US Army Corps of Engineers ®
Portland District

DRAFT **Environmental Assessment**

Fall Creek Dam and Reservoir Adult Fish Facility Upgrade

Willamette River Basin

Middle Fork Willamette River

Lane County, Oregon

DRAFT November 2014

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Draft Environmental Assessment
Fall Creek Fish Collection Facility Upgrade
Willamette River Basin
Middle Fork Willamette River, Oregon
October 2014

Responsible Agency: The responsible lead Federal agency for this Environmental Assessment (EA) is the U.S. Army Corps of Engineers, Portland District (Corps).

Abstract: The Corps proposes to upgrade the Fall Creek Fish Collection Facility to enhance fish passage through the Fall Creek Dam and implement the National Marine Fisheries Service (NMFS) Reasonable and Prudent Alternative (RPA) Measure 4, Fish Passage, as recommended in the *Endangered Species Act Section 7(a)(2) Consultation, Biological Opinion and Magnuson-Stevens Fishery Conservation & Management Act Essential Fish Habitat Consultation on the Willamette River Basin Flood Control Project* (BiOp) issued July 11, 2008 (NMFS 2008).

This draft Environmental Assessment (EA) evaluates the potential environmental effects of rebuilding the Fall Creek fish collection facility to meet the National Marine Fisheries Service (NMFS) fish passage guidelines as outlined in the BiOp and Corps requirements. The dam and reservoir are located within areas deemed to be critical habitat for Upper Willamette River (UWR) Chinook salmon and which have high conservation value. The Middle Fork population of UWR Chinook salmon is considered to be at very high risk of extinction based on an analysis of its recent abundance, productivity, spatial structure, and diversity.

Various alternatives for overall project location and facility layout for the Fall Creek fish collection facility rebuild project were considered. The alternatives were then further refined to two alternatives: the No Action Alternative and the Preferred Alternative consisting of an elongated at-grade facility. The parameters used to establish the design criteria for the fish ladder, pre-sort pool, holding/acclimation ponds, and sorting facility pertain specifically to Chinook salmon and steelhead. The facility design would also accommodate other fish species, including cutthroat trout, resident rainbow trout, and lamprey passage. The alternatives were evaluated based on biological efficiency, constructability, environmental impact, operation, and overall cost. The agency preferred alternative provides volitional swim-up facilities, the ability to hold fish, and water-to-water transfer capabilities. However, the Preferred Alternative (at-grade fish facility) is the agency's preferred alternative primarily because it utilizes fewer 90 degree turns and incorporates a rounded entrance and orifices which benefit fish movement through the ladder, while minimizing delay and possible injury.

Based on this draft Environmental Assessment and on coordination with Federal agencies, Native American Tribes, and State agencies, the preferred alternative would meet the Corps' purpose and need to upgrade the existing fish collection facility. Long term effects of the project would primarily be beneficial to fish as it would result in improvements to the survival of fish released upstream of the Fall Creek Dam. However, short-term adverse effects would result from construction-related activities.

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ABBREVIATIONS AND ACRONYMS

APE	Area of Potential Effect
BiOp	Biological Opinion
BLM	Bureau of Land Management
BMP	best management practices
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
cy	cubic yard(s)
DEQ	Oregon Department of Environmental Quality
DOE	determination of eligibility
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
FONSI	Finding of No Significant Impact
FR	Federal Register
ft	foot or feet
gpm	gallons per minute
HEC-RAS	Hydrologic Engineering Center - River Analysis System (model)
hp	horsepower
IPS	Intake and Pump Structure
IWW	in-water work
LRAPA	Lane Regional Air Protection Agency
mg/l	micrograms per liter
MLLW	mean lower low water
NHRP	National Register of Historic Places
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
ODFW	Oregon Department of Fish and Wildlife
O&M	operation and maintenance
PDT	Product Development Team
RM	river mile
RPA	Reasonable and Prudent Alternatives
TDG	total dissolved gas
USFWS	U.S. Fish and Wildlife Service
UWR	Upper Willamette River

1. INTRODUCTION

The U.S. Army Corps of Engineers (Corps or USACE) proposes to upgrade the existing Fall Creek Fish Collection Facility to enhance fish passage through the Fall Creek Dam and implement the National Marine Fisheries Service (NMFS) Reasonable and Prudent Alternative (RPA) Measure 4, Fish Passage, as recommended in their *Endangered Species Act Section 7(a)(2) Consultation, Biological Opinion and Magnuson-Stevens Fishery Conservation & Management Act Essential Fish Habitat Consultation on the Willamette River Basin Flood Control Project* (BiOp) issued July 11, 2008 (NMFS 2008).

The July 2008 BiOp evaluated the effects of the continued operation and maintenance of the Willamette Valley Project (WVP) to species listed under the Endangered Species Act (ESA) which are under their jurisdictional purview. The NMFS concluded that the Corps proposed action was not sufficient to avoid jeopardy or adverse modification of designated critical habitat for two fish species: Upper Willamette River (UWR) Chinook salmon (*Oncorhynchus tshawytscha*) and UWR steelhead (*O. mykiss*). The NMFS BiOp included a RPA to the Corps' proposed action that, if implemented, would avoid the likelihood of jeopardy to listed species or adverse modifications to their critical habitats. The RPA includes measures for fish passage, water quality, flows, water contracts, habitat improvements, and hatcheries. Specifically, RPA 4.6, "Upgrade Existing Adult Fish Collection and Handling Facilities," requires the Corps to design, construct, install, operate and maintain new or rebuilt adult fish collection facilities in affected Willamette River sub-basins that incorporate current anadromous salmonid passage facility design criteria (NMFS February 2008), and the best available science and technologies.

This draft environmental assessment (EA) evaluates the potential environmental effects of rebuilding the Fall Creek fish collection facility to meet NMFS fish passage guidelines, as outlined in the 2008 BiOp, as well as meet the Corps' requirements for operator safety. The dam and reservoir are located within areas deemed to be critical habitat for Upper Willamette River (UWR) Chinook salmon and having high conservation value. The Middle Fork population of UWR Chinook salmon is considered to be at a very high risk of extinction based on an analysis of its recent abundance, productivity, spatial structure, and diversity (McElhany *et al*. 2007).

1.1. Action Area

For the purpose of this analysis, the action area is defined as all areas to be affected directly or indirectly by the proposed action and not merely the immediate area involved in the proposal. The Corps operates 13 dams and reservoirs in Oregon's Willamette River Basin, which collectively comprise the WVP. The WVP was authorized principally by three separate successive Flood Control Acts: 1938, 1950, and 1960. House Document 531, as incorporated by the Flood Control Act of May 17, 1950 (81st Congress, 2nd Session), remains the overall guiding document pertaining to the operation and maintenance of the project. The WVP was authorized with the full recognition that it would cut off extensive areas of upstream habitat. To compensate, fish hatcheries and other measures such as fish collection facilities were authorized.

The WVP encompasses four sub-basins of the Willamette River Basin. This Draft EA describes the proposed work at one of the four dams operated by the Corps within the Middle Fork Willamette sub-basin, including Fall Creek Dam. The Middle Fork Willamette River is a tributary of the

Willamette River whose confluence is located in the south eastern portion of the Willamette watershed at River Mile (RM) 186.[1]. The Middle Fork sub-basin drains a watershed of approximately 1,370 square miles, which includes the cities of Oakridge, Westfir, Lowell, Dexter, Fall Creek, and Jasper (Figure 1).

Four Corps dams, also referred to as "projects", were constructed in the Middle Fork Willamette sub-basin. Three projects were built on the Middle Fork of the Willamette River, while a fourth (and the focus of this Draft EA) was built on Fall Creek, a tributary to the Middle Fork Willamette River. Lookout Point (RM 19.9) and Dexter (RM 16.8) were completed together in 1955 with the construction of Hills Creek (RM 47.8) being completed in 1961. Fall Creek Dam on Fall Creek (at RM 7.9) was later completed in 1965. The four projects form a complete barrier to upstream fish passage for steelhead and Chinook salmon.

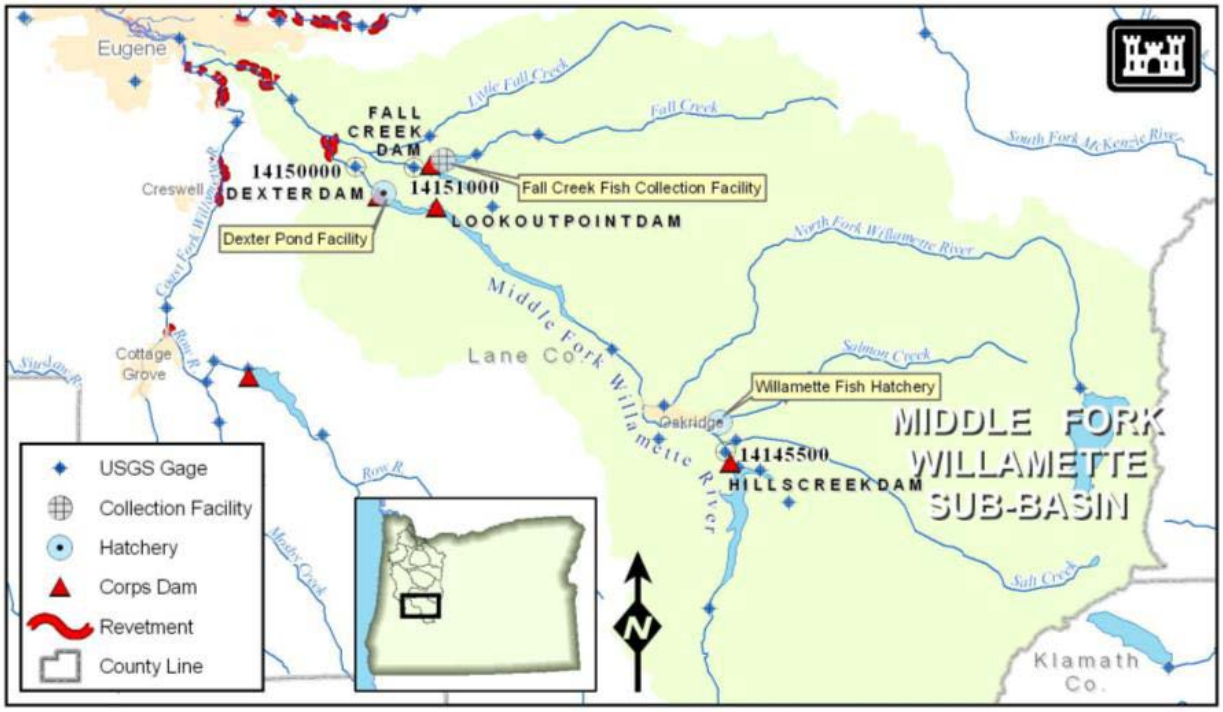


Figure 1: Middle Fork Willamette Sub-basin

Fall Creek Dam is a Corps dam that was constructed on the Middle Fork of the Willamette River during the mid-1960s with the primary purpose of reducing property damage from seasonal flooding. The dam is a 175 ft. high zoned rock-filled dam located about two miles north of the town of Lowell, Lane County, Oregon and about 25 miles southeast of Eugene (Figure 2). The dam impounds both Winberry Creek and Fall Creek, which are tributaries of the Middle Fork Willamette River, encompassing an upstream drainage area of 184 square miles. Fall Creek flows into the Fall Creek Arm of the reservoir north of Winberry Creek, which makes up the Winberry Arm of the lake. At full pool (elevation 834 feet mean sea level [MSL]), the reservoir has a storage capacity of 125,000 acre-feet.

[1] http://www.willamette-riverkeeper.org/WRK/riverforks1.html

Fall Creek dam provides flood protection, water storage, recreation, and fish passage. There is no hydropower facility at the dam, and a gated concrete spillway and outlet are operated to regulate the elevation of the reservoir. The regulating outlet is used throughout the year to provide downstream flows to Fall Creek and the spillway gates are used in emergencies to evacuate flows from the reservoir during extreme flood events. The project area for the adult fish collection facility is approximately 0.5 acre on the north bank of the regulating outlet channel, downstream of the dam.

