.2.2 Clean Water Act Section 402

This section authorizes National Pollutant Discharge Elimination System (NPDES) permits for the discharge of pollutants, such as stormwater. The EPA, Region 10, has a general permit for discharges from construction activities. IDFG would issue a Notice of Intent to obtain coverage under this general permit, and will prepare a Stormwater Pollution Prevention Plan to address stabilization practices, structural practices, stormwater management, and other controls.

4.2.3 Clean Water Act Section 404

Authorization from the Corps is required in accordance with the provisions of Section 404 of the Clean Water Act when dredged or fill material is discharged into waters of the United States, including wetlands. IDFG will coordinate with the Corps to obtain a Section 404 permit for any fill placed in wetlands or non-wetland waters, and work with DEQ to obtain Section 401 water quality certification (see Section 4.2.1). Potential impacts on wetlands and other waters are described in Sections 3.3, *Vegetation and Wetlands*, and 3.4, *Water Resources*, of this EA.

4.3 FISH AND WILDLIFE

4.3.1 Endangered Species Act

The ESA (16 USC 1531 et seq.) establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants, and the preservation of the ecosystems on which they depend. The ESA is administered by USFWS for terrestrial species and some freshwater fish species, and by National Oceanic and Atmospheric Administration (NOAA) Fisheries for anadromous fish and marine species. Section 7(a) of the ESA requires federal agencies to ensure that the actions they authorize, fund, and carry out do not jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat. Section 7(c) of the ESA and other federal regulations require that federal agencies prepare a biological assessment (BA) addressing the potential effects of their actions on listed or proposed endangered species and critical habitats.

BPA consulted with the USFWS lists of fish, wildlife, and plant species in Bonner County that are protected under the ESA to determine which endangered or threatened species and critical habitat may occur in the action area as defined in Sections 3.3, *Vegetation and Wetlands*, and 3.5, *Fish and Wildlife*, of this EA.

Based on the USFWS lists and reconnaissance-level surveys by IDFG, BPA determined that five species have the potential to occur and be affected by the project—water howellia, bull trout and bull trout critical habitat, grizzly bear, Canada lynx, and wolverine. BPA and IDFG entered into pre-consultation with USFWS regarding potential effects on these species and critical habitat. No ESA-listed species under the jurisdiction of NOAA fisheries are known to occur within the project area.

Pursuant to the requirements of Section 7(c) of the ESA, BPA and IDFG prepared a draft BA and submitted it to USFWS. The draft BA addressed effects of the project on water howellia, bull trout and bull trout critical habitat, grizzly bear, Canada lynx, and wolverine. Based on the BA, BPA determined that the project would have no effect on water howellia, grizzly bear, Canada lynx, and wolverine. Due to the potential presence of juvenile bull trout in the project area during proposed construction times and the extent of shoreline work within the delta, BPA determined that the project would be likely to adversely affect bull trout and may adversely modify bull trout critical habitat.

There are no known occurrences of grizzly bear, Canada lynx, and wolverine in the action area, and they are unlikely to be in the action area during the staging and construction periods (preliminary consultation with USFWS, December 4, 2013). While the project may improve bull trout critical habitat over the long term because habitat in the delta would shift to a more channelized system with increased thermal refugia and large woody debris, cover, and complexity, short-term impacts of barging and dumping rock would impact species if present. BPA expects to submit the final BA to USFWS in December 2013, with a request to enter into formal consultation. The potential effects on ESA-listed species are discussed in greater detail in Sections 3.3, *Vegetation and Wetlands*, and 3.5, *Fish and Wildlife*, of this EA.

4.3.2 Fish and Wildlife Conservation and Fish and Wildlife Coordination Act

The Fish and Wildlife Conservation Act of 1980 (16 USC 2901 et seq.) encourages federal agencies to conserve and promote conservation of non-game fish and wildlife and their habitats. The Fish and Wildlife Coordination Act (16 USC 661 et seq.) requires federal agencies with projects affecting water resources to consult with USFWS and the state agency responsible for fish and wildlife resources. The analysis in Section 3.5, *Fish and Wildlife*, of this EA indicates that the project would have low to moderate impacts on fish and wildlife, with implementation of appropriate mitigation. BPA and IDFG are consulting with USFWS regarding potential effects of the project on ESA-listed fish and wildlife species and will implement the mitigation measures included in the BA and any other measures that USFWS requires.

4.3.3 Migratory Bird Treaty Act and Federal Memorandum of Understanding

The Migratory Bird Treaty Act of 1918, as amended, implements various treaties and conventions between the United States and other countries, including Canada, Japan, Mexico, and Russia, for the protection of migratory birds (16 USC 703–712). Under the act, taking, killing, or possessing migratory birds, or their eggs or nests, is unlawful. The act classifies most species of birds as migratory, except for upland and nonnative birds such as pheasant, chukar, gray partridge, house sparrow, European starling, and rock dove.

BPA (through the U.S. Department of Energy [DOE]) and USFWS have a memorandum of understanding (MOU) to address migratory bird conservation in accordance with Executive Order 13186 (Responsibilities to Federal Agencies to Protect Migratory Birds), which directs each federal agency that is taking actions possibly negatively affecting migratory bird populations to work with the USFWS to develop an agreement to conserve those birds (DOE and USFWS, 2013). The MOU addresses how both agencies can work cooperatively to address migratory bird conservation and includes specific measures to consider implementing during project planning and implementation.

The analysis in Section 3.5, *Fish and Wildlife*, of this EA indicates that the project would have low to moderate impacts on birds, including migratory birds, with implementation of appropriate mitigation. The project would avoid potential effects on nesting birds by conducting ground-disturbing activities during the non-breeding season (September to February). In the event that potential effects on nesting populations could not be avoided, BPA would work with IDFG and USFWS to determine appropriate mitigation measures.

4.3.4 Bald Eagle and Golden Eagle Protection Act

The Bald Eagle and Golden Eagle Protection Act (16 USC. 668–668d) addresses taking or possessing of and commerce in bald and golden eagles, with limited exceptions. The Act only covers intentional acts or acts in "wanton disregard" of the safety of bald or golden eagles.

Bald and golden eagles may occur at the project site. Because the project would not involve knowing take or other acts in wanton disregard of bald or golden eagles, implementation of the project would not violate the provisions of the Bald Eagle and Golden Eagle Protection Act.

4.4 LAND USE PLAN CONSISTENCY

As indicated in Section 3.6, *Land Use and Recreation*, implementation of the project would be consistent with applicable local land use planning and zoning in Bonner County. See Section 3.6, *Land Use and Recreation*, for further discussion.

4.4.1 Farmland Protection Policy Act

The Farmland Protection Policy Act (7 USC 4201 et seq.) directs federal agencies to identify and quantify adverse impacts of federal programs on farmlands. The purpose of this act is to minimize the number of federal programs that contribute to the unnecessary and irreversible conversion of agricultural land to non-agricultural uses. As discussed in Section 3.6, *Land Use and Recreation*, of this EA, the project would not convert any area of agricultural land to non-agricultural uses.

4.5 CULTURAL AND HISTORIC RESOURCES

Laws and regulations govern the management of cultural resources. A cultural resource is an object, structure, building, site, or district that provides irreplaceable evidence of natural or human history of national, state, or local significance, such as National Landmarks, archaeological sites, and properties listed (or eligible for listing) in the National Register. Cultural resource-related laws and regulations include the following:

- Antiquities Act of 1906 (16 USC 431–433)
- Historic Sites Act of 1935 (16 USC 461–467)
- National Historic Preservation Act (NHPA; 16 USC 470 et seq.), as amended, inclusive of Section 106
- Archaeological Data Preservation Act of 1974 (16 USC 469 a–c)
- Archaeological Resources Protection Act of 1979 (16 USC 470 aa–mm), as amended
- Native American Graves Protection and Repatriation Act (25 USC 3001 et seq.)
- Executive Order 13007 Indian Sacred Sites
- American Indian Religious Freedom Act of 1978 (42 USC 1996, 1996a)

Section 106 of the NHPA requires federal agencies to consider the effects of their actions on historic properties. The NHPA provides a process (known as the Section 106 process) that enables agencies to assess impacts on historic properties along with participation from interested and affected parties such as tribes, and then avoid, minimize, or mitigate for these impacts. Historic properties may be pre-contact or historic sites, including objects and structures that are included in or eligible for inclusion in the National Register. Historic properties also include artifacts or remains within historic sites and properties of traditional and cultural importance to tribes.

To this end, BPA, in coordination with the Corps, has provided information about the project and requested input on the level and type of identification and evaluation efforts for prehistoric resources to the Idaho State Historic Preservation Office (SHPO) and the following tribes:

- Kalispel Tribe of Indians
- Coeur d'Alene Tribe
- Kootenai Tribe of Idaho
- Confederated Salish and Kootenai Tribes

4.6 AIR QUALITY

The federal Clean Air Act, as amended (42 USC 7401 et seq.), requires the EPA and delegated states to carry out a wide range of regulatory programs intended to assure attainment of the NAAQS. In Idaho, both the EPA and DEQ have responsibility for air quality. Because the project would occur in an area that is currently in attainment for meeting the NAAQS and because no stationary sources of air emissions would occur, construction activities associated with the project are exempted for state regulation. Air quality impacts from construction are expected to be low and mitigation measures are discussed in Table 2-2. When the project is complete, all construction-related emissions are expected to cease.

4.6.1 Climate Change

Gases that absorb infrared radiation and prevent heat loss to space are called GHGs. Models predict that atmospheric concentrations of all GHGs will increase over the next century, but the extent and rate of change is difficult to predict, especially on a global scale. As a response to concerns over the predicted increase of global GHG levels, various federal and state mandates address the need to reduce GHG emissions.

The Clean Air Act is a federal law that establishes regulations to control emissions from large generation sources such as power plants; limited regulation of GHG emissions occurs through the New Source Review permitting program.

