Birch Creek Floodplain Restoration Project

Draft Environmental Assessment

August 2020

DOE/EA-2135

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ACRONYMS

ACS	American Community Survey
APE	area of potential effect
BMP	best management practice
°C	degrees Celsius
CAA	Clean Air Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	Methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
dB	Decibels
dBA	A-weighted decibels
DPS	distinct population segment
EA	environmental assessment
EFH	Essential Fish Habitat
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionarily significant unit
°F	degrees Fahrenheit
FCRPS	Federal Columbia River Power System
FEMA	Federal Emergency Management Agency
FONSI	finding of no significant impact
FR	Federal Register
ft.	Feet
FWCA	Fish and Wildlife Conservation Act
GHG	greenhouse gas
GIS	Geographic Information Systems
Leq	equivalent sound level
Lmax	maximum sound level

MBTA	Migratory Bird Treaty Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
Northwest Power Act	Pacific Northwest Electric Power Planning and Conservation Act
NPCC	Northwest Power and Conservation Council
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NWP	Nationwide Permit
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
PM	particulate matter
PM_{10}	particulate matter 10 micrometers or less in diameter, or fugitive dust
$PM_{2.5}$	particulate matter 2.5 micrometers or less in diameter
RM	River Mile
SWPPP	Stormwater Pollution Prevention Plan
TMDL	total maximum daily load
USC	United States Code
USFWS	U.S. Fish and Wildlife Service

CHAPTER 1 INTRODUCTION

1.1 Background

The Bonneville Power Administration (Bonneville) is deciding whether to fund the Birch Creek Floodplain Restoration Project sponsored by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). This project is located on Birch Creek a few miles south of Rieth, Oregon (Figure 1-1). The project is designed to improve habitat conditions for Endangered Species Act (ESA)-listed mid-Columbia steelhead (*Oncorhynchus mykiss*) and other native fish species.

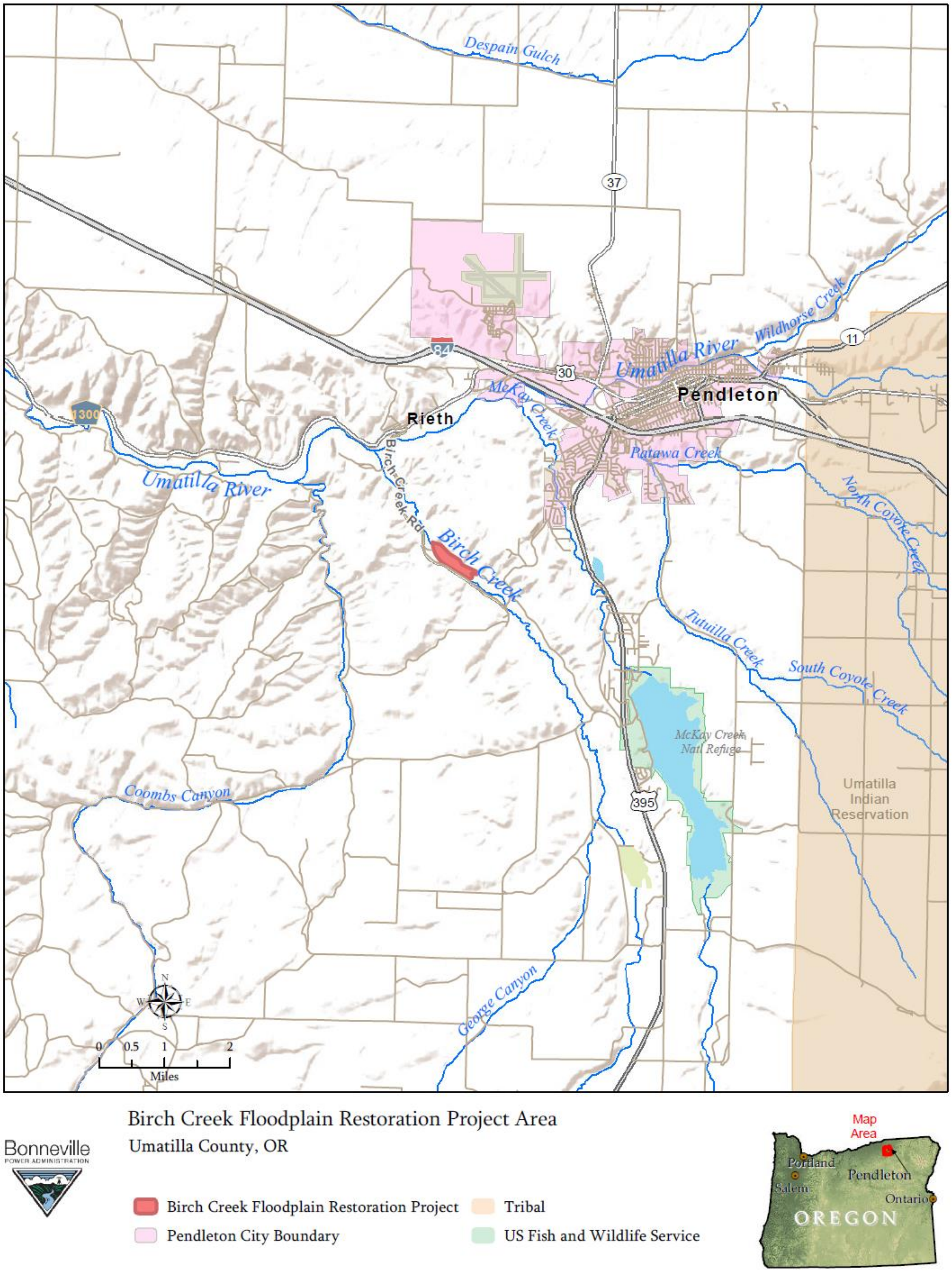
Proposed restoration activities would include main-channel realignment and restoration; improving secondary channel and floodplain interactions; installing habitat-forming in-stream structures made from large pieces of wood; wetland creation; and riparian and upland vegetation plantings.

Bonneville is the lead agency preparing this draft environmental assessment (EA) under the National Environmental Policy Act of 1969 (NEPA) (42 United States Code [USC] 4321 *et seq.*) and its implementing regulations. NEPA requires federal agencies to assess the impacts of proposed actions on the environment.

Bonneville prepared this EA to determine if the Proposed Action would significantly affect the environment, and thus, warrant the preparation of an environmental impact statement (EIS), or whether it is appropriate to prepare a finding of no significant impact (FONSI).

This chapter describes Bonneville's need to act on the purposes that the agency seeks to achieve. The chapter also includes project background and summarizes the public-scoping process and comments received.

Figure 1-1. Project Vicinity Map.



1.2 Purpose and Need

Bonneville is a federal power-marketing agency that is part of the U.S. Department of Energy. Several statutes govern Bonneville's operations, including the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act) (16 U.S.C. 839 et seq.), which directs Bonneville to protect, mitigate, and enhance fish and wildlife affected by the development and operation of the Federal Columbia River Power System (FCRPS). To assist in accomplishing this, the Northwest Power Act requires Bonneville to fund fish and wildlife protection, mitigation, and enhancement actions consistent with the Northwest Power and Conservation Council's (NPCC) Fish and Wildlife Program and other purposes of the act. Under this program, the NPCC makes recommendations to Bonneville concerning which fish and wildlife mitigation measures to implement.

Bonneville needs to respond to the CTUIR's requests for funding the Birch Creek Floodplain Restoration Project. In meeting the need for action, Bonneville seeks to achieve the following purposes:

- Support efforts to mitigate for the effects of development and operation of the FCRPS on fish and wildlife in the mainstem Columbia River and its tributaries pursuant to the Northwest Power Act.
- Help Bonneville meet its obligations under the Endangered Species Act (ESA) by fulfilling commitments begun under the 2008 NOAA Fisheries Federal Columbia River Power System Biological Opinion (as supplemented in 2010 and 2014) (2008 BiOp) and ongoing commitments under the 2019 NOAA Fisheries Columbia River System BiOp (2019 CRS BiOp). The 2008 BiOp called for identifying tributary habitat restoration projects, and the 2019 CRS BiOp largely continues the tributary habitat restoration program.
- Fulfill Bonneville's commitments to the CTUIR under the 2018 Columbia River Fish Accord Extension agreement.
- Minimize adverse impacts to the human environment, avoid jeopardizing the continued existence of ESA-listed species, and avoid adverse modification or destruction of designated critical habitat.

1.3 Public Scoping and Key Issues

To help determine the issues addressed in this EA, Bonneville conducted public scoping outreach that initiated on **February 13, 2020**. Bonneville mailed letters to potentially interested and affected persons, agencies, Tribes, and organizations. Bonneville accepted public comments on the project until **March 14, 2020**. The letter provided information about the project and EA scoping period, requested comments on issues to be addressed in the EA, and described how to comment (i.e., through mail, fax, telephone, and Bonneville's project website). Bonneville posted this on the project website to provide information about the Proposed Action and the EA process: www.bpa.gov/goto/BirchCreek.

As the project sponsor, CTUIR received a request from Bonneville for comments on the Proposed Action, as well as on potential cultural resources.

Bonneville received one written comment, posted at the project website above, and two comments by telephone during the scoping period. These comments focused on the following:

- Project purpose and need in relation to the Northwest Power Act and Columbia River Fish Accords.
- Existing noise levels of the groundwater well and pumping station in the project area.

These scoping comments are addressed in the appropriate sections of the EA.

CHAPTER 2 ALTERNATIVES

This chapter describes the alternatives analyzed in detail in this EA: The Proposed Action and the No Action alternatives. It compares the alternatives by potential environmental consequences and also identifies potential mitigation measures

2.1 Proposed Action

Under the Proposed Action, Bonneville would fund the Birch Creek Floodplain Restoration Project. It would involve actions between RMs 1.8 and 2.7 on Birch Creek as measured from its confluence with the Umatilla River. The ultimate goal of the project is to restore fish and wildlife habitat along Birch Creek and to address the primary limiting factors identified in the NPCC's Umatilla Subbasin Plan, 2008 Columbia River Fish Accords and the Birch Creek Watershed Assessment and Action Plan (CTUIR 2015) for steelhead in the Umatilla River and Birch Creek.

The project objectives are to improve habitat conditions for foraging, rearing, spawning, and migrating resident and ESA-listed fish. The Proposed Action would involve utilizing a River Vision (Jones et al. 2008) based approach to construct project elements that initiate recovery of in-stream and floodplain processes through the addition of structural features, off-channel habitat creation, wetland creation, and riparian vegetation enhancement. These activities are described in greater detail below.

In addition, Bonneville would fund a conservation easement or the acquisition of fee title to facilitate the implementation of the project and ensure that it provides a long-term restoration benefit.

The primary proposed restoration elements associated with the Proposed Action, as shown in Table 2-1, would include:

Table 2-1: Proposed Action Restoration Elements

Restoration Element	Quantity/Metric (in applicable unit)
Main-Channel Realignment and Restoration	About 1.2 miles (6,250 feet) of primary channel realignment
Improve Secondary Channel and Floodplain Interactions	About 0.6 mile (3,400 feet) of secondary channel excavation
Install Habitat-Forming Instream Structures	About 830 pieces of wood per mile
Wetland Creation	9.9 acres of created wetland
Riparian and Upland Vegetation Plantings	29.7 acres of riparian habitat enhanced
Overall Disturbance Area	35.9 acres

2.1.1 Main-Channel Realignment and Restoration

Measured from its confluence with the Umatilla River, about a one-mile section of Birch Creek (between RMs 1.8 to 2.7) would be realigned and restored. New channel excavation would begin at the downstream end of the project area. It is anticipated that the new channel would be excavated to an average depth of about 4 feet, which would increase the main channel by approximately 6,250 feet. These activities would seek to increase aquatic and riparian habitat diversity and complexity, reconnect stream channels to floodplains, improve long-term nutrient storage, provide substrate for macroinvertebrates, moderate flow disturbance, increase retention of organic materials, and provide refuge for fish and other aquatic species. Earthen plugs would be left in place at each end of the excavated length of the main channel before connecting to the main channel during the in-water work window.

One objective of the project is to reconnect primary and secondary channels to reactivate the floodplain at various flows, improving floodplain connectivity and aquatic habitat through a range of flows. The goal is to restore stream form and function to begin to restore ecological processes that once supported unimpeded fish passage, temporary storage of water, more natural sediment transport processes, all life history stages of all aquatic organisms and the accumulation of organic material.

Channel reconstruction would focus on improving channel process and function by reconnecting the primary active channel of Birch Creek to its floodplain, increasing instream structural complexity, installing structural elements, restoring the streambank, and enhancing “roughness.” Material selection (e.g., large wood) for the structural elements would include native species. These activities would result in enhancing natural stream processes by increasing the range of stream velocities, improving sediment routing, increasing hyporheic exchange to improve floodplain water storage and capacity, improving flow timing and duration, and reducing buffering water temperatures throughout the year.

2.1.2 Improve Secondary Channel and Floodplain Interactions

These activities would focus on re-establishing stream channel functions within the floodplains. One side channel would be created along the former alignment of Birch Creek to increase floodplain connectivity, provide off-channel habitat features (e.g., alcoves and backwater refugia), promote hyporheic exchange (the mixing of surface and shallow subsurface water through a streambed’s porous sediment), and reduce water temperatures. In addition, fill would be placed along the existing channel alternating between the left bank and right bank to narrow the channel to a side channel width. Typical sections of these side channels would be designed and constructed to accommodate about 20 percent of the average two-year flow volumes. The downstream end of these side channels would be constructed to form alcoves and backwater habitat features at all flow levels to maximize the creation of these habitat types.

Another project objective is to promote channel migration, which would also encourage natural side channel formation over time. Although this cannot be measured at the onset of the project, it is anticipated that this would create a number of new side channels into the future by promoting these processes.

2.1.2.1 Install Habitat-Forming In-Stream Large-Wood Structures

A total of about 90 large-wood structures would be installed within the existing and the proposed new main channel. These structures would resemble log jams placed throughout the project length within the ordinary high water (OHW) boundary. Placing structures made from natural habitat-forming large-wood materials would provide complexity that encourages the initiation of processes that support spawning, rearing, and resting habitat for salmonids and other aquatic species. Structures would be built from locally sourced large wood and boulders. The boulders would be used as ballast within some of the log-jam structures and as individually placed rocks. The randomly placed individual rocks would be located in riffle habitat types to help create additional microsite complexity and increase juvenile rearing and adult resting cover.

Actions utilizing these structures would be designed to increase instream structural complexity and diversity, mimicking the processes and functions of natural input of large wood (e.g., whole conifer and hardwood trees, logs, root wads, etc.). Design criteria would be focused on balancing biological benefit, structural resiliency, and enhancing or complementing stream and floodplain processes.

Large wood placement would use size classes for wood that include at least three different categories. Typically, these size categories include 12–18 inches, 18–24 inches and 24 inches plus at diameter breast height (DBH) (i.e., 4.5 feet above the ground with bark intact) and 30 feet or greater in length as the primary pieces within the placement or structure. Materials with dimensions smaller than this (e.g., shrubs, branches, smaller trees, etc.) may be incorporated (woven) into the structures for racking.

Techniques for wood placement would involve hauling trees from an area outside of the riparian zone and placing them individually or in aggregate in specified locations in the project area. Locations for wood placement would be driven by the objectives to increase coarse sediment storage, increase habitat diversity and complexity, retain gravel for spawning habitat, improve flow, provide long-term nutrient storage, increase retention of organic inputs, and provide refugia for fish during high flows.

Boulders sized about 2 and 4 feet in diameter from a nearby quarry or from treated onsite riprap would be installed to stabilize large-wood structures and create resting habitat for fish.

2.1.3 Wetland Creation

About 10 acres of wetlands and seasonally disconnected aquatic habitats would be constructed within the floodplain through excavations in over 20 discrete areas throughout the floodplain. These wetlands would be variable depth to allow for some interaction under a variety of flow regimes. An objective of the project is to excavate some of these larger wetland areas to become perennial, open-water wetlands, which are connected to the channel. Each excavated area would advance the goal of restoring wetland habitats that provide high-velocity refuge, cover, and important food source for salmon and steelhead in addition to other species of fish and wildlife. Wetland excavation work would begin on the downstream end of the project area to prevent seepage flow from upstream excavated areas.

2.1.4 Riparian and Upland Vegetation Planting

Riparian and upland vegetation planting efforts would have three objectives. The first objective would be to re-establish locally collected, native vegetation that would outcompete non-native and invasive plant species. The second objective would be to initiate natural processes while minimizing negative impacts—some areas would allow for re-adjusting to natural processes while other areas would focus on preventing short-term soil erosion. These plantings may also provide shade, nutrient conversion, and woody material recruitment. The third objective would be to establish plants for tribal members' use as First Foods.[1]

During construction, willow (*Salix* spp.), black cottonwood (*Poplus trichocarpa*) and red-osier dogwood (*Cornus sericea*) cuttings would be utilized to plant within log jams. These stakes would be locally collected 7 to 10 days prior to use and would be placed in water to soak until placed in the jams, while the log jams are being constructed.

During the first fall after construction activities begin, the project would begin planting in all of the disturbed areas. Some of these areas would only be sown with grass seed, while some would be planted with rooted shrub species, depending on the objective of each specific area. It has been demonstrated to be most effective to plant the grass seed in this region after October 15, annually. This allows the seed to overwinter and germinate when conditions are suitable the following spring. This date is used to ensure the seed does not germinate and then dry out in the earlier fall, thus dying. This native seed also has a higher germination rate when it is frozen. Some of these planting areas are discussed below.

Newly constructed channels and side channels would be grass seeded the first fall. The project would not plant any rooted stock in these types of habitats until the channel has experienced at least one higher flow event. This allows that channel to adjust and begin to more clearly define its boundaries. Project staff would then re-evaluate the situation and develop a planting plan for these areas within the first 2 to 3 years after construction.

Other areas, such as staging areas and access routes would be decompacted and grass seeded the first fall. Planting would not be initiated here for 2 to 3 years to allow the soil to settle prior to planting rooted

[1] First Foods are defined as the minimum ecological products necessary to sustain CTUIR culture (Jones 2008).

stock. This equates to higher survival rates, as the plants' roots aren't exposed to potential air pockets in newly disturbed soils.

Once the site has settled, depending on survival rates, approximately 5,000 to 8,000 plants would be planted per year for a decade. Plants would be spaced 7 by 7 feet per plant, which equates to 849 plants per acre. If the survival rate falls below 70 percent, that area would be replanted the following season. In the spring, annual noxious weed treatment of planted areas would be conducted through both mechanical and chemical means to reduce competition.

A substantial amount of the project area would be relatively undisturbed. These areas would be planted with rooted stock the first fall, post-construction.

Table 2-2 delineates the native grass seed mix that would be planted during the fall following construction. The seed source for all of these species would be locally collected within the region. Some would be collected for the project and sent to a commercial grass seed producer.

Table 2-2: Native Grass Seed Mix Composition

	Common Name	Scientific Name	Percent Composition
Riparian Sites	Blue Wildrye	*Elymus glaucus*	40%
	Idaho Fescue	*Festuca idahoensis*	40%
	Mountain Brome	*Bromus marginatus*	15%
	Tufted Hairgrass	*Deschampsia cespitosa*	5%
Mesic/Upland Sites	Basin wildrye	*Leymus cinereus*	30%
	Idaho Fescue	*Festuca idahoensis*	20%
	Sandberg Bluegrass	*Poa secunda*	15%
	Prairie Junegrass	*Koeleria macrantha*	15%
	Bluebunch Wheatgrass	*Pseudoroegneria spicata*	15%
	Mountain Brome	*Bromus marginatus*	5%

Some of the primary First Foods species that would be used in planting efforts include: elderberry (*Sambucas nigra*), chokecherry (*Prunus virginiana*), serviceberry (*Amelanchier arborea*), willow (*Salix* spp.), currant (*Ribes* spp.), rose (*Rosa* spp), spirea (*Spirea douglasii*), black hawthorn (*Crataegus douglasii*), oceanspray (*Holodiscus discolor*), red-osier dogwood (*Cornus sericea*) and snowberry (*Symphoricarpos albus*). These native plants typically show higher survival rates in restoration areas. Trees and shrubs would be planted in the floodplain to re-establish natural processes in restoration areas.

2.1.5 Temporary Staging Areas, Access Roads, and Water Crossings

Riparian vegetation would be cut to the ground level for temporary access roads. A staging area up to about 5 acres near the existing access road to Birch Creek Road would be cut to grass level. The temporary main access road would be used along the entire length of the existing channel, running parallel to Birch Creek with a width up to about 20 feet. This would allow for two-way traffic for large construction equipment. At least one temporary bridge would be installed to allow for large construction equipment access to either side of wetted channels. This bridge would likely be moved at least two times during construction. Temporary water crossings would be made at locations that minimize the impacts to existing vegetation.

2.1.6 New Groundwater Well and Removal of Existing Infrastructure

An existing groundwater pumping station and existing irrigation pipe would be removed to implement the restoration. To replace it, a new well would be drilled on the east side of Birch Creek. The current location of the well and a pipe crossing Birch Creek conflicts with the proposed main channel realignment. Above-ground sections of existing irrigation pipe and associated electric-utility line conduit crossing Birch Creek near RM 2.25 at the lower end of the project area would be removed in all locations within the floodplain of this project. Most of the buried sections of pipe from the floodplain to the Point of Use (POU) would be left in place.

The new groundwater well would be drilled across Birch Creek and uphill from where restoration project elements occur. The well would be located at the irrigators' point of use. The new well would be drilled to a depth of approximately 750 to 1,000 feet. Concrete would be poured in a 5-foot radius around the well and for the approximate 20-foot by 20-foot footprint where a new pumping station would be built. Any materials generated by the drilling (e.g. drilling mud) would be safely disposed of in the immediate area of the drilling, or completely removed from the project site and safely disposed by the well drilling company.

Construction vehicles would access the new well site using existing roads currently used for access to irrigated fields. Construction of this new well, in addition to plugging and abandonment procedures for the existing well, would be approved by the Oregon Department of Water Resources (ODWR) as needed and comply with ODWR administrative rules.

2.2 Construction Sequencing and Timing

2.2.1 Construction Activities

The restoration elements in the Proposed Action would be conducted within stream channels, riparian areas, floodplains, and uplands. They would be accomplished using manual labor, hand tools (chainsaws, tree planting tools, augers, shovels, and more), all-terrain vehicles, flat-bed trucks, and heavy equipment (backhoes, excavators, bulldozers, front-end loaders, dump trucks, winch machinery, cable yarding, etc.).

Specifically, implementing the Proposed Action would require operating about 4 excavators, 1 bulldozer, 2 front-end loaders/scrapers, a large water truck, as well as about 4 off-road dump trucks. Materials would be hauled using an additional 2 or 3 end- or side-dump dump trucks, and between 2 and 4 logging trucks. This equipment and vehicles would repeatedly make trips to the site and likely operate on site at the same time. Utilizing erosion control best management practices, mass excavation of channels and wetland features, transport and placement of soil and the existing channel be performed using a variety of industry-standard earthmoving equipment such as tracked excavators and bulldozers. Dust abatement would be completed by keeping the roads and work areas watered down. This would also help alleviate fire concerns.

Crews would carry out construction of the large wood structures in the following sequence: First, during in-water work season, the area immediately surrounding each structure would be isolated with nets to prevent fish from entering the area. Then, qualified fish biologists would perform fish salvage to physically remove any remaining fish. Prior to construction, a temporary cofferdam comprised of non-erodible materials would isolate each work area located within the nets previously installed. Next, construction crews would excavate trenches to a minimum depth of 6 feet to install each large wood structure. The area upstream of each structure would be excavated to facilitate development of side channels. Boulders would be installed along with spoils from excavation to backfill each structure, which would be compacted with an excavator bucket.

Wetland creation would be carried out with mechanical excavation using tracked excavators. Preparation of areas for plantings and maintenance would be performed by visiting the site with trucks and initially operating mechanical equipment to decompact soil after heavy equipment leaves the site.

The new groundwater well would be drilled using a standard well-drilling rig using an augerbit drill. Casing would be installed in the drill shaft in 20-foot sections, which would be welded together. A concrete-mixing truck would pour concrete for the well pad and a foundation for the pumping house.

2.2.2 Anticipated Construction Schedule and Phasing

The Proposed Action would be carried out during two calendar years. Work would be planned depending on whether it would occur in water, which would require it to occur during the summer in-water work window for Birch Creek (July 1-October 31) specified by Oregon Department of Fish and Wildlife (ODFW) to protect salmonids. New channel construction and wetland excavation in areas above the OHW mark would occur during fall and winter of the first calendar year. In addition, during the first calendar year's in-water work window, to improve secondary channel and floodplain interaction, fill would be placed to narrow the existing channel. The rest of the in-channel work, such as installing in-stream structures, would occur during the in-water work window in the second calendar year. The irrigation pipe and pump station removal would occur during the first calendar year with construction of the new well completed before the following summer when irrigation water would be needed by water rights holders.

Table 2-3: Anticipated Construction Schedule and Phasing

<table>
<tr><th>Before in-water work window (November 1 to June 30)</th></tr>
<tr><td>
Complete pre-construction activities:

Construction staking and flagging sensitive areas;
Mobilize to site and prepare it for construction;
Install temporary erosion and sediment controls.