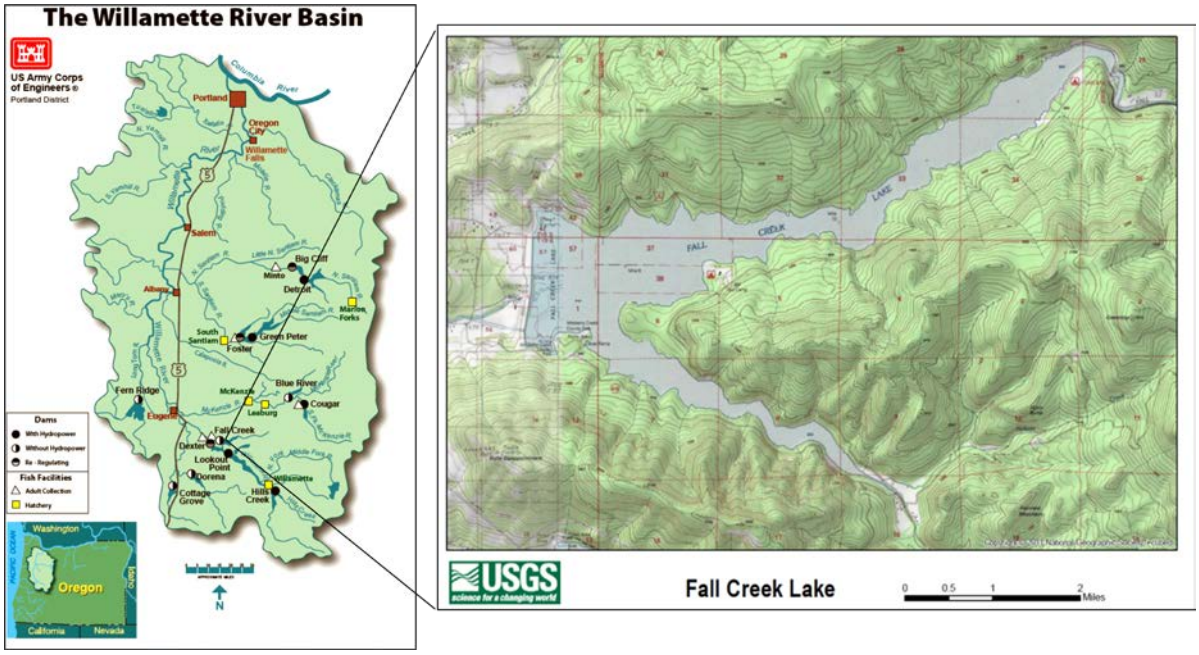


Figure 2: Location of Fall Creek Dam in the Willamette River Basin

1.2. Purpose and Need

The underlying need for the Corps' proposed upgrade to the existing fish collection facility is to enhance fish passage and recovery, and comply with the RPA 4.6. The proposed action would help restore listed populations of winter steelhead and Chinook salmon and improve critical habitat for these populations. The primary deficiencies at the existing fish collection facility include: the inability to safely handle, sort, and transport Chinook and steelhead while managing other species; the inability to hold adult fish following sorting; and the inability to transfer fish in a "water-to-water" fashion from the collection facility into transport vehicles. The purpose of the proposed project is to upgrade the existing facility to improve the transport of ESA-listed fish around the Fall Creek dam. The parameters used to establish the design criteria for the fish ladder, pre-sort pool, holding/acclimation ponds, and sorting facility specifically pertain to Chinook salmon and winter steelhead. The facility would also be designed to allow other fish species to enter and negotiate the trap, including Pacific lamprey (*Entosphenus tridentatus*), cutthroat and resident rainbow trout (*O. clarki* and *O. mykiss*, respectively).

An upgraded fish facility is needed to reduce stress and injury sustained by adult fish during the process of collection, sorting and preparation for transport to the release sites 2 miles upstream of the dam. All resident fish collected in the fish facility which are not transported upstream of the dam are released back into the regulating outlet channel. Because the facility would be used in lieu of volitional fish passage, this measure is deemed by NMFS as an essential first step toward addressing

low population numbers caused by decreased spatial distribution, primarily from loss of habitat, which is a limiting factor for Upper Willamette River (UWR) Chinook salmon and UWR steelhead. Improved collection and release of adult fish would minimize fish stress and injury, resulting in improved upstream fish passage. Lack of access to critical habitat above the dam, injury and mortality associated with inadequate passage facilities, and restriction to degraded habitat below the dams has likely contributed to steep declines observed in these populations and has reduced the functioning of critical habitat.

The 2008 NMFS BiOp states a new fish collection facility must be built at Fall Creek that complies with NMFS criteria for upstream passage/collection facilities. The existing facility does not comply with NMFS criteria and has been found to be deficient in its ability to hold adult fish following sorting, and to transfer fish in water from facility to transport vehicle (water-to-water transport). Replacing the existing facility to safely handle, sort, and load adult fish may decrease pre-spawning mortality of all fish handled at the facility, resulting in improvements in fish survival upstream of the Fall Creek Dam.

1.3. Project Description

Construction of Fall Creek Dam interrupted migrations of native anadromous and resident fish including spring Chinook, winter and summer steelhead, rainbow trout, and cutthroat trout. To mitigate for these impacts the Corps introduced an adult trap-and-haul facility and smolt stocking program. Water is supplied to the fish collection facility from April through October at a rate ranging between 30 and 280 cubic feet per second (cfs) via a combination of three stacked rows of horn-shaped structures ("fish horns") located on the upstream face of the dam at 720, 765, and 800 feet MSL. The current adult fish trapping facility at Fall Creek is comprised of a concrete fish ladder, pre-sort pool, powered fish crowder, and hopper/ anesthetizing tank (Figure 3).

Figure 3: Current Fall Creek Fish Collection Facility at the dam outlet

Both upstream and downstream fish passage were part of the original construction, whereby downstream passage consists of the three rows of fish horns (see Figure 4). Studies in the 1990's by the Oregon Department of Fish and Wildlife (ODFW) demonstrated poor passage efficiency and high mortality of those fish that did not pass through the horns. As a result, the Corps operates the horns to minimize fish attraction and entrainment. The majority of downstream migration occurs during a deep drawdown of the reservoir allowing juvenile fish to pass through a regulating outlet (RO) in a run-of-river scenario. For upstream fish passage, fish are collected and transported to a release site approximately two miles upstream of the dam. All non-target species are released back into the regulating outlet channel after enumeration and tagging. Water supply for the fish facility is withdrawn from the reservoir via the fish horns on the upstream face of the dam (see Figure 4).

Figure 4: Fish horns, exposed during reservoir drawdown

The existing fish collection facility, while in need of improvements, is currently operable and would be used to maintain uninterrupted upstream fish passage during construction of the proposed replacement facility. Operating the existing facility involves guiding upstream migrating fish into the RO channel using the discharge of attraction water coming from the facility. The current operating standards for the facility are detailed in the *Fall Creek Dam Fishway Standard Operating Procedures* (Appendix A). Upon entering the facility, the fish climb a series of ladder pools into a pre-sort pool located at the uppermost end of the ladder. A finger weir located at the entrance to the pre-sort pool deters them from returning to the ladder. A powered crowder is used to crowd fish from the pre-sort pool into the fish chute, which leads to a hopper that doubles as an anesthetic tank. Once anesthetized, the fish are moved by hand from the hopper/tank into a 1,500 gallon tank truck and transported to a release site approximately two miles upstream of the dam. Resident trapped fish are returned to the regulating outlet channel.

Following completion of the rebuild, the new facility would be a state-of-the-art fish collection facility designed to minimize handling and stress of Chinook salmon and steelhead, while facilitating the Corps' fish mitigation program in the Willamette River Basin in coordination with ODFW.

2. ALTERNATIVES

Thirteen alternatives, including the No Action Alternative, were developed and evaluated by the Corps and regional resource agencies. A collaborative interdisciplinary process involving the resource agencies including NMFS, the U.S. Fish and Wildlife Service (USFWS), ODFW, and the Corps' design team were used to identify critical components and develop evaluation criteria to help in the alternatives identification process. As documented in the Corps' Engineering Design Document, the alternatives were screened down to two that were selected for further evaluation and design development, as described below (URS 2013).

2.1. Alternatives Selection Process

Alternatives for the fish facility upgrade were evaluated using several categories including: biological, hydraulic, real estate, environmental, technical, risk, and cost (Table 1). While other fish species could enter and navigate the facility, the parameters used to establish the design criteria for the fish ladder, pre-sort pool, holding/acclimation ponds, and sorting facility specifically pertain to UWR Chinook salmon, and winter and summer steelhead. Considerations for lamprey passage based on the guidance outlined in the Corps' *Pacific Lamprey Passage Improvements Implementation Plan, Final Report* (Corps 2009). Lamprey are considered a species of concern with specific provisions including rounded fish ladder orifices, rounded ladder entrances, and openings to exclude lamprey from floor and wall diffusers.

Table 1. Description of Evaluation Parameters for Facility Layout Alternatives

Parameter	Description
Biological Criteria	How well does it accommodate all species? Are agency concerns addressed? Does facility have the potential to negatively impact pre-spawning mortality? Can the facility accommodate lamprey passage?
Hydraulic Criteria	Does it effectively operate over the range of expected flows? Facility must be designed to provide effective attraction, holding, and passage of fish from the river into the facility under all normal operating conditions. At no time shall fish become stranded as a result of water supply failure, inability to meet passage velocity criteria, or lack of adequate water quality.
Real Estate	Does facility require real estate actions? What is the time requirement for any real estate actions?
Environmental	Are there any environmental concerns?
Capital Construction Cost	What are the construction costs? Does it include expensive excavation, power upgrades, real estate acquisitions, structural components? The capital construction costs should be minimized if possible. This includes limiting impacts to existing facilities, minimizing earth and rock excavation, and facilitating the use of small cofferdams.
Operations & Maintenance Cost	What are life cycle costs? Does O&M require a lot of labor and materials?
Existing Operational Constraints	Can the facility continue to collect and acclimate fish during construction? The fish collection facility should be designed, constructed, and operated to minimize impacts to existing operations.
Design Complexity	Is this a complex design? Does the design require any extensive computer or physical modeling?
Construction Risk	How long will construction take? Are large excavations required? Are there any risks that could delay or prolong construction?
Performance Risk	Is it a new concept? Has it been done before? Are there personnel safety issues? Is a prototype required to demonstrate performance?

Multiple alternatives for prospective work were considered based on biological efficiency, constructability, environmental impact, operation, and cost. A technical memorandum summarizing all alternatives considered and the alternatives selection process is presented in Appendix B. Of the 13 alternatives originally developed for evaluation, the screening criteria eliminated all but two (the

No Action Alternative and the Preferred Alternative) for detailed evaluation in this draft EA. The preferred alternative supports a gravity-fed system to supply water to the fish facility, maximizes volitional movement of adult fish through the facility, and provides the ability to hold fish temporary before transferring via a water-to-water system for transport to upstream release sites. Conceptual drawings for the Preferred Alternative are provided in Appendix C.

2.2. No Action Alternative

Under the no action alternative, the Fall Creek fish collection facility would not be rebuilt, and the existing facility would continue to be operated in accordance with the standard operating procedures as detailed in Appendix A. The original facility was not designed to accommodate safe handling, sorting, and loading of ESA-listed fish that must survive to spawn in the wild. At the existing facility, ESA-listed fish may be subjected to direct injury or physically handled in a manner that contributes to the high levels of pre-spawning mortality observed in the Middle Willamette Sub-basin. The existing facility also does not meet the NMFS criteria for trapping and is unable to acclimate juveniles during higher flows. In addition, the existing facility does not provide a safe working environment for the operators. There are a number of safety hazards at Fall Creek including inadequate or missing guardrails, unsafe access to the intake, unsafe access to weir, and electrocution hazards. These issues place employees at risk for falls, drowning, and other serious accidents.

The No Action Alternative is inconsistent with RPA 4.6 in the 2008 NMFS BiOp, which requires the Corps to update and refurbish the Fall Creek facility to be operational by March 2016 in order to meet NMFS criteria for upstream passage/collection facilities. Compliance with the RPA in the BiOp is necessary to avoid jeopardizing ESA-listed fish species in the Willamette River Basin. Under the no action alternative, the existing Fall Creek facility would continue to be out of compliance with NMFS criteria. This alternative is being carried forward for analysis as required by the National Environmental Policy Act (NEPA) to evaluate the relative merits and disadvantages of the action alternatives with that of taking no action.

Under the No Action Alternative, there would be no need for a construction staging area, no use of borrow or disposal sites, and no construction of access roads. The current stormwater system would direct runoff from pavement to the RO channel. The existing facility and roadways would remain intact and no revegetation would occur throughout the project area.

2.3. Preferred Alternative – At-Grade Fish Facility

Under the Preferred Alternative, the Fall Creek fish collection facility would also be rebuilt and the existing facility would continue to be operated during construction. The existing entrance ladder would be maintained, the holding, sorting, and loading facilities would be constructed at-grade, (e.g. foundations on ground level, and the elevation difference required for direct water-to-water transfer truck loading would be achieved by excavation of the truck loading bay below grade). See Figure 6 and Figure 6 for a detailed layout of the proposed upgraded fish facility per the Preferred Alternative.