The EPA has issued the Final Mandatory Reporting of Greenhouse Gases Rule (40 CFR 98) that requires reporting of GHG emissions from large sources. Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHGs are required to submit annual reports to the EPA (74 FR 56260).

Executive Orders 13423 (Strengthening Federal Environmental, Energy, and Transportation Management) and 13514 (Federal Leadership in Environmental, Energy, and Economic Performance) require federal agencies to measure, manage, and reduce GHG emissions by agency-defined target amounts and dates.

GHG emissions were calculated for project construction activities including off-road construction equipment and on-road vehicles. GHG emissions would be below EPA's mandatory reporting threshold, of 25,000 metric tons and the impact of the project on GHG concentrations would be low, as discussed in Section 3.9, *Air Quality, Noise, Hazardous Waste, and Public Health and Safety*, of this EA.

4.7 NOISE

The Noise Control Act of 1972 (42 USC 4901 et seq.) sets forth a broad goal of protecting all people from noise that jeopardizes their health or welfare. The act further states that federal agencies are authorized and directed, to the fullest extent consistent with their authority under federal laws administered by them, to carry out the programs within their control in such a manner as to further this policy. Idaho has not established state-wide regulations limiting noise emissions from commercial facilities. Similarly, Bonner County has not established a noise control ordinance that limits noise emissions. The noise impacts from the project would be temporary and moderate for the noise receptors within 2,000 feet of construction, and low to none for noise receptors farther than 2,000 feet from project actions. As described in Section 3.9, *Air Quality, Noise, Hazardous Waste, and Public Health and Safety*, of this EA, the project would have primarily temporary low to moderate noise impacts, and mitigation measures are identified to further reduce noise impacts in Table 2-2.

4.8 HAZARDOUS MATERIALS

Several federal laws related to hazardous materials and toxic substances potentially apply to the project, depending upon the exact quantities and types of hazardous materials created or stored at the delta.

4.8.1 Spill Prevention Control and Countermeasures Rule

The Spill Prevention Control and Countermeasures Rule (40 CFR Part 112) includes requirements to prevent discharges of oil and oil-related materials from reaching navigable waters and adjoining shorelines. It applies to facilities with total aboveground oil storage capacity (not actual gallons onsite) of greater than 1,320 gallons and facilities with belowground storage capacity of 42,000 gallons. No onsite storage of oil or oil-related materials is proposed as part of the project.

4.8.2 Comprehensive Environmental Response Compensation Liability Act, as Amended

The Comprehensive Environmental Response Compensation Liability Act (42 USC 9601 et seq.), as amended, provides funding for hazardous materials training in emergency planning, preparedness, mitigation implementation, response, and recovery. Eligible individuals include public officials, emergency service responders, medical personnel, and other tribal response and planning personnel. No Superfund sites are located within the project.

4.8.3 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act, as amended, is designed to provide a program for managing and controlling hazardous waste by imposing requirements on generators and transporters of hazardous waste, and on owners and operators of treatment, storage, and disposal facilities (42 USC 6901 et seq.). Each facility owner or operator is required to have a permit issued by EPA or the state. Typical construction and maintenance activities have generated small amounts of these hazardous wastes—solvents, pesticides, paint products, motor and lubricating oils, and cleaners. Small amounts of hazardous wastes may be generated by the project. These materials would be disposed of according to state law and the Resource Conservation and Recovery Act. Solid wastes would be disposed of at an approved landfill or recycled.

4.8.4 Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (7 USC 136 [a-y]) registers and regulates pesticides. Pesticides may be used as part of the project and would be used in accordance with all applicable federal and state regulations. Herbicide containers would be disposed of according to Resource Conservation and Recovery Act standards.

4.8.5 Uniform Fire Code

The development of a Hazardous Materials Management Plan may also be required by local fire districts in accordance with the Uniform Fire Code. IDFG would develop and implement such a plan, if required.

4.9 EXECUTIVE ORDER ON ENVIRONMENTAL JUSTICE

In February 1994, Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority and Low-income Populations) was released to federal agencies. This order states that federal agencies shall identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. The project would not cause disproportionately high and adverse impacts on minority and low-income populations. Section 3.11, *Socioeconomics*, of this EA contains a discussion on environmental justice.

4.10 ENVIRONMENTAL PERMIT REQUIREMENTS

Table 4-1 presents a list of required environmental permits for the Clark Fork River Delta Restoration Project.

Table 4-1 Environmental Permits Required

Permit	Agency	Authorization	Description
Non-Navigational Encroachment Permit	Idaho Department of Lands	Idaho Administrative Procedure Act (IDAPA) 20.03.04.010.16; Idaho Code 58-1306	For encroachment in, on, or over navigable waters of the State of Idaho; 60-day minimum comment period, 120 days if hearing required
Reclamation Permit	Idaho Department of Lands	Idaho Surface Mining Act, Title 47, Chapter 15, Idaho Code	For developing new borrow area(s)
Water Quality Certification	Idaho Department of Environmental Quality (DEQ)	Clean Water Act, Section 401	For compliance with state water quality standards
Dredge and Fill Permit	U.S. Army Corps of Engineers (Corps)	Clean Water Act, Section 404	For discharge of dredged or fill material into waters of the U.S.
National Pollutant Discharge Elimination System Construction Stormwater Discharge Permit	U.S. Environmental Protection Agency (EPA)	Clean Water Act, Section 402	Required if more than 1 acre of soil disturbance
Incidental Take Permit	U.S. Department of the Interior (USDI) Fish and Wildlife Service (USFWS)	Endangered Species Act	Requires biological assessment for listed species (for example, bull trout)
Free Use (Mineral Materials) Permit	USDI Bureau of Land Management (BLM)	43 CFR 3604	To acquire mineral materials from public lands
Land Use Authorization Permit	USDI Bureau of Land Management (BLM)	43 CFR 2920	For the use, occupancy, and development of the public lands

4.11 RESOURCE MANAGEMENT PLAN CONFORMANCE

The *Coeur d'Alene Resource Management Plan* (RMP) addresses BLM's land management actions at the Clark Fork River delta. The RMP's Record of Decision, signed in 2007, allows for the project based on the relevant goals, objectives, and actions listed in Table 4-2. Additional information pertaining to RMP conformance is found in the Appendixes to the RMP (BLM, 2007a).

Table 4-2 Relevant Goals, Objectives, and Actions of BLM's Coeur d'Alene Resource Management Plan

Goal SO-1. Manage soils on public land to maintain, restore, or improve soil erosion class and watershed health.	
Objective SO-1.1. Ensure that management actions for other resource programs incorporate adequate soil protection.	**Action SO-1.1.1.** Implement BMPs for surface-disturbing activities (RMP Appendix C). **Action SO-1.1.2.** Subwatersheds identified for restoration should be considered and reviewed by BLM for restoration opportunities to reduce adverse erosion and sediment (RMP Appendix D and Map 2 in Appendix G). **Action SO-1.1.3.** Apply appropriate reclamation measures to mitigate adverse erosion and sediment delivery. **Action SO-1.1.4.** Implement Riparian Conservation Area (RCA) Management Guidelines in RMP Appendix A as management guidance.
Goal VR-1. Provide for the Proper Functioning Condition of riparian and wetland areas.	
Objective VR-1.1. Strive to achieve Proper Functioning Condition (PFC) for at least 75 percent of the riparian and wetland areas across the field office.	**Action VR-1.1.1.** Complete riparian and wetland inventory and assessment. **Monitoring VR-1.1.2.** Monitor nonfunctional and functional at-risk areas to detect upward or downward trend. **Action VR-1.1.3.** Improve degraded riparian and wetland vegetation by implementing Coeur d'Alene Native Fish Strategy (CNFISH) guidance in RMP Appendix A. **Action VR 1.1.4.** Maintain riparian and wetland areas in PFC so their condition rating is not degraded.

Table 4-2 Relevant Goals, Objectives, and Actions of BLM's Coeur d'Alene Resource Management Plan

Goal FW-1 – Manage aquatic, riparian, and wetland habitats to provide for a natural abundance and diversity of fish and wildlife with self-sustaining populations in northern Idaho.	
Objective FW-1.1. Promote recovery of aquatic, riparian, and wetland habitats, including maintaining/ improving watersheds.	**Action FW-1.1.1.** Establish RCAs consistent with Riparian Management Objectives and Standards & Guidelines in the CNFISH (see RMP Appendix A and Appendix D).
Objective FW-1.2. Protect high quality aquatic, riparian, and wetland.	**Action FW-1.2.1.** Follow priorities in RMP Appendix D when implementing conservation and restoration activities. **Action FW-1.2.2.** Within prioritized subwatersheds, identify Desired Future Condition for riparian and aquatic resources. **Action FW-1.2.3.** Do not undertake management activities that will degrade existing habitat in conservation subwatersheds. Do not undertake management activities that will retard attainment of trends towards improvement of aquatic habitats in restoration subwatersheds.
Goal SS-1 – Conserve listed species and the ecosystems upon which they depend.	
Objective SS-1.1. Comply with recovery activities for all Threatened and Endangered (T&E) species.	**Action SS-1.1.5.** In cooperation with the IDFG, USFWS, USFS, and other partners, implement conservation measures for bald eagle. Conserve mature riparian forests (cottonwood galleries) in suitable habitat to maintain their integrity for use by bald eagles. Eradication of nonnative invasive species will be emphasized in riparian areas that compete with cottonwood regeneration. Continue to identify problem areas and implement appropriate weed control measures. **Action SS-1.1.10.** In cooperation with the IDFG, USFWS, USFS, and other partners, implement conservation measures for yellow-billed cuckoo. Mature riparian forests (cottonwood galleries) will be conserved in suitable habitat to maintain their integrity for use by yellow-billed cuckoo. Eradication of nonnative invasive species will be emphasized in riparian areas that compete with cottonwood regeneration. Continue to identify problem areas and implement appropriate weed control measures.