Acquisition, hauling, and staging of large wood structures.
Clear vegetation to the ground level for temporary access roads.
Begin main channel and wetland excavations above OHW, including initial construction of terrace fill and roughness, leaving a small earthen plug at the upstream end of the project to leave the area dry.
Remove existing groundwater well and pump station, drill new groundwater well, and;
Complete construction of the pump station before summer irrigation season.
</td></tr>
<tr><th>During in-water work window (July 1 to October 31)</th></tr>
<tr><td>
Install cofferdam, remove downstream earthen plug, and salvage fish.
Remove upstream earthen plug and slowly introduce flow from Birch Creek into the new main channel and monitor for turbidity.
Isolate existing Birch Creek and conduct fish salvage, if needed, to remove stranded fish.
Dewater existing Birch Creek and construct roughness.
Install in-stream habitat-forming features such as large-woody structures.
</td></tr>
<tr><th>After in-water work window (after October 31)</th></tr>
<tr><td>
Seed and mulch all disturbed areas.
Site clean-up and demobilization.
Decompact soil and initiate first series of riparian and wetland vegetation plantings.
</td></tr>
</table>

2.3 No-Action Alternative

Under the No Action Alternative, Bonneville would not fund the Birch Creek Floodplain Restoration Project and CTUIR would not construct the project. The area would remain in its current state, including the current Birch Creek channel alignment and water well.

2.4 Comparison of the Alternatives

Table 2-4 compares the Proposed Action to the No Action Alternative, and provides a summary and comparison of the potential environmental consequences of each alternative. Detailed analysis of environmental consequences is provided in Chapter 3.

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

Resource Category	Proposed Action	No Action
Geology and Soils	• **Low-to-moderate impact.** Short-term low-level impacts to soil would occur from construction activities for the new groundwater well and pump station in addition to soil impacts from implementing restoration actions. Low-level long-term effects of these restoration actions would ultimately improve soil quality and productivity.	• **No impact.** There would be no effect to geology (including subsurface geology from a new well) and soils.
Vegetation	• **Moderate-to-high impact.** Short-term moderate adverse impacts to vegetation from construction and the resulting changes to plant communities. Long-term high beneficial impacts from restored floodplain function and revegetation of native plant communities.	• **No impact.** There would be no impact to vegetation.
Water Resources	• **Moderate-to-high impact.** Though restoration activities would have short-term, moderate, adverse impacts on water quality and stream temperature, the Proposed Action is expected to improve stream sediment and turbidity conditions overall. In addition, over the long term, a high beneficial impact from the increased return volume and decrease in water temperatures for groundwater recharge.	• **No impact.** There would be no improvements in stream structure and groundwater. Additionally, no impacts to groundwater from drilling a new groundwater well.

Resource Category	Proposed Action	No Action
Wetlands and Floodplains	• **Moderate impact.** For wetlands and floodplains, there would be high long-term beneficial impacts from reconnecting the floodplain and wetland creation.	• **No impact.** There would be no wetland and floodplain creation nor improvements in connectivity to the floodplain.
Fish and Aquatic Species	• **Moderate impact.** After the implementation of the design features and mitigation measures defined in Bonneville's Habitat Improvement Program (HIP) conservation measures, there would be a short-term adverse impact to fish and aquatic species from sedimentation from construction, with a moderate long-term beneficial impact from improved flow and habitat conditions.	• **No impact.** There would be no impact to fish and aquatic species without implementation of the Proposed Action.
Wildlife	• **Low-to-moderate impact.** Restoration activities would have short-term adverse impacts due to construction disturbance and associated conversion of existing habitat with long-term beneficial impacts with improved habitat conditions.	• **No impact.** There would be no impact from construction-related disturbances to wildlife individuals and habitat.
Cultural Resources	• **No-to-low impact.** The Proposed Action would result in minimal to no impact on archeological resources depending on the level and amount of disturbance.	• **No impact.** There would be no ground disturbance with the No Action Alternative, and there would therefore be no potential to affect cultural resources.
Land Use	• **Low-to-moderate impact.** Restoration actions would change land use because land previously used for agricultural activities would be dedicated to floodplain habitat and a new hydrologic regime.	• **No impact.** Current land uses would remain the same.
Air Quality	• **Low impact.** Impacts would primarily occur from short-term emissions of criteria pollutants and dust from construction vehicles, which would be temporary and localized in nature.	• **No impact.** No emissions of criteria pollutants associated with construction would occur.

Resource Category	Proposed Action	No Action
Climate Change	• **Low impact.** Greenhouse-gas emissions would result from short-duration construction activities. Long-term contribution to the amelioration of climate change could result from restoring functional riparian, wetland, and floodplain habitats that store carbon. Increased water table inputs that could ameliorate effects of climate change on aquatic species by lowering water temperatures.	• **No impact.** No contributions from construction-vehicle emissions of greenhouse gases. There also would not be any amelioration of climate change through creation of wetland soils or its impacts through water table inputs that lower water temperatures.
Noise	• **Low-to-moderate impact.** Short-term low impacts from noise generated by the Proposed Action would be minimal due to the relatively short duration of construction, and a long-term moderate impact from reducing noise levels by relocating a groundwater well pump. In addition, a low-level long-term beneficial impact from increasing natural sounds.	• **No impact.** There would not be noise generated from construction. The groundwater well pump would continue to elevate noise levels for extended durations.
Public Health and Safety	• **Low impact.** The potential health and safety risks to workers and the public during construction would have low short-term effects during construction.	• **No impact.** There would be no change in public health or safety risks without implementation of the Proposed Action.
Socioeconomics	• **Low-to-moderate impact.** Short-term beneficial economic impacts to local communities from an estimated $2 million in direct project spending and temporary employment for about 10-15 construction workers.	• **No impact.** There would be no change in socioeconomic conditions without implementation of the Proposed Action.
Environmental Justice	• **Low impact.** The Proposed Action would not generate any health or environmental impact that might disadvantage any population. The long-term impact would likely be beneficial to Indian Tribes (the most likely environmental justice population to be affected) in contributing to the restoration of fish resources sufficient to support ceremonial, subsistence and commercial fishing.	• **No impact.** The Proposed Action would not induce any environmental or economic change to a community or an environmental justice population.

2.5 Mitigation Measures

To minimize impacts to resources from the Proposed Action, the best management practices (BMPs) and mitigation measures described in Table 2-5 would be implemented during the design and construction of the project.

In addition to the mitigation measures described below, conservation measures from Bonneville's programmatic Habitat Improvement Program (HIP) Endangered Species Act (ESA) programmatic Section 7 consultation would be implemented to reduce impacts to ESA-listed fish species. Conservation measures from Bonneville's HIP consultation applicable to this project are listed in Appendix A.

Table 2-5: Mitigation Measures

Resource Category	Mitigation Measures
Geology and Soils	• Follow the general standards for well abandonment, new well construction and maintenance under Oregon Department of Water Resources administrative rules to protect subsurface geology. • Create a Sediment Control Plan, and include daily monitoring during in-water construction, regular inspection, and recording control measures. • Use sediment barriers, such as silt fences, ballast berms, and straw wattles. • Minimize the area of disturbance. • Use water trucks to apply water to control dust, as needed. • Apply mulch or straw, or reseed exposed soil areas to reduce erosion and dust and completing work within a given area. • Sequence construction to minimize soil exposure and erosion potential. • Decompact staging areas and decommissioned access roads through subsoiling to a minimum of 18 inches and replanting. • Continue monitoring channel formation, particularly to ensure that functioning channels are experiencing sustainable levels of aggradation and erosion.
Vegetation	• Wash construction equipment before it is mobilized to the project area to control the spread of non-native species. • Minimize disturbance to native vegetation. • Employ zero swing excavators to decrease disturbance areas. • Replant with native seed mix as rapidly as possible following the completion of construction. • Develop a plan to monitor and maintain native-plant communities and control non-native and invasive plants. • Include mechanical and chemical treatment methods for non-native species.
Water Resources, Wetlands and Floodplains	• Obtain Clean Water Act permits and apply permit-specific protection measures. • Follow Oregon groundwater law and all standards and procedures required under Oregon Water Resources Department administrative rules to minimize impacts to groundwater from contamination, waste, and loss of pressure. • Monitor turbidity during construction by taking a baseline measurement 100 feet upstream and a second downstream measurement (approximately 50 feet downstream from construction activities) to ensure turbidity does not exceed levels established under the ESA consultation with NMFS. If this monitoring indicates that turbidity controls are ineffective, immediately mobilize work crews to repair, replace, or reinforce controls as necessary. • Obtain on-site materials for restoration activities to the degree possible. • Develop a Spill Prevention Control and Countermeasures (SPCC) Plan prior to project initiation. • Identify and locate staging areas, storage sites (fuel, chemical, equipment, and materials) potentially polluting activities, and secure them using methods identified in the SPCC 150 feet or more from any natural water body or on an adjacent,

Resource Category	Mitigation Measures
	established road area in a location and manner that would preclude erosion into, or contamination of, the stream or floodplain. • Use only hydraulic fluids approved for work in aquatic environments that are biodegradable. • Wash heavy equipment before delivery to project site to remove oils, fluids, grease, weed seed, etc. • Inspect and clean heavy equipment regularly. Repair any leaks immediately upon discovery. • Identify pollution and control measures that would be implemented in the SPCC. • Have a spill containment kit on site at all times during construction. • Operate all small engines within a non-permeable container when operating near water. • Perform all non-emergency maintenance of equipment off site. • Dispose all waste (solid waste, hazardous materials, etc.) off site, as regulated by the state. • Remove all equipment, materials, supplies, and waste from project site when complete. • Schedule activities and manage water flows and levels to provide dry working conditions as much as possible. • Stockpiled soils would be covered if they would be inactive for more than a few days. • Machinery for in-water work would be operated in out-of-stream areas as much as possible.
Fish and Aquatic Species	• Construct only during in-water work windows (July 1 to October 31) specified by ODFW and National Marine Fisheries Service (NMFS). • A qualified fish biologist would be on-site to conduct fish salvage after isolating work areas according to NMFS protocols for handling ESA-listed fish. • Limit the amount of stream that is dewatered to the minimum practicable to accomplish the project objectives. This includes not filling the entire current channel to reduce the mortality of all aquatic organisms. • Preserve riparian vegetation to the extent possible during construction. • Implement all conservation measures relevant to listed anadromous fish and bull trout from HIP Biological Opinions (see Appendix A).
Wildlife	• Schedule tree removal between September 15 and March 1 to protect migratory birds. If tree removal is necessary during this window, a qualified biologist would conduct a preconstruction survey to determine whether nesting birds are present. • If temporary construction areas provide suitable nesting habitat, implement actions that render that potential habitat unattractive to birds.
Cultural Resources	• Maintain construction limits 30 feet away from the historic properties boundaries. • An archaeological monitor shall be present during ground disturbing activities occurring within 100 feet of the south and east banks of Birch Creek and areas where

Resource Category	Mitigation Measures
	work will reach depths below the plow zone and existing utilities such as the buried irrigation pipe • Explain cultural resource-related mitigation measures to construction contractors and inspectors, including field marking for avoidance, during preconstruction meetings. Depict cultural sites as sensitive areas to avoid in construction documents and on construction maps. • Implement an Inadvertent Discovery Plan for cultural material (e.g., structural remains, Euro-American artifacts, or Native American artifacts) that details construction crew member responsibilities for reporting in the event of a discovery of cultural material during construction; require work to stop immediately and notification of local law enforcement officials (as required), appropriate BPA personnel, SHPOs, land managers, and affected tribes if cultural resources or human remains are discovered during construction activities. • Implement an Inadvertent Discovery Plan for human remains, suspected human remains, or any items suspected to be related to a human burial (i.e., funerary items, sacred objects, or objects of cultural patrimony). This will include the following procedures: o Halt of activities. All survey, excavation, and construction activities shall cease. The human remains shall not be disturbed any further. o Notification. Local law enforcement official, the local government, and the Indian tribal governments shall be contacted immediately. o Inspection. The county coroner, or appropriate official, shall inspect the remains at the project site and determine if they are prehistoric/historic or modern. Representatives from the Indian tribal governments shall have an opportunity to monitor the inspection. o Jurisdiction. If the remains are modern, the appropriate law enforcement officials shall assume jurisdiction and the cultural resource protection process may conclude. o Treatment. In Oregon, prehistoric/historic remains of Native Americans shall generally be treated in accordance with the in accordance with the procedures set forth in ORS 97.740 to 97.760.
Land Use	None identified.
Air Quality	• Apply water from water trucks to excavation areas and set a low speed limit to reduce dust. • Limit idling for construction vehicles and machinery.
Climate Change	• Limit idling for construction vehicles and machinery.
Noise	• Limit construction to daylight hours (typically the hours between 7:00 a.m. and 7:00 p.m.) • Fit equipment with best available sound muffling devices to the extent practicable, and check mufflers on a regular basis to ensure they function properly. • Review construction phasing to minimize the duration of particularly noisy activities and the overall duration of construction near residences.

Resource Category	Mitigation Measures
Public Health and Safety	• Conduct construction safety meetings to start each workday to review potential safety issues and concerns. • Use adequate signage and other routine safeguards for worker and public safety, and especially when utilizing ingress and egress to ensure safe crossings over railroad tracks for vehicle traffic. • Require workers to wear all necessary personal protective equipment when working with potentially hazardous materials. • Temporarily store any waste liquids generated at the staging areas under an impervious cover until they could be properly transported to and disposed of at a facility that is approved for receipt of hazardous materials.
Socioeconomics	None identified.
Environmental Justice	None identified.

CHAPTER 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the environmental conditions in and around the project area that could be affected by the Proposed Action or the No Action Alternative, and evaluates the potential impacts that could arise from implementing either alternative. The impact levels are characterized as high, moderate, low, or no impact. These impact levels are based on the analysis provided, incorporating the considerations of context and intensity defined in the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] 1508.27). For each resource category, Table 2-5 in Chapter 2 identifies minimization and mitigation measures that would help reduce or avoid impacts.

Table 3-1 identifies resources initially considered for impact analysis. Not all the resources present in the project area would experience impacts that require further analysis in this EA because alternatives would result in either no impact or a negligible impact on the resource.

Table 3-1: Resources Initially Considered for Impact Analysis

Resource	Resource Status	Resource Evaluation
Geology and Soils	Present, Affected	Impacts are further disclosed under Environmental Consequences.
Vegetation	Present, Affected	Impacts are further disclosed under Environmental Consequences.
Water Resources, Wetlands and Floodplains	Present, Affected	Impacts are further disclosed under Environmental Consequences.
Fish and Aquatic Species	Present, Affected	Impacts are further disclosed under Environmental Consequences.
Wildlife	Present, Affected	Impacts are further disclosed under Environmental Consequences.
Cultural Resources	Present, Affected	Impacts are further disclosed under Environmental Consequences.
Land Use	Present, Affected	Impacts are further disclosed under Environmental Consequences.
Recreation	Present, Not Affected	Because the alternatives would not be expected to change the existing or future recreational use on Birch Creek, there would be no effect to recreation under the alternatives.
Transportation and Infrastructure	Present, Not Affected	Use of and access to private, county, or state roads would not change in or near the project corridor. Temporary traffic delays would occur during construction along Birch Creek Road, but these delays would be negligible. Residents would be notified of upcoming construction activities and potential disruptions.
Visual Quality	Present, Negligible Impact	Existing views of the project area would not change because the overall degree of visual change in the existing viewshed along Birch Creek would be limited under the alternatives.

Table 3-1: Resources Initially Considered for Impact Analysis

Resource	Resource Status	Resource Evaluation
		Views of construction areas would be temporary with all equipment and materials removed after construction, resulting in a short-term low visual impact, and a long-term negligible impact.
Air Quality	Present, Affected	Impacts are further disclosed under Environmental Consequences.
Greenhouse Gases	Present, Affected	Impacts are further disclosed under Environmental Consequences.
Noise	Present, Affected	Impacts are further disclosed under Environmental Consequences.
Public Health and Safety	Present, Affected	Impacts are further disclosed under Environmental Consequences.
Socioeconomics	Present, Affected	Impacts are further disclosed under Environmental Consequences.
Environmental Justice	Present, Affected	Impacts are further disclosed under Environmental Consequences.

3.1 Geology and Soils

3.1.1 Affected Environment

3.1.1.1 Geology and Soils

The project area is located within the plains and terraces of the Umatilla Plain geologic province, which generally consists of sedimentary deposits (CTUIR 2016). Project-area soils are primarily silt loams of the Hermiston silt loam series typically found on stream bottomlands and low terraces (NRCS 2002). These are moderately deep soils that are somewhat excessively drained (CTUIR 2016; NRCS 2013). They generally support land uses such as small grain-fallow cropping and rangeland. Slopes are 0 to 3 percent throughout the project area. These soils are moderately susceptible to erosion from wind and water (NRCS 2013). These soils also have a medium level of susceptibility to compaction, which suggests that compaction could occur when construction equipment first passes, but would then be able to support equipment passing through with minimal increases in soil density (NRCS 2013).

Based on soil associations, the Natural Resources Conservation Service identifies farmlands as either prime farmland, unique farmland, or land of statewide importance. The farmland classification for soils described above for the project area is “prime farmland only if irrigated” (NRCS 2015). Because these project-area soils are not currently irrigated, there is no prime farmland in the project area.

Bonneville completed a phase one site assessment finding no landowner disclosures regarding potential sources of contamination and past and present land uses indicating that there are no contaminated soils.

3.1.2 Environmental Consequences – Proposed Action

With the use of heavy machinery for wetland creation, channel reconstruction, the Proposed Action would compact and expose soils in the project area. The total area of disturbance would be 35.9 acres. In addition to disturbing soils during drilling and construction activities, drilling the groundwater well would penetrate water-bearing basaltic subsurface rock layers. To minimize the impact of these activities, relevant design criteria, mitigation measures, and BMPs (see Table 2-5) would apply to minimize impacts to soils and subsurface geology, maintain long-term productivity of soils in riparian ecosystems, and facilitate long-term recovery of soil properties and function where needed.

The use of heavy construction equipment would directly impact soils. Heavy equipment use would compact, displace (move it from one place to another), mix horizons, and cause puddling.[2] These impacts can be expected throughout the construction site but would be limited to the construction footprint. Soil productivity and function would be impaired in the short term, but would likely recover within 15 years (Fleming et al. 2006; Lloyd et al. 2013; Page-Dumroese et al. 2006).

As discussed throughout this EA, restoration actions are intended for long-term improvement of the ecological function of Birch Creek, riparian areas, wetlands, and floodplains. Though short-term impacts to soil would be experienced, the long-term impacts of these restoration actions would ultimately improve soil quality and productivity from improved floodplain interactions and re-establishing native plant communities.

The Proposed Action is designed to restore natural flooding and sediment deposition regimes. In that natural or restored environment, seasonal flooding contributes to fine sediment deposits, which promote riparian growth of vegetation with propagules,[3] seeds, and organic matter. The deposited sediment also amends the soil's physical function by increasing water-holding capacity and providing a substrate for seedlings to establish. Reestablishing these processes in riparian areas and floodplains allows soil hydrologic, biologic, and nutrient-cycling functions to be restored and maintained (Stromberg et al. 2007; Tabacchi et al. 1998).

In summary, there would be short-term low-level impacts to soil would occur from construction, which would result in a **low impact** to soil. Low-level long-term effects of these restoration actions would ultimately improve soil quality and productivity, which would result in a **moderate beneficial impact**.

3.1.3 Environmental Consequences – No Action

There would be no construction activity associated with the No Action Alternative and therefore soils would not be affected from construction, however, there would not be an improvement in soil quality and productivity from the restoration actions. In addition, there would be no impact to subsurface geology from drilling a new groundwater well. Therefore, there would be **no impact** to geology and soils.

3.2 Vegetation

3.2.1 Affected Environment

3.2.1.1 Vegetation

3.2.1.1.1 Introduced Upland Vegetation Communities

Introduced (non-native) upland vegetation covers the majority (about 80 percent) of the project area. These communities cover about 60 acres of the project area. The area for the new groundwater well is

[2] Soil puddling is the effect of operating heavy machinery in soils with a high moisture content to produce uniformly soft structure-less mud.

[3] Propagules are vegetative structures that can become detached from a plant and give rise to a new plant (e.g., a bud, sucker, or spore).

agricultural land that consists of similar non-native upland vegetation. This vegetation community primarily consists of non-native grass and forb species such as cheatgrass (*Bromus tectorum)*, tall tumblemustard (*Sisymbrium altissimum*), black mustard (*Brassica nigra*), and several state and/or county-listed noxious weeds, including cereal rye (*Secale cereale*), Scotch thistle (*Onopordum acanthium*), yellow starthistle (*Centaurea solstitialis*), Russian knapweed (*Acroptilon repens*), and kochia (*Bassia* [*Kochia*] *scoparia*). Native vegetation species, such as Great Basin wildrye (*Leymus cinereus*), yarrow (*Achillea millefolium*), fiddleneck (*Amsinckia* spp.) are sporadically present. Scattered shrubs, primarily elderberry (*Sambucus nigra* subsp. *caerulea*) and big sagebrush (*Artemisia tridentata*), are also occasionally present in this vegetation community.

Introduced upland vegetation in the northern corner of the project area supports large stands of wetland plant species such as common teasel (*Dipsacus fullonum*) and poison hemlock (*Conium maculatum*), interspersed with upland species such as Scotch thistle, Canada thistle (*Cirsium arvense*), black mustard, common mullein (*Verbascum thapsus*), common houndstongue (*Cynoglossum officinale*), catnip (*Nepeta cataria*), bull thistle (*Cirsium vulgare*), and sterile brome (*Bromus sterilis*). As discussed below, bull thistle, Canada thistle, common houndstongue, and poison hemlock, are state-listed noxious weeds.

3.2.1.1.2 Riparian Vegetation Communities

Riparian vegetation occurs along Birch Creek and covers about 10 acres (about 13 percent) of the project area. Canopy cover in riparian vegetation ranges from sparse cover in the southern and central portion of the project area to greater than 80 percent cover in the northern portion of the project area. Tree species observed in riparian areas include alder (*Alnus* spp.), black cottonwood (*Populus trichocarpa*), box elder (*Acer negundo*), coyote willow (*Salix exigua*), Mackenzie's willow (*Salix prolixa*), and non-native tree species such as Russian olive (*Elaeagnus angustifolia*) and green ash (*Fraxinus pennsylvanica*). Shrubs observed in riparian areas included chokecherry (*Prunus virginiana*), blue elderberry, golden currant (*Ribes aureum*), and redosier dogwood (*Cornus sericea*). Herbaceous forbs and graminoids common in riparian areas include reed canarygrass (*Phalaris arundinacea*), common teasel, western Canada goldenrod (*Solidaga lepida* var. *lepida*), western goldenrod (*Euthamia occidentalis*), stinging nettle (*Urtica dioica*), common bedstraw (*Galium aparine*), catnip, and western clematis (*Clematis ligusticifolia*).

As discussed below, eight state-listed noxious weeds, Russian knapweed (*Acroptilon repens*), common houndstongue, poison hemlock, field bindweed (*Convolvulus arvensis*), common St. John's-wort (*Hypericum perforatum*), Canada thistle, Scotch thistle, and yellow starthistle, were also observed in riparian vegetation communities.

3.2.1.1.3 Cliffs, Caves, and Talus

Due to its rocky nature, vegetative cover is low in this habitat and vegetation community type. It covers 3.05 acres (about 4 percent) of the project area. Vegetation that does occur in these areas includes weedy species such as cheatgrass and tall tumblemustard, as well as three state- or county-listed noxious weeds: Scotch thistle, yellow starthistle, and cereal rye. Native species within the cliffs, caves, and talus community include western clematis and rubber rabbitbrush (*Ericameria nauseosa*).

3.2.1.1.4 Perennial Grassland

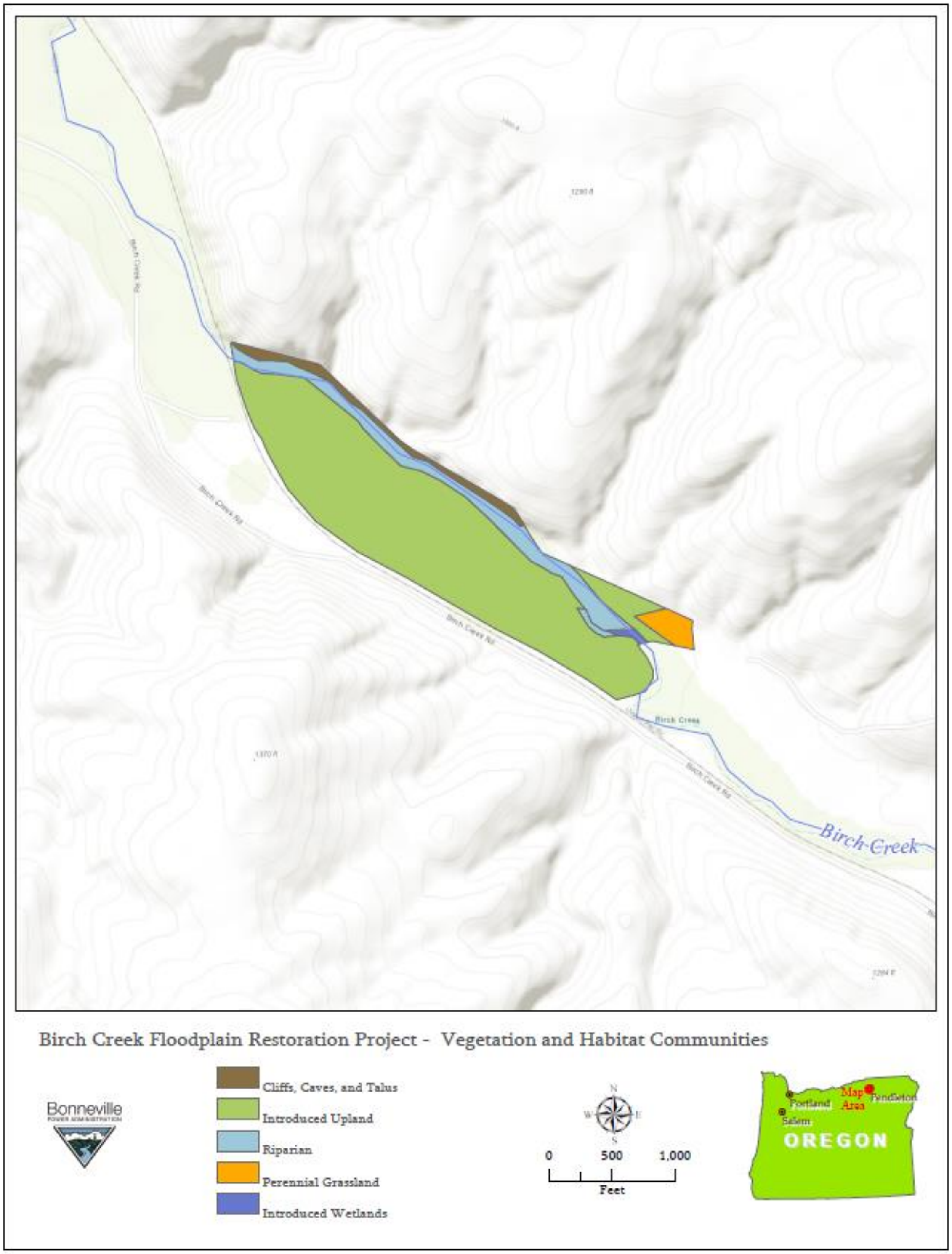
A small, 1.9-acre portion (about 3 percent of the total) in the southeastern corner of the project area on the north side of Birch Creek consists of perennial grassland. The dominant plant species is the native grass Great Basin wildrye. However, non-native invasive plant species, including cheatgrass, clasping pepperweed (*Lepedium perfoliatum*), and rattail fescue (*Vulpia myuros*), are also abundant in this area.