This alternative utilizes the berm to the west of the existing facility to support an extension of the existing fish ladder and the at-grade fish facility in a more elongated design as compared to the existing facility (Figure 6 below, and Appendix C). While this proposed layout expands the facility footprint beyond the existing parking lot and fish facility, it has the advantage that most of the new construction can be completed while maintaining a fish collection facility at Fall Creek, thereby meeting NMFS criteria for upstream passage/collection requirements. The Preferred Alternative minimizes 90 degree turns over the existing facility, benefiting fish movement through the ladder by maintaining hydraulic traction and minimizing delay and possible injury.

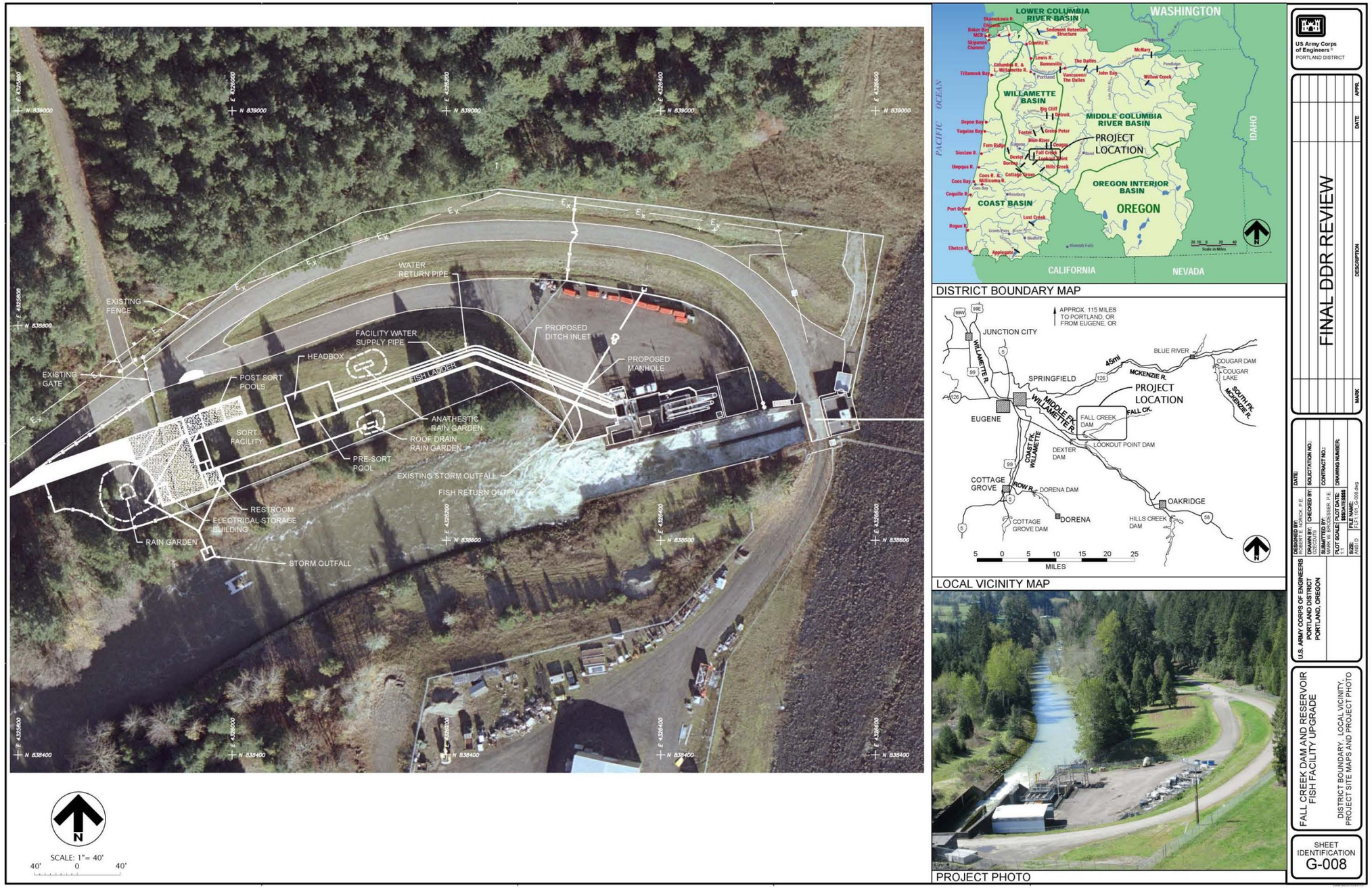


Figure 5: Proposed Fall Creek Fish Facility Design

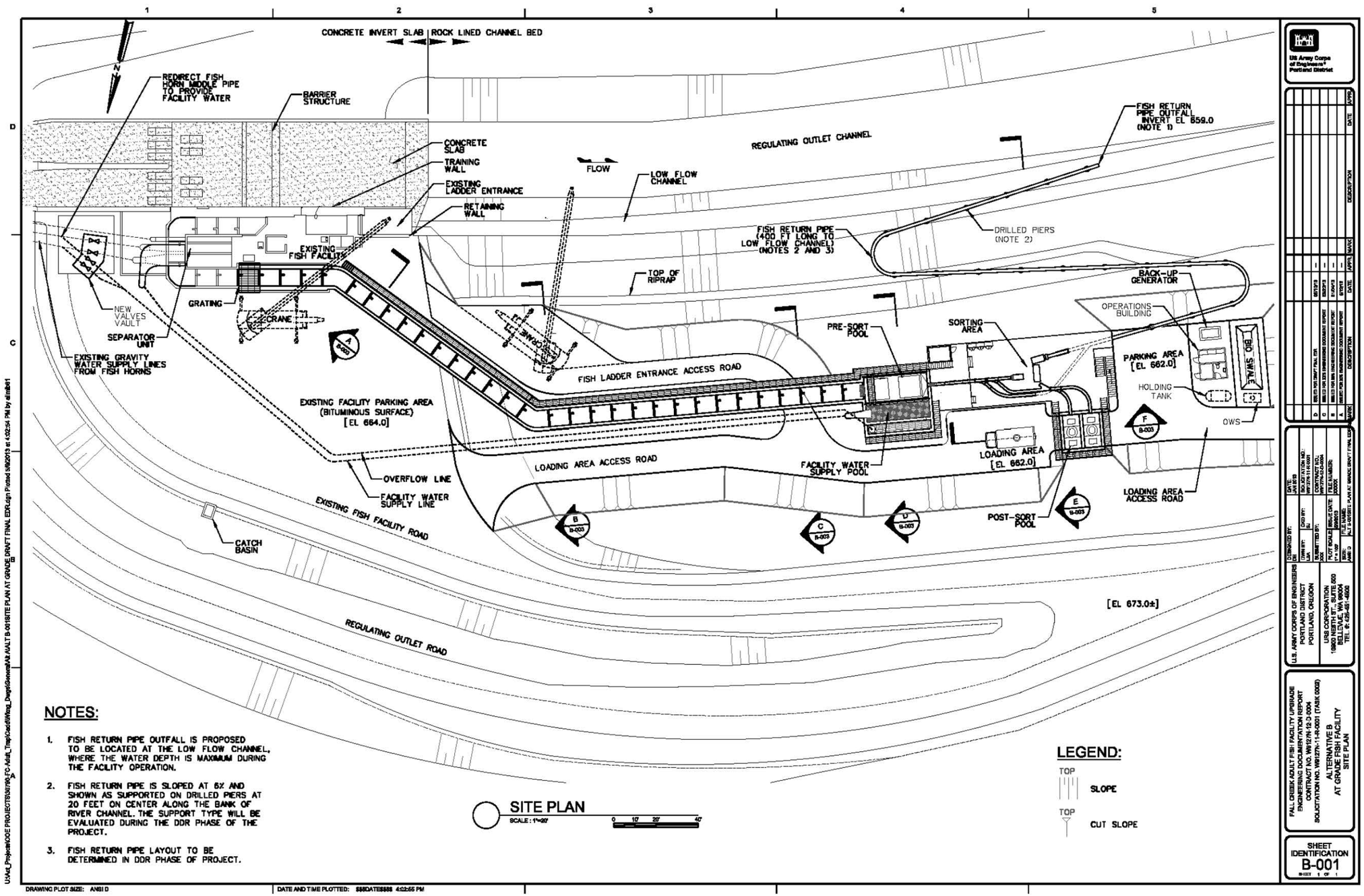


Figure 6: Proposed site plan for the Preferred Alternative

2.4. Project Components

The Preferred Alternative is composed of a suite of project elements, discussed in detail below.

- Fish Horns
- Fish ladder
- Pre-sort pool
- Sorting area and anesthetic tank
- Post-sort holding pools
- Fish return to river pipe
- Truck loading and transport
- Rain gardens and stormwater management
- Access, maintenance buildings, and other amenities
- Construction considerations

2.4.1. Fish Horns

The existing facility is supplied with water by gravity via the fish horn system. At each of the three levels of horns within the reservoir, there is a large, medium, and small horn (total of nine horns). The large horn at each elevation discharges into a common conveyance pipe that passes through the dam and terminates at the facility's supply pool. All nine horns are fitted with hydraulically-operated valves to control the flow of the water entering them. Although the fish horns are capable of meeting the entrance flow requirements, modification would be necessary under the Preferred Alternative to improve flow and prevent future clogging issues. This would be achieved by installing a concrete liner in the existing horns. Additional water can also be supplied from the primary stilling basin of the RO channel, but this source is rarely used.

2.4.2. Fish Ladder

A new fish ladder would be constructed and would extend to the west of the existing facility and oriented slightly to the north to avoid the existing trees located along the RO channel bank and then continue west, terminating at the new pre-sort pool at water surface elevation 691.3 feet MSL. This design adds 31 new fish ladder pools to the existing ladder (see Appendix C). The fish ladder includes the existing ladder entrance, the pools and weirs would be dimensionally similar to the existing ladder's weirs and pools.

The fish ladder is a weir and orifice ladder more commonly referred to as an Ice Harbor ladder type. In this specific instance, the ladder is a one-half Ice Harbor design as only one weir, one orifice, and a non-overflow wall is located between the pools. To accommodate Chinook salmon, steelhead, and other native fish species, the ladder would be 6-feet wide and have a 3-foot weir with a 15- by 12-inch orifice located on the floor underneath a 3-foot non-overflow section. Concrete or steel grated walkways would be provided where necessary along one side, and the ladder would terminate with a finger weir at the entrance to the pre-sort pool which would prevent fish from returning to the ladder.

2.4.3. Pre-sort Pool

The pre-sort pool is the last pool in the fish ladder. The pre-sort pool would consist of a 30-foot long by 12-foot wide concrete pool with a water surface elevation of 691.3 feet MSL. The pool would have a freeboard of 5 feet and would be supplied with water via two floor diffusers. Water entering the pre-sort pool in this manner would overflow the finger weir and cascade down the fish ladder.

An electrically operated, rail-mounted fish crowder would span the pool width and be used to crowd fish toward a false weir separating the pre-sort pool from the distribution flume leading to the sorting area. A separate brail recessed in the floor would crowd the fish vertically into the false weir. Fish would swim volitionally from the pre-sort pool into the distribution flume.

2.4.4. Sorting Area

The sorting area consists of a steel grated platform with standing seam roof shelter covering all sorting and evaluation activities. Fish passing over the false weir from the pre-sort pool would drop into a 15-inch wide flat bottomed stainless steel flume supplied with sufficient water along its length to maintain a 2-inch water depth throughout the flume. The flume would have an initial downward slope of 19 percent upon exiting the false weir, flattening out to 5.5 percent for the remainder of the distance in order to provide a steady conveyance velocity of 8 fps. A viewing station would be installed over the flume, immediately downstream of the false weir.

A passive integrated transponder (PIT) tag detector station would be installed downstream of the false weir. A series of pneumatically operated switch gates would be installed in the flume to sort fish into different holding pools or to direct fish back into the tailrace depending on whether they would be transported upstream of the dam or released back into the river downstream of the dam. The first switch gate (No. 1) would be installed immediately downstream of the PIT tag station and would operate to direct fish into the post-sort pools or shunt fish directly to back to the river. The second switch gate (No. 2) downstream of the first gate would provide the ability to shunt fish into the first of two post-sort pools. The third switch gate (No. 3), downstream from the gate No. 2 would direct fish into the second post-sort pool.

Non-target fish would be returned directly to the RO channel. The primary destination for most fish (Chinook and steelhead) exiting the pre-sort pool would be the anesthetic tank. To prevent flume water from diluting or overtopping the anesthetic tank, a floor diffuser would be installed in the flume just ahead of the tank to dewater the flume. Fish would be anesthetized using clove oil. Disposal of anesthetic solution wastewater would occur during truck loading, and all wastewater would flow into the constructed rain gardens for treatment via infiltration.