Table 4-2 Relevant Goals, Objectives, and Actions of BLM's Coeur d'Alene Resource Management Plan

Objective SS-1.1. (Continued)	**Action SS-1.3.2.** In cooperation with the IDFG Conservation Data Center (CDC), USFWS, and other partners, implement conservation measures specific to the management of water howellia. Mature riparian forests will be conserved in suitable habitat to protect habitat needed by pollinators of this species. (a) Do not authorize commercial firewood cutting within riparian forests. Retain forest structure on the edge of riparian areas with known populations or in suitable habitat for shading these wetland areas.
Goal VR-1 – Manage landscapes across the public lands in a manner that will protect scenic quality values and promote aesthetically pleasing surroundings.	
Objective VR-1.1. Use the visual resource management system to manage visual resources in a manner that is consistent with management direction of the other resource programs.	**Allocation VR-1.1.1.** Visual resources on BLM lands will be managed under the [mapped] class designations. (Visual Resource Management classes identify the degree of acceptable visual change within a characteristic landscape, based on scenic quality, visual sensitivity, and visibility.)
Goal MN-2 – Make...mineral materials...available for exploration, acquisition, and production consistent with other resource goals.	
Objective MN-2.1. Identify area(s) open to...mineral material disposal….	**Allocation MN-2.1.2.** Approximately 76,048 acres are open to...mineral material disposal…. (See Map 13 in Appendix G of the RMP [BLM, 2007a]). **Allocation MN-2.1.3.** Surface use stipulations outlined in Appendix B will apply to...mineral material disposal…. (See Map 13 in Appendix G of the RMP [BLM 2007a]).

Table 4-2 Relevant Goals, Objectives, and Actions of BLM's Coeur d'Alene Resource Management Plan

Applicable Surface Use Stipulations from RMP Appendix B.	**No Surface Occupancy Stipulation-2: Fisheries, Special Status Fish, Aquatic Species, Riparian and Wetland Vegetation** *Stipulation:* Surface occupancy is prohibited within: • 91 meters (300 feet) of fish-bearing streams • 46 meters (150 feet) of permanently flowing non-fish-bearing streams, • 46 meters (150 feet) of ponds, lakes, reservoirs, and wetlands greater than 1 acre *Exception:* The authorized officer may grant an exception if an environmental assessment reveals that a proposed action may affect but is not likely to adversely affect a special status species, or concurrence is obtained from the USFWS (through applicable provisions of the Endangered Species Act), to allow an adverse effect to a listed species. *Modification:* Buffer distances may change based on monitoring and scientific research. *Waiver*: None. **Controlled Surface Use Stipulation-1: Visual Resource Management (VRM) Class II** *Stipulation:* All surface-disturbing activities, semi-permanent and permanent facilities in VRM Class II areas may require special design including location, painting, and camouflage to blend with the natural surroundings and meet the visual quality objectives of the area. *Exception*: None. *Modification:* None. *Waiver:* This stipulation may be waived if the authorized officer determines that there is no longer VRM Class II within the area of application.

Chapter 5
Tribes, Individuals, Organizations, and Agencies Receiving the Environmental Assessment

Those consulted include local, state, and federal agencies; public officials; tribes; landowners and trustees in the project vicinity; media; and others who expressed an interest in the project. Specific individuals were contacted to gather information and data about the project area and applicable requirements, as part of consultation, or for permit applications.

5.1 FEDERAL AGENCIES

- U.S. Environmental Protection Agency (EPA), Office of Water and Watersheds
- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service
- U.S. Department of the Interior Fish and Wildlife Service (USFWS), Coeur D'Alene Office
- U.S. Bureau of Land Management
- U.S. Army Corps of Engineers
- U.S. Forest Service

5.2 STATE AGENCIES

- Idaho Department of Environmental Quality (DEQ)
- Idaho Department of Fish and Game (IDFG), Coeur D'Alene Office
- Idaho Department of Lands
- State of Idaho House and Senate members for Districts encompassing the project area
- Idaho State Historic Preservation Office (SHPO)

5.3 TRIBES

- Kalispel Tribe of Indians
- Coeur d'Alene Tribe
- Kootenai Tribe of Idaho
- Confederated Salish and Kootenai Tribes

5.4 LOCAL GOVERNMENTS

- Bonner County Commissioner's Office
- Idaho Association of Counties

5.5 NEWSPAPERS

- Bonner County—Bonner County Daily Bee
- Coeur d'Alene—Coeur d'Alene Press

5.6 LANDOWNERS AND TRUSTEES IN THE PROJECT AREA

- Avista Corporation
- Idaho Conservation League
- Pend Oreille Business Community
- Lake Pend Oreille, Pend Oreille River, Priest Lake and Priest River Commission
- Pend Oreille Waterkeepers
- Private citizens (80 within a ¼ mile of the lake perimeter)
- Tillberg/Crane Construction

5.7 TECHNICAL OVERSIGHT COMMITTEE

- Ducks Unlimited
- Terragraphics
- River, Research and Design

Chapter 6
List of Preparers

The Clark Fork River Delta Restoration Project EA was prepared by the Bonneville Power Administration (BPA), in cooperation with the U.S. Bureau of Land Management (BLM) and the U.S. Army Corps of Engineers (Corps), and with the assistance of CH2M HILL, a consulting firm. The following lists those individuals who participated in the preparation of this EA.

6.1 BONNEVILLE POWER ADMINISTRATION (BPA)

Jenna Peterson. Responsible for: project management, overall document preparation. **Education:** M.S., Archaeology; B.S., Anthropology. **Experience:** Over 10 years within the environmental compliance field. BPA, 7 years: Environmental Protection Specialist.

Joe Dickinson. Responsible for: GIS analysis and preparation of figures. **Education:** B.S., Geography. **Experience:** 10 years working in GIS, primarily in electrical transmission and environmental compliance.

6.2 U.S. BUREAU OF LAND MANAGEMENT (BLM)

Doug Evans. Responsible for: project management, permitting, document review and preparation. **Education:** B.S., Botany. **Experience:** BLM, 14 years as a Natural Resource Specialist.

Scott Pavey. Responsible for: project management, NEPA coordination, permitting, document review and preparation**. Education:** M.S., Forest Resources. **Experience:** BLM, 12 years in Planning and Environmental.

6.3 IDAHO DEPARTMENT OF FISH AND GAME (IDFG)

Katherine Cousins. Responsible for: Project Lead for the Clark Fork River Delta Restoration Project, document review, biological assessment. **Education:** M.S., Animal Physiology; B.S. (Honors), Biology. **Experience:** 28 years with various fish and wildlife agencies including the Canadian Department of Fisheries and Oceans and NOAA fisheries; IDFG, 10 years: currently Mitigation Staff Biologist for Northern Idaho.

Chip Corsi. Responsible for: document review. **Education:** M.S., Zoology; B.S., Fisheries Management. **Experience:** IDFG 33 years: currently Regional Supervisor for the Panhandle Region.

6.4 CONSULTANTS

Kath Althen/CH2M HILL. **Responsible for:** document editing. **Education:** M.A., Economics; B.A., Economics. **Experience:** 31 years in technical editing and report preparation. Contractor to BPA.

Carrie Andrews/CH2M HILL. **Responsible for:** project management/public health and safety. **Education:** B.A., Environmental Planning and Policy. **Experience:** 16 years in environmental compliance. She has been involved in regulatory analysis, environmental compliance evaluations, preparedness and prevention plans, environmental permitting, public outreach, and environmental management system development and implementation. Contractor to BPA.

Louise Brown, P.E./CH2M HILL. **Responsible for:** noise analysis. **Education:** M.S., Environmental Science and Engineering; B.A., Liberal Arts. **Experience:** 15 years in environmental compliance management for industry. Experienced in air permitting activities. Broad background in noise measurements and analyses for industrial and transportation clients. Contractor to BPA.

Josh Butler, P.E./CH2M HILL. **Responsible for:** erosion/sediment/geotechnical. **Education:** M.S., Civil Engineering B.S.; Civil Engineering. **Experience:** 16 years in completing site civil design, including grading and drainage plans, and preparation of drawings and specifications. Technical lead for bioengineering design of streambank and shoreline stabilization, and for implementing erosion control measures on a variety of projects. Designed, installed, and monitored instrumentation for embankments and retaining walls over soft soils and on sloping ground with landslide potential. Contractor to BPA.

Steve Clayton, Ph.D., P.E./CH2M HILL. **Responsible for:** streambank stabilization and restoration. **Education:** Ph.D., Biological and Agricultural Engineering; M.S., Natural Resource Conservation; B.S., Human Biology. **Experience:** 20+ years in implementing successful river restoration, wildlife habitat improvement, and environmental education projects throughout the West. Integrates innovative, site-specific solutions to manage accelerated rates of bank erosion using combinations of vegetation, wood, coir, and rock. Contractor to BPA.

Brian Drake, P.E./CH2M HILL. **Responsible for:** water quality/water resources. **Education:** M.S., Environmental and Water Resources; B.S., Civil Engineering. **Experience:** 6 years in NEPA analyses and documentation, modeling and assessing water quality, water supply and planning, stream restoration, hydrologic and hydraulic evaluations and modeling, and conveyance analysis and design throughout the Northwest. Assessed bioaccumulation and trophic transfer of organic contaminants from sediment. Contractor to BPA.

David Fornander/CH2M HILL. **Responsible for:** natural resources/fish. **Education:** Ph.D., Geography; M.S., Biology; B.S., Biology. **Experience:** 20+ years in aquatic ecology, fisheries, and watershed management in the Northwest, and Idaho specifically. Experience developing and determining effects associated with large-scale restoration elements/activities specific to improving fisheries and aquatic ecosystem function at the site and watershed scale. Contractor to BPA.

Mark Greenig/CH2M HILL. **Responsible for:** visual, land use, and recreation. **Education:** M.U.P. Urban Planning; B.S., Landscape Architecture. **Experience:** 25+ years in visual, land use, recreation resources for NEPA and state EISs/EAs for a range of hydroelectric, utility, water resource, and natural resource projects throughout the western U.S. Experience as a land use and recreation planner; has written shoreline, land use, and natural resource management plans. Involved in initial facility planning to avoid impacts, impact assessment, and developing mitigation measures/aesthetic treatments to decrease project opposition and build support. Contractor to BPA.