Other species include bulbous bluegrass, black mustard, and common teasel. As discussed below, this area has three state-listed noxious weeds: scotch thistle, kochia, and yellow starthistle.

3.2.1.1.5 Introduced Wetland Vegetation

Introduced (non-native) wetland vegetation covers a very small portion of the project area. This community covers 0.38 acre (less than 1 percent) of the total project area. Dominant vegetation in this area consists primarily of reed canarygrass, common teasel, rough cocklebur (*Xanthium strumarium*), and common horsetail (*Equisetum arvense*). As discussed below, the state-listed noxious weed Canada thistle also occurs in this area.

Figure 3-1: Plant Communities in the Project Area.



3.2.1.1.6 Special-Status Plant Species

Information on special-status (state and federally listed, including candidate species) plant species was obtained from the U.S. Fish and Wildlife Service (USFWS) for federal ESA-listed species, and from the Oregon Department of Agriculture (ODA) and Oregon Biodiversity Center for Oregon state-listed plants. Based on a review of species information and the results of field surveys, there are no federal ESA-listed species with potential to occur in the project area. Two state-listed plants would have a low potential to occur in the project area: the endangered northern wormwood (*Artemisia campestris* var. *wormskioldii*) and threatened lawrence's milkvetch (*Astragalus collinus* var. *laurentii*). In addition, five Oregon listing-candidate species could potentially occur: Oregon bolandra (*Bolandra oregana*), Dwarf evening-primrose (*Eremothera* (*Camissonia*) *pygmaea)*, Liverwort monkeyflower (*Erythranthe* (*Mimulus*) *jungermannioides*), Sessile mousetail (*Myosurus sessilis*), Columbia yellowcress (*Rorippa columbiae*) (ORBIC 2018).

Field surveys conducted within the project area did not document individuals of any of these seven species (Tetra Tech 2019a). Because these field surveys did not observe or document individuals or suitable habitat in project area, special-status (including federally and state-listed species and candidate species for listing) are unlikely to occur.

3.2.1.1.7 Noxious Weeds

Noxious weeds are non-native plants designated by the Oregon State Weed Board as those that pose the greatest public menace due their rapid spread on private, state, county and federally owned lands that they are a top priority for action by weed-control programs (ODA 2018).

ODA classifies weeds based on economic and environmental significance and lays out recommendations for eradication and control of the species within each classification: A-Listed weeds occur in small-enough infestations to make eradication or containment possible; or if not known to occur, their presence in neighboring states make future occurrence in Oregon seem imminent. Infestations are subject to eradication or intensive control where found. B-Listed weeds are regionally abundant, but may have limited distribution in some counties. Recommended actions include intensive control at the state, county, or regional level, as determined on a site-specific, or case-by-case basis. T-Designated weeds, which are species selected from the "A" or "B" list, receive priority attention for prevention and control, including the development and implementation of a statewide management plan for each T-designated species.

A 2018 survey of the project area notes that noxious species in the project area include Scotch thistle (*Onopordum acanthium*), poison hemlock (*Conium maculatum*), Himalayan blackberry (*Rubus armeniacus*), Russian knapweed (*Acroptilon repens*), spotted knapweed (*Centaurea stoebe*), yellow starthistle (*Centaurea solstitialis*), and Canada thistle (*Cirsium arvense*) (CTUIR 2018). In addition, bull thistle (*Cirsium vulgare*), common St. John's wort (*Hypericum perforatum*), field bindweed (*Convolvulus arvensis*), and perennial pepperweed (*Lepidium latifolium*) also occur within the project area (Tetra Tech 2019a). Of these noxious plant species, the most abundant observed in the project area include Canada thistle, field bindweed, poison hemlock, Scotch thistle, and yellow starthistle (Tetra Tech 2019a). In general, the highest densities of weed occurrences are in riparian areas along Birch Creek and in introduced upland vegetation.

Table 3-2: Noxious Weeds Known or Potentially Occurring in the Project Area*

Noxious Weed Common Name	Noxious Weed Scientific Name	Oregon State Weed Board Classification	Umatilla County Classification
bull thistle	*Cirsium vulgare*	B	-
Canada thistle	*Cirsium arvense*	B	B
common St. John's-wort	*Hypericum perforatum*	B	B
field bindweed	*Convolvulus arvensis*	B	-
Kochia	*Bassia* (*Kochia*) *scoparia*	B	B
perennial pepperweed	*Lepidium latifolium*	B/T	-
poison hemlock	*Conium maculatum*	B	B
Russian knapweed	*Acroptilon repens*	B	B
Scotch thistle	*Onopordum acanthium*	B	B
yellow starthistle	*Centaurea solstitialis*	B	B
Cereal rye	*Secale cereale*	-	B
Himalayan Blackberry	*Rubus armeniacus*	B	-
Spotted Knapweed	*Centaurea stoebe*	B/T	A

* Noxious weed inventory based on Tetra Tech and CTUIR survey information (Tetra Tech 2019a; CTUIR 2018).

3.2.2 Environmental Consequences – Proposed Action

The restoration of healthy riparian and upland vegetative communities as well as seeding and planting native species would involve ground-disturbing activity. Controlling invasive plants is also a component of the Proposed Action. Over the long term, therefore, the impacts to vegetation would be the restoration, improvement, or maintenance of native plant communities.

In the short term, however, the construction activity, due to heavy construction equipment, could affect plant communities rather dramatically. When heavy equipment is put to use, soil is turned and plants are uprooted, buried, and torn apart. About 29 acres of vegetation would be affected in this manner.

Planting native vegetation would stabilize the banks and minimize long-term sediment contributions to the channel. Any bare soil would be seeded or planted with vegetation in the fall following significant precipitation. Native grasses would be seeded for short-term erosion protection, in conjunction with mulching of native materials where available, or using weed-free straw, to ensure coverage of exposed soils and protection of seed and seedlings.

While the short-term mechanical damage to plants and plant communities is an obvious impact of construction activities, a more serious impact could be the creation of bare soil sites suitable for colonization by invasive plants. The project area would be visually inspected for noxious and invasive species prior to the commencement of construction. Any weeds that are identified would be treated prior to the construction. Any ground disturbed by the project activities would be seeded with an appropriate native erosion control seed mix to reduce the risk of erosion and invasion by noxious weeds. All materials that are imported to the project site would be inspected for weed and weed seeds prior to work beginning. Certified weed-free mulch may be applied as a short-term protection for disturbed soils. Noxious weed inventory or treatment would occur annually for a minimum of 5 years post construction. This would be completed by CTUIR personnel.

Another impact to vegetation is introducing flows into a floodplain that has not experienced consistent flowing water for many decades. In the absence of frequent watering, the majority of this area has converted to upland plant communities. Applying flows to plants not suited to saturated soils for long periods of time would cause them to die out, and would be replaced by plants capable of handling wetter conditions. Plant communities would thereby change to riparian or wetland communities. These changes could be dramatic, such as the conversion of upland communities throughout the project site to riparian plant communities.

In addition, the installation of a new groundwater well would disturb approximately 0.1 acres of vegetation for well-drilling activities and construction of a new pumping station.

In summary, there would be short-term adverse impacts to vegetation from construction and the resulting changes to plant communities. Long-term **high** beneficial impacts from restored floodplain function and revegetation of native plant communities. Overall, short- and long-term impacts would be **moderate.**

3.2.3 Environmental Consequences – No Action

Under the No Action Alternative, no construction impacts would occur. There would be no improvement in riparian vegetation. Vegetation communities would remain dominated by non-native species with continued likely decline in the diversity of native plants. Overall, there would be **no impact.**

3.3 Water Resources

3.3.1 Affected Environment

Birch Creek, a tributary of the Umatilla River, flows southeast to northwest. The main channel is pinned against the valley wall on its northern bank with eroded banks and minimal access to the floodplain. It primarily flows within a single main channel roughly between river miles 1.8 to 2.5 and 2.6 to 2.7. Between river miles 2.5 and 2.6, Birch Creek's flow has eroded the southern banks to form an ephemeral, braided secondary channel pattern. Estimated pooling along Birch Creek is about 4 pools per mile.

Birch Creek typically has low flows, which can be exacerbated by upstream water withdrawals and result in little to no flow in late summer months. Historically, dry (zero-flow) conditions have been documented in its lower reaches in the mid-nineteenth century before agricultural settlement of the area (GLO 1860), which suggests that Birch Creek in the project area does not naturally have perennial flow conditions.

3.3.1.1 Water Quality

Designated beneficial uses refer to the benefits that may be derived from a water body. They provide for the protection of public-water supplies, fish, shellfish, wildlife, as well as recreational, agricultural, navigation, and aesthetic purposes. The designated beneficial uses in the Umatilla Basin and Subbasin are administratively designated by ODEQ.

The beneficial uses designated for the Umatilla Subbasin are public/private domestic and industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, and hydropower (OAR 340-041-0310, Table 310A). Under the beneficial use designated for fish and aquatic life, the administrative rules specifically make fish-use designations along Birch Creek, which include salmon and trout rearing and migration and salmon and steelhead spawning use from October 15 to May 15 (OAR 340-041-0310, Figures 310 A–B).

Under Section 303(d) of the Clean Water Act, ODEQ must regularly assess the quality of the state's waters and report conditions to the EPA. For reporting and approval by EPA, ODEQ identifies and maintains the Section 303(d) list of waterbodies considered impaired and thus not meeting state water-quality standards. A Section 303(d) listing requires development of a total maximum daily load (TMDL)—the numerical value that represents the highest amount of a pollutant that a waterbody can receive while still meeting state and national water-quality standards.

Birch Creek, from the Umatilla River to the confluence of East Birch Creek and Pearson Creek, a point approximately 25 river miles upstream of the project area, is listed on ODEQ's 303(d) list for iron. This indicates that the presence of iron in Birch Creek impairs beneficial uses for fishing, drinking water, aquatic life, and human health, and therefore needs a TMDL for iron, although one has not been developed. Iron levels found in project-area reaches of Birch Creek likely originate from lumber operations near Pilot Rock because elevated iron concentrations are commonly found in waterbodies adjacent to chip piles and log yards (ODEQ 2020b). Additionally, while not listed as 303(d) waters, some reaches of Birch Creek do not meet ODEQ water quality standards for flow modification, which indicates impaired beneficial uses for salmonid rearing and spawning. In addition, ODEQ identifies Birch Creek as not meeting water quality standards for temperature and pH, which both have TMDLs.

The average August water temperature in Birch Creek is about 60 degrees Fahrenheit. Water temperatures that promote salmon and steelhead survival range from 52 to 59 degrees Fahrenheit (NMFS 2009). Higher water temperatures adversely affect salmonid metabolism, growth rate, and disease resistance, as well as the timing of adult migrations, fry emergence, and smoltification (Bonneville 2012).

3.3.1.2 Groundwater

The project area sits within a region generally underlain by Columbia Plateau basaltic rock aquifers, which are thick, permeable aquifers at or near the surface. They are not vertically permeable due to their thickness, which slows the rate and movement of groundwater flow and recharge (UCCGTF 2008). In general, these aquifers typically flow at relatively shallow depths anywhere from 100 to 700 feet below the surface and have declining water levels (USGS 1994).

The existing groundwater well runs 469 feet deep. The well log estimates water-bearing zones between 200 and 387 feet where black basalt constitutes the rock layers. Combined with a separate off-project-site groundwater well fulfilling the same water right (certificate 91811), the groundwater well on the project site is limited to a diversion not to exceed 3 acre feet per acre (1 acre foot covers one acre to a depth of one foot or 325,851 gallons) for each irrigated acre during irrigation season (OWRD 2018). Both wells under this water right supply irrigation water to 450 acres of crops located uphill from the project area.

The project area does not sit within the designated critical groundwater-restricted areas in Umatilla County (ODEQ 2020a). There are no sole-source aquifers in the project area.

3.3.1.3 Wetlands and Floodplains

3.3.1.3.1 Wetlands

Wetlands were not identified during a wetland delineation conducted in the project area (Tetra Tech 2019c). The deep topographic incision that separates Birch Creek from its floodplain has reduced surface and groundwater flow from the creek to any areas that might have supported wetlands.

3.3.1.3.2 Floodplains

Historically, Birch Creek had a wide main channel and tributary streams[4] developed through seasonal flooding, beaver activity, and sediment enrichment or mobilization. It was a lower-gradient, anastomosed stream,[5] with a tendency to migrate across the floodplain when flows exceeded its banks. Birch Creek is now deeply incised and disconnected from its floodplain from construction of the Union Pacific railroad, roads, bridges, and berms and agriculture practices. These activities have caused channel confinement, straightening, and relocation against the valley wall limiting access to the floodplain. As a result, the 100-year flood inundates only about 40 percent of the historic floodplain. The 10-year and 2-year floods inundate about 8 to 5 percent of the historic floodplain, respectively. Decreased floodplain connection has considerably lowered the water table (Tetra Tech 2019b). Abandoned side channels are likely disconnected from ground/surface water (except during the highest of flood events) and no longer migrate across the floodplain.

A portion of the project area on the south side and within about 400 to 500 feet of Birch Creek is Federal Emergency Management Agency (FEMA) designated floodplains. FEMA considers these floodplains subject to inundation by a 1-percent-annual-chance flood event.

3.3.2 Environmental Consequences – Proposed Action

3.3.2.1 Water Resources

3.3.2.1.1 Water Quality

Construction activities would be the primary driver for short-term impacts to water quality, with sedimentation, turbidity, and temperature the primary variables of concern. Another concern would be the potential fuel and fluid leaks from heavy equipment, but the probability of such an event is low, and the extent of the problem would likely be small given the mitigation in place for these actions (see Table 2-5). Long term, the Proposed Action would be expected to improve water quality.

Clean Water Act Section 303(d) Listed Waterbodies

The Proposed Action would not contribute iron to stream reaches listed for iron because the restoration activities would not contribute iron to Birch Creek or remobilize iron from ground disturbance. For this reason, there would no impact to impaired waterbodies in the project area.

Sedimentation and Turbidity

While the Proposed Action would restore the production, transport, and deposition of sediment throughout the watershed. Construction activities would cause short-term impacts on water quality. Operation of heavy equipment in the stream channel during instream structure placement, opening of side channels, and stream reconstruction would increase turbidity. Channel reconstruction and side-channel restoration would expose about a mile of channel to flow for the first time in decades. Removing fill plugs on the side channels would mobilize sediment and increase turbidity either during initial water flows or during the first high flows. Sediment transport and turbidity in side channels would depend on a channel's proximity to the project area, size, and stream gradient.

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[4] A "connected" floodplain is one where high stream flows have the capability at varying flood levels to flow onto and across adjacent floodplains where its transported sediment can be deposited as the flows spread out, slow down, and lose energy.

[5] Stream anastomosis refers to the branching and interconnecting structure, or network, of main channels, side channels, and seasonal overflow channels that divide then reconnect, with the main stream flow migrating from one to another over time across a floodplain.

Sediment plumes would be most concentrated within, and downstream of, the project area during and immediately following construction activities. Implementation of mitigation and monitoring measures (see Table 2-5) would restrict the plume to no more than a few hundred feet, which would gradually decline in the hours and days after construction. Sediment plumes also could occur during future high-water events until vegetation is reestablished and the stream adjusts to newly established site characteristics. Reactivating existing, vegetated side channels would generate less sediment than allowing flow into recently constructed side channels before revegetation occurs.

Sediment delivery with increased turbidity would also occur during instream log and boulder placement as excavators travel across stream banks between material staging areas and the channel. Excavator tracks and dragging and pushing logs and boulders would disturb soil and may allow it to enter the channel. Additionally, streamside trees could be uprooted causing sediment to enter the channel. Limiting soil and stream bank disturbance would be accomplished by placing more than one instream structure per access route between the staging area and channel, if possible. Scarifying (i.e., shallow ripping of the soil surface with excavator bucket tines), seeding, and mulching access routes prior to the wet season would minimize overland sediment movement to streams from this potential source. Re-contouring stream banks adjacent to log and boulder placement sites would further minimize sediment production and turbidity.

Instream log placements would increase the sediment storage capability of the stream reaches. Instream structures reduce flow velocity resulting in the sorting and deposition of sediment and the creation of gravel spawning beds and gravel/sand/silt/clay bars and floodplains. While the Proposed Action's design includes placement of log and boulder structures in a series along the stream reaches, it can take years for downstream structures to capture sediment if the stream has limited existing sediments available. In the case of a debris flow entering the Proposed Action's stream reaches, one or more structures could capture tens to hundreds of cubic yards of sediment and wood that would otherwise be lost because of the current absence of structures in the reaches.

To address sedimentation concerns, activities would be scheduled to limit the amount of time that areas would be susceptible to disturbance. A sediment control plan would in place prior to commencing construction. Flows would be completely or partially diverted around the work site through a combination of pumping and/or pre-approved methods and returned to the channel below the project area. Water would be slowly (reaching full streamflow over a period of at least one hour) released back into the channel to minimize sediment movement in the channel.

Turbidity monitoring would occur downstream of the project during all instream work activities. Onsite turbidity measurements would be taken in two locations: a baseline measurement 100 feet upstream of construction activities and a second measurement 50 feet downstream of the activity. If turbidity exceeds the standards established in the ESA consultation with NMFS, activities would be paused to mobilize work crews to repair, replace, and reinforce controls with additional HIP conservation measures to bring the turbidity levels back in compliance.

In the short term, adverse impacts on water quality from increased sedimentation and turbidity would be moderate. However in the long term, the Proposed Action would improve stream functions by increasing stream sediment movement and retention while also decreasing turbidity during most flow events. Increased sinuosity, reduced gradient, and lower water velocity would improve sediment sorting and storage and enhance habitat within the project area stream reaches. Beneficial impacts on water quality would be **moderate**.

Temperature

The Proposed Action could cause short-term increases in stream temperature due to construction-related disturbance of riparian vegetation and stream channels and increased stream length.

The Proposed Action, combined with natural recovery and passive riparian restoration, would be expected to have long-term beneficial effects by lowering stream temperatures. Activities would improve streamside shade through revegetation of riparian areas; restore stream channel morphology in channels that are currently unnaturally wide and shallow or lack pools; and improve surface water-groundwater interactions that lower water temperatures.

Stream channel relocation would expose more stream surface area to sunlight, leading to short-term temperature increases, until stream bank revegetation occurs. Planting fast-growing willows (*Salix spp.*) and other riparian species along the new channel would reduce stream surface exposure over time.

Reconnecting historic side-channels with floodplains, and constructing new side channels and alcoves, would increase temperature heterogeneity (alternating patterns of water temperatures); create diverse habitat by increasing channel length and stream-floodplain interaction; and supply large amounts of subsurface flow to the main channel (IMST 2004).

The use of heavy equipment in the stream would damage or remove stream-shading vegetation. Placement of logs and boulders by heavy equipment would require access routes and staging areas for storage of trees, logs, and rocks for instream placement. The removal of shade-producing trees and shrubs, if necessary to facilitate movement, storage, and placement of large wood and boulders would have the potential to cause localized temperature increases for one or more years, or until vegetation is reestablished. Construction would avoid trees and existing shade-producing riparian vegetation during in-stream project implementation. The loss of scattered individual trees within densely vegetated riparian areas, however, would likely not produce a measurable increase in stream temperature.

Minimizing impacts to vegetation during project implementation and replanting the project area immediately after construction could reduce or eliminate potential impacts to stream temperature increases, and lessen the time to recovery should minor temperature increases occur. The impact of log and boulder structures would likely offset impacts associated with the development of in-stream habitat features that decrease water temperatures (e.g., pools). Logs placed over the channel would also provide shade. Restored sediment-deposition processes, and the action of narrowing and deepening channels, would increase flows and decrease the surface area of the stream exposed to direct sunlight.

In the short term, impacts on water quality (temperature) from removal of riparian vegetation in the immediate vicinity of the stream reconstruction area would have a **moderate impact**. However, long-term impacts would be positive as riparian vegetation matures and temperatures decrease to below preconstruction levels. Long term, these beneficial impacts on water quality would be **moderate to high**.

3.3.2.1.2 Groundwater

In the short term, restoration activities under the Proposed Action would not affect groundwater from construction activities because they would generally occur at and near surface level and not penetrate deep enough to affect the current groundwater level.

Over the long term, groundwater would increase connectivity and recharge rates within the project area due to increased channel complexity, expanded floodplain, and constant connection to wetlands. Because the current simplified channel in Birch Creek prevents flows from connecting with their floodplains, those floodplains lack a connection and the capacity absorb water because at present, when Birch Creek overtops its banks, water returns to the main channel relatively quickly. Through main channel realignment and secondary channel and wetland creation, the Proposed Action would make floodplains more accessible and facilitate widespread recharge of groundwater throughout flooded areas. Therefore, floodwater returned to the channel via groundwater would increase, as would the time it takes for that return to occur. Both conditions—greater return volume and greater return time—would also favor lower stream temperatures. Because the Proposed Action would improve channel complexity, expand floodplains, and add wetlands, long-term moderate beneficial groundwater impacts would result.

The new groundwater well would no longer withdraw water from the groundwater from its current location in the project area, however, the new groundwater well would drill into similar water-bearing basaltic rock layers to access groundwater at its new location where it is used to irrigate crops. To minimize potential groundwater impacts from contamination, waste, and loss of pressure, the new well would be constructed to the standards required under Oregon Water Resources Department administrative rules. After construction, the volume of groundwater withdrawn under the Proposed Action would fulfill the same level specified under existing water rights and not increase in volume.

Overall, there would be a **moderate to high impact** to groundwater from the project, primarily from the long-term beneficial impacts from restoration activities that improve connection to groundwater.

3.3.2.2 Wetlands and Floodplains

3.3.2.2.1 Wetlands

The Proposed Action would create a total of about 10 acres of wetland within the project area that would support an abundance of wetland habitats. Reconstruction of Birch Creek's incised stream channel would elevate ground water levels in adjacent wet areas that may have been wetland in the past. Following construction, Birch Creek would be redirected (at its upstream end) to its former floodplain's surface elevation via a newly constructed channel. The surrounding excavated area becomes sub-irrigated at the elevation of the wet meadow and floodplain. Though the short-term impacts from stream bank excavations, plug construction, and channel relocation would be dramatic, these systems would ultimately have a long-term beneficial impact on wet meadows by recreating wetland conditions lost due to Birch Creek's incision.

Over the long term, creation of the wetlands and reconstruction of the stream would reduce stream-bank erosion and improve riparian and wet-meadow vegetation conditions in the floodplain. By raising the stream base level to the historic-floodplain elevation, the groundwater table would be restored. This re-watering of the wet meadow would result in the re-establishment of riparian herbs and woody vegetation within a couple of years, though the constructed features may take longer. By raising the stream base level to floodplain elevation, the meadow's historic function of acting as a "sponge" and reservoir for runoff would be restored.

Overall, there would be a long-term **moderate impact** from wetland creation under the Proposed Action.

3.3.2.2.2 Floodplains

Construction of secondary channels, side channels, alcoves, roughness[6] treatments on the historic floodplain would have short-term impacts on the floodplain but would also improve long-term floodplain functions. Disturbance within the floodplain also would occur from placement staging areas and access roads during construction. Because Birch Creek has little connection to its floodplain, these activities would have a limited impact to preexisting surface water connections. Work within the historic floodplain

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[6] Floodplain roughness treatments includes the scarification or low level reshaping of soil surfaces, the planting of vegetation, and the placement of woody debris with the intent that these actions would slow the flow of water across the floodplain surface thereby increasing the potential for sediment to be deposited.

would be completed in phases so that as each segment of floodplain is improved, it becomes capable of improving long-term function before the next high flows.