Once anesthetized, a brail floor in the anesthetic tank would be raised to allow the fish to be removed for evaluation on an adjacent portable table. Following evaluation, the fish would be placed in the recovery tank and following recovery, either released back to the RO channel via the return pipe or returned to the distribution flume and directed to one of the two post-sort pools.

2.4.5. Post-Sort Holding Pools

Fish would only be held temporarily in the collection facility, and no long-term holding pools/ponds would be included as part of the post-sort holding pools. The post-sort holding pools would consist of two 8-foot wide by16-foot long concrete pools with a water surface elevation of 685.0 feet MSL. Water supply to the post-sort pools would be piped from the head box using a gravity-fed system. The pools would have a freeboard of 5 feet and be fitted with a 3-foot diameter fish loading outlet at the midpoint of their sloping floors. Each pool would have a screened overflow weir to maintain the desired pool water level with discharge capacity of 4 cfs. Two diffusers are located at the bottom of each pool: one providing an aerobic inflow of 0.5 cfs, and the other used to lower the pool in preparation for truck loading. Control valves would be used to regulate the inflow from no flow (0 cfs) during truck load to 0.5 cfs flow to maintain aerobic conditions to a higher flow (4.5 cfs) for pool filling.

The minimum drainage from the two post-sort pools is a constant flow of 1.0 cfs. When the sorting deck is in operation, an additional flow of 2.0 cfs originating from the distribution flume enters the post-sort pools, increasing the drainage flow to 3.0 cfs. This flow would be returned to the river in a diffuse manner to prevent false attraction of fish. All spillage from truck loading, sorting deck wash down water, and stormwater runoff would pass through a constructed rain garden and returned to the river. The outfall would be diffused to prevent false attraction.

2.4.6. Fish Return Pipe

An 18-inch diameter polyvinal chloride (PVC) fish return pipe with 2 inch water depth would be used to return non-target fish back to the river, with an approximate change in the vertical rise of 26 feet. Due to the high variation in the water level of Fall Creek, it is estimated that the maximum vertical drop between the outfall of the return pipe and Fall Creek water surface would be 6 feet (resulting in a velocity of 20 ft per second), based on the available data in the secondary stilling basin and U.S. Geological Survey (USGS) gaging.

In order not to exceed the NMFS-recommended maximum channel impact velocity of 25 ft per second, a milder downward slope of 6 percent is required for the return pipe, resulting in a pipe length of over 400 feet. The fish return pipe is designed to operate with up to 3,400 cfs flowing into Fall Creek and a 1-ft discharge clearance above the water. At higher flows, the exit pipe would be submerged. The outfall location would be at the low flow channel on the right side of the gravel paved channel, where the channel is deepest. The discharge location is also at a sufficient distance away from the facility to reduce the chances for a fish returned to the river from returning to the facility via the entrance to the fish ladder. The fish return pipe may be supported on concrete drilled piers spaced 20 feet apart or other support structures.

2.4.7. Truck Loading

In order to transfer fish from the post-sort pools to the 1,500-gallon transport truck, the truck's inlet flange would first be connected to the pool's outlet flange and the truck would be filled with water. A knife gate between the two flanges would then be opened, allowing fish to enter into the truck's basin. The water level in the post-sort pool would then be lowered using the adjustable weir, and all remaining water and fish in the pool would be transferred to the truck. The knife gate would then be closed, the flanges disconnected, and the pool refilled. (The truck is then ready to transport fish to upstream outplant locations for spawning.) Excess water drained from the truck would be captured in a trench drain located in the slab beneath the loading dock and drained by gravity to the facility's rain garden for treatment prior to discharge into the RO channel.

2.4.8. Rain Gardens and Stormwater Management

Stormwater from the developed site would be routed to rain gardens (vegetated infiltration basins) constructed for water quality treatment. The rain garden would be designed to accommodate projected stormwater from the project area and water discharged during truck loading, discarding stormwater into the RO channel. The size and depth of the rain garden would be designed based on infiltration rates of the site's soils and designed to collect and filter runoff, allowing pollutants to settle out prior to discharge. The rain garden would be located to capture stormwater runoff from the parking area, access roads, fish facility and other ancillary buildings, which would house electrical and mechanical equipment, restrooms, and office space for employees. Areas not draining into the rain gardens would use vegetated swales or filter strips for onsite water quality treatment.

The project's stormwater design does not include a cartridge system (a water quality vault). Rather, the design incorporates an underdrain system to collect groundwater from around the proposed structures and uphill cut slopes and convey flows to the adjacent RO channel. The rain garden would be vegetated to attenuate stormwater flows and trap sediments, break down pollutants, reduce erosion, and increase water quality and overall habitat value. It should be noted that this design represents the preliminary storm design, and is subject to modification. The final post-construction stormwater design would meet all necessary Federal, State, and local requirements.

2.4.9. Access, Maintenance Building, Security Fencing, and Other Amenities

The existing facility is accessed from Big Fall Creek Road, and this road and access to the facility would be maintained under the Preferred Alternative. Whereas the existing facility is closed to the public, the new facility would accommodate visitors by appointment only. The new facility access would be similar to the existing access, with a security fence surrounding the perimeter of the facility. A paved access road begins at a locked bar gate located at the right-of-way. The access road would remain unchanged from the bar gate to the beginning of the new construction area.

Operations building would house the necessary mechanical and electrical equipment, a washroom, and an office to include a packaged water treatment system to supply the facility washroom with approximately 10 gallons per minute (gpm) of potable water. The treatment system would utilize a combination of ultraviolet light irradiation and micro-filtration. A 1,500-gallon underground sewage tank would be located adjacent to the operations building. An above ground connection for a travel trailer holding tank drain would be provided and the existing maintenance building would be reused.

2.4.10. Construction Considerations

Timing. Construction duration would be approximately 18 months for both action alternatives. Construction at Fall Creek is anticipated to begin in late summer of 2015, beginning with the retrofitting of the fish horns, water supply pipes, and the valves/ actuators. Construction of the fish facility is estimated to begin in the spring of 2016 with completion in December 2017 for testing and commissioning. The project is anticipated to be operational in the spring of 2018 to capture the beginning of spring migration. The ODFW preferred in-water work (IWW) period is July 15 through August 31, and all IWW would be performed during this window. If needed, an extension to the IWW may be requested and coordinated with ODFW and NMFS.

Excavation. The ladder and sorting facility would be located west of the existing facility in an undeveloped area and would require some excavation. Construction of the ladder would temporarily block access to the RO channel and existing control room; these areas would be reached by a crane until construction is completed. The new fish ladder would parallel the RO channel to the pre-sort pool, and the sorting area would be supported by pile-supported columns. The new loading area would require rock excavation and the construction of retaining walls. Access roads and the loading and parking areas would be paved with asphalt and/or concrete. Stormwater would drain into the RO channel after filtering through the rain garden.

Ancillary Sites. The Corps owns land immediately south of the existing fish facility where an existing 'boneyard' houses equipment and vehicles. This area would be used for construction staging and stockpiling of materials associated with the facility upgrade (see Figure 7). In addition, all roads used for the transportation of equipment and materials (new and excavated) during construction would be existing roadways and no temporary access roads would be constructed. Disposal of materials would be in commercially available quarries in the area, and the contractor would be required to provide evidence that the quarries are permitted and appropriate for use.

A new, permanent access road would be constructed for fish-transport trucks to travel to and from the collection facility and the existing road for transport to upstream spawning sites. The new road would be constructed from the existing road and travel southeast to the new fish collection facility. The road would be 15 feet wide and approximately 150 feet in length.

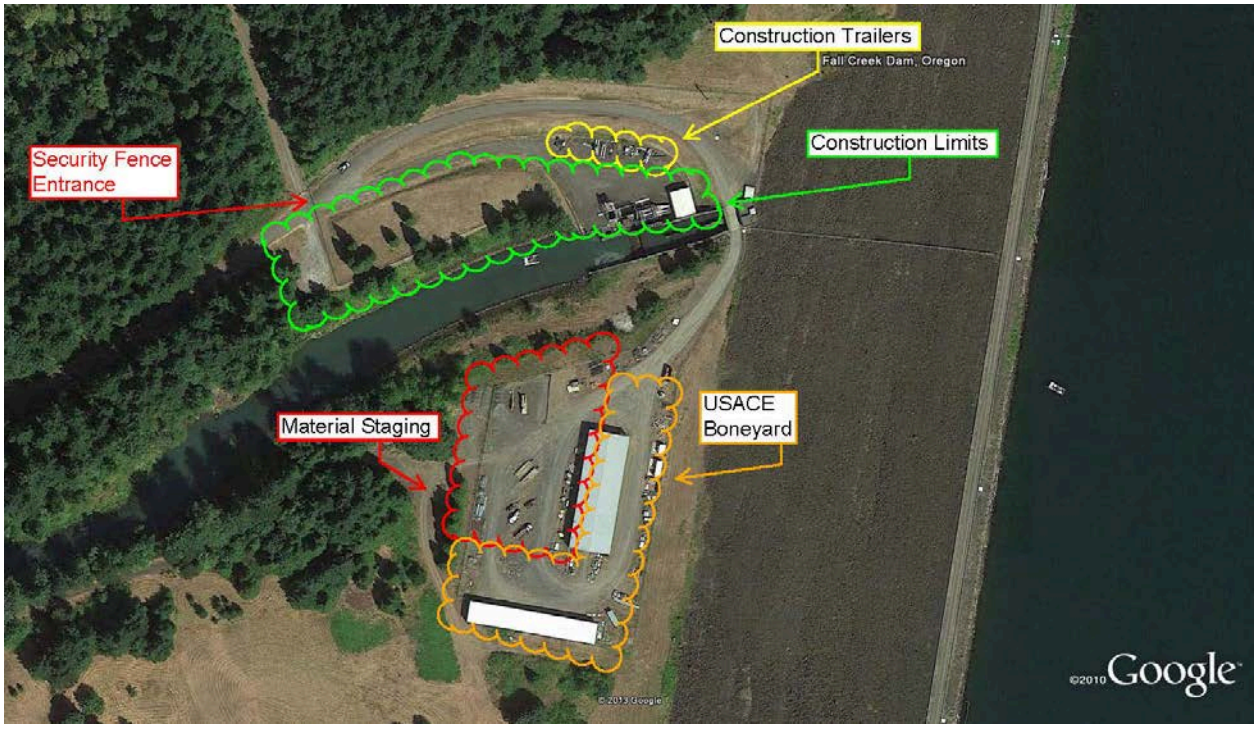


Figure 7: Ancillary sites (staging, stockpile, access roads) for the Preferred Alternative

River Bank Revetment. The project area currently has riprap on both sides of the river to protect the river bank from seasonal high flows in the RO. Riprap would be required at the upstream and downstream contacts between natural bank and along the toe of the concrete dam structures. This riprap would also provide both transition and protection for natural vegetation and woody structures adjacent to the facility. The transition from revetment to natural bank would be done with least disturbance possible to protect existing natural bank structure and would use woody vegetation where existing vegetation and woody material is lacking.

Stormwater and Erosion Control. During construction, disturbed work areas would be mulched and unused material stockpiles would be covered to reduce runoff resulting from rain or inclement weather during construction. Disturbed ground and stockpiles held over the winter would be protected with fiber bonded mulch. Sediment and erosion control measures would be renewed, as necessary, until permanent vegetation and permanent storm runoff control measures are effective. Post-construction stormwater runoff from slopes, roads, and facility work areas would be managed via the constructed rain garden discussed in Section 2.4.6.

Post-Construction. The site would initially be seeded with sterile erosion control grass to allow both the soil seed bank and windblown seeds to re-establish natural vegetation. Sterile seed would be mixed with an erosion control fiber mulch to protect cut slopes and disturbed areas until natural vegetation is established. Low vegetation would be placed to monitor soil slopes, for visual site security, and to minimize leaves and branches blowing in the fish ladder and ponds.