Robin McClintock/CH2M HILL. **Responsible for:** cultural resources. **Education:** B.S., Anthropology. **Experience:** 25+ years in designing and conducting cultural resource surveys and site evaluations. Expertise in compliance with the NEPA and the National Historic Preservation Act and Executive Order 11593. Has prepared cultural resource mitigation and site management plans, and determinations of National Register eligibility. Contractor to BPA.

Rick McCormick, P.E./CH2M HILL. **Responsible for:** air and hazardous materials/waste. **Education:** M.S., Environmental Engineering; B.S., Biology. **Experience:** 15 years in environmental engineering, regulatory review, and air quality permitting, including database compliance management, regulatory negotiation, air dispersion modeling, air emission inventories, best available control technology (BACT), prevention of significant deterioration (PSD) analyses, hazardous waste management plan preparation, and waste stream characterization and analysis. Contractor to BPA.

Steve Mader/CH2M HILL. **Responsible for:** project management. **Education:** Ph.D., Forestry; M.S., Silviculture; B.S., Forest Biology. **Experience:** 32 years in natural resource management, environmental regulations, ecological functions and values. Contractor to BPA.

Denny Mengel/CH2M HILL. **Responsible for:** Draft EA task lead. **Education:** Ph.D., Soil Science; M.S., Forest Resources; B.S., Wildlife Biology. **Experience:** 30 years in NEPA and ESA analyses and documentation in Idaho and the Northwest. Extensive experience conducting rare plant, wildlife, wetland, and habitat surveys. Background conducting biological inventories, habitat assessments, and field surveys throughout the Northwest. Contractor to BPA.

Darren Muldoon/CH2M HILL. **Responsible for:** transportation and right-of-way. **Education:** M.U.P., Urban and Regional Planning; B.S., Environmental Science and Geosciences. **Experience:** 11 years with expertise in land use, transportation, and environmental permitting and planning. Experience including land use and transportation assessments; federal, state, and local environmental permit applications; and NEPA environmental documentation. Contractor to BPA.

Michelle Neumann/CH2M HILL. **Responsible for:** air quality**. Education:** B.S., Civil Engineering. **Experience:** Quality checking emissions calculations, air quality dispersion modeling for Environmental Impact Reports, class I analysis, and health risk assessments; also, emissions calculations for Title V permit applications**.** Contractor to BPA.

Rachel Newton/CH2M HILL. **Responsible for:** vegetation. **Education:** M.S., Botany; B.S., Biology. **Experience:** 7 years in surveying and monitoring sensitive and invasive plant species throughout the Intermountain West and Pacific Northwest. Experience with USDA Forest Service and USDI Bureau of Land Management special status plant management— conducting pre- and post-treatment monitoring and formulating recommendations based on data analysis. Experience surveying and monitoring rare plant species, including restoration. Contractor to BPA.

Eric Oden/CH2M HILL. **Responsible for:** document editing. **Education:** M.S., Education; B.S., Education. **Experience:** 28 years in technical editing and report preparation. Contractor to BPA.

Rob Rodland/CH2M HILL. **Responsible for:** socioeconomics. **Education:** B.A., Geography. **Experience:** 13 years in land use expertise in NEPA. Experience managing multidisciplinary environmental documentation projects. Permitting experience with federal, state, and local permits. Technical expertise focusing on environmental justice, socioeconomics, and land use. Contractor to BPA.

Cindy Salazar/CH2M HILL. **Responsible for:** noise**. Education:** M.S., Environmental Management; B.S., Applied Ecology. **Experience:** 10 years in writing California Environmental Quality Act Environmental Impact Reports and NEPA Environmental Impact Statements. Work includes Initial Studies, Negative Declarations, Mitigated Negative Declarations, Proponents Environmental Assessments, and Preliminary Environmental Assessments. Contractor to BPA.

Chris Waller/CH2M HILL. **Responsible for:** hazardous materials/waste**. Education:** B.S., Civil and Environmental Engineering. **Experience:** 2 years in hazardous materials management and regulations. Work includes resource reports, HazCom program development, SPCC plan development, and environmental auditing. Contractor to BPA.

Monica Wright/CH2M HILL. **Responsible for:** air resources. **Education:** Ph.D., Environmental Sciences and Resources; B.S., Chemistry. **Experience:** 10 years in scientific and regulatory air quality fields. Work has included air quality modeling, air emissions inventories, air permitting, research and regulatory meteorological and air quality monitoring, and data analysis. Contractor to BPA.

Chapter 7
Acronyms and Abbreviations

°F	degrees Fahrenheit
ADT	average daily traffic
APE	area of potential effects
AQI	air quality index
BA	biological assessment
BLM	U.S. Bureau of Land Management
BMP	best management practice
BPA	Bonneville Power Administration
ca.	circa
CDC	Conservation Data Center
CFR	Code of Federal Regulations
cfs	cubic feet per second
CNFISH	Coeur d'Alene Native Fish Strategy
CO_2e	carbon dioxide equivalent
Corps	U.S. Army Corps of Engineers
Council	Northwest Power and Conservation Council
CY	cubic yard
dB	decibel
dBA	A-weighted decibel
DEQ	Idaho Department of Environmental Quality
DOE	U.S. Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMFAC	EMission FACtors
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act (16 USC 1531 et seq.)
FCRPS	Federal Columbia River Power System
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FONSI	Finding of No Significant Impact
FR	Federal Register

GHG	greenhouse gas
GPS	global positioning system
GWP	global warming potential
HPMP	Historic Properties Management Plan
Idaho 200	State Highway 200
IDAPA	Idaho Administrative Procedure Act
IDFG	Idaho Department of Fish and Game
IPCC	Intergovernmental Panel on Climate Change
ITD	Idaho Transportation Department
L_{max}	maximum noise level
log yard	Clark Fork River Drift Yard
management plan	*Pend Oreille Wildlife Management Area Management Plan*
MOU	memorandum of understanding
MP	Milepost
mph	miles per hour
NAAQS	National Ambient Air Quality Standards
National Register	National Register of Historic Places
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act (16 USC 470 et seq.)
NOAA	National Oceanic and Atmospheric Administration or National Marine Fisheries Service
Northwest Power Act	Pacific Northwest Electric Power Planning and Conservation Act of 1980 (16 USC 839b[h][10][A])
NPDES	National Pollutant Discharge Elimination System
OHWM	ordinary high water mark (elevation)
PBTTAT	Panhandle Bull Trout Technical Advisory Team
PCE	primary constituent element
PEM	palustrine emergent wetland
pers. comm.	personal communication
PFC	Proper Functioning Condition
PFO	palustrine forested wetland
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
PM_{10}	particulate matter less than or equal to 10 microns in diameter
project	Clark Fork River Delta Restoration Project

PSS	palustrine scrub-shrub
RCA	Riparian Conservation Area
RCNM	Roadway Construction Noise Model
Reclamation	U.S. Bureau of Reclamation
RMP	Resource Management Plan
SHPO	State Historic Preservation Office
sp.	species
spp.	species (plural)
ssp.	subspecies
SWPA	System-Wide Programmatic Agreement
T&E	Threatened and Endangered
TCP	traditional cultural property
TMDL	total maximum daily load
US 95	U.S. Highway 95
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USC	U.S. Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service or U.S. Department of the Interior Fish and Wildlife Service
USGS	U.S. Geological Survey
VRM	Visual Resource Management
WMA	Wildlife Management Area

Chapter 8
Glossary

A-weighted sound pressure level (dBA)	A logarithmic measurement of sound based on the decibel but weighted to approximate the human perception of sound. Commonly used for measuring environmental and industrial noise levels.
Ambient noise	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Archaeological District	A geographically definable area, urban or rural, possessing a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united by past events or aesthetically by plan or physical development.
Area of potential effects	The geographic area within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effect is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.
Armor	Placement of a covering on a streambank that prevents erosion.
Bedload	Sediment moving on or near the stream bed by jumping, rolling, or sliding.
Bendway weir	Low-elevation, level-crested stone structure projecting from a bank and angled upstream to break up secondary currents and redirect flow away from a streambank, thereby reducing erosion of the streambank.
Borrow area	An area where material (usually soil, gravel, rock, or sand) has been dug for use at another location.
Brackish	Water that has more salinity than freshwater, but not as much as seawater.
Breakwater	A shore-parallel structure that reduces the amount of wave energy reaching the protected area. It is similar to a natural bar or reef and is designed to dissipate wave energy. The reduction in wave energy slows the littoral drift, produces sediment deposition, and provides a shoreline bulge or “salient” feature in the sheltered area behind the breakwater.
Brumation	Brumation is the equivalent in reptiles to mammalian hibernation, when the reptile body “shuts down.”
Candidate species	Plant and animal taxa reviewed for possible inclusion on a federal list of endangered or threatened species. A candidate species is not protected by law, but could possibly be protected in the future.

Carbon dioxide equivalent (CO_{2e})	Measure for describing how much global warming a given type and amount of greenhouse gas may cause, using the functionally equivalent amount or concentration of carbon dioxide (CO_2) as the reference.
Critical habitat	Habitat essential to the conservation of an endangered or threatened species listed under the ESA that has been designated by the USFWS or the National Marine Fisheries Service.
Cumulative impact	The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
Curation	For recovered archaeological data, preservation of archaeological collections of pre-contact and historic cultural materials and associated records recovered under the authority of cultural resources laws, codes, and regulations.
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the measured pressure to the reference pressure, which is 20 micropascals.
Delta	A deposit of alluvium, usually flat and fan-shaped, formed where moving water is slowed by a body of standing water.
Drawdown zone	The area at the edge of a body of water that is frequently exposed to the air due to changes in water level.
Endangered species	Plants or animals that are in danger of extinction through all or a significant portion of their ranges and that have been listed as endangered by the USFWS or NOAA.
Environmental Justice Populations	Low-income and minority populations protected under Executive Order 12898 from disproportionate adverse effects of federal projects.
Eutrophication	A process where water bodies receive excess nutrients that stimulate excessive plant growth.
Facultative	Migrant bird species that breed and rear young in the United States and Canada, but winter in more temperate zones such as the southern United States or Mexico.
Fen	A peat-forming wetland that receives nutrients from sources other than precipitation: usually from upslope sources through drainage from surrounding mineral soils and from groundwater movement.
Fetch	The area in which waves are generated by wind having a rather constant direction and speed; sometimes used synonymously with fetch length or wind fetch.