The Proposed Action would be constructed to encourage the restoration of certain floodplain and stream channel features that have been lost or have degraded over time. The current objective is on proper floodplain function and resilience rather than control.

By restoring stream-flow connection to the floodplain, either through raising the stream base level to floodplain elevation, or by increasing anastomosed conditions, the floodplain's function as a "sponge" and reservoir for runoff would be restored. An increase in hyporheic exchange would occur as a result of this newly established reconnection. When floodplain function is restored, a portion of winter and spring runoff is stored in floodplain soils where it is available for release later in the spring and summer. This restored function would result in some degree of improved flow timing and temperature, including augmentation of some seasonal flows, potentially resulting in benefits for aquatic species and downstream irrigators. The primary flow augmentation effect would typically occur in late spring as stored groundwater from winter and spring runoff flows out of floodplain soils to the stream channel. This augmentation of channel flow would often extend into summer months, but the degree of this impact would vary.

The Proposed Action would increase inundation from the 2-year flood from 5 percent to 18 percent of the floodplain, 10-year flood from 8 percent to 33 percent of the floodplain, and 100-year flood from 40 percent to 50 percent of the floodplain.

Overall, there would be short-term impacts to the floodplain from construction activities and a long-term beneficial impact to floodplains from the improved floodplain function resulting from the Proposed Action. Overall, there would be a short- and long-term **moderate impact** to floodplains**.**

3.3.3 Environmental Consequences – No Action

3.3.3.1 Water Quality

There would be no improvements to stream structure, no increased connectivity to floodplains, stream-shading riparian vegetation would not be improved, road drainage conditions would remain unchanged, thus the sediment-controlling and water-cooling impacts of these actions would not be realized. Therefore, there would be **no impact** to water quality under the No Action Alternative.

3.3.3.2 Groundwater

There would be no groundwater impacts from restoration activities nor from a new groundwater well because it would not be drilled. The groundwater benefits from the channel complexity and increased wetland and floodplain connectivity would not be realized. Therefore, there would be **no impact** to groundwater under the No Action Alternative.

3.3.3.3 Wetlands and Floodplains

Under the No Action Alternative, many areas of floodplain would remain disconnected from Birch Creek, and Birch Creek's ability to provide flood attenuation, water storage, sediment transport and deposition, and floodplain and wetland habitat would be limited and remain unimproved. There would be no long-term beneficial impact resulting from creating wetlands where they currently do not exist. Therefore, there would be **no impact** to wetlands and floodplains under the No Action Alternative.

3.4 Fish and Aquatic Species

3.4.1 Affected Environment

3.4.1.1 General Fish and Aquatic Species

Birch Creek has non-anadromous fish species such as redband trout (*Oncorhynchus mykiss gairdneri*)) and some mountain whitefish (*Prosopium williamsoni*). In addition, Birch Creek has native suckers such as bridgelip (*Catostomus columbianus*) and largescale sucker (*Catostomus macrocheilus*), which is most common. It also has native minnow species such as redside shiners (*Richardsonius balteatus*), speckled dace (*Rhinichthys osculus*), and northern pikeminnow (*Ptychocheilus oregonensis*) (ODFW 2020).

Although survey information suggests their absence in Birch Creek, thus their presence is highly unlikely, freshwater mussels such as *Anodonta* could have beds in areas protected from higher flows in pools and eddies and behind boulders (USFWS 2009; Bonneville 2004).

Birch Creek also supports aquatic invertebrate biota such as numerous species of insects (dragonflies, mayflies, stoneflies, caddisflies, butterflies, and beetles) in addition to in-stream macroinvertebrates that support nutrient cycling and provide an important food source for fish.

3.4.1.2 Anadromous Species

3.4.1.2.1 Pacific Lamprey

Pacific lampreys (*Entosphenus tridentatus*) are anadromous, using both fresh water and marine habitats to complete their life cycle. They are a culturally important species to Tribes including the CTUIR, a Federal Species of Concern, and Oregon State sensitive species. They have recently increased in number in the Umatilla River and, therefore, could migrate to Birch Creek (USFWS 2019c); however, recent monitoring data from the first mile of Birch Creek has not revealed the presence of Pacific lamprey (ODFW 2020). This could be due in part to a lack of suitable habitat in Birch Creek to support lamprey. For these reasons, Pacific lampreys are unlikely to be found in Birch Creek.

3.4.1.2.2 Spring- and Fall-run Chinook Salmon

Birch Creek provides spawning and rearing habitat for spring- and fall-run Chinook salmon (*O. tshawytscha*). For fall runs, adults return in fall, spawn in winter, and juveniles out-migrate to the ocean in May. For spring runs, adults return in the spring, spawn in the late summer or early fall, and juveniles out-migrate in March, sometimes spending a full year in freshwater and out-migrating as yearlings.

Spring- and Fall-run Chinook populations historically inhabited the lower three river miles of Birch Creek until populations declined as a result of habitat degradation and impeded passage associated with diversion dams. While Birch Creek was not targeted for the effort, CTUIR collaborated with ODFW to reintroduce them to nearby watersheds in the 1980s after their extirpation early in the 20th century (CTUIR 2016; ODFW 2020). The current population occupies in the lower 1.5 miles of Birch Creek immediately downstream of the project area, which could extend to project-area reaches. While no spawning is currently believed to occur in Birch Creek, juveniles and spring-run yearlings use Birch Creek as refugia (ODFW 2020).

3.4.1.2.3 Coho Salmon

Birch Creek provides spawning habitat for coho salmon (*O. kisutch*). Not known to be historically present in the Birch Creek watershed, they were reintroduced to surrounding watersheds in the middle of the 20th century and now occur in the lower 15 miles of Birch Creek, which includes the project area. Spawning and juvenile out-migration from Birch Creek occurs in low numbers, and not every year, but did occur with some numbers in the spring of 2020 (ODFW 2020).

3.4.1.3 Special Status Fish and Designated Critical Habitat within Affected Area

Steelhead and bull trout (*Salvelinus confluentus*) are the only potential state-listed or federally listed species present in or near the project area.

3.4.1.3.1 Steelhead

Steelhead in the Umatilla River and tributaries such as Birch Creek belong to the Umatilla-Walla Walla major population group (MPG), part of the Middle Columbia River (MCR) Steelhead Distinct Population Segment (DPS) listed as a threatened species (57 Fed.Reg.14517) under the ESA. Birch Creek is Designated Critical Habitat (70 Fed.Reg. 52685).

According to the 2016 Birch Creek Action Plan, the Birch Creek watershed serves as a priority summer steelhead habitat where the species occurs throughout its entire historic range (CTUIR 2016). The recovery plan for the Middle Columbia Steelhead DPS identifies the Umatilla MPG as highly viable, with more than half that production from Birch Creek (CTUIR 2016; Carmichael and Taylor 2010).

Steelhead spend spawning and rearing life stages in project-area reaches of Birch Creek. They spawn from February to late June. Rearing occurs for an average of two years. Outmigration occurs in small numbers from late November through June, with the largest numbers leaving the Birch Creek system in April and May (CTUIR 2016).

3.4.1.3.2 Bull Trout

The initial review of special-status species information indicated that ESA-listed bull trout (*Salvelinus confluentus*) could be present during specific life stages a couple miles downstream in the mainstem Umatilla River, therefore bull trout is a species that could potentially occur in Birch Creek during winter rearing or migration life stages. However, bull trout have not been observed in Birch Creek during recent data collection efforts (ODFW 2020). In addition, because bull trout require cold, clean, complex, and connected habitat, Birch Creek's current water temperature is likely too warm and habitat conditions too degraded for bull trout to be present.

There is no designated critical habitat for bull trout in Birch Creek.

3.4.2 Environmental Consequences – Proposed Action

Short-term adverse impacts to fish may result from project construction. The largest potential impacts associated with the Proposed Action are the impacts from injury or mortality to all fish species at the time of project activities and impacts to fish species from increases in fine sediment during and immediately post-construction. Other impacts relate to the potential for invasive species colonization.

Construction activities could disturb, kill, and injure fish and aquatic species through sedimentation pulses and inadvertent crushing from operating heavy equipment during in-stream, main-channel, side-channel, or floodplain excavations. Noise and vibrations from heavy equipment may temporarily disturb fish and aquatic species residing in the immediate project area. Equipment operations and resulting pulses of turbidity may temporarily displace fish and aquatic organisms upstream or downstream. In addition, accidental spills of lubricants and fuels that could occur from heavy equipment operation in riparian areas can be lethal to fish and aquatic species when exposed.

Fish and aquatic species could also be harmed by the isolation and dewatering of in-water work areas in a stream segment. Though most actions would provide downstream passage in a bypass channel, dewatering a segment of the river would displace native fish from their home ranges and limit their movement during implementation. Aquatic species salvage would occur, but it would be focused on fish, and other aquatic species such as macroinvertebrates may experience mortality.

The most lethal effects to fish from the Proposed Action would result from their handling and removal from the dewatered work areas. All aspects of fish handling, such as electrofishing, dip netting, and time out of water are stressful and can lead to immediate or delayed mortality (Murphy and Willis 1996). Electrofishing causes physiological stress that may exceed a fish's physiological tolerance limits and cause physical injury or death, including cardiac or respiratory failure (Snyder 2003), or impairment of reproductive success, growth, resistance to infectious diseases, and survival (Wedemeyer *et al.* 1990). Primary contributing factors to these effects are differences in water temperature (between river and wherever fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma.

Design features and mitigation measures (see Table 2-5) would be used during implementation to reduce potential impacts to all species, including ESA-listed steelhead.

The Proposed Action would result in long-term beneficial impacts to fish and aquatic species. These long-term impacts of the Proposed Action would aid in re-establishing the hydrologic regimes, increase the area available for rearing habitat for fish, improve access to higher quality rearing habitat, increase the hydrologic capacity of side channels, increase channel and water velocity diversity and complexity, provide resting areas for fish at various levels of inundation, increase floodplain nutrient and sediment storage, promote wood retention, and establish and augment native plant communities. Increased vegetation and habitat complexity would improve thermal regulation, hydrologic and nutrient cycling, channel formation and sediment storage, floodplain development and energy dissipation, which would benefit fish and aquatic species.

The effects to ESA-listed steelhead would be the same as those described above. Bonneville consulted with NMFS for the Proposed Action under Section 7 of the ESA for Bonneville's Habitat Improvement Program (HIP). As described in Chapter 2, the Proposed Action would adhere to the HIP conservation measures and terms and conditions. Due to the lack of bull trout or designated critical habitat in the project area, the Proposed Action would have no effect on bull trout or designated critical habitat.

Overall, with the implementation of the design features and mitigation measures defined in HIP conservation measures, there would be a low short-term adverse impact to fish and aquatic species from sedimentation and electrofishing. This short-term impact would be balanced out with a moderate long-term beneficial impact from improved flow and habitat conditions. On balance, because the project would substantially improve habitat conditions for fish and aquatic species, there would be **moderate beneficial impact** on fish.

3.4.3 Environmental Consequences – No Action

Under the No Action Alternative, potential short-term adverse impacts, such as disturbance from fish salvage and temporary habitat modification to fish and aquatic species would not occur, but the long-term beneficial impacts to anadromous and resident fish would not be realized. There would be **no impact**.

3.5 Wildlife

3.5.1 Affected Environment

3.5.1.1 General Wildlife

Based on the plant communities described in section 3.2.1.1 above, wildlife habitat in the project area is generally low quality from past disturbances likely the result of grazing, agricultural practices, and other development along Birch Creek, which has affected the vegetation communities that are present. Vegetation largely determines wildlife site usage and results in some habitats hosting higher wildlife densities at certain times of the year.

The available habitat types in the project area along Birch Creek and the site of the new groundwater well include low-quality habitat in introduced upland vegetation, and perennial grassland, and introduced wetland vegetation, low- to moderate-quality habitat within riparian habitat, and moderate-quality habitat along cliffs, caves, and talus. The sections below describe specific habitat types in their order of prevalence in the project area.

3.5.1.2 Introduced Upland Vegetation

This habitat and vegetation community consists of areas heavily degraded by land-use activities such as past agricultural practices. These areas also include potentially fallow agricultural areas not cultivated recently. Habitat and vegetation quality in introduced upland vegetation in the project area is generally very low due to the high predominance of non-native species, including state- and county-listed noxious weeds, and high levels of disturbance.

Wildlife either observed during the survey effort or likely to use this habitat type include a variety of common wildlife species such as American crow (*Corvus brachyrhynchos*), American kestrel (*Falco sparverius*), Eurasian-collared dove (*Streptopelia decaocto*), European starling (*Sturnus vulgaris*), gopher snake (*Pituophis catenifer*), horned lark (*Eremophila alpestris*), killdeer (*Charadrius vociferus*), mourning dove (*Zenaida macroura*), mule deer (*Odocoileus hemionus*), northern harrier (*Circus cyaneus*), prairie rattlesnake (*Crotalus viridis*), red-tailed hawk (*Buteo jamaicensis*), turkey vulture (*Cathartes aura*), western meadowlark (*Sturnella neglecta*), and wild turkey (*Meleagris gallopavo*) (Tetra Tech 2019a). Other species not observed during the survey effort but could occur in this vegetation and habitat community include turtle dove (*Streptopelia turtur*), Brewer's blackbird (*Euphagus cyanocephalus*), red-winged blackbird (*Agelaius phoeniceus*), yellow-headed blackbird (*Xanthocephalus xanthocephalus*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), cinnamon teal (*A. cyanoptera*), merganser (*Mergus merganser*), introduced ring-necked pheasant (*Phasianus colchicus*) and quail (*Callipepla californica*), bald eagle (*Haliaeetus leucocephalus*),

3.5.1.3 Riparian Vegetation

Riparian vegetation within the project area ranges from areas with sparse canopy cover and an abundance of non-native, invasive species, such as reed canarygrass, to areas of relatively dense canopy cover, with greater cover of native species in the understory. Although canopy cover in riparian habitat within the project area is predominantly native tree and shrub species that provide important wildlife habitat, much of the understory in these areas consists of non-native, invasive species.

Wildlife observed during the survey effort or that would likely occur in riparian habitat within the project area include American goldfinch (*Carduelis tristis*), American robin (*Turdus migratorius*), American white pelican (*Pelecanus erythrorhynchos*), bald eagle, bank swallow (*Riparia riparia*), black-capped chickadee (*Poecile atricapillus*), Bullock's oriole (*Icterus bullockii*), downy woodpecker (*Picoides pubescens*), eastern kingbird (*Tyrannus tyrannus*), great blue heron (*Ardea herodias*), house wren (*Troglodytes aedon*), MacGillivray's warbler (*Oporornis tolmiei*), mule deer, osprey (*Pandion haliaetus*), red-winged blackbird, western kingbird (*Tyrannus verticalis*), western wood-pewee (*Contopus sordidulus*), and yellow warbler (*Dendroica petechia*). In addition, although the survey effort did not detect their presence, beaver (*Castor canadensis*) likely use this habitat for feeding and passage.

3.5.1.4 Cliffs, Caves, and Talus

Habitat in and among the cliffs, caves, and talus provide important perching, roosting, and nesting habitat for many wildlife species, including raptors and bat species. There is an active bank swallow (*Riparia riparia*) colony nesting along Birch Creek. Wildlife observed during the survey effort were and red-tailed hawk. Bank swallow nests were observed both within and outside the project area. In addition to wildlife species observed during surveys, American crow; American kestrel; cliff swallow (*Petrochelidon pyrrhonota*); golden eagle (*Aquila chrysaetos*); prairie falcon (*Falco mexicanus*); turkey vulture; western fence lizard (*Sceloporus occidentalis*); western pipistrelle bat (*Pipistrellus hesperus*); and California myotis bats (*Myotis californicus*), fringed myotis bats (*Myotis thysanodes*), and yuma myotis bats (*Myotis yumanensis*) are likely to occur in this habitat type.

3.5.1.5 Perennial Grassland

The small portion of habitat provided by perennial grassland in the project area provide habitat for American crow, Eurasian collared dove, European starling, and horned lark, all of which were observed during the survey effort. In addition, wildlife likely to occur in this habitat type are the same species described in the introduced upland vegetation section above.

3.5.1.6 Introduced Wetlands

Wildlife species observed during the survey in the wetland vegetation included the common toad (*Bufo bufo*) and Pacific chorus frog (*Pseudacris regilla*). In addition, red-winged blackbird and Pacific chorus frog are likely to occur in this habitat type.

3.5.2 Special Status Wildlife

Information on special-status (state and federally listed species) obtained from the U.S. Fish and Wildlife Service for ESA-listed species and the Oregon Department of Fish and Wildlife (ODFW) for state-listed wildlife indicates low potential for ESA-listed species, and moderate potential for other special status wildlife species in the project area.

Although two ESA-listed species, the endangered gray wolf (*canus lupus*) and threatened yellow-billed cuckoo (*Coccyzus americanus*), were identified as potentially occurring in the project area, based on a review of information on special-status species, the survey effort did not find either of these species nor any sign of them. In addition, based on the record of known occurrences, both ESA-listed species are unlikely to occur near the project site: gray wolf individuals are unlikely to be present except for transient individuals because no known wolf areas are near the project site (ODFW 2018b); and the yellow-billed cuckoo has not actively bred in Oregon since the 1940s.

The Washington ground squirrel (*Urocitellus washingtoni*), which is endangered under the Oregon list, was also identified as having a low potential to occur based on the review of special-status species information. This survey effort did not observe the species or suitable habitat. For this reason, the Washington ground squirrel is unlikely to occur in the project area.

Although no nests were identified in the project area, bald and golden eagles have moderate to high potential of occurring in the project site. Bald eagles have a moderate likelihood of occurrence in the project area based on field observations and due to a few factors such as the presence of water. While unlikely to nest in the project area due to lack of large deciduous trees along Birch Creek, they have been observed by project staff using the area for hunting or perching within their territory. During the survey effort, one bald eagle was observed outside the project area occupying a tree near the Umatilla River, approximately two miles north of the project. By contrast, golden eagles have a high likelihood of using the project as they tend to favor areas of partially or fully open country around mountains, hills or cliffs. The project supports potential nesting along the small cliffs on the north side of Birch Creek, however, the preferred hunting habitat is in cliff areas outside the project area. A known golden eagle nest is north of the Umatilla River, about 2.5 miles outside the project area.

3.5.3 Environmental Consequences – Proposed Action

In general, restoration activities would have short-term adverse impacts with long-term positive impacts on most wildlife species and their habitats. The goal of the proposed restoration actions is to restore the ecological function of native habitat, primarily aquatic habitats, riparian corridors, and floodplains. Improvement of impaired aquatic and riparian habitat function and condition is expected to increase and improve wildlife habitat resiliency, carrying capacity, and connectivity within and between watersheds. This would increase wildlife's reproductive potential both at the individual level (from improved site conditions within a home range) and at the population level (by improving dispersal capabilities between disjunct subpopulations).

During implementation of restoration activities, however, there would be some level of disturbance to wildlife individuals and their habitats. Though project design criteria (such as avoidance of known nest or den sites) and mitigation measures (such as timing restrictions and retention of large trees, logs, and snags; see Table 2-5) are routinely applied to minimize such disturbance, some measure of disturbance impact would likely remain.

The degree of disturbance mostly determines the degree of impact. Some proposed actions may disturb wildlife by the simple presence (sound, movement, shadows) of human beings, although no vegetation is destroyed. For these, the larger, more mobile, species such as birds and small mammals may be temporarily displaced from their home territories. Such displacement forces individuals into nearby territories likely occupied by others of their kind where there would now be increased competition for space and resources. This intra-species competition would be sustainable for the short term if individuals could return to their former habitats once the human disturbance had passed. For non-mobile species (*e.g.* invertebrates and amphibians), the presence of humans would be a source of stress (disrupted feeding, breeding, hiding, etc.) that they could not escape for the duration of the activity. Such stress or disturbance can make the animal more vulnerable to predation or impact its physical condition perhaps affecting its future survival.

Other types of disturbance can affect wildlife apart from the restoration site. These include noise, turbidity, smells, etc. While these actions do not modify habitats, they can temporarily disrupt wildlife behavior and displace their use of habitats. Birds, for example, would be directly affected and some amount of nest abandonment could most likely occur due to noise disturbance.

The Proposed Action would remove the vegetation (the wildlife habitat). Mobile species would be permanently displaced (at least as far as their individually short lifespans are concerned) as it may take three to ten growing seasons for desired habitat conditions to be restored. Intra-species competition because of increased densities from displaced individuals in habitats adjacent to action sites would not be sustainable over multiple seasons. This is especially the case in aquatic and riparian habitats where available habitat is usually limited, and the ability of wildlife species that are closely associated with those habitats to relocate is limited.

The adverse impacts described above would be short-term (one to ten years) and would occur on habitats likely in need of improvement. In nearly all cases, however, the resulting condition would be restored, improved, or expanded habitat over what had been there previously, with vegetation affording a higher carrying capacity for both dependent and generalist wildlife than that of the existing condition. Though these restored conditions would likely not benefit the individuals affected by the original action, the local population of their species is anticipated to benefit for the long term.

In summary, there would be a short-term **low impact** to wildlife from construction disturbances construction and habitat removal. Long term, there would be a beneficial **moderate impact** from improved conditions that result from habitat restoration.

3.5.4 Environmental Consequences – No Action

There would be no short-term impact to wildlife such as disturbance or temporary habitat reduction from the No Action Alternative. However, there would also be no improvement to wildlife or habitat disturbance from the No Action Alternative. There would also be no improvement in riparian areas or with floodplain and wetland creation, providing no opportunity for increase in wildlife numbers or productivity. Overall, there would be **no impact** to wildlife under the No Action Alternative.

3.6 Cultural Resources

Cultural resources are those physical remains, objects, places, historic records, and traditional cultural practices or beliefs that connect people to their past. Historic properties, as defined by 36 CFR 800, the implementing regulations of Section 106 of the National Historic Preservation Act (NHPA) (54 USC 300108), are a subset of cultural resources that includes any prehistoric or historic district, site, building, structure, or object that meets defined eligibility criteria for the National Register of Historic Places (National Register). Historic properties can include artifacts, records, and remains that are related to and located within sites and properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization (also known as Traditional Cultural Properties). No Traditional Cultural Properties were identified within the project's Area of Potential Effect (APE) and are not discussed further.

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 such resources. Cultural resources are evaluated for eligibility of listing in the National Register using four criteria commonly known as Criteria of Eligibility 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 and to be considered a historic property.

3.6.1 Affected Environment

Ethnographic

The project lies within the cultural area of several groups including the Sahaptin-speaking groups: the Cayuse (*Weyiiletpuu*) and Umatilla (*Imatalamlama*) (Stern 1998; Walker 1998), the Yakima and neighboring groups. The Walla Walla primarily used lands closer to the confluence of the Columbia and Walla Walla rivers, while the Cayuse primarily occupied lands southeast of the Touchet River (Ray 1936). The Yakama occupied lands to the west. Neighboring the Sahaptin-speakers were the Nez Perce to the east. Intermarriage was common between the Cayuse, Walla Walla, and Umatilla cultures and the Nez Perce. The peoples of the Columbia Plateau shared a similar lifeway organized around summer fishing camps on the Columbia River or a major tributary followed by winter villages located away from the river. Walker (1998) identified eight distinguishing features of cultural organization on the Plateau. Settlement patterns tend to be linear, within a riverine, resources gathered are diverse (anadromous fish, game, roots), complex fishing technology, transmission of goods between groups, intermarriage between groups, extension of trade links through institutionalized trading partnerships, limited political integration, and a relatively uniform mythology and religious beliefs. Settlement and movement through the landscape follow a seasonal annual round subsistence cycle. Though a single well-placed site may double as a winter and summer village, these situations are rare. Summertime movement was directed by dispersed resources, smaller groups were tasked with collected there resources to store for the leaner winter months. Labor was divided into task groups included fishing, hunting, and gathering. Within these groups, labor was further divided based on sex. Women, children and elderly gathered, butchered, and tended to the domicile, while men focused their attention on hunting and fishing. The archaeological record suggests that these patterns persisted throughout aboriginal history. Over time as populations grew people became more settled, and sociocultural complexity increased.

Historic

John Jacob Astor established a trading base at the mouth of the Columbia and set up posts between Fort Astoria and St. Louis from 1810 to 1812 (Toepel 1980). Astor then sold his Oregon interests to the North West Company in 1814, who built Fort Walla Walla in 1818. The North West Company entered into a coalition with the Hudson's Bay Company in 1821, and the post became a powerful center of trade for horses and other goods (Stern 1998). The Hudson's Bay Company was a dominate force in the fur trade in Oregon for the next twenty years.

Large-scale Euroamerican immigration into northeastern Oregon began in the early 1840s, after the Spalding Mission at Lapwai and the Whitman Mission at Waiilatpu were established in 1836 (Dodd 1982). The mission failed to convert the *Weyíiletpu* to Christianity and agriculture. Large scale migration of emigrants over the Oregon Trail began around 1843 when people traveled over the Blue Mountains and into the Umatilla River Valley near the town of Cayuse, Oregon (National Historic Oregon Trail Interpretive Center n.d.a). The expansion of Euroamerican settlement upon traditional aboriginal subsistence lands in the region led to repeated conflicts with Native Americans. This led to the negotiation and signing of the Treaty of 1855 between *Imatalamłáma*, *Weyíiletpu*, and *Walúulapam* and the United States government. The outcome of the treaty negotiations was that the *Walúulapam*, *Imatalamłáma*, and *Weyíiletpu* retained a reservation in the *Weyíiletpu* homeland (Miller 2019). The tribes ceded 6.4 million acres to the United States, reserved rights for fishing, hunting, gathering foods and medicines, and pasturing livestock, and reserved 510,000 acres on which to live. The treaty was signed on June 9, 1855.