3. AFFECTED ENVIRONMENT

Section 102(B) of NEPA, as amended, instructs federal agencies to evaluate the relevant resources pertinent to the decision-making process. For this reason, only those resources which could influence selection of the proposed action or which may be affected by the proposed action were evaluated, including physical, biological, and social resources. Other resources, including geography, topography, hydropower generation, irrigation, etc. were considered but not carried forward for detailed analysis because the resources would not be impacted through the implementation of the proposed action. The following resources are evaluated for potential effects:

1. Physical Processes and Resources
   - 1.1. Geology and Soils
   - 1.2. Hydrology and Hydraulics
   - 1.3. Water Quality
   - 1.4. Air Quality, Noise
2. Biological Resources
   - 2.1. Vegetation
   - 2.2. Wetlands
   - 2.3. Fish and Wildlife, including Threatened and Endangered Species
3. Social Resources
   - 3.1. Cultural and Historical Sites
   - 3.2. Socio-Economic
   - 3.3. Recreation
   - 3.4. Aesthetic Resources
   - 3.5. Land Uses
4. Climate Change

The Corps' construction of the Fall Creek dam initiated fundamental changes to the Fall Creek watershed and the Middle Fork Willamette River sub-basin, including the elimination of fish passage between the lower river and upstream spawning habitats. In addition, construction of the dam altered stream flows which affect downstream water quality, and the quantity and quality of in stream and riparian habitats. Subsequent channelization to the Fall Creek watershed and Middle Fork Willamette River sub-basin occurred in the 1950s and 1960s, during which levees were constructed throughout the floodplain to safeguard against flooding, and culverts were installed to drain fields for agriculture, both of which disconnected the river from its natural floodplain. In spite of these changes, the resource descriptions provided below serve as the baseline condition (current condition, not pre-dam condition) against which the potential effects of the project alternatives are evaluated in the following sections.

3.1. Physical Processes and Resources

From its headwaters in the Willamette National Forest to its confluence with the Middle Fork of the Willamette River, Fall Creek occurs entirely in Lane County. The general character of the Fall Creek Watershed ranges from timber lands at the headwaters to agricultural lands at the confluence with the Middle Fork of the Willamette River, without passing through any major metropolitan area, although there are some small communities close to the river. There are various recreation opportunities in the watershed, including boating, fishing, camping, and hiking.

Fall Creek dam and reservoir are located in the Middle Fork Willamette River Sub-basin (Hydrologic Unit Code No.17090001) in Oregon's Willamette Valley. This sub-basin comprises 13 watersheds, including the Fall Creek Watershed and drains about 1,350 square miles. The reservoir

is relatively deep with a mean depth of 67.5 feet at the normal full pool elevation and a maximum depth of 160 feet. When constructed, the reservoir had a storage capacity of about 125,000 acre-feet at full pool elevation. Fall Creek reservoir currently has 115,100 acre-feet of storage and about 57,000 useable acre-feet of storage for flood storage (Taylor *et al*., 2012). Fall Creek reservoir has been operated to maintain a high pool into late summer to improve recreational conditions. Under current operations, the reservoir is lowered between September and November to its lowest pool elevation which is maintained from December through January for flood storage and then allowed to refill between February and mid-May (Taylor *et al*., 2012).

The Fall Creek Watershed has a climate typical of the western slope of the Cascades. Temperatures are mild year-round with warm dry summers and mild wet winters. Temperatures are generally dependent on elevation, with warmer temperatures at lower elevations. Temperatures in Eugene, located about 20 miles to the northwest and lower in elevation, show mean daily minimum and maximum temperatures ranging from about 33 degrees Fahrenheit (°F) (0 degrees Celsius [°C]) and 47°F (8°C) in January to 51°F (11°C) and 82°F (28°C) in July. Spring and fall are moist seasons with long periods of light rain. The average annual rainfall is 50.9 inches, occurring as snow during winter in the higher elevations of the watershed. Weather patterns are primarily influenced by Pacific Ocean fronts, which dominate from September to May and result in upslope winds from the southwest. During the summer months, the pattern can be either a frontal pattern off the Pacific, or it can be an offshore pattern (east wind) caused by an interior high-pressure system in conjunction with a coastal low-pressure system. Temperature inversions causing emissions to be trapped under a layer of cold surface air can be common during winter months. During the summer, high-pressure systems that do not allow movement of air pollutants out of the area are common (FERC 2013).

The entire Middle Fork Willamette Watershed, including Fall Creek, encompasses nearly 866,000 acres. The area has a population of approximately 24,000 people (MFWWC 2009). Land use in the watershed is 95 percent forest of which 72 percent is public, and the remaining 28 percent is private (MFWWC 2009). The landscape is a patchwork of recent clearcuts, tree plantations, and mature forest, including old growth. Remnant mature and old growth forest habitat is fragmented by clearcuts. About one-third of the forest is in late successional stage (Willamette National Forest 1995).[2] Nearly 50 percent of the watershed forest has been logged over the past 60 years (Willamette National Forest 1995). The North Fork of the Middle Fork Willamette River is a designated National Wild and Scenic River, however, the Fall Creek Fish Collection Facility does not occur within this designation reach.

3.1.1. Geology and Soils

Much of the Middle Fork Willamette River sub-basin was derived from a series of massive ice age floods that came from Glacial Lake Missoula in Montana and scoured across Eastern Washington, sweeping its topsoil down the Columbia River Gorge. When floodwaters met log-and-ice jams at Kalama in southwest Washington, the water caused a backup that filled the entire Willamette Valley to a depth of 300 to 400 feet above current sea level (Allen, *et al*. 2009). Some geologists suggest that the Willamette Valley flooded in this manner multiple times during the last ice age (Orr, *et al*. 1992). The lake gradually drained away, leaving layered sedimentary soils on the valley floor to a

[2] According to the ODFW's *Oregon Conservation Strategy, February 2006*, late successional forests are defined by the plant species composition, overstory tree age and size, and the forest structure. Late succession includes characteristics such as a multi-layered tree canopy, shade tolerant trees growing in the understory, large-diameter trees, and a high volume of dead wood such as snags and logs.

height of about 180 to 200 feet (55 to 61 m) above current sea level throughout the Tualatin, Yamhill and Willamette valleys (Orr *et al* 1992).

The headwaters of the sub-basin are characterized by two major physiographic provinces; the High Cascades and the Western Cascades provinces (Franklin and Dyrness 1988). In the High Cascades the geology includes recent deep lava deposits that contribute spring-fed flows to the system. These spring-fed sources are not sufficient to measurably influence flow patterns or water temperature regimes in the mainstem river reaches below the dams; however, the headwater elevations are high enough to form seasonal snowpack, which contributes to summer stream flows and maintains cooler water temperatures. The western foothills and lower peaks of the Western Cascades province has much older volcanic material including deeply weathered rocks, steep and highly dissected hill slopes, and widespread erosion. Stream runoff patterns are dominated by a rain-on-snow hydrology in the mid to upper elevations and rain-dominated flow patterns in the lower sub-basin, which lead to rapid delivery of water into the stream network. The lower sub-basin below Jasper is in the Willamette Valley Province, characterized by broad alluvial flats and low basalt hills. The very low gradient profile of the valley promotes meandering of the rivers. The geology of the project area is largely unconsolidated alluvial sediments consisting of gravel, sand, silt, and clay.

Soils in the Middle Fork sub-basin tend to be unstable and finely textured with high clay content. Mass wasting from steep slopes, and less severe but more pervasive surface erosion, contributes substantial sediment and turbidity to downstream areas. A total of 57 soil complexes were identified within a 3,280-foot (1,000-meter) buffer around Fall Creek reservoir (FERC 2013). The soils varied greatly in steepness, drainage ability, and depth-to-bedrock. A 2011 survey conducted by Symbiotics found four soil complexes within the immediate vicinity of the project: (1) Dixonville-Philomath-Hazelair; (2) Dupee silt loam; (3) Ochrepts and Umbrepts; and (4) Pits. Dixonville-Philomath-Hazelair complex soils are located in rolling foothills and toe slopes (FERC 2013). The slope for the soil complexes varies from 3-35 percent, and at the base of Fall Creek dam, the slope is 3-12 percent. Depth-to-bedrock ranges from 20 to 40 inches, and the soil complex is moderately to highly erodible. Dupee complex silt loam is a deep, somewhat poorly drained soil found in drainage ways, other depressions, alluvial fans, and foothills. Ochrepts and Umbrepts complex soils are made up of well-drained soils along streams that have cut through terraces above flood plains and major rivers.

3.1.2. Hydrology and Hydraulics

The hydrograph in the Middle Fork sub-basin reflects the seasonality of rainfall, with the majority of runoff occurring during the winter and low flows occurring during July and August. Typically, a smaller secondary peak occurs in May and June when headwater elevations experience seasonal runoff. In the lower sub-basin, areas below 1500 feet elevation, rainstorms are the dominant cause of runoff. A portion of the Lower Middle Fork Willamette River and the majority of the Little Fall Creek are above 1500 feet elevation and are subject to rain-on-snow events leading to high runoff events (MFWWC 2009).

Within the Fall Creek watershed, 180 miles of perennial streams drain about 184 square miles. Fall Creek drains the northern portion of the subwatershed, while the south fork of Winberry Creek drains the southern portion. Both Winberry Creek and Fall Creek flow into Fall Creek Reservoir, and Fall Creek continues for almost 7 more miles before joining the Middle Fork of the Willamette River. Little Fall Creek joins Fall Creek approximately 3.5 miles downstream of the dam at river mile (RM) 3.15. At nearly a third of the size of Fall Creek with a drainage area of 58.4 square miles, Little Fall Creek is not impounded and provides a source of water with a natural hydrograph and temperature regime for the lower 4 river miles of Fall Creek.

The reservoir is operated to maintain a high pool elevation into late summer to provide recreational opportunities. Under current operations, the reservoir is drained each year after Labor Day to its lowest elevation during the period of November through January. Historically, the minimum pool has been elevation 728 feet MSL. In 2007, 2008, and 2009, as a result of consultations with NMFS in association with implementation of the Willamette Valley BiOp (NMFS, 2008), the target minimum pool has been lowered to elevation 714 feet MSL. In 2010, the reservoir was lowered to elevation 690 feet MSL, and in 2011, the reservoir was further lowered to elevation 680 feet MSL to facilitate improved downstream passage of juvenile Chinook salmon, basically emptying the reservoir and creating a run of the river condition (Taylor *et al.*, 2012).

The USGS gaging station #14151000 (Fall Creek below Winberry Creek, near Fall Creek, Oregon) is 1.1 miles downstream of Fall Creek Dam. The period of record for this station is from 1935 to present. Flow has been regulated at this station by Fall Creek Dam operations since 1966 when construction was completed by the Corps. There are no diversions between the dam outlet and the gage station. Symbiotics (2011) analyzed flow data from 1970 through 2010 (Table 2). Average monthly minimum flows ranged from 52 cfs in February to 402 cfs in October, while average monthly maximum flows ranged from 314 cfs in July to 2,620 cfs in December. Representative of typical conditions, average median monthly flows ranged from 122 cfs in July to 1,011 cfs in December. Table 2 lists all average monthly minimum, mean, median, and maximum flow data for the USGS gage. Flows at the USGS gage station exceeded 52 cfs 90 percent of the time, 330 cfs 50 percent of the time, and 1,384 cfs 10 percent of the time (Symbiotics 2011).

Table 2. Average monthly flow data for USGS gaging station 14151000 (1970–2010)

Month	Average Minimum Flow (cfs)	Average Mean Flow (cfs)	Average Maximum Flow (cfs)
January	190	1,101	2,612
February	52	380	1,428
March	64	403	1,325
April	84	383	1,194
May	124	402	1,099
June	122	306	929
July	84	179	314
August	170	244	367
September	249	689	1,002
October	402	744	1,188
November	274	925	2,084
December	210	1,092	2,620

Source: Symbiotics (2011)

3.1.3. Water Quality

The Oregon Department of Environmental Quality (ODEQ) maintains ambient water quality monitoring sites throughout Oregon, and trends in water quality are measured using the Oregon Water Quality Index (ODEQ 2008). The Index analyzes a defined set of water quality parameters including temperature, dissolved oxygen, biochemical oxygen demand, pH, total solids, ammonia and nitrate nitrogen, total phosphorous, and fecal coliform. The Index produces a score describing general water quality, which are grouped into the following categories: less than 60 (very poor), 60-79 (poor), 80-84 (fair), 85-89 (good), and 90-100 (excellent).

In 2006, the ODEQ developed the Willamette Basin Total Maximum Daily Load (TMDL), in which tributary rivers and streams in the Willamette River watershed are evaluated for water quality. A TMDL is a tool for implementing water quality criteria and is based on the relationship between pollution sources and in-stream water quality conditions. The Willamette TMDL focuses on the three most common 303(d)-listed pollutants in the basin: temperature, bacteria, and mercury. The portion of Fall Creek above Fall Creek Reservoir is evaluated as part of the Middle Fork Willamette Subasin TMDL, and the portion of Fall Creek below the dam (the mouth to RM 7) is included in the mainstem Willamette River TMDL. The Middle Fork Willamette River and some of the tributaries do not meet the ODEQ water quality standards for some parameters, and Fall Creek has been identified as water quality limited for temperature, both above and below Fall Creek Dam.