Fill material	Soil that is placed at a specified location to bring the ground surface up to a desired elevation.
Global warming potential (GWP)	A relative measure of how much heat a greenhouse gas traps in the atmosphere.
Glyph	An element of writing: an individual mark on a written medium that contributes to the meaning of what is written.
Greenhouse gas (GHG)	A gas in an atmosphere that absorbs and emits radiation within the thermal infrared range. The primary greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone.
Hummock	Irregular ground surface with up to 3 feet of micro-topographic relief, represented by inorganic features, except where plants have created depressions or mounds of soil.
Hybridization	A genetic cross between two species.
Lentic	Of, relating to, or designating natural communities living in still waters (such as lakes, ponds, or swamps). Opposite of lotic.
Littoral	Of, relating to, or situated on the shore of the sea or a lake.
Live cuttings	Deeply planted willow stems to provide mechanical bank protection.
Longitudinal Peaked Stone Toe Protection	Continuous bank protection consisting of a triangular (in cross section) stone dike placed longitudinally at, or slightly streamward of the toe of an eroding bank. Constructed using a well-graded stone. Such protection has the ability to self-adjust when undercut by hydraulic forces.
Lotic	Of, relating to, or living in moving water. Opposite of lentic.
Low-income population	Defined as persons residing in households with an income between the federal poverty guidelines and an amount two times greater than those guidelines.
Maximum noise level (L_{max})	The maximum A-weighted sound pressure level (dBA) reached during a measurement period.
Mesic	Of, characterized by, or adapted to a moderately moist habitat.
Mire	A stretch of swampy or boggy ground.
Minority population	Defined as people with the following origins: Black (or African-American, having origins in any of the black racial groups of Africa); Hispanic (of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race); Asian-American (having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands); or American Indian and Alaskan Native.

Mitigation	Mitigation is a mechanism to avoid, minimize, rectify, or reduce the adverse environmental impacts associated with agency actions. Federal agencies typically rely upon mitigation to reduce environmental impacts through modification of proposed actions and consideration and development of mitigation alternatives during the NEPA process. Planned mitigation at times can serve to reduce the projected impacts of agency actions to below a threshold of significance or to otherwise minimize the effects of agency action.
Neotropical or Obligate	Migrant bird species that breed and rear young in the United States and Canada, but winter in Mexico, the Caribbean Islands, and Central and South America.
Particulate matter	Inhalable solid and liquid particles; PM_{10} = coarse particles less than or equal to 10 microns in diameter; $PM_{2.5}$ = fine particles less than or equal to 2.5 microns in diameter.
Priority Species	Species for which the State of Idaho requires protective measures or management to ensure their future survival because of low population numbers, sensitivity to habitat alteration, or tendency to form in vulnerable groups, or because they are of commercial, recreational, or tribal importance.
Reach	A selected portion of a channel's length between any defined limits.
Reclamation	The process of restoring and revegetating a disturbed site to, or near to, its previous habitat quality.
Redd	A scooped-out hollow in a stream bed where eggs are deposited and develop.
Revetment	Sloping structures placed on banks or cliffs in such a way as to absorb the energy of incoming water.
Riparian	Pertaining to anything connected with, adjacent to, or influenced by a stream, river, lake, reservoir, or other water body.
Riverward	In a direction towards a river.
Salmonid	Characteristic of the family *Salmonidae*, which includes the salmon, trout, and whitefish.
Sensitive species	For BLM, plant and animal species identified by the BLM State Director for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density and habitat capability that would reduce a species' existing distribution.
Sphagnum bog	A wetland characterized by acidic waters, spongy peat deposits, and sphagnum moss covering the floor.

Steeper	As referenced in the text, steeper applies to the slope or gradient of the streambed. Steeper-sloped headwater streams are Rosgen Morphological Stream Types A and B, which have channel slopes of 4-10 percent and 2-4 percent, respectively.
Take	Under the ESA, take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering.
Talus	Fallen disintegrated material that has formed a slope at the foot of a steeper declivity.
Threatened species	Any plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which have been listed as threatened by the USFWS or NOAA.
Toe of Riverbank	The toe zone of a streambank is the area that is most susceptible to erosion. It is located on the bank between the ordinary water level and the low water level, where it is strongly affected by currents and erosional events. The cohesiveness of the soil at the toe of the riverbank affects the rate at which the overlying soil layers become undercut by flows.
Traditional Cultural Property	Properties associated with cultural practices or beliefs of a living community that are rooted in the history of the community.
Weir	A small dam, fence, control, or barrier placed in an open channel that can be used to measure water discharge or catch fish.
Wetland	Wetlands, for the purposes of the Clean Water Act, must meet a three-parameter approach that includes the presence of hydrophytic (water-loving) vegetation, wetland hydrology, and hydric soils (soils subject to saturation/inundation). All three parameters must be present, under normal circumstances, and the wetland must be connected to or have a significant nexus with “waters of the U.S.” for an area to be designated as a jurisdictional wetland under the Clean Water Act.

Chapter 9
References Cited

Air Resources Board. 2007. *Calculating Emission Inventories for Vehicles in California. User's Guide*. EMission FACtors model (EMFAC2007 v.2.3). California Air Resources Board, Sacramento, CA.

Argus, George W. 2010. "Salix." In: Flora of North America Editorial Committee, eds. 1993+. *Flora of North American North of Mexico.* 16+ vols. New York and Oxford. Vol. 7, p. 83.

Avista Corporation (Avista). 1999. "Clark Fork Settlement Agreement." In: *FERC License for the Clark Fork Project (FERC No. 2058)*. Federal Energy Regulatory Commission. January 1.

Avista Corporation (Avista). 2001. *Movement and Behavior of Adfluvial Bull Trout Downstream of the Cabinet Gorge Dam, Clark Fork River, Idaho*. Normandeau Associates, Inc. August 2001. 7 pp. + Appendixes.

Avista Corporation (Avista). 2002. *Assessment of Cabinet Gorge Fish Hatchery Ladder as a Bull Trout Fish Passage Facility*. Prepared for Avista Corporation and U.S. Fish and Wildlife Service, in cooperation with Montana Fish, Wildlife and Parks. Apex Aquatics. February 2002. 35 pp. + Appendixes.

Bachman, Dana, Gary Gadwa, and Craig Groves. 1990. "A Winter Survey for Wolverines (*Gulo gulo*) on the Sawtooth and Challis National Forests, Idaho." In: *Cooperative Challenge Cost Share Project: Boise, ID*. Idaho Department of Fish and Game, Bureau of Wildlife, Nongame and Endangered Wildlife Program, Natural Heritage Section. [In cooperation with: U.S. Department of Agriculture, Forest Service, Sawtooth National Forest; Challis National Forest.] 29 pp.

Behnke, R.J. 1992. *Native Trout of Western North America.* American Fisheries Society Monograph 6.

Beranek, L.L. 1988. *Acoustical Measurements*. American Institute of Physics, Woodbury, NY.

Birtwell, I.K., G.F. Hartman, B. Anderson, D.J. McLeay, and J.G. Malick. 1984. "A Brief Investigation of Arctic Grayling (*Thymallus arcticus*) and Aquatic Invertebrates in the Minto Creek Drainage, Mayo, Yukon Territory: An Area Subjected to Placer Mining." *Canadian Technical Report of Fisheries and Aquatic Sciences* 1287.

Bisson, P.A. and R.E. Bilby. 1982. "Avoidance of Suspended Sediment by Juvenile Coho Salmon." *North American Journal of Fisheries Management* 4:371-374.

Bjornn, T.C. and D.W. Reiser. 1991. "Habitat Requirements of Salmonids in Streams." In: W.R. Meehan (ed.). *Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitat*. American Fisheries Society, Bethesda, MD. Special Publication 19. pp. 83-138.

BLM. See U.S. Bureau of Land Management.

Boating the Inland NW. 2013. Accessed on August 5, 2013. <http://www.boatingtheinlandnw.blogspot.com/>.

Bodi, L. 2011. Personal communication. Letter from L. Bodi/BPA Vice President Environment, Fish and Wildlife, to J. Chatburn/Administrator Idaho Office of Energy Resources. October 28.

Bonner County. 2013. Bonner County Revised Code as supplemented March 20, 2013. Accessed on August 5, 2013. <http://sterlingcodifiers.com/codebook/index.php?book_id=827>.

Bonneville Power Administration (BPA) Northwest Power Planning Council / Columbia Basin Fish and Wildlife Authority. 2001. *Pend Oreille Erosion Abatement and Landform Restoration.* Section 9, Project Description. Project ID 24006. Bonneville Power Administration FY 2001 Provincial Project Review.

Bonneville Power Administration (BPA), U.S. Army Corps of Engineers (USACE), and U.S. Bureau of Reclamation (Reclamation). 1995. *Columbia River Power System Operation Review Environmental Impact Statement*. November. Available at: <http://www.nww.usace.army.mil/planning/er/reports.htm#EIS>.

Bonneville Power Administration (BPA), U.S. Army Corps of Engineers (USACE), and U.S. Bureau of Reclamation (Reclamation). 1997. *Columbia River System Operation Review on Selecting an Operating Strategy for the Federal Columbia River Power System (FCRPS)*. Record of Decision (ROD). Available at: <http://energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/EIS-0170-ROD-02-1997.pdf>.