Archaeological Resources

In compliance with the NHPA, BPA is identifying and documenting archaeological resources in the APE and evaluating them for eligibility for listing in the NRHP. BPA conducted a literature review of known sites within one mile of the proposed project. This literature review (Ashley 2020) identified a total of 5 archaeological resources (sites and isolates) within a 1-mile search radius of the APE. No previously recorded cultural resources were identified within the APE.

BPA conducted cultural resource field surveys within the APE to locate previously unrecorded archaeological sites, as well as to revisit previously recorded sites to further evaluate their location relative to the project components. Surveys were conducted for the entire APE.

The cultural resource survey identified five new archaeological resources—four sites and one isolate—within the APE (Table 3-3). Two historic sites, one multicomponent, one prehistoric site, and one prehistoric isolate were identified during field surveys. Of the four new sites identified during the survey, two were determined eligible for listing in the National Register. The remaining two sites and one isolated find were determined not eligible for listing on the National Register. The sites were not determined eligible because they do not meet the minimum requirements for the Criteria of Eligibility found in National Register regulations (36 CFR 60.4).

Table 3-3: Historic Archeological Resources Identified within the Project APE*

Site	Date Recorded	Type	Site Description	National Register Eligibility Determination
4100113B	2020	Site	Basalt rock wall	Not Eligible
R040713A	2020	Site	Precontact lithic and thermal feature	Eligible
4100110A	2020	Site	Multi-component site	Eligible
4020611A	2020	Site	Historic canal	Not Eligible
4100111A	2020	Isolate	Granite Pestle	Not Eligible

* Cultural resources listed on, or eligible for listing on the National Register of Historic Places are referred to as historic properties. Unevaluated sites are considered in the same manner as eligible resources until an eligibility recommendation has been determined.

3.6.2 Environmental Consequences – Proposed Action

All proposed work and access areas were surveyed to determine if cultural resources are present and, if so, to avoid them, where possible. As shown in Table 3.3, two eligible sites (R040713A and 4100110A) were identified within the project area, but project construction would avoid the identified historic properties. With avoidance of known resources, the project is not expected to affect known cultural resources. Through BPA's Section 106 consultation process, BPA provided its eligibility determinations and its finding of no effect to the Oregon State Historic Preservation Office, which provided concurrence through its letter dated July 16, 2020.

While BPA conducted a thorough inventory of cultural resources in the project areas, construction activities may have the potential to affect cultural resources, including human remains, though not currently known to exist in the APE. Should an unanticipated cultural resource be encountered during project activities, implementation of the mitigation measures described in Table 2-5 would ensure that previously undiscovered resources would be managed properly under applicable laws and regulations, and would minimize both direct and indirect impacts from the project.

Therefore, the project would result in **no-to-low** impact on archeological resources.

3.6.3 Environmental Consequences – No Action

There would be no ground disturbance with the No Action Alternative, and there would therefore be no potential to affect cultural resources.

3.7 Land Use

3.7.1 Affected Environment

The general setting of the project is an agricultural landscape with pockets of rangeland. The dominant past and present land use in the project area is agriculture.

The project area is located on privately owned lands in Umatilla County near the small town of Rieth. It sits several miles from downtown Pendleton, which has an estimated population of 16,810 people (PSU 2019). The project area is zoned for exclusive farm use, a designation adopted under state law to preserve and maintain agricultural lands for farming (UCDLUP 2018).

The project area is also used to pump groundwater to satisfy water rights utilized for off-site agriculture. Located at its northern end, a groundwater well and pumping station connects to an irrigation pipe that carries water across Birch Creek to an intake several hundred yards away.

3.7.2 Environmental Consequences – Proposed Action

Restoration actions would change land use at the site because lands previously farmed would become dedicated to floodplain habitat and therefore would no longer be farmed. While the Umatilla County exclusive farm use land use designation would not change, future agricultural activities would no longer be allowed on the site. This would not result in a substantial reduction to overall agricultural lands available in the county or within the project site. New channels may change how lands are accessed. A new hydrologic regime with seasonal flooding might become the norm when previously those high waters were contained within a channelized river.

The removal/relocation of the groundwater pump station would not change the amount of water pumped, which would always remain within the water rights held by the land owner, unless those rights were sold or donated for conservation purposes by a willing rights-holder.

In summary, because there would be limited change to current land use under the Proposed Action, there would be a **low-to-moderate impact** to land use.

3.7.3 Environmental Consequences – No Action

There would be no short- or long-term impacts to land use under the No Action Alternative. The proposed restoration project would not be implemented, therefore current land uses would remain the same.

3.8 Air Quality and Climate Change

3.8.1 Affected Environment

3.8.1.1 Air Quality

Ambient (outdoor) air-quality standards prevent air pollution from reaching levels that are harmful to public health and the environment. Ambient air-quality standards are generally set at state and federal levels.

Under the Clean Air Act (CAA), 42 USC §§ 7401 *et seq.*, the U.S. Environmental Protection Agency (EPA) establishes National Ambient Air Quality Standards (NAAQS) to protect air quality and prevent air pollutants from reaching levels harmful to public health and the environment. These standards identify six criteria pollutants that raise particular concern for human health and the environment, including particulate matter (PM),[7] carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone, and lead. The Oregon Department of Environmental Quality (ODEQ) maintains a monitoring network measuring the levels of these pollutants. Monitoring results that consistently exceed NAAQS result in EPA identifying a non-attainment area.

The project area and Umatilla County are in attainment for all six criteria pollutants (ODEQ 2019a). The closest ODEQ monitoring station is the Pendleton McKay Creek station a little over two miles from the project site, which monitors $PM_{2.5}$ annually and ozone during spring and summer months (ODEQ 2019b). While current readings for air-pollutant levels are below NAAQS, the primary air pollutant of concern in the project vicinity is elevated particulate matter, $PM_{2.5}$ or PM_{10}, which comes from all types of combustion, including motor vehicles, power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes. In the area near the project site, particulate matter is generally highest during winter months from local wood-burning stoves (AQC 2012).

3.8.1.2 Climate Change

Greenhouse gases (GHGs) are chemical compounds in the earth's atmosphere that absorb and trap infrared radiation (heat) that is reflected or emitted from the surface of the earth. The trapping and subsequent buildup of heat in the atmosphere creates a greenhouse-like effect that maintains a global temperature warm enough to sustain life. Some forms of GHGs can be produced either by natural processes or as a result of human activities. However, the current scientific consensus is that human-made sources are increasing atmospheric GHG concentrations to levels that would raise the earth's average temperature. The United States Global Climate Research Program (USGCRP) found that since the 1970s, average U.S. temperatures and sea levels have risen and precipitation patterns have changed (USGCRP 2009). The Intergovernmental Panel on Climate Change found similar patterns on a global climate scale (IPCC 2007).

Ongoing global climate change has implications for the current and likely future status of salmon, but particularly for the Pacific Northwest, where snow melt into the Columbia River Basin (Basin) has substantial influence on regional hydrology. Recent studies, particularly by the Independent Scientific Advisory Board, describe the potential impacts of climate change in the Basin. These impacts may decrease snowfall, increase early year runoff, decrease summer and fall flow, and generally increase

[7] $PM_{2.5}$ and PM_{10} refers to fine particulate matter (i.e., less than 2.5 or 10 microns in diameter), that reduce visibility, cause the air to appear hazy, and lodge deep in human lungs when levels are elevated.

water temperatures. Specifically for the Birch Creek watershed, mean August stream temperatures are expected to increase by around 2.7 degrees Fahrenheit by the 2040s (USFS 2014).

3.8.2 Environmental Consequences – Proposed Action

3.8.2.1 Air Quality

Project impacts to air quality are expected to be low both in concentration and duration. Construction equipment would emit some carbon monoxide, nitrogen oxide, unburned hydrocarbons, and particulate matter (primarily soot) from tailpipe emissions and cause dust during ground disturbance. These could affect air quality locally for short durations. The Proposed Action is not expected to generate long-term or short-term violations of state air quality standards. Impacts would primarily occur from construction and would be temporary and localized in nature, and thus would not have long-term impacts on air quality.

Overall, with the implementation of the mitigation measures in Table 2-5, short-term and localized emissions from construction would result in a **low impact** to air quality.

3.8.2.2 Climate Change

Greenhouse gas emissions associated with the Proposed Action (primarily carbon dioxide, methane, and nitrous oxide) would be localized and temporary. They would be generated by the short-term emissions from construction equipment, off-road vehicles, and on-road vehicles (including worker commuting and material delivery). Given the short construction duration, low number of vehicles and equipment, and estimate of emissions well below the EPA's reporting threshold,[8] the impact from greenhouse gas emissions would be low and therefore the potential for the Proposed Action to accelerate climate change would be low.

The Proposed Action would, however, contribute to the amelioration of global climate change and its adverse warming impacts. The restoration of functional riparian, wetland, and floodplain habitats would expand the amount of wetland soils in which atmospheric carbon would be sequestered (Nahlik and Fennessy 2016). Wetlands can accumulate large carbon stores, making them an important sink for atmospheric carbon dioxide and holding up to, or in some cases, even more than 40 percent soil carbon (Vepraskas and Craft 2016), which is substantially greater than the 0.5–2 percent carbon commonly found in agricultural soils (Lal *et al* 1995). By increasing stored carbon through the increase of wetland soils, the Proposed Action would help mitigate for the release of greenhouse gases.

The Proposed Action would also provide for an increase of long-term water table inputs through restoring floodplain function and increasing connectivity of Birch Creek to its floodplain. It would also increase riparian shading of Birch Creek. Both of these results from the Proposed Action would help lower water temperatures, thereby ameliorating the impacts of climate change on aquatic species.

In summary, the Proposed Action would result in short- term and long-term **low impacts** by contributing low levels of global greenhouse gas emissions from construction and the low levels of climate-change impact amelioration by restoring wetland and floodplain habitats and lowering water temperatures.

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[8] On October 30, 2009, the U.S. Environmental Protection Agency published a rule (40 CFR Part 98) for the mandatory reporting of 25,000 metric tons or more of carbon dioxide equivalent per year of greenhouse gases from large GHG emissions sources in the United States.

3.8.3 Environmental Consequences – No Action

3.8.3.1 Air Quality

Because construction would not occur, no emissions would occur and no dust would be generated that could result in an air-quality impact. Therefore, there would be **no impact** under the No Action Alternative.

3.8.3.2 Climate Change

The No Action Alternative would neither contribute to the accumulation of GHGs (because there would be no use of fossil-fuel powered vehicles) nor contribute to the amelioration of such GHG accumulation by increasing wetland soils that could otherwise sequester those gasses. In addition, long-term water table inputs from increased connectivity between Birch Creek and its floodplain would not occur. For these reasons, the No Action Alternative would have **no impact** on climate change.

3.9 Noise

3.9.1 Affected Environment

The definition of noise is an unwanted sound that disrupts normal human activities or that diminishes the quality of the environment. It is usually caused by human activity that adds to the natural acoustic setting of a locale. For this assessment, the A-weighted decibel scale,[9] abbreviated as dBA, is used to describe sound and noise levels.

Natural sounds such as flowing water, wind moving through trees and vegetation, and wildlife generally characterize the soundscape in the absence of human-generated sounds. Several specific sources of human-generated sounds frequently elevate noise levels in the project area. Railroad tracks run adjacent to project site in parallel with Birch Creek Road, frequently elevating sound levels from passing trains. In addition, the existing groundwater well pump substantially elevates noise levels in the project area when it operates, which increases in frequency and duration during the summer irrigation season. Other sounds contributing to noise levels come primarily from low-level vehicle traffic on Birch Creek Road. Typical day-night-average sound levels for agricultural crop land similar to the project area is around 45 dB (EPA 1974); however, those sound levels increase to 80 dB or higher with passing trains and for extended durations when the groundwater well pump operates. Table 3-3 displays different levels of noise, typical sources of specific noise levels, and the likely noise level created by different restoration actions.

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[9] This is a logarithmic scale that ranges from 0 dBA to about 160 dBA and approximates the range of human hearing. The threshold of human hearing is about 0 dBA; less than 30 dBA is very quiet; 30 -60 dBA is quiet; 60-90 dBA is moderately loud; 90-110 dBA is very loud; and 110-130 is uncomfortably loud. A 10-decibel increase in sound levels is perceived as a doubling of the loudness. Ldn is also a noise level measurement used to indicate the average noise level over a 24-hour (day/night) period.

Table 3-4: Example Noise Levels*

Source(s)	Sound Levels** (dBA)	Relevance of sound at this level
Shotgun, Rifle, Handgun Fireworks (at three ft.)	>160	Sounds created by a shock wave
Jet engine (taking off)	150	Harmfully loud
Airplane (taking off)	140	
Stock car races Jet takeoff (at 100-200 ft.)	130	Threshold of pain
Heavy machinery/Chainsaw	120	Threshold of sensation or feeling
Car horn Baby crying / Maximum vocal effort.	110	Regular exposure of more than one minute risks permanent hearing loss. Physical discomfort.
Snowmobile Garbage truck Jet takeoff (at 2000 ft.)	100	> 95 dBA- no more than 15 minutes/day unprotected exposure recommended; One hour per day risks hearing loss.
Heavy truck (at 50 ft.) Motorcycle (operator) Power lawnmower Jet ski Shouted conversation	90	Very annoying
Heavy traffic Many industrial workplaces Electric razor	85	Level at which hearing damage begins with eight hour exposure
Average city noise Freight train (at 50 ft.)	80	Annoying; interferes with conversation
Freeway traffic (at 50 ft.) Urban housing on major avenue (Ldn) Inside a car TV audio	70	Interferes with telephone conversation. EPA Ldn sound level for lifetime exposure without hearing loss.
Normal conversation Sewing machine	60	Intrusive; Interference with human speech begins at about 60 dBA
Rainfall Refrigerator Wooded residential (Ldn) Light auto traffic (at 100 ft.)	50	Quiet Comfortable Sleep disturbance may occur at less than 50 dBA.
Soft whisper (at 15 ft.)	30	Very quiet
Normal breathing	10	Just audible
	0	Threshold of human hearing

*Adapted from multiple sources, including EPA 1974, League for the Hard of Hearing, www.lhh.org; and The Canadian Hearing Society, www.chs.ca

**These are typical levels near the noise source and some may be approximate averages of ranges; actual sound levels experienced by the public may depend on several factors, most importantly, distance from the sound source.

The project area is on private land at least five miles from the nearest schools or hospitals in nearby Pendleton, so there would no impact on such sensitive receptor sites. Several residences sit on private property across from the project site near the existing railroad tracks and on a bluff across Birch Creek, which are within range to hear project-area noise levels.

3.9.2 Environmental Consequences – Proposed Action

Implementing the Proposed Action would require use of heavy equipment for short periods during the construction timeline. This would increase ambient noise levels in the short term. On a short-term basis, construction activities would elevate existing noise level to between 80-100 dBA at the construction site. Such noise would come from construction, transportation, and site rehabilitation activities and the associated equipment (heavy machinery, heavy equipment, vehicles, generators, compressors, etc.). Many of these noises are loud, but they would vary in duration and timing. High noise levels would not be constant.

Construction-related noise could impact nearby residents and wildlife during construction. The project, therefore, would limit construction activities to normal daytime working hours. Short-term impacts from noise are expected to be minimal due to the relatively short duration of construction.

Long term, the relocation option for the groundwater well would move it away from residences that experience elevated noise levels during the irrigation season. Typical sound levels would not exceed 80 dBA for extended durations due to groundwater pumping, and would return to a quieter level of 40 dBA.

Once implemented, the floodplain restoration project would not make noise, except for that from limited vehicle access to the site to monitor and maintain it. Follow-up maintenance actions would likely be limited to infrequent use of equipment for vegetation replantings. The noise from these actions, however, is expected to be similar to or less than that generated near the project area prior to restoration actions, and from those in surrounding areas.

For these reasons, the Proposed Action would result in a **low impact** to noise levels. There would be a **moderate**, long-term beneficial impact to noise levels by relocating the existing groundwater pumping station and well.

3.9.3 Environmental Consequences – No Action

There would be no noise impacts associated with construction under the No Action Alternative. The stationary source of human-generated noise within the project site, a groundwater well pump, would remain in place and continue to elevate sound levels to 80 dBA and higher for extended durations.

3.10 Public Health and Safety

3.10.1 Affected Environment

There are few existing risks to public health and safety on the project site. Local ingress and egress to the project requires crossing over the Union Pacific railroad crossing over the tracks traversing the project site. Umatilla County Sherriff's Office, City of Pendleton Police, and Pendleton Fire & Ambulance Department provide law enforcement and emergency services a short distance from the site.

As discussed in section 3.3.1.3.2 above, FEMA-designated floodplains are found within a portion of the project area, which indicates the existing potential for health and safety hazards to occur during a 1-percent-annual-chance flood event. In general, FEMA-designated floodplains are also found along Birch Creek upstream and downstream of the project area, indicating the same existing potential for health and safety hazards during a similar flood event.

Bonneville conducted a phase-one environmental site assessment of the project area and did not find any recognized environmental conditions that would indicate evidence of contamination that would pose a hazard to public health. Therefore, the project site contains no known existing water and soil contaminants that would pose a risk to public health and safety under normal conditions.

3.10.2 Environmental Consequences – Proposed Action

The primary impact of the Proposed Action on public health and safety would be the potential to hinder traffic flow and response time of emergency vehicles or by the presence of construction equipment or supply vehicles on Birch Creek Road. The short-term construction and restoration activities would not be expected to overburden the existing health and safety infrastructure. The potential health and safety risks to workers and the public during construction would not be greater than a standard construction project, and therefore the short-term impacts of the project to health and safety would be low. Adequate signage and other routine safeguards for worker and public safety would minimize these impacts.

The Proposed Action would maintain or improve flood protection for existing public and private infrastructure outside the project area during the 100-year flood event. Increased floodplain connection within the project area would temporarily store flood water and may slightly decrease downstream flows and stages in short-duration flood events.

Restored flow regimes and seasonal flooding at restoration sites is an intended result from many restoration projects. The restored site could create low-lying or poorly drained areas which could seasonally pond water long enough to provide breeding habitat for mosquitoes, which are a nuisance and a public-health threat, since they can serve as vectors for disease. This impact is anticipated to be negligible given the minimal incremental increase in such habitat the project area would create along Birch Creek when it experiences high flows.

For these reasons, the Proposed Action would result in a **low impact** on public health and safety.

3.10.3 Environmental Consequences – No Action

Under the No Action Alternative, the project would not be implemented and therefore construction-related impacts would not occur. Conditions that may affect public health and safety would remain unchanged, so there would be **no impact**.

3.11 Socioeconomics

3.11.1 Affected Environment

This section primarily relies on the best-available demographic data obtained through the U.S. Census Bureau based on the American Community Survey (ACS) program updated annually. 5 census tracts were chosen for the study area because they generally represent the baseline socioeconomic data on nearby populations.[10] These tracts are compared with county-wide totals for Umatilla County to provide regional context.

[10] Tract 9505 includes the immediate project area near Rieth and rural Umatilla County, tracts 9504, 9506, and 9507 include Pendleton and rural areas of Umatilla County, and tract 9400 includes the Umatilla Indian Reservation.

Community Character

The project area is situated near the town of Rieth on the outskirts of Pendleton, Oregon, which are agriculture-based rural communities. Pendleton's history is deeply rooted in agriculture, ranching, manufacturing such as the Pendleton woolen mill, and its well-known Pendleton Round-Up rodeo—a week-long event held annually the second week in September, which typically draws more than 50,000 visitors to town. Situated at the foot of the Blue Mountains, the community also serves as a jumping-off point for recreational activities such as hunting, fishing, skiing, snowshoeing, cycling, and hiking (City of Pendleton 2019).

Population, Demographics, and Housing

Based on 2018 population estimates, Umatilla County has a population of 76,736 people with the most populous areas in the county seat of Pendleton (16,810) and its largest city of Hermiston (18,200) (USCB 2019; PSU 2019). Growth across the county has averaged less than one percent the last three years (PSU 2019). Located east of Pendleton, the Umatilla Indian Reservation has a population of 2,956 (USCB 2019). Study-area census tracts represent about 29 percent of the total current county population.

Table 3-5: Demographic Characteristics

Measure	Study Area	Umatilla County
Population	21,929	76,736
Median Age	39.4	36.1
% Minority Population	25.8%	20.9%
Households	8,021	30,172
Average Size	2.53	2.65
Median Income	25,954	50,071
% One-Unit Structures	69.5%	65.2%
% Two-or-More Units	19.3%	17.6%
Poverty Rate	14.5%	17.8%
Unemployment Rate	10.8%	8.32%
% of Population Age 25 or Older With Bachelor's Degree or Higher	18.3%	15.5%

Employment and Income

The largest employment centers within Umatilla County are Hermiston and Pendleton. Within study-area tracts, the ACS estimates a total active labor force (civilian employed population over than 16 years) of approximately 17,700 people. As illustrated by Table 3-5, which summarizes the employment by industry for workforce living in the study area and compares it to Umatilla County, the top five industries employing study-area residents are education and health care (24 percent), manufacturing (12 percent), retail trade (12 percent), public administration (12 percent), and arts, entertainment, and recreation, and accommodation, and food services (11 percent). Compared to Umatilla County as a whole, the study area is mostly similar, with the exception of the percentage of people working in the industry category for agriculture, forestry, fishing and hunting, and mining—more people work in that category in the county as a whole. As discussed above and illustrated in Table 3-5, median income for the study area is about half that of the county.

Table 3-6: Employment by Industry for Study-Area Residents

Industry	Study Area		Umatilla County	
	%	Rank	%	Rank
Agriculture, forestry, fishing and hunting, and mining	3.2%	10	9.7	4
Construction	5.6%	7	4.8	9
Manufacturing	11.9%	2	12.0	3
Wholesale trade	1.9%	13	2.8	11
Retail trade	11.8%	3	13.5	2
Transportation and warehousing, and utilities	4.4%	8	6.9	7
Information	1.8%	12	1.5	13
Finance and insurance, and real estate and rental/leasing	2.6%	11	2.6%	12
Professional, scientific, and management, and administrative and waste-management services	6%	6	6.1%	8
Educational services, and health care and social assistance	24.4%	1	19.1%	1
Arts, entertainment, and recreation, and accommodation and food services	11%	5	7.9%	6
Other services, except public administration	4%	9	4.6%	10
Public administration	11.6%	4	8.5%	5

Environmental Justice

Identifying low-income and minority populations in the study area lays the foundation for characterizing environmental justice in the study area. A census tract within the study area meets environmental-justice criteria if more than 20 percent of its population is below the poverty level or if the percentage of the population that identifies as a minority is greater than the percentage of the state identifying as a minority. Based on the 2017 ACS estimate, Oregon's minority population is 15.1 percent. On the basis that they are the home to minority populations higher than the statewide average, most environmental-justice populations reside in two census tracts: census tract 9400, coextensive with the Umatilla Indian Reservation, has a minority population of 49.2 percent; and census tract 9506, encompassing downtown Pendleton and an area south of town to the east of the project area, has minority population of 21.1 percent.

3.11.2 Environmental Consequences – Proposed Action

Population, Demographics, and Housing

There would generally be little impact on local populations from implementing the Proposed Action. Construction crews would likely consist of about 10-15 local workers; however, as discussed below, overall employment associated with the Proposed Action could range as high as about 48 jobs. None of the actions would generate a requirement for additional permanent employees nor would they require individuals to leave the local area, or relocate within it. There would therefore be no impact on housing available for local populations in Pendleton and surrounding areas in Umatilla County. This action would not displace people or eliminate residential suitability from lands being restored or from lands near restoration project sites. Overall, there would be **low impact** on population, demographics, and housing.

Employment and Income

Implementation of the restoration actions would likely create short-term beneficial economic impacts from the temporary employment of construction workers and for local businesses through purchases of food, fuel, lodging, and materials associated with the estimated $2 million in overall direct project spending. Materials necessary to build projects would also be sourced locally (e.g., large-woody material and boulders), and lodging, food, and other services would be required to support construction workers traveling from outside of the immediate area. When practicable, local companies would be utilized for restoration project activities, which could provide a short-term increase in jobs in Umatilla County. Accounting for the predicted multiplier effect for employment and economic output from a restoration project in Oregon—estimated at 15.7 and 23.8 jobs per $1 million spent and 1.4 to 2.4 times the direct project spending amount—the resulting employment and local economic output could range as high as 47.6 jobs and $4.8 million (Nielsen-Pincus and Moseley 2010).

The restoration actions may also improve fish runs and natural scenery leading to long-term benefits for fishing and tourism within the communities.

Land-use conversions in restored riparian areas from agriculture to natural habitats may require changes in grazing practices or some land uses, but no action is anticipated to impact agricultural productivity or revenue sufficient to change land uses, decrease ranching- or farming-related jobs, or lead to a decrease in agricultural support services.

Overall, for these reasons, there would be a **moderate impact** on employment and income.

Environmental Justice

As discussed above, environmental justice populations are present in the general proximity of the project area. The Proposed Action, however, does not propose activities that would result in displacements of human activity or land uses except for a private landowner allowing altered land uses to accommodate restoration actions on their property. As such, the Proposed Action would not generate any human health or environmental impact that might disadvantage any population, including minority or low-income populations.