The most current information on water quality parameters for Fall Creek is contained in a Federal Energy Regulatory Commission (FERC) licensing proposal for a hydroelectric project at Fall Creek Reservoir (Symbiotics 2010). As part of this process, a two year study (2008-2010) was conducted by the applicant with the objective of further characterizing temperature, dissolved oxygen, pH, turbidity, and nutrient parameters in the reservoir and below the RO and the fish collection facility. The results of this two year effort are summarized below.

3.1.3.1. Temperature

Reservoir temperature profiles taken from 2008 through 2010 compared favorably to previous studies conducted between 1984 and 1997 and consistently show a typical seasonal reservoir temperature regime of a relatively warm and monomictic[3] water body that becomes stratified during summer and thermally mixed by late fall. Historically, Fall Creek Reservoir temperature profiles depicted a well-mixed, uniformly-cold reservoir from January to February. Stratification develops in May and June, resulting in surface temperatures between 14 and 17°C and a thermocline starting at 5 to 15 feet below the surface within the metalimnion, and hypolimnetic temperatures between 7 and 9°C. As surface temperatures drop in late August through September, the thermocline drops to near 30 feet below the surface, and hypolimnion temperatures ranged from 6 to 10°C (Figure 6).

Temperatures below the RO, Fish Facility and points downstream are a direct reflection of water released either through the RO, the fish horns, or a combination of the two. The seven-day-average temperature standard (as defined by ODEQ) is 13°C from September 1 to June 15, and 16°C from June 16 to August 31. Temperature monitoring at the RO showed a rise above the standard (13°C) in both the average and the seven-day average of the maximum to a high of about 16°C for several weeks in the fall. The break in the 2008 lines indicates a period of time when data collectors at the fish collection facility were suspected to be dry and thus the temperature data was not accurate. In the second study year, temperatures exceeded the 16°C standard for a couple days in July, parts of August, and thereafter declined to about 11°C until late-September when temperatures again rose above the 13°C standard. Both years exhibited some exceedence of the standard in downstream fall temperatures which reflect a shift in the source of water from the upper horn to the middle horn in late September. As the warmer epilimnion of the reservoir descended toward the middle horn in October, temperatures at the fish collection facility rose correspondingly.

[3] Monomictic lakes or reservoirs are relatively deep, do not freeze over, and undergo a single stratification and mixing cycle during the year, typically in the fall and winter.

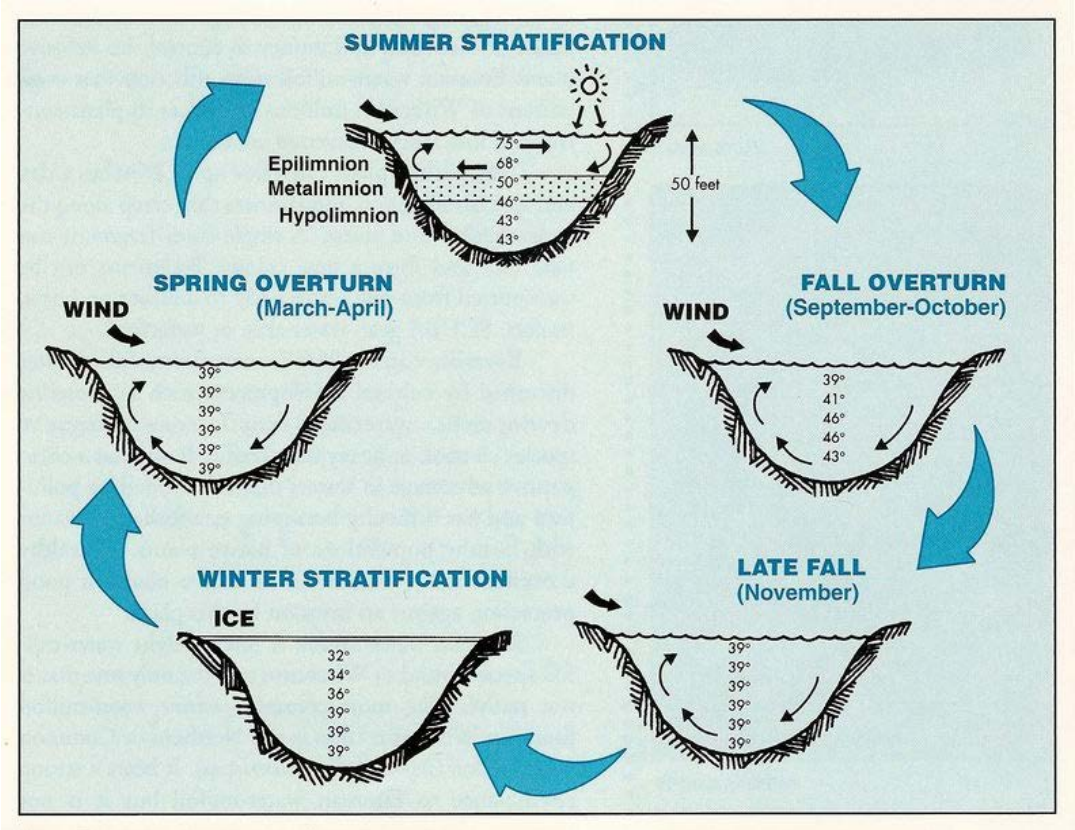


Figure 8: Typical seasonal reservoir temperature stratification

3.1.3.2. Dissolved Oxygen

The dissolved oxygen (DO) profile in the reservoir showed decreasing concentrations in micrograms per liter (8-10 mg/L) at all depths from June to August, with slightly increasing concentrations in the hypolimnion, and slightly depleted concentrations in the thermocline[4] during summer stratification and slightly depleted concentrations near the reservoir bottom. Dissolved oxygen concentrations over the winter (December through March) were consistent at about 11 to 12 (mg/L) throughout the water column.

Dissolved oxygen levels at the fish facility and in the RO channel below the dam typically range between 10 and 13 mg/L. Levels do not fall below 8 mg/L, the minimum standard for cold water streams (Symbiotics 2010).

3.1.3.3. Turbidity, pH, and Nutrients

Turbidity measurements were notably elevated at the RO immediately following its opening and again near the end of a series of winter storms.

Within the reservoir, most summer pH measurements were within ODEQ standards for surface waters (pH 6.5 to 8.5). However, readings as high as pH 11 were recorded in the hypolimnion

[4] A thermocline is the region in a thermally stratified body of water which separates warmer surface water from cooler, deep water and in which temperature decreases rapidly with depth.

between depths of 80 and 100 feet. Measurements for areas below the dam, including the fish collection facility showed that pH was well within acceptable standards at all times.

Total phosphorus was slightly elevated near the reservoir bottom. Nitrates followed a similar pattern and were markedly higher in the tailwater during summer of the first study year (2008) of Symbiotic's evaluation of water quality. Generally, most readings were relatively low and within acceptable levels.

3.1.4. Air Quality, Noise

The Environmental Protection Agency (EPA) has established human health-based National Ambient Air Quality Standards (NAAQS) for six air pollutants (criteria pollutants): particulate matter (PM_{10} and $PM_{2.5;}$ particulate matter less than or equal to 10 or 2.5 microns), ozone (O^3), carbon monoxide (CO), sulfur dioxide (SO^2), nitrogen dioxide (NO^2) and lead (Pb).

Air quality in the study area is managed by the Lane Regional Air Protection Agency (LRAPA). Three of the six pollutants are continuously monitored in Lane County, including particulate matter, ozone and carbon monoxide. Air quality in most of Lane County is very good, with Eugene/Springfield averaging 323 days a year in the "green" (good) category of the air quality index. However, some of the inland areas and mountain valleys experience periods of air stagnation. When this happens during winter months, cold air often becomes trapped near the valley floor with slightly warmer air aloft, creating temperature inversion conditions. The combination of cold stagnant air and restricted ventilation causes air pollutants to become trapped near the ground. Wintertime temperature inversions contribute to high particulate levels. Stagnant periods in the summertime contribute to increases in ozone levels, causing the local air quality to deteriorate.

Historically, LRAPA had designated the Eugene-Springfield Urban Growth Area as a non-attainment area for PM_{10}. Currently, Eugene meets both the PM_{10} and $PM_{2.5}$ standards and is in the process of regaining attainment status. Lane County, in its entirety is in attainment with the federal ozone standards. The Eugene/Springfield area was designated a "non-attainment" area for CO in the late 1970s, but was later re-designated as an attainment area in 1994 (LARPA 2009).

Lane County noise ordinances (Code 6.5) prohibit noise that exceeds 50 A-weighted decibels (dBA) at any time between 10:00 p.m. and 7:00 a.m. of the following day, or 60 dBA at any time between 7:00 a.m. and 10:00 p.m. of the same day. In addition, the Lane County ordinances prohibit noise that is plainly audible at any time between 10:00 p.m. and 7:00 a.m. of the following day within a noise sensitive unit which is not the source of the sound, or on a public right-of-way at a distance of 50 feet or more from the source of the sound. Generally, the use of construction equipment is allowed between the hours of 7 a.m. and 7 p.m. at normal operating levels.

3.2. Biological Resources

3.2.1. Vegetation

Vegetation around the existing facility contains some trees, and low shrubs with some grasses. The upslope areas and are forested with Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsgua heterophylla*) western red cedar (*Thuja plicata*), and a variety of deciduous tree and shrub species. Understory species include sword fern, lady fern, skunk cabbage, and blackberry.

The Fall Creek dam and reservoir lie at the interface of three ecological subregions: Willamette River and Tributaries Gallery Forest ecoregion, Valley Foothills ecoregion, and Western Cascades Lowlands and Valleys ecoregion (Thorson *et al*. 2003). Fall Creek and its original floodplain are part of the Willamette River and Tributaries Gallery Forest ecoregion. Extensive riparian forests

once dominated floodplains in the region but have since been largely replaced by agricultural land and residential development. Some riparian forests still exist along the margins of Fall Creek below the dam. Common tree species include bigleaf maple (*Acer macrophyllum*), black cottonwood *(Populus trichocarpa)*, red alder *(Alnus rubra)*, Oregon white oak *(Quercus garryana)*, and Oregon ash *(Fraxinus latifolia)*.

The uplands to the west are part of the Valley Foothills ecoregion, a transitional area between the Willamette Valley and the Cascade Mountains. This area is characterized by mixed oak woodlands, grasslands, and Douglas fir forests, although this ecoregion has been extensively converted to pasturelands, vineyards, orchards, tree farms, and residential development. Remnant Oregon white oak stands occur below the dam and have been the focus of recent release and restoration efforts by the Corps (Corps 2007).

Lands to the east of the dam and along much of the reservoir are part of the Western Cascades Lowlands and Valleys ecoregion. This ecoregion consists of extensive and highly productive coniferous forests managed for both commercial and recreational uses. Dominant tree species include western hemlock, Douglas fir *(Pseudotsuga menziesii)*, and western red cedar. Mixed coniferous forests cover the hillsides surrounding Fall Creek dam and reservoir. Douglas fir is the principal overstory species, but hemlock, red cedar, cottonwood, alder, and maple are also common. Most of the forests in the area have been previously harvested, creating a patchwork landscape of tree stands where stand age and conditions vary considerably.

Downstream of the outlets, riparian gallery forests remain relatively intact along the margins of Fall Creek. The relatively steep shorelines of the reservoir preclude the growth of emergent vegetation; however, a few fringe marshes exist. The dam spillway supports wetland communities and ponds not found elsewhere in the area, except in the Tufti Wildlife Management Area, located about 1 mile downstream of the dam. Outside of the immediate reservoir area, rural home sites, agricultural and pastureland, and extensive timber management shape the landscape.

Downstream of the dam, habitat quality has been severely degraded. Large woody debris is depleted, decreasing the number of pools used for adult holding and juvenile rearing habitat. Channels have lost much of their complexity, decreasing the number of side channels normally used for juvenile rearing and refugia. Riparian vegetation has been modified, decreasing its value to aquatic organisms because the vegetation helps shade streams and retain sediments. While some spawning habitat is available, there is an inadequate supply of gravel and cobble for spawning, and some areas have been scoured down to bedrock. In addition, Fall Creek undergoes substantial variability in turbidity and sediment loads when the reservoir is drawn down during the winter to facilitate downstream passage of juvenile Chinook salmon through the dam's regulating outlets.