Bonneville Power Administration (BPA), U.S. Bureau of Reclamation (Reclamation), and U.S. Army Corps of Engineers (USACE). 2009. *Systemwide Programmatic Agreement for the Management of Historic Properties Affected by the Multipurpose Operations of Fourteen Projects of the Federal Columbia River Power System for Compliance with Section 106 of the National Historic Preservation Act.* October.

Borough of Poole. 2004. *Poole Harbour Approach Channel Deepening and Beneficial Use of Dredged Material, Environmental Statement*. Chapter 14. Prepared by Royal Haskoning, November 2004. <http://www.phc.co.uk/publications_channel.html>.

BPA. See Bonneville Power Administration.

Burmester, R.F., R.M. Breckenridge, R.S. Lewis, and M.D. McFaddan. 2004. *Geologic Map of the Clark Fork Quadrangle, Bonner County, Idaho. Idaho Geological Survey*. Digital Web Map 25, scale 1:24,000.

Chatburn, J. 2012. Personal communication. Letter from J. Chatburn/Administrator Idaho Office of Energy Resources, to L. Bodi/BPA Vice President Environment, Fish and Wildlife. June 1.

Clarke, A.H. 1981. *The Freshwater Molluscs of Canada*. National Museum of Natural Sciences, National Museums of Canada, Ottawa. 446 pp.

Corsi, C. 2013. Personal Communication between Corsi, C./IDFG and David Fornander/ CH2M HILL.

Cousins, Katherine. 2013. Personal communication between Katherine Cousins/Idaho Fish and Game Mitigation Staff Biologist and Denny Mengel/CH2M HILL. August 1.

DEQ. See Idaho Department of Environmental Quality.

DeVore, P.W., L.T. Brooke, and W.A. Swenson. 1980. "The Effects of Red Clay Turbidity and Sedimentation on Aquatic Life in the Nemadji River System." In: S.C. Andrews, R.G. Christensen, and C.D. Wilson. *Impacts of Nonpoint Pollution Control on Western Lake Superior*. U.S. Environmental Protection Agency, Washington, DC. EPA Report 905/9-79-002-B.

DeVos, A. and S.E. Matel. 1952. "The Status of Lynx in Canada, 1920–1952." *Journal of Forestry* 50:742–745.

Donald, D.B. and D.J. Alger. 1993. "Geographic Distribution, Species Displacement, and Niche Overlap for lake Trout and Bull Trout in Mountain Lakes." *Canadian Journal of Zoology* 71: 238-247.

Downs, C.C., D. Horan, and E. Morgan-Harris. 2006. "Spawning Demographics and Juvenile Dispersal of an Adfluvial Bull Trout Population in Trestle Creek, Idaho." *North American Journal of Fisheries Management* 26:190–200.

Ducks Unlimited, Inc. 2011. *Recent Bank Pin Information.* Unpublished Report. Ducks Unlimited, Inc., Spokane, WA.

Ducks Unlimited, Inc. 2013. *Clark Fork Delta Restoration (US-ID-65-1)*, 65 Percent Design Plan Set. Prepared for Idaho Department of Fish and Game. June.

DuPont, J.M. and D.H. Bennett. 1993. *The Effects of Drawdown on Fishes in the Pend Oreille River, Idaho*. University of Idaho, Department of Fish and Wildlife Resources, Moscow, ID. 8 pp.

Entz, R. and J. Maroney. 2001. *Draft Pend Oreille Subbasin Summary*. Prepared for the Northwest Power Planning Council. Pend Oreille Subbasin Planning Team. March 16.

EPA. See U.S. Environmental Protection Agency.

Federal Emergency Management Agency (FEMA). 2013. *Map Service Center*. <https://msc.fema.gov/webapp/wcs/stores/servlet/FemaWelcomeView?storeId=10001&catalogId=10001&langId=-1>.

Federal Highway Administration. 2006. *Roadway Construction Noise Model (RCNM) User's Guide*. Final Report, January. FHWA-HEP-05-054, DOT-VNTSC-FHWA-05-01.

Federal Transit Administration. 2006. *Transit Noise and Vibration Impact Assessment*. Report FTAVA-90-1003-06. May.

FEMA. See Federal Emergency Management Agency.

Fields, R.L., P.F. Woods, and B. Berenbrock. 1996. *Bathymetric Map of Lake Pend Oreille and Pend Oreille River, Idaho*.

Findlay Engineering, Inc. 2000a. *Report on Feasibility of Erosion Stabilization, Pend Oreille Delta*. Findlay Engineering, Inc., Westbrook, ME. Prepared for Avista Corp. July. 18 pp.

Findlay Engineering, Inc. 2000b. *Shoreline Stabilization Guidelines, Clark Fork Project*. Findlay Engineering, Inc., Westbrook, ME. Prepared for Avista Corp.

Frenzel, S.A. 1991. *Hydrologic Budgets, Pend Oreille Lake, Idaho, 1989-90*. U.S. Geological Survey. Boise, Idaho.

Gatto, L.W. and W.W. Doe, III. 1987. "Bank Conditions and Erosion Along Selected Reservoirs." *Environmental Geology* 9(3): 143-154.

Goetz, F. 1989. *Biology of the Bull Trout Salvelinus Confluentus: A Literature Review*. USDA Forest Service, Willamette National Forest, Eugene, OR. 53 pp.

Griffith, J.S. 1988. "Review of Competition Between Cutthroat Trout and Other Salmonids." *American Fisheries Society Symposium* 4:134-140.

Gunter, B. 2013. *Kullyspell House*. <http://sandpoint.com/Community/history_kullyspellhouse.asp>. Accessed December 6, 2013.

Hastings, Roxanne I. and Henk C. Greven. 2007. "Grimmia." In: Flora of North America Editorial Committee, eds. 1993+. *Flora of North America North of Mexico.* 16+ vols. New York and Oxford. Vol. 27, p. 660.

Heck, Brian. 2013. Personal communication between Brian Heck/Ducks Unlimited and Steve Mader/CH2M HILL. July 29.

Henderson, J. 1929. *Non-marine Mollusca of Oregon and Washington*. The University of Colorado, Boulder 17(2):47-191.

Henderson, Norlan C. 2002. "Iris." In: Flora of North America Editorial Committee, eds. 1993+. *Flora of North America North of Mexico.* 16+ vols. New York and Oxford. Vol. 26, p. 390.

Hitchcock, C.L. and A. Cronquist. 1973. *Flora of the Pacific Northwest: An Illustrated Manual*. University of Washington Press, Seattle, WA.

Hixsom, Luke. 2014. Personal communication between Luke Hixson/USFS and David Fornander/CH2M HILL. January 9.

ICF Jones & Stokes and Illingworth and Rodkin, Inc. 2009. *Final Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish*. California Department of Transportation, Sacramento, CA.

Idaho Department of Environmental Quality (DEQ). 2001. *Pend Oreille Lake Subbasin Assessment and Total Maximum Daily Loads*. Idaho Department of Environmental Quality, Coeur d'Alene, ID.

Idaho Department of Environmental Quality (DEQ). 2002. *Total Maximum Daily Load for Nutrients for the Nearshore Waters of Pend Oreille Lake, Idaho*.

Idaho Department of Environmental Quality (DEQ). 2007. *Lower Clark Fork River Subbasin Assessment and Total Maximum Daily Loads*. Idaho Department of Environmental Quality, Coeur d'Alene, ID.

Idaho Department of Environmental Quality (DEQ). 2011. *Idaho's 2010 Integrated Report*.

Idaho Department of Environmental Quality (DEQ). 2012. *2010 Air Quality Data Monitoring Summary*. Boise, ID. <http://www.deq.idaho.gov/media/859872-2010-aq-monitoring-data-report.pdf>.

Idaho Department of Fish and Game (IDFG). 1999. *Pend Oreille Wildlife Management Area Management Plan*. July.

Idaho Department of Fish and Game (IDFG). 2001. "Clark Fork Delta Protection and Mitigation Program." Letter from Greg Tourtlotte, IDFG to Nate Hall, Avista Corporation. Idaho Department of Fish and Game, Coeur d'Alene, ID. November 28.

Idaho Department of Fish and Game (IDFG). 2010. *FY 2010-2013 and Beyond Fish and Wildlife Program Project Solicitation*. Section 10.

Idaho Department of Fish and Game (IDFG). 2011. *Observation of Western Pearlshell (*Margaritifera falcata*) reported February 17, 2011 - 1:31pm by idfg-aschmidt*. February 17. <https://fishandgame.idaho.gov/species/observations/detail/597385>.

Idaho Department of Fish and Game (IDFG). 2012. *Clark Fork River Delta Restoration Project,* Design Team Workshop. Coeur d'Alene, ID. December 4-6, 2012. Idaho Department of Fish and Game, Coeur d'Alene, ID.

Idaho Department of Fish and Game (IDFG). 2012. Office of Energy Resources Letter. June 1.

Idaho Department of Fish and Game (IDFG). 2013a. *Clark Fork River Delta Restoration Project, Biological Assessment [Draft]*. Idaho Department of Fish and Game, Coeur d'Alene, ID. April.

Idaho Department of Fish and Game (IDFG). 2013b. *Idaho Fish and Wildlife Information System Species Counties List*. <https://fishandgame.idaho.gov/ifwis/portal/sites/ifwis/files/statusspecies/ObtainInfo/Species_Counties_052212.xlsx>. Accessed August 13, 2013.

Idaho Department of Fish and Game (IDFG). 2013c. *Idaho Fish and Wildlife Information System. Plant Element Occurrence Database*. Idaho Department of Fish and Game, Boise, ID. Accessed July.

Idaho Department of Fish and Game (IDFG). 2013d. *Panhandle Region Fisheries*. Accessed on August 6, 2013. <http://fishandgame.idaho.gov/public/fish/>.

Idaho Department of Fish and Game (IDFG). 2013e. *Historical Fish Stocking Information*. <http://fishandgame.idaho.gov/public/fish/stocking>.

Idaho Department of Fish and Game (IDFG). 2013f. *Fisheries Management Plan 2013 – 2018; A Comprehensive Guide to Managing Idaho's Fisheries Resources*. Idaho Department of Fish and Game, Boise, ID. 90 pp. + Appendixes.