The potential short-term loss of a small amount of riparian or upland habitats in anticipation for restored, more-productive habitats to develop is not likely to have consequential adverse impacts on cultural or traditional practices of Indian Tribes (the most likely environmental justice population to be affected). On the other hand, the Proposed Action seeks to restore wildlife, anadromous fish runs, and increase the capacity of Birch Creek to produce and support fish. The long-term impact, if successful in achieving its goals, would likely be beneficial to Indian Tribes in contributing to the restoration of fish resources sufficient to support ceremonial, subsistence and commercial fishing.

On balance, the Proposed Action is unlikely to result in negative impacts on any population. Overall, with the short-term adverse impact from restoration work and long-term beneficial impact to fish and wildlife habitat, the Proposed Action would have a **low impact** on environmental justice populations.

3.11.3 Environmental Consequences – No Action

The No Action Alternative would not induce any environmental or economic change to a community or an environmental justice population. There would be no adverse impact, short- or long-term in the study area. However, there would also be not be any potential for long-term beneficial impacts of restored fish runs and improved riparian areas and floodplains that might otherwise contribute to improved socioeconomic conditions.

3.12 Cumulative Impacts

Cumulative impacts describe the impact on the environment that results from the incremental impact of a project when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such action (40 CFR 1508.7). Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time. The effects of past actions in the vicinity of the proposed action are part of the affected environment baseline for each resource. Past actions of cumulative environmental consequence in the Birch Creek watershed include agriculture, construction of transmission lines, bridges, roads, and the Union Pacific railroad, water withdrawals, rural development, timber harvest, grazing, suppression of natural fire regimes, and harvests of fish and wildlife.

Sections 3.1 through 3.11 of this chapter present information about current environmental conditions and the environmental and socioeconomic consequences of implementing the Proposed Action.

Present actions include the use and maintenance of roads and the Union Pacific railroad; ongoing land uses and management actions such as agriculture and associated water withdrawals from Birch Creek; grazing; lumber yard operations near Pilot Rock; forest management in the Umatilla National Forest; and the management and harvest of fish and wildlife populations.

Reasonably Foreseeable Future Actions

To identify potential reasonably foreseeable projects to consider in the cumulative effects assessment, planned work by Bonneville, the CTUIR, US Forest Service, and ODFW was reviewed, as were county planning documents and other publicly available planning information sources. The planning department for Umatilla County was also contacted. The list below of reasonably foreseeable projects primarily includes planned work by Bonneville, CTUIR, ODFW, and Umatilla County for which specific projects were identified that could be considered reasonably foreseeable.

Reasonably foreseeable future actions (RFFAs) are those where some form of planning (environmental or engineering) has been initiated or a planning document (e.g., transportation plan; forest management plan) exists that describes specific potential projects. RFFAs in the project's region of influence include:

- **Ongoing actions.** Continuance of the ongoing actions listed above, with some increases in those ongoing actions as populations and land-use pressures gradually increase.
- **UmaBirch Floodplain Restoration Project.** CTUIR, with Bonneville funding, would restore the Umatilla River and Birch Creek and their associated floodplains in several locations near the confluence of the Umatilla River near Rieth. Restoration activities proposed would include levee removal or setback; main channel realignment and restoration; side channel and floodplain creation and reconnection; wetland and pond creation; and upland vegetation plantings
- **East Birch Floodplain Restoration Project.** CTUIR, with Bonneville funding, would reconnect the floodplain through about a one-mile reach located roughly 15 miles upstream of the Proposed Action. This project would initiate pool development, remove levees, restore topography and vegetation, and construct new channels, floodplain ponds, side channels; and alcoves.
- **Umatilla County Road Maintenance on Birch Creek Road.** Umatilla County conducts annual maintenance activities on Birch Creek Road that includes road grading on all sections from Rieth to the sections south of Pilot Rock.

- **ODFW Umatilla Fish Enhancement projects.** ODFW maintains multiple projects in Birch Creek basin including over 100 riparian acres (including yearly herbicide treatments) and over 5 miles of stream habitat, and riparian fence. Planned projects along Birch Creek would focus on constructing and maintaining existing riparian fencing.

Cumulative Impacts

Geology and Soils

The geographic area for cumulative impacts to geology and soils is the Birch Creek watershed. Past, present, and RFFAs that affect geology and soils primarily result from land-disturbing activities associated with rural development, agriculture, railroad and road maintenance, grazing, and the floodplain restoration projects. Grazing and agricultural activities during the planting and harvest cycle throughout the watershed would continue to disturb soils in upland and riparian areas and create the potential for erosion and sedimentation.

The Proposed Action would contribute to the cumulative impact on a short-term basis due to minor and temporary increases in erosion from construction. It would also add incremental improvement with the formation of floodplain and hydric wetland soils. On balance, the proposed action when combined with past and current actions and RFFAs, would result in a low cumulative impact to soils with the mitigation measures described in table 2-5, which would decrease further with revegetation efforts.

Vegetation

The geographic area for cumulative impacts to vegetation is the Birch Creek watershed. Past, present, and RFFAs that could cumulatively affect vegetation, including the spread of noxious weeds, include the use and maintenance of roads and the Union Pacific railroad, agriculture, forest management, grazing, and the floodplain restoration projects.

The Proposed Action would contribute to a low cumulative effect to vegetation during construction because other activities that affect vegetation would occur during the same timeframe as construction. Long term, the Proposed Action could incrementally improve vegetation by reestablishing native plants and limiting the spread of invasive plant species, which could combine with the beneficial effects from other restoration projects in the watershed. On balance, applying the mitigation measures described in Table 2-5 to construction activities when combined with past and current actions and RFFAs, would ensure that cumulative impacts would remain low during construction.

Water Resources (Water Quality, Groundwater, Wetlands, and Floodplains)

The geographic area for cumulative impacts to water resources is the Birch Creek watershed to the confluence of Birch Creek and the Umatilla River. For groundwater, it includes the underlying aquifer used for agricultural withdrawals for surrounding farmland. Past, present, and RFFAs that cumulatively affect surface and groundwater include road and railroad construction, maintenance, and use, agriculture and associated surface water withdrawals, and grazing, timber harvest and lumber yard operations, forest management, the floodplain restoration projects that alter the quality or quantity of water in Birch Creek.

The Proposed Action would likely cumulatively affect water quality through sediment discharges and vegetation removal on a short-term basis during and after construction. Longer term, the Proposed Action would incrementally improve downstream water quality in Birch Creek by improving sedimentation and turbidity conditions. On balance, the design features and mitigation measures in Table 2-5 would ensure that cumulative impacts to water quality from construction would be low, with long-term moderate beneficial and cumulative impacts to water resources.

The Proposed Action would not contribute an adverse cumulative effect with the implementation of mitigation described in Table 2-5 and because it would not increase the volume of groundwater withdrawn. It would incrementally improve groundwater and contribute to a low beneficial cumulative effect from the increased return volume for groundwater recharge.

The Proposed Action would contribute a low beneficial cumulative effect to wetlands and floodplains because it would create wetlands and expand floodplains where they do not exist or currently have limited function.

Fish and Wildlife

The geographic area for cumulative impacts to fish and wildlife is the Birch Creek watershed. Past and present development, water withdrawals for agriculture, and other activities have had a cumulative impact on fish and wildlife and their habitats. The conversion of land for grazing, agriculture, and rural development have resulted in the loss of fish and wildlife habitat. The Proposed Action would cumulatively affect fish and wildlife primarily through temporary construction disturbance and vegetation removal. The Proposed Action would create thermal refugia and recruit large woody debris, creating habitat favorable to ESA-listed Steelhead and other anadromous species. It would also create and improve wildlife habitat. Overall, project construction when combined with past and current actions and RFFAs, would have a low adverse cumulative impact on fish and wildlife, with long-term moderate beneficial cumulative impacts to fish and wildlife.

Cultural Resources

Cultural resources in the APE have likely been cumulatively affected by past, present, and current development activities. Most impacts have likely occurred as a result of inadvertent disturbance or destruction during ground-disturbing activities such as road work and facility construction. Other RFFAs the vicinity of the APE have the potential to disturb previously undiscovered cultural resources. Implementation of the mitigation measures described in Table 2-5 would minimize potential proposed project impacts and would reduce the potential for construction activities to contribute incrementally to the adverse cumulative impact on cultural resources in the APE. In the event that previously undiscovered historic properties were encountered, potential impacts would be no to low, depending on the level and amount of disturbance and the eligibility of the resource for listing on the National Register.

Land Use

The geographic area considered for cumulative impacts analysis is the Birch Creek watershed. Land use has incrementally changed over time due to past and present development, particularly with rural development and conversion of open space to agriculture, which is expected to continue at a gradual pace. In addition, restoration projects such as that under the Proposed Action and reasonably foreseeable floodplain restoration projects, may convert lands previously used for agriculture and grazing into riparian vegetation and wetlands that make them unsuitable for those prior land uses. Under the Proposed Action, existing land use is expected to slightly change in this manner, thus the impacts from the Proposed Action, when combined with past and current actions and RFFAs, would contribute to a low cumulative impact to land use.

Air Quality and Climate Change

Past, present, and reasonably foreseeable actions affecting air quality and greenhouse gases (GHGs) include all types of combustion engine use in cars and trains on nearby roads and highways, residential wood burning, industrial and agricultural operations, forest management, and grazing. The Proposed Action would result in some short-term emissions of criteria pollutants, including particulate matter, from construction equipment, but would not add a stationary source that would produce long-term emissions. The mitigation measures in Table 2-5 would minimize emissions from the Proposed Action, which when combined with past and current actions and RFFAs, would result in a low cumulative air quality impact.

The Proposed Action would have a cumulative impact on climate change by adding GHGs to the atmosphere. These sources of GHG emissions would continue, and any addition, when considered globally, would contribute incrementally to long-term atmospheric conditions for climate change. The Proposed Action would contribute such incremental additions of GHGs through restoration actions that require construction activities using heavy equipment.

GHG contributions globally have also contributed to a trend of less predictable and reduced flows as well as increasing temperatures in Birch Creek, which is expected to continue into the future. Combined with other habitat improvement projects in Birch Creek, such as the UmaBirch and East Birch floodplain restoration projects, the Proposed Action could contribute to a low cumulative impact in reducing local climate change impacts by improving water quality through reduction of water temperatures and alleviating stressors for anadromous and resident fish species by increasing the availability of habitat and cold-water refugia.

Noise

The geographic area considered for noise cumulative impacts includes neighboring properties that encompass the area where sounds generated from within the project area could be heard by humans or wildlife. The ongoing activities accounting for noise impacts primarily include extended periods of noise generated by a groundwater pumping station on the project site during irrigation season, vehicle traffic from Birch Creek Road, and trains passing on the Union Pacific railroad. RFFAs such as annual Birch Creek road maintenance may add to these noise levels. Cumulatively, construction under the Proposed Action may coincide with these sources of noise, particularly passing trains, which may result in a moderate cumulative impact when combined with past and current actions and RFFAs, in short durations; however, the implementation of mitigation and BMPs listed in Table 2-5, in conjunction with the long-term reduction in noise in removing the existing noise-generating groundwater pumping station under the Proposed Action, would reduce that impact level to low.

Public Health and Safety

The geographic area for cumulative impacts to public health and safety includes Pendleton, Birch Creek Road, and nearby floodplain areas along Birch Creek to the confluence with the Umatilla River. While there are no known public health and safety risks associated with RFFAs, the potential cumulative impact to health and safety is primarily associated with the risk that an emergency response during construction could combine with other incidents in the Pendleton area to reduce the response time and availability of emergency services. The mitigation measures in Table 2-5 would minimize health and safety risks from construction and assure that there would be no cumulative impact to health and safety related under the Proposed Action.

Regarding the cumulative impact to health and safety hazards relating to flood risk, combined with the past, present, RFFAs, such as planned floodplain restoration projects, the Proposed Action would maintain or improve flood protection and, therefore, would have a negligible beneficial cumulative impact.

Socioeconomics

The geographic area for cumulative socioeconomic impacts is Umatilla County and the Umatilla Indian Reservation. The Proposed Action would not directly add permanent jobs, so there would be no incremental cumulative impact on local populations and income, and therefore no need to change infrastructure and services to accommodate new residents. Forecasts of future returns of anadromous salmonids are not available, thus expenditures and income associated with their potential contribution to socioeconomic impacts cannot be predicted; however, the addition of the Proposed Action in concert with habitat-improvement projects in Birch Creek, such as the UmaBirch and East Birch floodplain restoration projects, and ODFW Umatilla Fish Enhancement projects, would ultimately increase anadromous fish returns. The cumulative impact of these actions expected to increase anadromous fish returns, over time, would improve local and regional economies, and further support tribal social and cultural interests, and would not result in cumulative adverse impact on environmental justice populations.

CHAPTER 4 ENVIRONMENTAL CONSULTATION, REVIEW, AND PERMIT REQUIREMENTS

Several federal and state statutes, implementing regulations, Executive Orders, and other consultation, review, and permit requirements are potentially applicable to this project (see Table 4-1). For this table, similar resources (e.g., vegetation and wildlife) have been combined when statutes or regulations overlap multiple resource areas.

Table 4-1. Potential Applicable Statutory, Regulatory, and Other Requirements

Potentially Applicable Requirement	Relevant Project Information
All Resources	
National Environmental Policy Act (NEPA) of 1969 42 U.S.C. § 4321 *et seq.*	Bonneville has prepared this EA pursuant to regulations implementing NEPA, which requires federal agencies to assess, consider, and disclose the impacts that their actions may have on the environment before taking major federal actions.
Geology and Soils	
The Farmland Protection Policy Act (7 U.S.C. 4201 et seq.)	The Farmland Protection Policy Act (7 U.S.C. 4201 et seq.) directs federal agencies to minimize the extent to which their programs result in the unnecessary and irreversible conversion of farmland to non-agricultural uses. The farmland classification for the project area is “prime farmland only if irrigated” (NRCS 2015). Because these project-area soils are not currently irrigated, there is no prime farmland in the project area.
Vegetation, Wildlife, and Fish	
Endangered Species Act of 1973 16 U.S.C. § 1531 *et seq.*	Impacts to federally listed anadromous fish and critical habitat, in addition to Pacific lamprey, are covered by a programmatic Biological Opinion issued by the National Marine Fisheries Service for Bonneville Habitat Implementation Program projects (NMFS 2013a) and impacts to listed terrestrial, marine, and non-anadromous fish species are covered by a Biological Opinion issued by USFWS (USFWS 2013a). These Biological Opinions are for habitat restoration projects in the Columbia River Basin funded by Bonneville under its HIP, which mitigates for impacts of the Federal Columbia River Power System on fish, wildlife, and their habitat. A HIP restoration review team review and Project Notification Form would be submitted prior to project implementation.
Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) of 1976 16 U.S.C. 1801 *et seq.*	Pacific salmon Essential Fish Habitat (EFH) is administered under the amended Magnuson-Stevens Act; EFH for steelhead, coho, and Chinook salmon are found in Birch Creek. Compliance with the Magnuson-Stevens Act would occur through adherence to the guidance in Bonneville’s HIP programmatic Biological Opinion.
Bald Eagle and Golden Eagle Protection Act (Eagle Act) of 1940 16 U.S.C. § 668-668d	No active bald eagle nests have been documented or observed near the project site, and the nearest active golden eagle nest is 2.5 miles from the project area. If a nest is identified, Bonneville would avoid construction activities within 0.5 mile of an active bald eagle or golden eagle nest during the breeding season and avoid snag and large tree removal to the extent possible.

Table 4-1. Potential Applicable Statutory, Regulatory, and Other Requirements

Migratory Bird Treaty Act (MBTA) of 1918 16 U.S.C. § 703-712 Responsibilities to Federal Agencies to Protect Migratory Birds Executive Order 13186	Many bird species protected under the MBTA are present in the project corridor and some nest in the general vicinity or the corridor. Potential impacts on nesting birds are described in Section 3.5, Wildlife. Compliance with the MBTA would be assured by adopting mitigation measures, such as using seasonal timing restrictions during the breeding season and avoiding removal of snags and large trees to the extent possible.
Fish and Wildlife Conservation Act 16 U.S.C. § 2901 *et seq*. Fish and Wildlife Coordination Act 16 U.S.C. § 661 *et seq.*	Bonneville contacted USFWS and ODFW during scoping. Consultation with USFWS and NMFS occurs through the application of their programmatic Biological Opinions and thereby incorporates BMPs to avoid and minimize potential impacts on fish and wildlife resources (Table 2-5). Impacts on fish and wildlife are described in section 3.4, Fish and Aquatic Species, and section 3.5, Wildlife.
Waters, Wetlands, and Floodplain Protection	
Clean Water Act (Sections 401, 402, 404, and 303(d)) 33 U.S.C. § 1251 *et seq*.	Birch Creek constitutes a waterbody subject to regulation under the Clean Water Act. CTUIR would obtain the necessary permits for this project as regulated under Clean Water Act Sections 401 and 404 (anticipated to be covered by the US Army Corps Of Engineers under Regional General Permit 6). For construction that disturbs soils, Oregon Department of Environmental Quality would issue a National Pollutant Discharge Elimination System (NPDES) permit under CWA Section 402. This permit would authorize the CTUIR to construct, install, modify, or operate erosion and sediment control measures and stormwater treatment and control facilities, and to discharge stormwater to public waters in conformance with all the requirements, limitations, and conditions set forth in the NPDES permit. In December 2018, the U.S. Environmental Protection Agency approved Oregon's 2012 Clean Water Act Section 303(d) list of impaired waterbodies that need pollution reduction plans, called Total Maximum Daily Loads or TMDLs. DEQ uses the 303(d) list to determine requirements for water quality permits and total maximum daily loads. As discussed in section 3.3.1.1, Birch Creek is on the section 303(d) list for iron, and TMDLs have yet to be established.
Safe Drinking Water Act of 1974 (42 U.S.C. § 300 *et seq.*).	There are no designated sole-source aquifers protected under Section 1424(e) of the Safe Drinking Water Act in the project area.
Floodplain/Wetlands Environmental Review Requirements 10 CFR 1022.12	As part of this NEPA review, DOE NEPA regulations require assessing impacts on floodplains and wetlands along with an evaluation of alternatives for protection of these resources in accordance with Compliance with Floodplain/Wetlands Environmental Review Requirements (10 CFR 1022.12), Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands. Project corridor wetlands were delineated in

Table 4-1. Potential Applicable Statutory, Regulatory, and Other Requirements

Floodplain Management Executive Order 11988 Protection of Wetlands Executive Order 11990	2018 and did not find that wetlands are present in the project area (Tetra Tech 2019c). A FEMA-designated floodplain covers much of the project area. As discussed in section 3.3.1.3.2, this evaluation determined that the Proposed Action would not result in long-term adverse impacts to wetlands or floodplains.
Air Quality and Greenhouse Gases	
The Clean Air Act, as revised in 1990 42 U.S.C. § 4701	Air quality impacts of the Proposed Action would be low, localized, and temporary, as described in section 3.8.
Final Mandatory Reporting of Greenhouse Gases Rule (40 CFR 98) Federal Leadership in Environmental, Energy, and Economic Performance Executive Order 13514	Greenhouse gas emissions would be low, localized, and temporary, as described in Ssection 3.8.
Cultural and Historic Resources	
Antiquities Act of 1906 16 U.S.C. § 431-433 Historic Sites Act of 1935 16 U.S.C. § 461-467 National Historic Preservation Act (NHPA), as amended, inclusive of Section 106 54 U.S.C. § 306108 *et seq.* Archaeological Data Preservation Act of 1974 (16 U.S.C. § 469 – 469-1) Archaeological Resources Protection Act of 1979, as amended 16 U.S.C. § 469 a-c Native American Graves Protection and Repatriation Act 25 U.S.C. § 3001 *et seq.* Indian Sacred Sites Executive Order 13007	Bonneville identified and documented cultural resources in the project area and evaluated them for eligibility for listing in the National Register of Historic Places. Pursuant to its responsibilities under Section 106 of the National Historic Preservation Act and 36 CFR Part 800, BPA initiated consultation with the Oregon State Historic Preservation Office (SHPO), Confederated Tribes of the Umatilla Indian Reservation, and Confederated Tribes of Warm Springs on January 8, 2020 and received responses from the SHPO on February 10, 2020 from the Tribes on January 13, 2020 and January 30, 2020. If previously unidentified cultural resources that would be adversely affected by the Proposed Action are found during construction, Bonneville would follow the procedures set out in Table 2-5 and in compliance with applicable regulations.

Table 4-1. Potential Applicable Statutory, Regulatory, and Other Requirements

American Indian Religious Freedom Act of 1978 (42 U.S.C. § 1996)	
Noise, Public Health, and Safety	
Noise Control Act of 1972 42 U.S.C. § 4901 *et seq*.	Noise disturbance would be short in duration, and would occur during daylight hours as described in section 3.9.
Spill Prevention Control and Countermeasures Rule 40 CFR 112 Comprehensive Environmental Response, Compensation, and Liability Act 42 U.S.C. § 9601 *et seq*. Resource Conservation and Recovery Act 42 U.S.C. § 6901 *et seq*.	Small amounts of hazardous chemicals such as fuels, and motor and lubricating oils could be released into the environment by the Proposed Action or used during construction work. Use of chemicals would be controlled via use of a Spill Prevention Plan. Any generated waste material 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.
State, County, and Local Plan Consistency	
Oregon Removal-Fill Law (ORS 196.795–990)	Because the Proposed Action would involve removal and fill activity in waterways and wetlands, CTUIR would obtain the necessary removal-fill permit from the Oregon Department of State Lands.
Umatilla County Development Code	As discussed in section 3.7.2, restoration actions would not create a major change in land uses, although there may be small-scale use modifications given the changes in water distribution and vegetation patterns on specific acres within the project area. For this reason, the Proposed Action would conform with Umatilla County's Exclusive Farm Use zoning designation.
Environmental Justice	
Executive Order (E.O.) 12898	Because short-term adverse impacts to resources (in particular fish and wildlife) that tribal populations could uniquely experience are generally low from the Proposed Action, there would not be disproportionately high and adverse impacts on environmental justice communities. Potential environmental justice impacts resulting from the Proposed Action are further discussed in section 3.11.2.

CHAPTER 5 TRIBES, AGENCIES, AND PERSONS RECEIVING THE EA

The project mailing list contains contacts for Tribes; local, state, regional, and federal agencies; public officials; interest groups and businesses; and potentially interested or affected landowners. These groups of stakeholders have directly received or have been given instructions on how to receive all project information made available so far, and they will have an opportunity to review the EA. Specific entities (other than private persons) receiving the scoping notifications and this EA are listed below by category.

5.1 Federal

National Marine Fisheries Service

Representative Greg Walden

Senator Ron Wyden

Senator Jeff Merkley

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service

5.2 State

Oregon Governor's Office

Oregon Department of Fish and Wildlife

Oregon Department of Environmental Quality

Representative Greg Barreto, District 58

State Senator Bill Hansell, District 29

5.3 Tribes

Confederated Tribes of the Umatilla Indian Reservation

5.4 Local Governments

Wallowa County Board of Commissioners

Union County Board of Commissioners

Umatilla County Board of Commissioners

5.5 Other

Columbia Rural Electric Association

Native Fish Society

Northwest Sportfishing Industry Association

Save Our Salmon Coalition

Snake River Salmon Solution

Trout Unlimited

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CHAPTER 7 APPENDIX

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Appendix A: Bonneville's HIP Mitigation Measures

HIP III CONSERVATION MEASURES

GENERAL AQUATIC CONSERVATION MEASURES APPLICABLE TO ALL ACTIONS.

The activities covered under the HIP III are intended to protect and restore fish and wildlife habitat with long-term benefits to ESA-listed species; however, construction activities may have short-term adverse effects on ESA-listed species and associated critical habitat. To avoid and minimize these short-term adverse effects, BPA has developed the following general Conservation Measures in coordination with USFWS and NMFS. These measures will be implemented on all projects covered under the HIP III.

7.1 Project Design and Site Preparation.

1) **Climate change.** Best available science regarding the future effects within the project area of climate change, such as changes instream flows and water temperatures, will be considered during project design.
2) **State and federal permits.** All applicable regulatory permits and authorizations will be obtained prior to project implementation. These permits and authorizations include, but are not limited to, the National Environmental Policy Act (NEPA), National Historic Preservation Act (NHPA), state and federal Section 404 of the Clean Water Act (CWA) permits, and Section 401 water quality certifications.
3) **Timing of in-water work.** Formal recommendations published by state agencies such as the Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW), Idaho Department of Fish and Game (IDFG), and Montana Fish Wildlife and Parks (MFWP) or informal recommendations from the appropriate state Fishery Biologist in regard to the timing of in-water work will be followed.
   a) Bull trout - Utilizing state-recommended in-water work windows will decrease potential effects to bull trout, but this alone may not be sufficient to protect local bull trout populations. This is especially true if work will occur in spawning and rearing areas because eggs, alevin, and fry are present nearly year round. Some project locations may not have designated in-water work windows for bull trout, or if they do, they may differ from the in-water work windows for salmon and steelhead. If this is the case, or if the proposed work is to occur within bull trout spawning and rearing habitats, the project sponsor will contact the appropriate USFWS field office to ensure that all reasonable implementation measures are considered and an appropriate in-water work window is being used to minimize project effects.
   b) Lamprey - the project sponsor and/or their contractors will avoid working instream or river channels that contain Pacific lamprey from March 1 to July 1 in low- to mid-elevation reaches (<5,000 feet). In high-elevation reaches (>5,000 feet), the project sponsor will avoid working instream or river channels from March 1 to August 1. If either timeframe is incompatible with other objectives, the area will be surveyed for nests and lamprey presence, and avoided if possible. If lampreys are known to exist, the project

sponsor will utilize dewatering and salvage best management practices (BMPs) outlined in USFWS 2010[11].

c) Exceptions to ODFW, WDFW, MFWP, or IDFG in-water work windows will be requested through the Variance Process.