In 2007, Fall Creek Hydro consulted with the Oregon Natural Heritage Information Center (NHIC, now the Oregon Biodiversity Information Center) to identify sensitive plant species with potential to occur in the project area. The NHIC lists 37 vascular plant species within Lane County as imperiled or vulnerable throughout their range or within Oregon. Of these species, 30 could potentially occur within the project area; others are specialized or endemic plants not likely to be found in the area. Of the 30 species with the potential to occur in the area, the NHIC records did not identify any recorded ESA-listed threatened, endangered, or plant species of concern within one mile of Fall Creek dam.

3.2.2. Wetlands

A wetlands survey was conducted by Corps Biologists for the entire project site in December 2012. A narrow, linear wetland of less than 0.02 acre was identified within the bed and bank of the roadside ditch along RO Road. The wetland is located in the ditch to immediately north of the road and approximately 90 yards from the existing fish facility heading due north. Dominant vegetation

consists of bulrush (*Scirpus microcarpus*), reed canary grass (*Phalaris arundinacea*), and water speedwell (*Veronica anagallis-aquatica*). The ditch's upstream source of hydrology is from a black outlet pipe (approximately 6-inch) and a white PVC outlet pipe (approximately 2-inch).

Within the project site, the right bank of the river is covered by rip-rap stone (approximately 20 feet from water's edge to shoulder of slope) with a dominance of upland vegetation consisting of Himalayan blackberry (*Rubus armeniacus*) and Scotch broom (*Cytisus scoparius*). Soil sampling was not possible due to the weight and depth of the stone. The toe of the slope, interfacing with the flowing water, was dominated by reed canary grass. The shoulder of the right bank is dominated by upland vegetation consisting of Douglas fir, western red cedar, and big leaf maple. A soil sample was taken, which was non-hydric and with no evidence of near-surface ground water evident within the soil pit after 10 minutes.

Within the project boundaries, the left bank of the RO channel was observed from the adjacent location on the right bank. The toe and slope of the bank was covered by rip-rap stone (approximately 3 feet from water's edge to shoulder of slope/terrace). The toe of the slope, interfacing with the flowing water, was dominated by the wetland species reed canary grass; however, a soil sample was not collected due to the presence of large rip-rap along the river bank. The shoulder of the slope/terrace was dominated by a grass understory and an upland vegetation overstory consisting of Douglas fir, western red cedar, and Scotch broom.

3.2.3. Fish and Wildlife

The species composition of fishes in Fall Creek Reservoir is a combination of native and introduced salmonids and warm water game fish. Fish species that occur in Fall Creek both above and below the reservoir and in tributaries above the reservoir, include Chinook salmon, steelhead and rainbow trout, cutthroat trout, mountain whitefish *(Prosopium williamson)*, redside shiner *(Richardsonius balteatus)*, speckled dace *(Rhinichthys osculus)*, largescale sucker *(Catostomus macrocheilus)*, western brook lamprey *(Lampetra richardsoni)*, and sculpin (*Cottidae* sp.) (USFS 2007, 2008). If the numbers of fish observed leaving the reservoir accurately reflect the system, the assemblage is dominated by introduced warm water game fish. Both Chinook salmon and steelhead are discussed in greater detail in Section 3.5 (Threatened and Endangered Species).

The reservoir provides a popular fishery for both largemouth bass *(Micropterus salmoides)* and rainbow trout, and fishing pressure for rainbow trout is high both above and below the reservoir. While Chinook are not specifically targeted as a sport fish, individuals experience harassment, stress, and mortality as a result of trout fishing (USFS 2007). Most warm water species in the area, such as members of the *Centrarchidae* (basses and sun- fishes) and *Ictaluridae* (catfishes) families, generally spawn during the spring and/or summer. These include bluegill *(Lepomis macrochirus)*, black crappie *(Pomoxis nigromaculatus)*, largemouth bass, and brown bullhead *(Ameiurus nebulosus)*. Adults and juveniles of these species may be present in the reservoir and in the river downstream throughout the year, as outmigration from the reservoir occurs regularly.

Following dam construction, the Corps implemented a rainbow trout mitigation program to mitigate for lost recreational fishing opportunities resulting of the construction and operation of the Willamette Project dams, including Fall Creek. The mitigation agreement calls for the production of no more than 277,000 pounds of rainbow trout, steelhead, and cutthroat trout annually for the Willamette Basin (Corps 2007). Rainbow trout comprise the majority (approximately 243,300 pounds) of this amount and are occasionally stocked directly into Fall Creek or Fall Creek Reservoir. Rainbow trout of various sizes are still stocked in Fall Creek (Symbiotics 2010).

Information and data on life history timing of both anadromous and non-anadromous salmonid fish species found in the project area have been summarized by the ODFW's Natural Resource

Information Management Program.[5] Periods of migration, spawning, egg incubation, and fry emergence for rainbow and cutthroat trout are similar, extending from winter into summer, although cutthroats precede rainbows by about one month for these stages. Winter and summer steelhead generally overlap those periods of spawning through fry emergence, however timing appears to be more discrete for winter steelhead. The temporal extent of egg incubation and fry emergence for all native species occurs over a prolonged period from September to April. Juveniles can be present throughout the year and downstream migration occurs nearly year round, peaking between November and June.

Upstream of the reservoir, the Fall Creek watershed provides isolated areas of high quality spawning habitat for the approximately 19 miles up to the natural fish barrier at Fall Creek Falls. The lower section of Fall Creek above the reservoir contains deep bedrock pools used as holding habitat with spawning gravel present in the pool tailouts. The middle and upper sections of Fall Creek contain more areas dominated by bedrock; however, there are still some deep pools and areas of quality spawning gravel. The majority of spawning occurs near the mouth of Hehe Creek (RM 24.8) and upstream of Big Pool Campground (RM 23.6).

Both Pacific lamprey and western brook lamprey have been documented in the project area. Unlike brook lamprey, Pacific lamprey do not occur above Fall Creek dam, and no Pacific lampreys have been collected at the Corps' fish collection facility. Adult Pacific lamprey migrate upstream from the ocean beginning in about April with most of the migration being completed by September. Spawning typically occurs in June and July. Brook lamprey are residents, spawning from April through July. Both lamprey species spawn in gravel-rich habitats, predominantly pool tail-outs and low-gradient riffles.

The varied landscape in the vicinity of Fall Creek dam supports a diverse assemblage of wildlife, including state and federal species of concern. Common wildlife species that have the potential to occur in the vicinity of Fall Creek reservoir include 75 mammals, 15 reptiles, 20 amphibians, and more than 200 birds (Noyes *et al*. 1985). The reservoir provides breeding, foraging, and migratory stopover areas for waterfowl, shorebirds, and raptors. Numerous hawks, falcons, and owls nest and/or forage in nearby Douglas-fir forests and oak woodlands. An osprey pair (*Pandion haliaetus*) nests approximately 0.5 mile downstream from the project site along Fall Creek. Both wintering and nesting bald eagles (*Haliaeetus leucocephalus*) can be found in western Oregon and are commonly observed at Fall Creek reservoir. In 2000, a nest was discovered on the ridge between the Fall Creek and Winberry Creek arms of the lake. The site has been consistently occupied since 2000, although the pair failed to fledge young in 2004 through 2007 (Symbiotics 2011). This nest tree is over 2.5 miles away from the proposed project area, however, this pair, and/or other individual eagles may use roost trees and/or foraging areas closer to the proposed project site. In addition, at least three other eagle pairs are known to occur approximately 3 miles to the south and west of the project at Dexter reservoir, and on Lookout Point Lake.

Shallow waters and nearby wetlands provide habitat for birds, northwestern pond turtles (*Clemmys marmorata marmorata*), western painted turtles (*Chrysemys picta bellii*), salamanders and frogs, including the northern red-legged frog (*Rana aurora aurora*), and numerous mammals, including coyote, bobcat, cougar, red fox, raccoon, bat species, mink, beaver, and multiple mice, vole, and shrew species. The northwestern pond turtle, western painted turtle, and northern red-legged frogs are listed as state and federal species of concern in the Oregon Natural Heritage Information Center (NHIC) database. Ungulates and other large mammals have direct access to most portions of the

[5] https://nrimp.dfw.state.or.us/nrimp/default.aspx?p=259

project area, except the proposed staging area within the Corps' fenced compound. Columbia black-tailed deer and Roosevelt elk occur in nearby forest, woodland, and savannah-like habitats. Other game species in the area include ruffed grouse, ring-necked pheasant, California quail, mountain quail, and wild turkey.

The northwestern pond turtle is found in aquatic habitats from the coast to the Cascade/Sierra Mountains from southern British Columbia to central California. Preferred habitats include still and slow-moving waters with vegetated banks and abundant basking sites, such as logs and boulders. Northwestern pond turtles excavate nests on south- or west-facing slopes in compact dry soil, high in clay or silt, with low cover of short grasses or forbs. In the Willamette Valley, the nesting period begins around June 1 and extends for 6 weeks. Eggs hatch after 90 days, and the young remain in the nest through the winter. Eggs and young are particularly vulnerable to predation from raccoons, other mammals, and various bird, amphibian, and fish species.

The Oregon NHIC database reports several sites within 1 mile of the project area with confirmed occurrences of northwestern pond turtles. They inhabit the entire dam spillway channel and nest on sloped banks of the channel near its confluence with Fall Creek. This population is one of only a few ODFW actively-managed populations in the state and is estimated at approximately 30 individuals. Similarly, small populations also occur in the Fall Creek and Winberry Creek arms of the lake and in the Tufti Wildlife Management Area, approximately 1.2 miles downstream of the dam. Although there appears to be suitable habitat in the vicinity of the proposed project (aquatic habitat, low cover of short grasses and forbs, basking sites) and the species is known to occur within about a mile of the project, no individual northwestern pond turtles have been observed in the immediate project area.

The western painted turtle ranges from western Ontario to British Columbia, south to Missouri, northern Oklahoma, eastern Colorado, Wyoming, Idaho, and northern Oregon, with isolated populations in Texas, New Mexico, Arizona, Utah, and Chihuahua, Mexico. Preferred habitats include ponds, marshes, small lakes, and ditches with abundant aquatic vegetation and basking opportunities. Nesting occurs from late May through mid-June, where 1 to 20 eggs are buried in moist loamy or sandy soil in an open site near water. The Oregon NHIC database reports confirmed occurrences of painted turtles in Tufti Pond downstream from Fall Creek dam. Habitat within the proposed project area is extremely limited, and the species is not known to occur there.

The northern red-legged frog is typically found near permanent waters associated with stream pools, marshes, ponds, and other quiet water bodies. On rare occasions, they travel into adjacent upland forests and meadows during wet weather. Summer refuge sites include small mammal burrows and moist leaf litter in riparian areas. Breeding typically occurs between March and July and lasts 1 to 2 weeks. Eggs are attached to stiff stems near the surface of the water and hatch in about 5 to 7 weeks. Larvae metamorphose into adults in 11 to 20 weeks (Nature Serve, 2012). A breeding population of northern red-legged frogs is known to occur in wetlands near the Fall Creek spillway but located off channel, away from the project area.

3.2.4. Threatened and Endangered Species

The ESA of 1973 (16 U.S.C. 1531 *et seq.*), as amended, provides for the conservation and recovery of endangered and threatened species and the ecosystems upon which they depend. The U.S. Fish and Wildlife Service (USFWS) and NMFS share joint jurisdiction for the administration of ESA-listed species. Under Section 7 of the ESA, federal agencies are required to evaluate the effects of actions they fund, permit, or authorize and consult with the USFWS and/or NMFS to ensure Federal actions will not jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. Critical habitat is defined as specific geographic locations critical to the

existence of a threatened or endangered species. The following sub-sections describe the threatened and/or endangered species present in the action area, and the designated critical habitats upon which they depend.

3.2.4.1. Species under NMFS Jurisdiction

Two Pacific salmonids occur in the project area: Upper Willamette River (UWR) Chinook salmon and Upper Willamette River winter steelhead. In September 2005, critical habitat was designated for these species (70 Federal Register [FR] 52630), but only critical habitat for Chinook is found within the project area. Critical habitat for winter steelhead does not extend upstream of the confluence of the Willamette and Calapooia Rivers, and summer steelhead are not native to the watershed.

The UWR distinct population segment (DPS)[6] of steelhead (*Oncorhynchus mykiss*) does not include steelhead in the Middle Fork Willamette River sub-basin; summer and winter steelhead are not considered native to the Middle Fork sub-basin or the Fall Creek watershed. Historically, only winter steelhead were native to the Willamette Valley, as Willamette Falls created a seasonal barrier passable only during the winter months at high flows. Although winter steelhead were occasionally present in the Middle Fork Willamette River sub-basin, the Middle Fork did not support an independent population and consequently the UWR steelhead DPS does not include steelhead in this sub-basin (Myers *et al*. 2006).