Idaho Department of Fish and Game (IDFG). 2013g. *2012 Waterfowl Seasons and Rules*. Accessed on August 6, 2013. <http://fishandgame.idaho.gov/public/hunt/rules/?getPage=66>.

Idaho Department of Fish and Game (IDFG). Undated. *Western Pearlshell* Margaritifera falcata. Idaho Fish and Wildlife Information System. <http://fishandgame.idaho.gov/ifwis/cwcs/pdf/Western%20Pearlshell.pdf>.

Idaho Department of Labor. 2013. *Bonner County Work Force Trends*. <http://labor.idaho.gov/publications/lmi/pubs/BonnerProfile.pdf>. Accessed August 15, 2013.

Idaho Scenic Byways. 2013. Accessed on August 5, 2013. <http://www.idahobyways.gov/byways/pend-orielle.aspx>.

Idaho State Department of Agriculture. 2012. *2012 Program Summary. Idaho Invasive Species Program.* Idaho State Department of Agriculture. Boise, ID.

Idaho State Department of Agriculture. 2013. *Idaho's 64 Noxious Weeds.* <http://www.agri.state.id.us/Categories/PlantsInsects/NoxiousWeeds/watchlist.php>. Accessed August 11, 2013.

Idaho Transportation Department (ITD). 2010. *Idaho on the Move*.

Idaho Transportation Department (ITD). 2013. Counter #26 – Kootenai Automatic Traffic Recorder <http://www.itd.idaho.gov/highways/roadwaydata/counters/026/index.html>.

IDFG. See Idaho Department of Fish and Game.

Intergovernmental Panel on Climate Change (IPCC). 1996. *Revised 1996 IPCC Guidelines for Greenhouse Gas Inventories*. Task Force on National Greenhouse Gas Inventories. Accessed August 2013. <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html>.

IPCC. See Intergovernmental Panel on Climate Change.

ITD. See Idaho Transportation Department.

Kelsey, H.M., M.A. Madej, J. Pitlick, P. Stroud, M. Coughlan, D. Best, and B. Belding. 1981. *Sediment Source Areas and Sediment Transport in the Redwood Creek Basin: A Progress Report*. Arcata, CA. Redwood National Park Technical Report 3. 133 pp.

Koehler, G.M. and J.D. Brittell. 1990. "Managing Spruce–fir Habitat for Lynx and Snowshoe Hares." *Journal of Forestry* 88(10):10–14.

Landers, R. and D. Hansen. 2008. *Paddle Routes of the Inland Northwest*. The Mountaineer's Books, Seattle, WA. pp. 180-183.

Lee, K.H. and R.S. Lunetta. 1990 *Watershed Characterization of Using Landsat Thematic Mapper Satellite Imagery, Lake Pend Oreille, Idaho*. EPA Environmental Systems Monitoring Lab. Las Vegas, Nevada.

Lewis, R.S., R.F. Burmester, R.M. Breckenridge, M.D. McFaddan, and W.M. Phillips. 2008. *Preliminary Geologic Map of the Sandpoint 30 x 60 Minute Quadrangle, Idaho and Montana, and the Idaho Part of the Chewelah 30 x 50 Minute Quadrangle*. Idaho Geological Survey, Digital Web Map 94, scale 1:100,000.

Lloyd, D.S. 1987. "Turbidity as a Water Quality Standard for Salmonid Habitats in Alaska." *North American Journal of Fisheries Management* 7: 34-45.

Lyons, K.J. 2013. *A Cultural Resources Inventory of the Clark Fork Delta, Bonner County, Idaho, Albeni Falls Dam Project, Federal Columbia River Power System*. Prepared for the USACE under contract #W912DW-10-D-1022 Task Order 3.

Maiolie, M.A. and S. Elam. 1993. *Dworshak Dam Impacts Assessment and Fisheries Investigations*. Annual report, Project 87-99. Idaho Department of Fish and Game, Boise, ID. Prepared for BPA, Portland, OR.

Martin, R.C., H.J. Hansen, and G.A. Meuleman. 1988. *Albeni Falls Wildlife Protection, Mitigation, and Enhancement Plan*. Idaho Department of Fish and Game, Boise, ID. Prepared for BPA, Portland, OR. August.

Maser, C.M., R. Bruce, J.F. Franklin, and C.T. Dyrness. 1981. *Natural History of Oregon Coast Mammals.* General Technical Report PNW-133. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, OR. 496 pp.

McCullah, John and Donald Gray. 2005. *Environmentally Sensitive Channel- and Bank-Protection Measures*. Transportation Research Board, National Cooperative Highways Research Program, Washington, DC. NCHRP Report 544.

McPhail, J.D. and C.B. Murray. 1979. *The Early Life History and Ecology of Dolly Varden (*Salvelinus malma*) in the Upper Arrow Lakes*. University of British Columbia, Vancouver, BC.

McQueen, Cyrus B. and Richard E. Andrus. 2007. "Sphagnum." In: Flora of North America Editorial Committee, eds. 1993. *Flora of North America North of Mexico.* 16+ vols. New York and Oxford. Vol. 27, p. 72.

Montana Natural Heritage Program. 2013. *Montana Field Guides: Plants.* Available at: <http://fieldguide.mt.gov/displayClasses.aspx?Kingdom=Plantae>.

NatureServe. 2013. *NatureServe Explorer: An Online Encyclopedia of Life* [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available at: <http://www.natureserve.org/explorer>. Accessed: August 14, 2013.

Northwest Power and Conservation Council (Council). 2002. *Pend Oreille Subbasin Plan*. Portland, OR.

Panhandle Bull Trout Technical Advisory Team (PBTTAT). 1998. *Lake Pend Oreille Key Watershed Bull Trout Problem Assessment*. Prepared for the State of Idaho, Boise.

Paragamian, V.L. and V.L. Ellis. 1994. *Kokanee Stock Status and Contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho*. Idaho Department of Fish and Game, Annual Report to Bonneville Power Administration, Project 85-339, Portland, OR.

Parametrix, Inc. 1998. *Assessment of Geomorphic Process Clark Fork Hydroelectric Project Relicensing, for WWP. U.S. Army Corps of Engineers. 1956. Alleviation of Erosion Damage, Albeni Falls Project.* Parametrix, Inc., Seattle, WA. Design Memorandum 15.

Parke, Randy. 2007. Personal Communication.

PBTTAT. See Panhandle Bull Trout Technical Advisory Team.

Pratt, K.L. 1996. *Bull Trout and Westslope Cutthroat Trout in Three Regions of the Lower Clark Fork River Between Thompson Falls, Montana and Albeni Falls, Idaho: A Discussion of Species Status and Population Interaction*. Trout Unlimited: Boise, ID. 29 p + appendixes.

Pratt, K.L. and J.E. Huston. 1993. *Status of Bull Trout (*Salvelinus confluentus*) in Lake Pend Oreille and the Lower Clark Fork River*. Report to Washington Water Power Company: Spokane, WA.

Quigley, T.M. and S.J. Arbelbide, tech. eds. 1997. *An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins: Volume III*. Gen. Tech. Rep. PNW-GTR-405. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR. 4 vol.

Reclamation. See U.S. Bureau of Reclamation.

Redding, J.M., C.B. Schreck, and F.H. Everest. 1987. "Physiological Effects on Coho Salmon and Steelhead of Exposure to Suspended Solids." *Transactions of the American Fisheries Society* 116: 737-744.

Rieman, B.E. and C.M. Falter. 1976. *Lake Pend Oreille Limnological Studies. Idaho Department of Fish and Game, Federal Aid to Fish and Wildlife Restoration, Project F-53-R-10. Job Performance Report.* Idaho Department of Fish and Game, Boise, ID.

Rieman, B.E., and J.D. McIntyre. 1993. *Demographic and Habitat Requirements for Conservation of Bull Trout*. U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Ogden, UT. General Technical Report INT-302.

Rosgen, D.L. 1994. "A Classification of Natural Rivers." *Catena* 22:169-199.

Ryan, R. and R. Jakubowski. 2013. "Idaho Native Salmonid Research and Monitoring Update 2012." Idaho Tributary Habitat Acquisition and Enhancement Program, Appendix A. Report to Avista Corporation, Spokane, Washington.

Scannell, P.O. 1988. *Effects of Elevated Sediment Levels from Placer Mining on Survival and Behavior of Immature Arctic Grayling*. Alaska Cooperative Fisheries Unit, University of Alaska. Unit Contribution 27.

Servizi, J.A. and D.W. Martens. 1991. “Effects of Temperature, Season, and Fish Size on Acute Lethality of Suspended Sediments to Coho Salmon.” *Canadian Journal of Fisheries and Aquatic Sciences* 49: 1389-1395.

Smith, A.H. 1936-1938. Kalispel Ethnographic Field Notes. Unpublished Manuscript on file with the Lewis-Clark State College Archives, Lewiston, ID.

Swanberg, T. 1997. “Movements of and Habitat Use by Fluvial Bull Trout in the Blackfoot River, Montana.” *Transactions of the American Fisheries Society* 126:735–746.

Tetra Tech, Inc. 2007. *Total Maximum Daily Load (TMDL) for Nutrients for the Nearshore Waters of Pend Oreille Lake, Idaho*. Tetra Tech, Inc., Fairfax, VA.

U.S. Air Force (USAF) IERA. 2003. *Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations*. Robert O’Brien and Mark Wade. Karta Technologies, San Antonio, TX.

U.S. Army Corps of Engineers (USACE). 1981. *Albeni Falls Project Master Plan*. Seattle District, Seattle, WA.

U.S. Army Corps of Engineers (USACE). 1983. *Final Environmental Impact Statement—Operation of Albeni Falls Dam, Idaho*. Seattle District, Seattle, WA.

U.S. Army Corps of Engineers (USACE). 2008. *Historic Properties Management Plan, Albeni Falls Dam and Pend Oreille Lake Project.* Seattle District, Seattle, WA.