Work area isolation and fish salvage activities are considered incidental to construction-related activities and shall occur during state-recommended in-water work windows.

4) **Contaminants.** The project sponsor will complete a site assessment with the following elements to identify the type, quantity, and extent of any potential contamination for any action that involves excavation of more than 20 cubic yards of material:
   a) A review of available records, such as former site use, building plans, and records of any prior contamination events;
   b) A site visit to inspect the areas used for various industrial processes and the condition of the property;
   c) Interviews with knowledgeable people, such as site owners, operators, and occupants, neighbors, or local government officials; and
   d) A summary, stored with the project file that includes an assessment of the likelihood that contaminants are present at the site, based on items 4(a) through 4(c).
5) **Site layout and flagging.** Prior to construction, the project area will be clearly flagged to identify the following:
   a) Sensitive resource areas, such as areas below ordinary high water (OHW), spawning areas, springs, and wetlands;
   b) Equipment entry and exit points;
   c) Road and stream crossing alignments;
   d) Staging, storage, and stockpile areas; and
   e) No-herbicide-application areas and buffers.
6) **Temporary access roads and paths.**
   a) Existing access roads and paths will be preferentially used whenever possible, and the number and length of temporary access roads and paths through riparian areas and floodplains will be minimized to lessen soil disturbance, soil compaction, and impacts to vegetation.
   b) Temporary access roads and paths will not be built on slopes where grade, soil, or other features suggest a likelihood of excessive erosion or failure. If slopes are steeper than 30%, the road will be designed by a civil engineer with experience in steep road design.
   c) The removal of riparian vegetation during construction of temporary access roads will be minimized. When temporary vegetation removal is required, vegetation will be cut at ground level (not grubbed).

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[11] USFWS. 2010. Best management practices to minimize adverse effects to Pacific lamprey. Available online at: http://www.fws.gov/pacific/Fisheries/sphabcon/lamprey/pdf/Best%20Management%20Practices%20for%20Pacific%20Lamprey%20April%202010%20Version.pdf

d) At project completion, all temporary access roads and paths will be obliterated, and the soil will be stabilized and revegetated. Road and path obliteration refers to the most comprehensive degree of decommissioning and involves decompacting the road surface and associated ditches, pulling the fill material onto the running surface, and reshaping to match the original contour.
e) Temporary roads and paths in wet areas or areas prone to flooding will be obliterated by the end of the in-water work window.

7) **Temporary stream crossings.**
a) Existing stream crossings will be preferentially used whenever reasonable, and the number of temporary stream crossings will be minimized.
b) Temporary bridges and culverts will be installed to allow for equipment and vehicle crossing over perennial streams during construction. Treated wood shall not be used on temporary bridge crossings or in locations in contact with or over water.
c) Equipment and vehicles will cross streams in the wet only where:
   i. The streambed is bedrock; or
   ii. Mats or off-site logs are placed in the stream and used as a crossing.
d) Vehicles and machinery will cross streams at right angles to the main channel wherever possible.
e) The location of the temporary crossing will avoid areas that may increase the risk of channel re-routing or avulsion.
f) Impacts to potential spawning habitat (i.e., pool tailouts) and pools will be avoided to the maximum extent possible.
g) No stream crossings will occur at active spawning sites, when holding adult listed fish are present, or when eggs or alevins are in the gravel. The appropriate state fish and wildlife agency will be contacted for specific timing information.
h) After project completion, temporary stream crossings will be obliterated, and the stream channel and banks restored.

8) **Staging, storage, and stockpile areas.**
a) Staging areas (used for construction equipment storage, vehicle storage, fueling, servicing, and hazardous material storage) will be 150 feet or more from any natural waterbody or wetland, or on an adjacent established road area in a location and manner that will preclude erosion into or contamination of the stream or floodplain.
b) Natural materials used for implementation of aquatic restoration, such as large wood, gravel, and boulders, may be staged within the 100-year floodplain.
c) Any large wood, topsoil, and native channel material displaced by construction will be stockpiled for use during site restoration at a specifically identified and flagged area.
d) Any material not used in restoration, and not native to the floodplain, will be removed to a location outside of the 100-year floodplain for disposal.

9) **Equipment.** Mechanized equipment and vehicles will be selected, operated, and maintained in a manner that minimizes adverse effects on the environment (e.g., minimally-sized, low pressure tires; minimal hard-turn paths for tracked vehicles; temporary mats or plates within wet areas or on sensitive soils). All vehicles and other mechanized equipment will be:
a) Stored, fueled, and maintained in a vehicle staging area located 150 feet or more from any natural water body or wetland or on an adjacent, established road area;

b) Refueled in a vehicle staging area located 150 feet or more from a natural waterbody or wetland, or in an isolated hard zone, such as a paved parking lot or adjacent, established road (this measure applies only to gas-powered equipment with tanks larger than 5 gallons);
c) Biodegradable lubricants and fluids shall be used on equipment operating in and adjacent to the stream channel and live water.
d) Inspected daily for fluid leaks before leaving the vehicle staging area for operation within 150 feet of any natural water body or wetland; and
e) Thoroughly cleaned before operation below ordinary high water (OHW), and as often as necessary during operation, to remain grease free.

10) **Erosion control.** Erosion control best management practices (BMPs) will be prepared and carried out, commensurate in scope with the action, that may include the following:
  a) Temporary erosion control BMPs.
    i. Temporary erosion control BMPs will be in place before any significant alteration of the action site and appropriately installed downslope of project activity within the riparian buffer area until site rehabilitation is complete.
    ii. If there is a potential for eroded sediment to enter the stream, sediment barriers will be installed and maintained for the duration of project implementation.
    iii. Temporary erosion control measures may include fiber wattles, silt fences, jute matting, wood fiber mulch and soil binder, or geotextiles and geosynthetic fabric.
    iv. Soil stabilization utilizing wood fiber mulch and tackifier (hydro-applied) may be used to reduce erosion of bare soil if the materials are noxious weed-free and nontoxic to aquatic and terrestrial animals, soil microorganisms, and vegetation.
    v. Sediment will be removed from erosion control BMP once it has reached 1/3 of the exposed height of the BMP.
    vi. Once the site is stabilized following construction, temporary erosion control BMPs will be removed.
  b) Emergency erosion control BMPs. The following materials for emergency erosion control will be available at the work site:
    i. A supply of sediment control materials; and
    ii. An oil-absorbing floating boom whenever surface water is present.

11) **Dust abatement.** The project sponsor will determine the appropriate dust control measures by considering soil type, equipment usage, prevailing wind direction, and the effects caused by other erosion and sediment control measures. In addition, the following criteria will be followed:
  a) Work will be sequenced and scheduled to reduce exposed bare soil subject to wind erosion.
  b) Dust-abatement additives and stabilization chemicals (typically magnesium chloride, calcium chloride salts, or ligninsulfonate) will not be applied within 25 feet of a natural waterbody or wetland and will be applied so as to minimize the likelihood that they will enter streams. Applications of ligninsulfonate will be limited to a maximum rate of 0.5 gallons per square yard of road surface, assuming a 50:50 (ligninsulfonate to water) solution.
  c) Application of dust abatement chemicals will be avoided during or just before wet weather and at stream crossings or other areas that could result in unfiltered delivery of

the dust abatement chemicals to a waterbody (typically these would be areas within 25 feet of a natural waterbody or wetland; distances may be greater where vegetation is sparse or slopes are steep).

d) Spill containment equipment will be available during application of dust abatement chemicals.
e) Petroleum-based products will not be used for dust abatement.

12) **Spill prevention, control, and counter measures.** The use of mechanized machinery increases the risk for accidental spills of fuel, lubricants, hydraulic fluid, or other contaminants into the riparian zone or directly into the water. Additionally, uncured concrete and form materials adjacent to the active stream channel may result in accidental discharge into the water. These contaminants can degrade habitat and injure or kill benthic invertebrates and ESA-listed species. The project sponsor will adhere to the following measures:
    a) A description of hazardous materials that will be used, including inventory, storage, and handling procedures will be available on-site.
    b) Written procedures for notifying environmental response agencies will be posted at the work site.
    c) Spill containment kits (including instructions for cleanup and disposal) adequate for the types and quantity of hazardous materials used at the site will be available at the work site.
    d) Workers will be trained in spill containment procedures and will be informed of the location of spill containment kits.
    e) Any waste liquids generated at the staging areas will be temporarily stored under an impervious cover, such as a tarpaulin, until they can be properly transported to and disposed of at a facility that is approved for receipt of hazardous materials.
13) **Invasive species control.** The following measures will be followed to avoid introduction of invasive plants and noxious weeds into project areas:
    a) Prior to entering the site, all vehicles and equipment will be power-washed, allowed to fully dry, and inspected to make sure no plants, soil, or other organic material adheres to the surface.
    b) Watercraft, waders, boots, and any other gear to be used in or near water will be inspected for aquatic invasive species. Wading boots with felt soles are not to be used due to their propensity for aiding in the transfer of invasive species.

7.2 Work Area Isolation & Fish Salvage.

Any work area within the wetted channel will be isolated from the active stream whenever ESA-listed fish are reasonably certain to be present, or if the work area is less than 300-feet upstream from known spawning habitats. Work area isolation & fish salvage activities are considered incidental to construction-related activities and shall occur during the state-recommended in-water work windows.

When work area isolation is required, design plans will include all isolation elements, fish release areas, and, when a pump is used to dewater the isolation area and fish are present, a fish screen that meets NMFS's fish screen criteria (NMFS 2011[12], or most current). Work area isolation and fish capture activities will occur during periods of the coolest air and water temperatures possible, normally early in the morning versus late in the day, and during conditions appropriate to minimize stress and death of species present.

For salvage operations in known bull trout spawning and rearing habitat, electrofishing shall only occur from May 1 to July 31. No electrofishing will occur in any bull trout occupied habitat after August 15. Bull trout are very temperature sensitive and generally should not be electrofished or otherwise handled when temperatures exceed 15 degrees Celsius. Salvage activities should take place during periods of the coolest air and water temperatures possible, normally early in the morning versus late in the day, and during conditions appropriate to minimize stress to fish species present.

Salvage operations will follow the ordering, methodologies, and conservation measures specified below in Steps 1 through 6. Steps 1 and 2 will be implemented for all projects where work area isolation is necessary according to conditions above. Electrofishing (Step 3) can be implemented to ensure all fish have been removed following Steps 1 and 2, or when other means of fish capture may not be feasible or effective. Dewatering and rewatering (Steps 4 and 5) will be implemented unless wetted instream work is deemed to be minimally harmful to fish, and is beneficial to other aquatic species. Dewatering will not be conducted in areas known to be occupied by lamprey, unless lampreys are salvaged using guidance set forth in USFWS 2010[13].

1) **Isolate.**
   a) Block nets will be installed at upstream and downstream locations and maintained in a secured position to exclude fish from entering the project area.
   b) Block nets will be secured to the stream channel bed and banks until fish capture and transport activities are complete. Block nets may be left in place for the duration of the project to exclude fish.
   c) If block nets remain in place more than one day, the nets will be monitored at least daily to ensure they are secured to the banks and free of organic accumulation. If the project is within bull trout spawning and rearing habitat, the block nets must be checked every 4 hours for fish impingement on the net. Less frequent intervals must be approved through a variance request.

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[12] NMFS. 2011. Anadromous salmonid passage facility design. Northwest Region. Available online at: http://www.nwr.noaa.gov/Salmon-Hydropower/FERC/upload/Fish-Passage-Design.pdf

[13] USFWS. 2010. Best management practices to minimize adverse effects to Pacific lamprey. Available online at: http://www.fws.gov/pacific/Fisheries/sphabcon/lamprey/pdf/Best%20Management%20Practices%20for%20Pacific%20Lamprey%20April%202010%20Version.pdf

   d) Nets will be monitored hourly anytime there is instream disturbance.

2) **Salvage.** As described below, fish trapped within the isolated work area will be captured to minimize the risk of injury, then released at a safe site:
   a) Remove as many fish as possible prior to dewatering.
   b) During dewatering, any remaining fish will be collected by hand or dip nets.
   c) Seines with a mesh size to ensure capture of the residing ESA-listed fish will be used.
   d) Minnow traps will be left in place overnight and used in conjunction with seining.
   e) If buckets are used to transport fish:
      i. The time fish are in a transport bucket will be limited, and will be released as quickly as possible;
      ii. The number of fish within a bucket will be limited based on size, and fish will be of relatively comparable size to minimize predation;
      iii. Aerators for buckets will be used or the bucket water will be frequently changed with cold clear water at 15 minute or more frequent intervals.
      iv. Buckets will be kept in shaded areas or will be covered by a canopy in exposed areas.
      v. Dead fish will not be stored in transport buckets but will be left on the streambank to avoid mortality counting errors.
   f) As rapidly as possible (especially for temperature-sensitive bull trout), fish will be released in an area that provides adequate cover and flow refuge. Upstream release is generally preferred, but fish released downstream will be sufficiently outside of the influence of construction.
   g) Salvage will be supervised by a qualified fisheries biologist experienced with work area isolation and competent to ensure the safe handling of all fish.

3) **Electrofishing.** Electrofishing will be used only after other salvage methods have been employed or when other means of fish capture are determined to not be feasible or effective. If electrofishing will be used to capture fish for salvage, the salvage operation will be led by an experienced fisheries biologist and the following guidelines will be followed:

The NMFS's electrofishing guidelines (NMFS 2000[14]).

   a) Initial Site Surveys and Equipment Settings
      i. In order to avoid contact with spawning adults or active redds, researchers must conduct a careful visual survey of the area to be sampled before beginning electrofishing.
      ii. Prior to the start of sampling at a new location, water temperature and conductivity measurements shall be taken to evaluate electrofisher settings and adjustments.

No electrofishing should occur when water temperatures are above 18°C or are expected to rise above this temperature prior to concluding the electrofishing survey. In addition,

[14] http://www.westcoast.fisheries.noaa.gov/publications/reference_documents/esa_refs/section4d/electro2000.pdf

studies by NMFS scientists indicate that no electrofishing should occur in California coastal basins when conductivity is above 350 µS/cm.

iii. Whenever possible, a block net should be placed below the area being sampled to capture stunned fish that may drift downstream.
iv. Equipment must be in good working condition and operators should go through the manufacturer's preseason checks, adhere to all provisions, and record major maintenance work in a logbook.
v. Each electrofishing session must start with all settings (voltage, pulse width, and pulse rate) set to the **minimums** needed to capture fish. These settings should be gradually increased only to the point where fish are immobilized and captured, and generally not allowed to exceed conductivity-based maxima (**Table 1**). Only direct current (DC) or pulsed direct current (PDC) should be used.

Table 1. Guidelines for initial and maximum settings for backpack electrofishing.

	Initial settings	Maximum settings	Notes
Voltage	100 V	Conductivity (µS/cm) / Max. Voltage < 100 / 1100 V 100 - 300 / 800 V > 300 / 400 V	In California coastal basins, settings should never exceed 400 volts. Also, no electrofishing should occur in these basins if conductivity is greater than 350 µS/cm.
Pulse width	500 µs	5 ms	
Pulse rate	30 Hz	70 Hz	*In general*, exceeding 40 Hz will injure more fish

b) *Electrofishing Technique*

i. Sampling should begin using straight DC. The power needs to remain on until the fish is netted when using straight DC. If fish capture is unsuccessful with initial low voltage, gradually increase voltage settings with straight DC.
ii. If fish capture is not successful with the use of straight DC, then set the electrofisher to lower voltages with PDC. If fish capture is unsuccessful with low voltages, increase pulse width, voltage, and pulse frequency (duration, amplitude, and frequency).
iii. Electrofishing should be performed in a manner that minimizes harm to the fish. Stream segments should be sampled systematically, moving the anode continuously in a herringbone pattern (where feasible) through the water. Care should be taken when fishing in areas with high fish concentrations, structure (e.g., wood, undercut banks) and in shallow waters where most backpack electrofishing for juvenile salmonids occurs. Voltage gradients may be high when electrodes are in shallow water where boundary layers (water surface and substrate) tend to intensify the electrical field.

iv. Do not electrofish in one location for an extended period (e.g., undercut banks) and regularly check block nets for immobilized fish.
v. Fish should not make contact with the anode. The zone of potential injury for fish is 0.5 m from the anode.
vi. Electrofishing crews should be generally observant of the condition of the fish and change or terminate sampling when experiencing problems with fish recovery time, banding, injury, mortality, or other indications of fish stress.
vii. Netters should not allow the fish to remain in the electrical field any longer than necessary by removing stunned fish from the water immediately after netting.

c) *Sample Processing and Recordkeeping*

i. Fish should be processed as soon as possible after capture to minimize stress. This may require a larger crew size.
ii. All sampling procedures must have a protocol for protecting held fish. Samplers must be aware of the conditions in the containers holding fish; air pumps, water transfers, etc., should be used as necessary to maintain safe conditions. Also, large fish should be kept separate from smaller prey-sized fish to avoid predation during containment.
iii. Use of an approved anesthetic can reduce fish stress and is recommended, particularly if additional handling of fish is required (e.g., length and weight measurements, scale samples, fin clips, tagging).
iv. Fish should be handled properly (e.g., wetting measuring boards, not overcrowding fish in buckets, etc.).
v. Fish should be observed for general condition and injuries (e.g., increased recovery time, dark bands, visually observable spinal injuries). Each fish should be completely revived before releasing at the location of capture. A plan for achieving efficient return to appropriate habitat should be developed before each sampling session. Also, every attempt should be made to process and release ESA-listed specimens first.
vi. Pertinent water quality (e.g., conductivity and temperature) and sampling notes (e.g., shocker settings, fish condition/injuries/mortalities) should be recorded in a logbook to improve technique and help train new operators. *It is important to note that records of injuries or mortalities pertain to the entire electrofishing survey, including the fish sample work-up.*
vii. The anode will not intentionally contact fish.
viii. Electrofishing shall not be conducted when the water conditions are turbid and visibility is poor. This condition may be experienced when the sampler cannot see the stream bottom in one foot of water.
ix. If mortality or obvious injury (defined as dark bands on the body, spinal deformations, de-scaling of 25% or more of body, and torpidity or inability to maintain upright attitude after sufficient recovery time) occurs during electrofishing, operations will be immediately discontinued, machine settings, water temperature, and conductivity checked, and procedures adjusted or electrofishing postponed in order to reduce mortality.

4) **Dewater.** Dewatering, when necessary, will be conducted over a sufficient period of time to allow species to naturally migrate out of the work area and will be limited to the shortest linear extent practicable.

a) Diversion around the construction site may be accomplished with a cofferdam and a by-pass culvert or pipe, or a lined, non-erodible diversion ditch. Where gravity feed is not possible, a pump may be used, but must be operated in such a way as to avoid repetitive dewatering and rewatering of the site. Impoundment behind the cofferdam must occur slowly through the transition, while constant flow is delivered to the downstream reaches.
b) All pumps will have fish screens to avoid juvenile fish impingement or entrainment, and will be operated in accordance with NMFS's current fish screen criteria (NMFS 2011[15], or most recent version). If the pumping rate exceeds 3 cubic feet per second (cfs), a NMFS Hydro fish passage review will be necessary.
c) Dissipation of flow energy at the bypass outflow will be provided to prevent damage to riparian vegetation and/or stream channel.
d) Safe re-entry of fish into the stream channel will be provided, preferably into pool habitat with cover, if the diversion allows for downstream fish passage.
e) Seepage water will be pumped to a temporary storage and treatment site or into upland areas to allow water to percolate through soil or to filter through vegetation prior to reentering the stream channel.

5) **Salvage Notice.** Monitoring and recording of fish presence, handling, and mortality must occur for the duration of the isolation, salvage, electrofishing, dewatering, and rewatering operations. Once operations are completed, a salvage report will document procedures used, any fish injuries or deaths (including numbers of fish affected), and causes of any deaths.

7.3 Construction and Post-Construction Conservation Measures.

1) **Fish passage.** Fish passage will be provided for any adult or juvenile fish likely to be present in the project area during construction, unless passage did not exist before construction, or the stream is naturally impassable at the time of construction. If the provision of temporary fish passage during construction will increase negative effects on ESA-listed species or their habitat, a variance can be requested from the NMFS Branch Chief and the USFWS Field Office Supervisor. Pertinent information, such as the species affected, length of stream reach affected, proposed time for the passage barrier, and alternatives considered will be included in the variance request.
2) **Construction and discharge water.**
   a) Surface water may be diverted to meet construction needs, but only if developed sources are unavailable or inadequate.
   b) Diversions will not exceed 10% of the available flow.
   c) All construction discharge water will be collected and treated using the best available technology suitable for site conditions.
   d) Treatments to remove debris, nutrients, sediment, petroleum hydrocarbons, metals and other pollutants likely to be present will be provided.
3) **Minimize time and extent of disturbance.** Earthwork (including drilling, excavation, dredging, filling and compacting) in which mechanized equipment is utilized instream

[15] NMFS. 2011. Anadromous salmonid passage facility design. Northwest Region. Available online at: http://www.nwr.noaa.gov/Salmon-Hydropower/FERC/upload/Fish-Passage-Design.pdf

channels, riparian areas, and wetlands will be completed as quickly as possible. Mechanized equipment will be used instreams only when project specialists believe that such actions are the only reasonable alternative for implementation, or would result in less sediment in the stream channel or damage (short- or long-term) to the overall aquatic and riparian ecosystem relative to other alternatives. To the extent feasible, mechanized equipment will work from the top of the bank, unless work from another location would result in less habitat disturbance.

4) **Cessation of work.** Project operations will cease under the following conditions:
   a) High flow conditions that may result in inundation of the project area, except for efforts to avoid or minimize resource damage;
   b) When allowable water quality impacts, as defined by the state CWA section 401 water quality certification or HIP III Turbidity Monitoring Protocol, have been exceeded; or
   c) When "incidental take" limitations have been reached or exceeded.
5) **Site restoration.** When construction is complete:
   a) All streambanks, soils, and vegetation will be cleaned up and restored as necessary using stockpiled large wood, topsoil, and native channel material.
   b) All project-related waste will be removed.
   c) All temporary access roads, crossings, and staging areas will be obliterated. When necessary for revegetation and infiltration of water, compacted areas of soil will be loosened.
   d) All disturbed areas will be rehabilitated in a manner that results in similar or improved conditions relative to pre-project conditions. This will be achieved through redistribution of stockpiled materials, seeding, and/or planting with local native seed mixes or plants.
6) **Revegetation.** Long-term soil stabilization of disturbed sites will be accomplished with reestablishment of native vegetation using the following criteria:
   a) Planting and seeding will occur prior to or at the beginning of the first growing season after construction.
   b) An appropriate mix of species that will achieve establishment, shade, and erosion control objectives, preferably forb, grass, shrub, or tree species native to the project area or region and appropriate to the site will be used.
   c) Vegetation, such as willow, sedge and rush mats, will be salvaged from disturbed or abandoned floodplains, stream channels, or wetlands.
   d) Invasive species will not be used.
   e) Short-term stabilization measures may include the use of non-native sterile seed mix (when native seeds are not available), weed-free certified straw, jute matting, and other similar techniques.
   f) Surface fertilizer will not be applied within 50 feet of any stream channel, waterbody, or wetland.
   g) Fencing will be installed as necessary to prevent access to revegetated sites by livestock or unauthorized persons.
   h) Re-establishment of vegetation in disturbed areas will achieve at least 70% of pre-project conditions within 3 years.
   i) Invasive plants will be removed or controlled until native plant species are well-established (typically 3 years post-construction).

7) **Site access.** The project sponsor will retain the right of reasonable access to the site in order to monitor the success of the project over its life.
8) **Implementation monitoring.** Project sponsor staff or their designated representative will provide implementation monitoring by filling out the Project Completion Form (PCF) to ensure compliance with the applicable BiOp, including:
   a) General conservation measures are adequately followed.
   b) Effects to listed species are not greater than predicted and incidental take limitations are not exceeded.
   c) Turbidity monitoring shall be conducted in accordance with the HIP III turbidity monitoring protocol and recorded in the PCF.
9) **CWA section 401 water quality certification.** The project sponsor or designated representative will complete and record water quality observations to ensure that in-water work is not degrading water quality. During construction, CWA section 401 water quality certification provisions provided by the Oregon Department of Environmental Quality, Washington Department of Ecology, or Idaho Department of Environmental Quality will be followed.