U.S. Army Corps of Engineers (USACE) and Bonneville Power Administration (BPA). 2011. *Final Environmental Assessment—Albeni Falls Dam Flexible Winter Power Operations, Bonner County, Idaho*. DOE/EA-1894. U.S. Army Corps of Engineers, Seattle, WA. July.

U.S. Bureau of Land Management (BLM). 1986. *BLM Manual Handbook 8410-1*, Visual Resource Inventory, 1986.

U.S. Bureau of Land Management (BLM). 2007a. *Record of Decision and Approved Coeur d’Alene Resource Management Plan*. June.

U.S. Bureau of Land Management (BLM). 2007b. *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States*. Final Programmatic Biological Assessment. USDI Bureau of Land Management, Nevada State Office, Reno, NV. June.

U.S. Bureau of Land Management (BLM). 2010. *Programmatic Environmental Analysis for Vegetation Treatments*. Coeur d’Alene Field Office.

U.S. Bureau of Land Management (BLM). 2013. Sensitive species list. <http://www.blm.gov/pgdata/etc/medialib/blm/id/wildlife/sensitive_species.Par.71825.File.dat/Sensitive_Species_list_for_WEBSITE_508.pdf>. Accessed August 27, 2013.

U.S. Census Bureau. 2013. *2010 Census*. Available at: <http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>. Accessed August 2013.

U.S. Department of Agriculture (USDA). 1982. *Soil Survey of the Bonner County Area, Idaho*. USDA Soil Conservation Service, Washington, DC.

U.S. Department of Energy and U.S. Fish and Wildlife Service (DOE and USFWS). 2013. *Memorandum of Understanding Between the Department of Energy And the U.S. Fish and Wildlife Service Regarding Implementation of Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds."* 78 Fed. Reg. 68041 – 68042.

U.S. Environmental Protection Agency (EPA). 1971. *Community Noise*. EPA-NTID300.3. December 1971. Pages cited: 18, 20, 21.

U.S. Environmental Protection Agency (EPA). 2007. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005*. EPA 430-R-07-00.

U.S. Environmental Protection Agency (EPA). 2010. *Report No. NR-009d. Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling Compression Ignition*. <http://www.epa.gov/otaq/models/nonrdmdl/nonrdmdl2010/420r10018.pdf>.

U.S. Environmental Protection Agency (EPA). 2013. *Sandpoint, Idaho, PM_{10} Maintenance Plan Summary*. Region 10. <http://yosemite.epa.gov/r10/AIRPAGE.NSF/8be3ce98191c7f0988256c140074ee64/46290d390c6c9eb188257b56006dfda3!OpenDocument>.

U.S. Fish and Wildlife Service (USFWS). 1953. *An Interim Report on Fish and Wildlife Resources Affected by Albeni Falls Project, Pend Oreille River, Idaho*.

U.S. Fish and Wildlife Service (USFWS). 1960. *Supplementary Follow-up Report, Albeni Falls Project, Idaho*.

U.S. Fish and Wildlife Service (USFWS). 2003. *Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan*. Clark Fork River Recovery Unit Chapter. <http://www.fws.gov/pacific/bulltrout/RP/Chapter_3%20Clark%20Fork.pdf>.

U.S. Fish and Wildlife Service (USFWS). 2013. *U.S. Fish and Wildlife Service - Idaho Fish and Wildlife Office Endangered, Threatened, Proposed, and Candidate Species With Associated Proposed and Critical Habitats in Idaho.* December 3.

USACE. See U.S. Army Corps of Engineers.

USAF. See U.S. Air Force.

USFWS. See U.S. Fish and Wildlife Service.

Wagner, David H. 1993. "Polystichum." In: Flora of North America Editorial Committee, eds. 1993+. *Flora of North American North of Mexico*. 16+ vols. New York and Oxford. Vol. 2.

Wagner, David H. 2013. Personal communication between David Wagner/ Northwest Botanical Institute and Rachel Newton/CH2M HILL. August 16.

Wahl, Nicholas C., Andrew M. Dux, William J. Ament, and William Harryman. 2011. *Lake Pend Oreille Research, 2010; Lake Pend Oreille Fishery Recovery Project; Annual*

Progress Report March 1, 2010—February 28, 2011. Idaho Department of Fish and Game, Boise, ID. IDFG Report Number 11-22.

Washington Department of Natural History – Washington Natural Heritage Program. 2011. *Field Guide to the Rare Plants of Washington*. Available at: <http://www1.dnr.wa.gov/nhp/refdesk/fguide/htm/fgmain.htm>.

Washington Department of Natural Resources. 2013. List of Vascular Plants Tracked by the Washington Natural Heritage Program. July. Accessed November 2013. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>.

Whitlock, S.L. 2013. *Kokanee spawning ecology and recruitment response to water level management in Lake Pend Oreille, Idaho*. An M.Sc. thesis, University of Idaho. 146 pp.

Xerces Society for Invertebrate Conservation, The. Undated. Margaritifera falcata *(Gould, 1850) Western pearlshell.* Profile prepared by Sarina Jepsen, Caitlin LaBar, and Jennifer Zarnoch. <http://www.xerces.org/western-pearlshell/>.

Yelverton, J.T., D.R. Richmond, W. Hicks, K. Saunders, and E.R. Fletcher. 1975. *The Relationship Between Fish Size and Their Response to Underwater Blast*, Report No. DNA 3677T, Contract No. DNA 001-74-C-0120 to Defense Nuclear Agency, Washington, DC.

Appendix A
Detailed Cut and Fill Volumes, Areas, and Elevations

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Detailed Cut and Fill Volumes, Areas, and Elevations

Table A-1 Estimated Areas and Fill/Cut Volumes of Earth Materials at Area 3/4/9 Clark Fork River Delta Restoration Project

Name	Finished Grade Elevation (feet)	Area (acres)	Fill (CY)	Cut (CY)
Area 3/4/9 A	2064.5 – 2066.5	29.5	219,848	
Area 3/4/9 B	2064.5 – 2066.5	23.8	115,806	
Area 3/4/9 C	2064.5 – 2066.5	28.7	182,224	
Total Fill			**517,878**	
Area 3 Borrow Area 1	2045.0 – 2049.0	37.7		510,173
Area 3 Borrow Area 2	2049.0	3.8		30,148
Area 3 Borrow Area 3	2045.0	5.1		56,984
Total Cut				**597,305**
597,305 CY - 517,878 CY = 79,427 CY Contingency				

Table A-2 Estimated Areas and Fill/Cut Volumes of Earth Materials at Area 5 Clark Fork River Delta Restoration Project

Name	Finished Grade Elevation (feet)	Area (acres)	Fill (CY)	Cut (CY)
Area 5 A	2064.5 – 2066.5	9.8	89,640	
Total Fill			**89,640**	
Area 5 Borrow Area 1	2045.0 – 2049.0	1.2		12,350
Area 5 Borrow Area 2	2045.0 – 2049.0	18.2		240,868
Total Cut				**253,218**
253,218 CY - 89,640 CY = 163,577 CY Contingency				

Table A-3 Estimated Areas and Fill/Cut Volumes of Earth Materials at Area 7 Clark Fork River Delta Restoration Project

Name	Finished Grade Elevation (feet)	Area (acres)	Fill (CY)	Cut (CY)
Area 7 A	2064.5 – 2066.5	34.3	195,413	–
Area 7 B	2064.5 – 2066.5	17.3	71,247	
Area 7 C	2064.5 – 2066.5	1.2	3,991	
Total Fill			**270,651**	
Area 7 Borrow Area 1	2049.0	29.7		369,779
Area 7 Borrow Area 2	2049.0	8.9		64,898
Area 7 Borrow Area 3	2049.0	6.0		39,624
Area 7 Borrow Area 4	2049.0	5.5		35,343
Area 7 Borrow Area 5	2050.0	5.1		32,650
Total Cut				**542,294**
542,294 CY - 270,651 CY = 271,643 CY Contingency				

Table A-4 Estimated Areas and Fill/Cut Volumes of Earth Materials at Area 11 Clark Fork River Delta Restoration Project

Name	Finished Grade Elevation (feet)	Area (acres)	Fill (CY)	Cut (CY)
Area 11 Area A	2064.5	2.7	13,324	
Area 11 Area B	2064.5	8.5	66,741	
Area 11 Area C	2064.5	8.7	32,780	
Area 11 Area D	2064.5	9.3	49,868	
Total Fill			**162,713**	
Area 11 Borrow Area 1	2049.0	19.0		227,166
Area 11 Borrow Area 1a	2045.0	1.6		9,758
Area 11 Borrow Area 2	2049.0	12.5		153,658
Total Cut				**390,582**
390,582 CY - 162,713 CY= 227,869 CY Contingency				

Appendix B
Photographs for Visual Resource Analysis

Appendix B
Photographs for Visual Resource Analysis

Figure B-1: *From ID 200 (near its railroad overcrossing) looking south towards Area 11 (a building associated with the Clark Fork River Drift Yard Access Area can be seen at right side of photograph) and Area 3, and Area 5 (White Island with tall trees) behind Area 3.*

Figure B-2: *From ID 200 (same location as Visual Figure B-1) looking southwest towards Area 11 (Log Yard).*

Figure B-3: *From ID 200 looking south at log yard.*

Figure B-4: *From Clark Fork River Drift Yard Access Area looking south at Area 3.*

Figure B-5: *Example of existing shoreline vegetation and trees beyond.*

Figure B-6: *From Derr Island Road looking down the Middle Fork (northwest) at residences on both banks. Part of Area 3 can be seen beyond river.*

Figure B-7: *Example of existing riprap breakwater at Area 3.*

Figure B-8: *Example of riprapped shoreline protection with woody debris and managed vegetation; Pack River nearly 5 years after establishment.*

Figure B-9: *Example of a stabilized shoreline; Pack River nearly 5 years after establishment.*

Figure B-10: *Example of created micro-topography and vegetative diversity and fish passage; Pack River nearly 5 years after establishment.*

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