7.4 Staged Rewatering Plan.

When appropriate, the project sponsor shall implement a staged rewatering plan for projects that involve introducing streamflow into recently excavated channels under the 2a) **Improve Secondary Channel and Wetland Habitat Activity category o**r 2f) **Channel Reconstruction categories.**

1) Pre-wash the newly-excavated channel before rewatering. Turbid wash water will be detained and pumped to the floodplain, rather than discharging to fish-bearing waters.
2) Prepare new channel for water by installing seine at upstream end to prevent fish from moving downstream into new channel until 2/3 of total streamflow is available in that channel. Starting in the early morning, introduce 1/3 of the flow into the new channel over a period of 1-2 hours.
3) Perform monitoring according to HIP III Turbidity Monitoring Protocol.
   1) If turbidity exceeds 10% of background, modify the activity to reduce turbidity. In this case, this may mean decreasing the amount of flow entering the new channel and/or correcting any other issues causing turbidity (e.g., correct a bank that is sloughing, install or correct a BMP, etc.).
   2) Monitor every 2 hours as long as the instream activity is occurring.
   3) If exceedances occur for more than 2 monitoring intervals in a row (4 hours), then the activity must stop until turbidity reaches background levels. This means that the contractor may have to plug off water supply to the new meander until turbidity is within acceptable levels.
   4) Once turbidity is within 10% of background levels, move on to the next re-watering stage.
4) Prepare to introduce the second 1/3 of the flow (up to a total of 2/3) to the new channel by installing seine at upstream end of old channel in order to prevent fish from moving into a partially-dewatered channel. Introduce the second 1/3 of the flow over the next 1-2 hours. Salvage fish from the old channel at this time, so that the old channel is fish-free before dropping below 1/3 of the flow. *Note: the fish will be temporarily blocked from moving*

downstream into either channel until 2/3 of the flow has been transitioned to the new channel. This blockage to downstream fish passage is expected to persist for roughly 12 to 14 hours, but fish will still be able to volitionally move out of the channel in the downstream direction. Perform monitoring as in #3 above.

5) After the second 1/3 of flow is introduced over 2 hours, and turbidity is within 10% of the background level, remove seine nets from the new channel, and allow fish to move downstream back into the channel.
6) Introduce the final 1/3 of flow. Once 100% of the flow is in the new channel, install plug to block flow into the old channel and remove seines from the old channel.

7.5 HIP III Turbidity Monitoring Protocol.

The Project Sponsor shall complete and record the following water quality observations to ensure that any increase in suspended sediment does not exceed the limit for HIP III compliance. Records shall be reported on the HIP III PCF.

If the geomorphology of the project area (e.g., silty or claylike materials) or the nature of the action (e.g., large amounts of bare earth exposed below the bankfull elevation) shall preclude the successful compliance with these triggers, notify your EC Lead who shall pre-notify the Services of the likelihood of an exceedance.

1. Take a background turbidity sample using a recently-calibrated turbidimeter in accordance with manufacturer's instructions, or measure turbidity with a visual turbidity observation (Figure 1). Turbidity should be measured every 2 hours while work is being implemented or more often if sediment disturbance varies greatly. Frequent monitoring will ensure that the in-water work area is not creating turbid conditions within the water column. The background samples/visual observations should be taken at a relatively undisturbed location approximately 100 feet upstream from the project area. Record the observation, location, and time before monitoring at the downstream point, known as the measurement compliance point.

2. Take a second sample or observation, immediately after each upstream sample or observation, at the measurement compliance point, approximately 50 feet downstream from the project area instreams that are 30 feet wide or less; 100 feet downstream from the project area for streams between 30 and 100 feet wide; 200 feet downstream from the project area for streams greater than 100 feet wide; and 300 feet from the discharge point or nonpoint source for locations subject to tidal or coastal scour. Record the downstream observation, location, and time.
3. Compare the upstream and downstream observations/samples. If observed or measured turbidity downstream is more than upstream observation or measurement (> 10%), the activity must be modified to reduce turbidity. If visual estimates are used, an obvious difference between upstream and downstream observations shall bear the assumption of a (> 10%) difference (Figure 1). Mark "Yes" or "No" on your datasheet. Continue to monitor every 2 hours as long as instream activity continues.

4. If exceedances occur for more than two consecutive monitoring intervals (after 4 hours), the activity must stop until the turbidity level returns to background, and the EC lead must be notified within 48 hours. The EC lead shall document the reasons for the exceedance and corrective measures taken, then notify the local NMFS branch chief and/or USFWS field supervisor and seek recommendations.
5. If at any time, monitoring, inspections, or observations/samples show that the turbidity controls are ineffective, immediately mobilize work crews to repair, replace, or reinforce controls as necessary.

Figure 1. Suggested Visual Observational Differences in Turbidity.

Research Note RMRS-RN-54. 2013

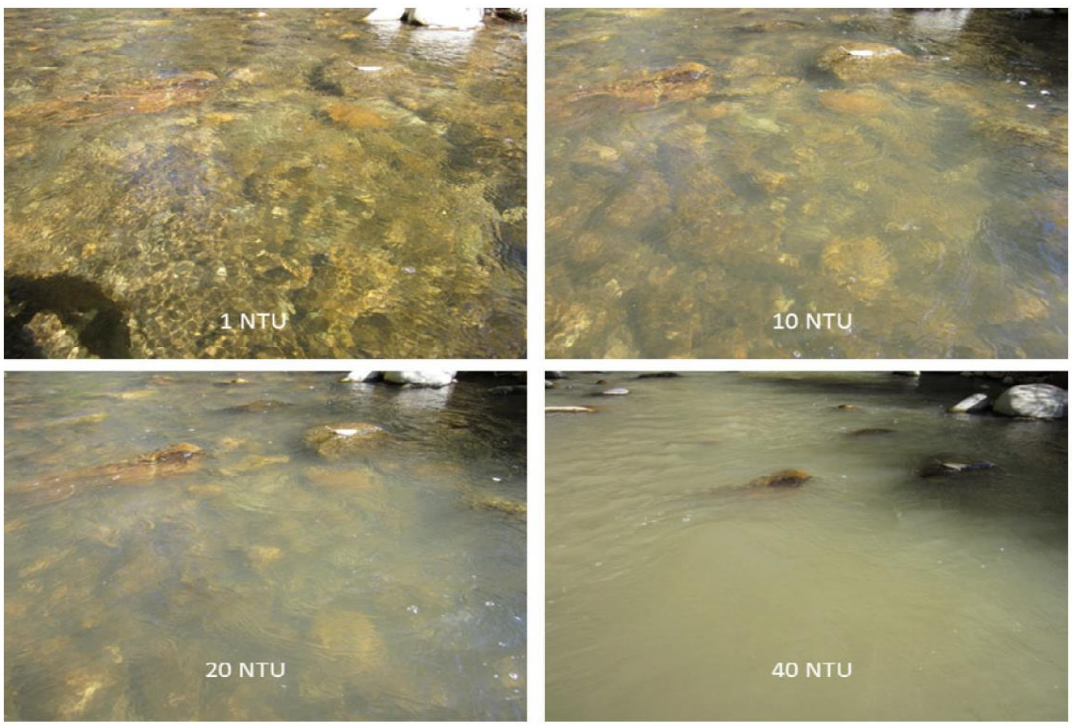

Figure 9 – Turbidity levels in Carmen Creek during Parmenter Lane culvert upgrade.

7.6 General Conservation Measures for Terrestrial Plants, Wildlife and Aquatic Invertebrates

This section describes general conservation measures and practices developed to minimize or avoid the exposure of certain endangered, threatened, and proposed (candidate) species managed by USFWS to any effects of the project activities. These standards include practices that would minimize or avoid any such effects on designated critical habitat for those species.

A USFWS biologist will review the PNF/PCF for each project to confirm the project design meets the conditions for *no effect* or *not likely to adversely affect* for listed species and/or critical habitat. Projects than cannot meet these conditions will need to be modified or will require a separate Section 7 consultation.

Identifying Species Locations. When proposed project locations have been identified, the EC Lead or project sponsor will obtain the current species list for the county in which the proposed project is located. The species lists can be accessed at the following websites:

- **Idaho**: http://www.fws.gov/idaho/species/IdahoSpeciesList.pdf
- **Oregon**: http://www.fws.gov/oregonfwo/Species/Lists/default.asp
- **Montana**: http://www.fws.gov/montanafieldoffice/Endangered_Species/
  Listed_Species/countylist.pdf
- **Washington, Western**: http://www.fws.gov/wafwo/speciesmap.html
- **Washington, Eastern**: http://www.fws.gov/wafwo/species_EW.html

If species are located within the county where the proposed project is located, refer to the habitat descriptions for each species below for each species or critical habitat to determine whether that listed species may occur in the vicinity of the proposed project.For additional assistance, contact the appropriate state USFWS office for more information:

- **Idaho Fish and Wildlife Office**: (208) 378-5243
- **Oregon Fish and Wildlife Office:** (503) 231-6179
- **Montana Ecological Services**: (406) 459-5225
- **Washington Fish and Wildlife Office**: (360) 753-9440
- **Eastern Washington Field Office:** (509) 891-6839
- **Central Washington Field Office:** (509) 665-3508

Site-specific information of listed species occurrences in Washington State may be obtained from the Washington Department of Fish and Wildlife Priority Habitat and Species Program http://www.wdfw.wa.gov/hab/phspage.htm and from the Washington Department of Natural Resources Natural Heritage Program at http://wdfw.wa.gov/mapping/phs/. Site-specific information of listed species occurrences in Oregon may also be available from the Oregon Biodiversity Information Center at http://orbic.pdx.edu/index.html.
Site-specific information of listed species occurrences in Oregon may also be available from the Oregon Biodiversity Information Center at http://orbic.pdx.edu/index.html.

If it is determined that listed species, critical habitat, or unsurveyed suitable habitat for listed species are located within the vicinity (generally within 1 mile) of the proposed project, the action agency will implement the following project design standards for each species. Additional species-specific conservation measures may apply (Your EC lead shall provide you with those).

Conservation Measures:

If it is determined that ESA-listed species, critical habitat, or unsurveyed suitable habitat for ESA-listed species are located within the vicinity (generally within 1 mile) of the proposed project, BPA will implement the following project design criteria for each species. Additional species-specific conservation measures may apply (the EC lead shall provide these).

1) **Project Access.** Existing roads or travel paths will be used to access project sites whenever possible; vehicular access ways to project sites will be planned ahead of time and will provide for minimizing impacts on riparian corridors and areas where listed species or their critical habitats may occur.
2) **Vehicle use and human activities.** Vehicle use and human activities, including walking in areas occupied by ESA- listed species, will be minimized to reduce damage or mortality to listed species.
3) **Flight patterns.** Helicopter flight patterns will be established in advance and located to avoid seasonally-important wildlife habitat
4) **Herbicide Use.** On sites where ESA-listed **terrestrial wildlife** may occur, herbicide applications will be avoided or minimized to the extent practicable while still achieving project goals. Staff will avoid any potential for direct spraying of wildlife, or immediate habitat in use by wildlife for breeding, feeding, or sheltering. Herbicide use in or within 1 mile of habitat where ESA-listed terrestrial wildlife occur will be limited to the chemicals and application rates as shown in **Table 2**.

Table 2: Maximum Application Rates within 1 Mile of Habitat where ESA-listed Terrestrial Species Occur.

	2,4-D	Aminopyralid	Chlorsulfuron	Clethodim	Clopyralid	Dicamba	Glyphosate 1	Glyphosate 2	Imazapic	Imazapyr	Metsulfuron	Picloram	Sethoxydim	Sulfometuron	Triclopyr (TEA)
Listed Species	Maximum Rate of Herbicide Appliction (lb/ac)														
Mammals	NA	0.22	0.083	NA	0.375	NA	2.0	2.0	0.189	1.0	0.125	NA	0.3	NA	NA
Birds*	NA	0.11	0.083	NA	0.375	NA	2.0	2.0	0.189	1.0	0.125	NA	0.3	NA	NA
Invertebrates*	NA	NA	NA	NA	0.375	NA	2.0	2.0	NA	1.0	NA	NA	0.3	NA	NA

NA = Not Authorized for use
** See required buffers and methods restrictions within each species-specific PDS*

7.7 River, Stream, and Floodplain Restoration

7.7.1 2a: Improve Secondary Channel and Wetland Habitats

Description. BPA proposes to review and fund projects that reconnect historical stream channels within floodplains; restore or modify hydrologic and other essential habitat features of historical river floodplain swales, abandoned side channels, spring-flow channels, wetlands, and historical floodplain channels; and create new self-sustaining side channel habitats, which are maintained through natural processes.

Actions include the improvement and creation of secondary channels, off-channel habitats, and wetlands to increase the available area for and access to rearing habitat; increase hydrologic capacity, providing resting areas for aquatic species at various levels of inundation; reduce flow velocities; and provide protective cover for fish and other aquatic species.

Reconnection of historical off- and side channel habitat that has been blocked includes the removal of plugs, which impede water movement through these areas; excavation of pools and ponds in the historical floodplain/channel migration zone to create connected wetland complexes; and reconnection of existing side channels with a focus on restoring fish access and habitat forming processes (e.g., hydrology, riparian vegetation restoration). In addition, wetland habits will be created to reestablish a hydrologic regime that has been disrupted by human activities, including functions such as water depth, seasonal fluctuations, flooding periodicity, and connectivity.

All activities intended for improving secondary channel habitats will provide the greatest degree of natural stream and floodplain function achievable and shall be implemented to address limiting factors specific to the basin. The long-term development of a restored side channel will depend on natural processes like floods and mainstem migration.

If more than 20% of the amount of water from the main channel shall be diverted into the secondary channel then the action shall be considered **Channel Reconstruction**.

Conservation Measures:

1) Off- and side-channel improvements may include minor excavation (≤ 10%) of naturally-accumulated sediment within historical channels. Evidence of historical channel location, such as land use surveys, historical photographs, topographic maps, remote sensing information, or personal observation. There is no limit as to the amount of excavation of anthropogenic fill within historical side channels as long as such channels can be clearly identified through field and/or aerial photographs.
2) Designs must demonstrate sufficient hydrology and that the project will be self-sustaining over time. Self-sustaining means the restored or created habitat would not require major or periodic maintenance, but function naturally within the processes of the floodplain.

3) Proposed new side channel construction must be within the functional floodplain (5-year recurrence interval), current channel meander migration zone, and require limited excavation for construction. Reconnection of historical fragmented habitats is preferred.
4) Side channel habitat will be constructed to prevent fish stranding by providing a continual positive **overall** grade to the intersecting river or stream or by providing a year-round water connection.
5) Excavated material removed from off- or side-channel habitat shall be hauled to an upland site or spread across the adjacent floodplain in a manner that does not restrict floodplain capacity. Hydric soils may be salvaged to provide appropriate substrate and/or seed source for hydrophytic plant community development. Hydric soils will only be obtained from wetland salvage sites.
6) Excavation depth will never exceed the maximum thalweg depth of the main channel.
7) All side channel and pool habitat work will occur in isolation from waters occupied by ESA-listed salmonid species until project completion. During project completion, a reconnection may be made by either excavation to waters occupied by ESA-listed salmonids or re-watering of these channel units.
8) Adequate precautions will be taken to prevent the creation of fish passage issues or stranding of juvenile or adult fish by demonstrating sufficient hydrologic conditions.
9) **Re-watering stream channels**. For stream channels which have been isolated and dewatered during project construction:
    a) Reconstructed stream channels will be "pre-washed" into a reach equipped with sediment capture devices, prior to reintroduction of stream flow.
    b) Stream channels will be re-watered slowly to minimize a sudden increase in turbidity (see **Staged Rewatering Plan**).

7.7.2 2c: Protect Streambanks Using Bioengineering Methods

Description. BPA proposes to review and fund projects that restore eroding streambanks through bank shaping; installation of soil reinforcements (e.g., coir logs, large wood, etc.) and other bioengineering techniques, as necessary, to support development of riparian vegetation; and/or planting of trees, shrubs, and herbaceous cover, as necessary, to restore ecological functions in riparian and floodplain habitats.

As actions that are covered by this programmatic need to have the sole purpose of restoring floodplain and estuary functions or to enhance fish habitat, streambank stabilization shall only be proposed when there are additional interrelated and interdependent habitat restoration actions.

Streambank erosion often occurs within meandering alluvial rivers on the outside of meander bends. The rate of erosion and meander migration is often accelerated due to degradation or removal of the riparian vegetation and land use practices that have removed riparian woody species. Historically, as the river migrates into the adjacent riparian areas, large wood would be recruited from the banks resulting in reduced near-bank velocities and increased channel boundary roughness. Where a functional riparian area is lacking, the lateral bank erosion may occur at an unnaturally accelerated rate. The goal of streambank restoration is to reestablish long-term riparian processes through re-vegetation and riparian buffer strips. Structural bank protection may be used to provide short-term stability to streambanks, allowing for vegetation establishment.

The primary structural streambank protection action proposed is the installation of large wood and riparian vegetation configured to increase bank strength and resistance to erosion. This is considered to be an ecological approach to managing streambank erosion (i.e., bioengineering).

The following bioengineering techniques[16] are proposed for use either individually or in combination: (a) woody plantings and variations (e.g., live stakes, brush layering, facines, brush mattresses); (b) herbaceous cover, for use on small streams or adjacent wetlands; (c) deformable soil reinforcement, consisting of soil layers or lifts strengthened with biodegradable coir fabric and plantings that are penetrable by plant roots; (d) coir logs [long bundles of coconut fiber], straw bales, and straw logs used individually or in stacks to trap sediment and provide a growth medium for riparian plants; (e) bank reshaping and slope grading, when used to reduce a bank slope angle without changing the location of its toe, to increase roughness and cross-section, and to provide more favorable planting surfaces; (f) tree and large wood rows, live siltation fences, brush traverses, brush rows, and live brush sills in floodplains, when used to reduce the likelihood of avulsion in areas where natural floodplain roughness is poorly-developed or has been removed; (g) floodplain flow spreaders, consisting of one or more rows of trees and accumulated debris used to spread flow across the floodplain; and (h) use of large wood as a primary structural component.

1) Without changing the location of the bank toe, damaged streambanks will be restored to a natural slope, pattern, and profile suitable for establishment of permanent woody vegetation. This may include sloping of unconsolidated bank material to a stable angle of repose or the use of benches in consolidated cohesive soils. The purpose of bank shaping is to provide a more stable platform for the establishment of riparian vegetation, while also reducing the depth to the water table, therefore promoting better plant survival.
2) Streambank restoration projects shall include the placement of a riparian buffer strip, consisting of a diverse assemblage of species native to the project area or region, including trees, shrubs, and herbaceous species. Do not use invasive species.
3) Large wood will be used as an integral component of all streambank protection treatments unless restoration can be achieved with soil bioengineering techniques alone.
4) Large wood will be placed to maximize near-bank hydraulic complexity and interstitial habitats through use of various large wood sizes and configurations of the placements.

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[16] For detailed descriptions of each technique refer to the WDFW Integrated Streambank Protection Guidelines: http://wdfw.wa.gov/publications/00046/,the USACE's EMRRP Technical Notes, Stream Restoration: http://el.erdc.usace.army.mil/publications.cfm?Topic=technote&Code=emrrp, or the NRCS National Engineering Handbook Part 654, Stream Restoration: http://policy.nrcs.usda.gov/viewerFS.aspx?id=3491

5) Structural placement of large wood should focus on providing channel boundary roughness for energy dissipation versus flow re-direction that may affect the stability of the opposite streambank.
6) Large wood will be intact, hard, and undecayed to partly decaying with untrimmed root wads to provide functional refugia habitat for fish. Use of decayed or fragmented wood found lying on the ground may be used for additional roughness and to add complexity to large wood placements but will not constitute the primary structural components.
7) Wood that is already within the stream or suspended over the stream may be repositioned to allow for greater interaction with the stream.
8) Large wood anchoring will not utilize cable or chain. Manila, sisal or other biodegradable ropes may be used for lashing connections. If hydraulic conditions warrant use of structural connections then rebar pinning or bolting may be used. The utilization of structural connections should be used minimally and only to ensure structural longevity in highly energetic systems (high gradient systems with lateral confinement and a limited floodplain). The need for structural anchorage shall be demonstrated in the design documentation.
9) Rock will not be used for streambank restoration, except as ballast to stabilize large wood unless it is necessary to prevent scouring or downcutting of an existing flow control structure (e.g., a culvert, bridge support, headwall, utility lines, or building). In this case, rock may be used as the primary structural component for construction of vegetated riprap with large wood. Scour holes may be filled with rock to prevent damage to structural foundations but will not extend above the adjacent bed of the river. This does not include scour protection for bridge approach fills.
10) The rock may not impair natural stream flows into or out of secondary channels or riparian wetlands.
11) Fencing will be installed as necessary to prevent access and grazing damage to revegetated sites and project buffer strips.
12) Riparian buffer strips associated with streambank protection shall extend from the bankfull elevation towards the floodplain a minimum distance of 35 feet.

7.7.3 2d: Install Habitat-Forming Natural Material Instream Structures (LW, Boulders, and Spawn Gravel)

1) Large wood placements must mimic natural accumulations of large wood in the channel, estuary, or marine environment and addresses basin defined limiting factors.
2) Large wood placements for other purposes than habitat restoration or enhancement are excluded from this consultation.
3) Large wood will be placed in channels that have an intact, well-vegetated, protected riparian buffer (of 35 feet or more) or in conjunction with riparian rehabilitation or management.
4) Stabilizing or key pieces of large wood that will be relied on to provide streambank stability or redirect flows must be intact, hard, and undecayed to partly decaying and should have untrimmed root wads to provide functional refugia habitat for fish. Use of decayed or fragmented wood found lying on the ground or partially sunken in the ground is not acceptable for key pieces but may be incorporated to add habitat complexity.
5) Large wood anchoring will not utilize cable or chain. Manila, sisal or other biodegradable ropes may be used for lashing connections. If hydraulic conditions warrant use of structural

connections then rebar pinning or bolting may be used. The utilization of structural connections should be used minimally and only to ensure structural longevity in highly energetic systems (high gradient systems with lateral confinement and limited floodplain). Need for structural anchorage shall be demonstrated in the design documentation.

6) Rock may be used for ballast but should be limited to what is needed to anchor the large wood.
7) Piling installation for large wood structures
    a. Minimize the number (<12 per structure) and diameter (<24-inch diameter) of pilings
    b. Use only wood piles; steel piles are not to be used under any circumstance
8) Drive each piling as follows to minimize the use of force and resulting sound pressure
    a. Use a vibratory hammer to drive the piles; an impact hammer shall not be used
    b. Select areas with soft substrate rather than rocky hard substrate; avoid bedrock
    c. Isolate the work area if possible to minimize acoustic disturbance

Conservation Measures (Boulder Placement):

1) Boulder placements for purposes other than habitat restoration or enhancement are not covered under HIP III.
2) Boulder placements will be limited to stream reaches with an intact well-vegetated riparian corridor, which includes native trees and shrubs. These plants may be either naturally-occurring or part of a restoration action. In addition, boulder placements will be limited reaches with a streambed that consists predominantly of coarse gravel or larger sediments.
3) The cross-sectional area of boulder placements may not exceed 25% of the cross-sectional area of the low-flow channel.
4) Boulder placements may not be installed with the purpose of shifting the stream flow to a single flow pattern in the middle or to the side of the stream.
5) Boulders will be machine-placed (no end dumping allowed) and will rely on the size of boulder for stability.
6) Boulders will be installed in a low position in relation to channel dimensions so that they are completely overtopped during channel-forming flow events (approximately a 2-year flow event).
7) Permanent anchoring, including rebar or cabling, may not be used.

Conservation Measures (Spawning Gravel):

1) Spawning gravel augmentation is limited to areas where the natural supply has been eliminated or significantly reduced through anthropogenic means.
2) Spawning gravel to be placed instream must be obtained from an upland source outside of the channel and riparian area and a properly-sized gradation for that stream, clean, and non-angular.
3) A maximum of 100 cubic yards of spawning-sized gravel can be imported or relocated and placed upstream of each structure.
4) Spawning gravel must be used in combination with other restoration activities that address the basin-specific limiting factors. For example, a project may consist of all of the following: planting streambank vegetation; placing instream large wood; and supplementing spawning gravel.
5) Imported gravel must be free of invasive species and non-native seeds.

7.7.4 2e: Riparian Vegetation Planting

1) An experienced silviculturist, botanist, ecologist, or associated technician shall be involved in designing vegetation treatments.
2) Species to be planted must be of the same species that naturally occurs in the project area.
3) Tree and shrub species as well as sedge and rush mats to be used as transplant material shall come from outside the bankfull width, typically in abandoned floodplains, and where such plants are abundant.
4) Sedge and rush mats should be sized to prevent their movement during high flow events.
5) Concentrate plantings above the bankfullelevation.
6) Species distribution shall mimic natural distribution in the riparian and floodplain areas.

7.7.5 2f: Channel Reconstruction

1) Detailed construction drawings must be provided.
2) Designs must demonstrate that channel reconstruction will identify, correct (to the extent possible), and account for in the project development process, the conditions that lead to the degraded condition.
3) Designs must demonstrate that the proposed action will mimic natural conditions for gradient, width, sinuosity and other hydraulic parameters.
4) Designs must demonstrate that structural elements shall fit within the geomorphic context of the stream system.
5) Designs must demonstrate sufficient hydrology and that the project will be self-sustaining over time. Self-sustaining means the restored or created habitat would not require major or periodic maintenance but function naturally within the processes of the floodplain.
6) Designs must demonstrate that the proposed action will not result in the creation of fish passage issues or post-construction stranding of juvenile or adult fish.

7.8 Monitoring and Adaptive Management Plan.

1) Introduction
2) Responsible parties involved.
3) Existing Monitoring Protocols
4) Project Effectiveness Monitoring Plan
    a) Objective 1
    b) Objective 2
5) Project Review Team Triggers
6) Monitoring Frequency, Timing, and Duration
    a) Baseline Survey
    b) As-built Survey
    c) Monitoring Site Layout
    d) Post-Bankfull Event Survey
    e) Future Survey (related to flow event)
7) Monitoring Technique Protocols

    a) Photo Documentation and Visual Inspection
    b) Longitudinal Profile
    c) Habitat Survey
    d) Survival Plots
    e) Channel and Floodplain Cross-sections
    f) Fish Passage
    g) Other
8) Data Storage and Analysis
9) Monitoring Quality Assurance Plan
10) Literature Cited

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