The naturally reproducing population of UWR steelhead present today likely became established in the Middle Fork and its tributaries in the 1950s following introductions of hatchery produced fish from the North Santiam fish hatchery. The ODFW supplemented natural-origin salmonids through its Salmon and Trout Enhancement Program to enhance recreational fishing opportunities. Currently, NMFS does not provide any protection under the ESA to steelhead populations upstream of the Calapooia River (near Albany, Oregon). For this reason, while winter or summer steelhead may be present in the action area, they are not afforded the same protections as the DPS that are ESA-listed as threatened and/or endangered in the lower portion of the Willamette Basin. As a result, Table 3 lists the ESA-listed species which were evaluated for potential effects resulting from implementing the proposed action.

Table 3. ESA-listed Species under NMFS Jurisdiction

Species/ESU	Status	Critical Habitat
UWR Chinook Salmon *Oncorhynchus tshawytscha*	Threatened	Designated, within project area

The Upper Willamette River Chinook ESU was listed as threatened on March 24, 1999 (64 FR 14308), and threatened status was reaffirmed on June 28, 2005 (70 FR 37160). The ESU includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River, as well as the populations in the Willamette River and its tributaries upstream of Willamette Falls, Oregon. Historically, this ESU spawned throughout the Willamette River Basin, including the Clackamas, Pudding, Mollala, Calapooia, Santiam, McKenzie and Middle Fork Willamette River sub-basins. Access to large swaths of historical spawning habitat was blocked by construction of the Willamette Valley Project dams, inclusive of Fall Creek dam.

[6] A distinct population segment is defined as a population of a particular species that is discrete from other populations of the same species, and which is also important to the long-term viability of the species as a whole.

Critical habitat for the Upper Willamette River Chinook ESU was designated on September 2, 2005 (70 FR 52630) and includes Fall Creek from its mouth upstream to a point more than 15 miles upstream of Fall Creek reservoir, as well as portions of the following tributaries upstream of Fall Creek dam: Alder Creek, Gold Creek, Logan Creek, Nelson Creek, Portland Creek, Sunshine Creek, and Winberry Creek. Primary constituent elements of critical habitat identified by NMFS that occur in the project area are as follow:

(1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development.

(2) Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

(3) Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover.

Past surveys have indicated that less than 10 percent of individuals comprising UWR spring Chinook populations are wild stock (Schroeder and Kenaston 2004). In Fall Creek, the level was less than 5 percent in some years (WRI 2004). In more recent years, the numbers of adult spring Chinook returning to the Fall Creek adult trap have shown greater proportions of naturally produced fish. However, naturally produced fish occur in low abundances.

The spring Chinook spawning migration in Fall Creek is generally from May to October, with migration peaking in June. The seasonal timing of key life stages of Chinook salmon in Fall Creek are summarized in Table 4. In Fall Creek and throughout the South Willamette, UWR spring Chinook may spawn from mid-August through October, with peak spawning from September through mid-October. The period of egg incubation through fry emergence extends from September into March and downstream juvenile migration peaks from November to June, but begin as early as October and last until July (ODFW 2003).

Table 4. Summary of general life history characteristics and timing of UWR spring-run Chinook salmon

Life History Trait	Characteristic
Willamette River entry timing	February to May
Spawning	March to June (peak spawning late April, early May
Spawning habitat	Headwater streams
Emergence	8 to 9 weeks after spawning
Rearing habitat	Headwater streams
Freshwater period	1-4 years, smolting occurs April to May
Age at return from sea	3 to 6 years (primarily 4 years

Source: NMFS, 2011; Symbiotics, 2011

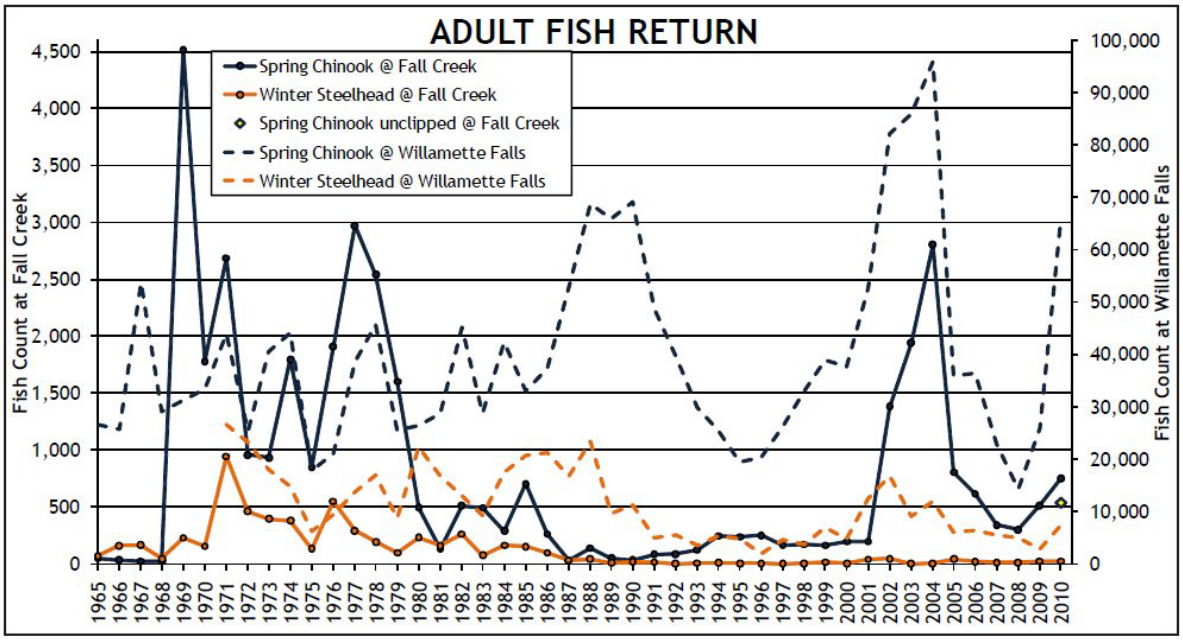
Historically, the run of adult Chinook salmon in the Middle Fork of the Willamette River may have numbered in the tens of thousands, and it is thought to have been the largest population of the species located upstream of Willamette Falls. Construction of the Dexter and Fall Creek dams blocked access to about 215 miles, or 80-percent of historical spawning habitat in the Middle Fork Willamette River sub-basin. Reportedly, about 450 to 600 Chinook spawned above Fall Creek Dam prior to its construction, but the run declined to as low as 60 fish in 1947. As mitigation for interruptions of the Fall Creek run, a trap-and-haul adult collection facility was constructed below

Fall Creek Dam, from which adults of natural origin are transported upstream for spawning in the upper headwaters.

Adult spring Chinook and winter steelhead returning to the collection facility have been monitored from 1965 through the present (Figure 7). The number of returning adult Chinook increased in 1969, reflecting contributions of hatchery-reared smolts, which ODFW began stocking in Fall Creek Reservoir in 1965. However, returns decreased dramatically in the late-1970s, remaining at reduced levels through 2000. Currently, no hatchery origin spring Chinook or steelhead are transported upstream, allowing only naturally-produced fish to spawn in upstream habitats.[7] Only winter steelhead are transported upstream for spawning, all summer steelhead are returned to the tailrace. In 2010, the spring Chinook run consisted of 747 fish, 538 or 72 percent of which were naturally produced (Symbiotics 2010). Originally, most (if not all) adult spring Chinook salmon and some winter steelhead trapped at Fall Creek fish facility were trucked to the McKenzie and other hatcheries and used as broodstock. Occasionally, adults collected at Dexter Dam were also stocked into Fall Creek Reservoir (Lindsay *et al*. 1998). Beginning in 1998, all of the spring Chinook returning to the collection facility were released above the dam (Corps 2007).

Juvenile spring Chinook salmon of various stocks and sizes were added to the reservoir on a near-annual basis between 1987 and 2001, totaling more than a million fish in some years. However, due to high injury and mortality rates during outmigration, this practice has since discontinued. Brood year survival in the reservoir between 1975 and 1990 was estimated at less than 0.1 percent and may have been partially the result of changes in dam operations (Homolka and Smith 1991). Fingerling-to-smolt survival in the reservoir has been estimated at 11.3 to 19.7 percent (Smith *et al*. 1985; Homolka and Smith 1991). Salmon smolts captured in gillnets in Fall Creek Reservoir in September 1990 showed good growth from the fingerling stage and averaged 138 millimeters. Only in years of extremely high stocking rates (over 2 million fingerlings), was there a detectable reduction in growth of smolts outmigrating in the autumn months (Homolka and Smith 1991).

[7] Hatchery origin fish are identified as having their adipose fin clipped. All hatchery adults which migrate up to the adult fish collection facility are returned to the tailrace to reduce the potential competition for spawning habitat with species native to the watershed, including UWR spring Chinook.



Source: Symbiotics 2011

Figure 9: Adult Chinook and steelhead counts at Willamette Falles and Fall Creek Fish Facility

The NMFS rates the extinction risk for each population over a 100-year timeframe as either very low, low, moderate, high, or very high based on abundance, productivity, spatial structure, and diversity characteristics. The UWR winter steelhead is currently at a *moderate* risk of extinction, and UWR spring Chinook is currently at a *high* risk of extinction, where five of the seven ESU populations are at a *very high* risk of extinction (McElhany et al. 2007). The life history diversity of all UWR Chinook has simplified over time as a result of less variation in ages, run timing and genetic introgression with hatchery fish. Similarly, the life history diversity of UWR steelhead has been eroded by small population sizes and genetic introgression from the ongoing release of summer steelhead. However, winter steelhead have not been as adversely affected by the Willamette Valley Project dams as UWR spring Chinook because their spawning habitat is more widespread than that of Chinook, and they are not as dependent on spawning habitats upstream of the dams.

Relative to the project area, NMFS lists the major limiting factors for ESA-listed salmonids as:

- Passage barriers and the lack of volitional fish passage at Corps dams to access upstream spawning habitats throughout the Willamette Valley;
- Reduced habitat complexity;
- Reduced access to off-channel rearing habitat;
- Loss of holding pools;
- Degraded water quality and increased pollutants;
- Elevated water temperatures;
- Lost or degraded floodplain function and connectivity;
- Reduced streamflow; and
- Altered substrate compositions (loss of spawning gravels).

3.2.4.2. Species under USFWS Jurisdiction

There are 11 threatened and endangered species which may occur in Lane County under the jurisdiction of the USFWS, as shown in Table 5 (USFWS 2010).

Table 5. ESA-listed species under USFWS jurisdiction which may occur in Lane County, Oregon

Species	Status	Critical Habitat
Northern spotted owl *Strix occidentalis caurina*	Threatened	Designated, not within project area
Marbled murrelet *Brachyramphus marmoratus*	Threatened	Designated, not within project area
Western snowy plover *Charadrius alexandrinus nivosus*	Threatened	Designated, not within project area
Short-tailed albatross *Phoebastria albatrus*	Endangered	Not designated
Oregon chub *Oregonichthys crameri*	Threatened*	Designated, not within project area
Bull trout *Salvelinus confluentus*	Threatened	Designated, not within project area
Willamette daisy *Erigeron decumbens var. decumbens*	Endangered	Designated, not within project area
Bradshaw's desert parsley *Lomatium bradshawii*	Endangered	Not designated
Kincaid's lupine *Lupinus sulphureus spp. kincaidii*	Threatened	Designated, not within project area
Fender's blue butterfly *Icaricia icarioides fenderi*	Endangered	Designated, not within project area
Oregon silverspot butterfly *Speyeria zerene hip polyta*	Threatened	Designated, not within project area

* The USFWS proposed delisting Oregon chub in December 2013 [79 FR 25 7136].

While the species listed in Table 5 are reported to occur in Lane County, many are not found in the project area, and/or the critical habitats supporting the conservation and recovery of these species is not found in the project area. The western snowy plover *(Charadrius alexandrinus nivosus)* and short-tailed albatross *(Phoebastria albatrus)* are coastal/pelagic species that do not occur in the project vicinity. Marbled murrelets nest in inland old-growth forests but are not known to occur as far inland as the proposed project at Fall Creek. Suitable habitat for the Willamette daisy *(Erigeron decumbens* var. *decumbens)*, Bradshaw's desert parsley *(Lomatium bradshawii)*, and Kincaid's lupine *(Lupinus sulphureus* ssp. *kincaidii)* does not occur in the project area, nor are any of the species know to occur in the project area. Willamette daisy populations occur mainly in bottomland prairies, but one population is found in an upland prairie remnant near Eugene, Oregon. Bradshaw's desert parsley is endemic to and was once widespread in wet prairies in the Willamette Valley. Currently, this plant is limited to a few sites in Lane, Marion, and Benton counties. Similar to the Willamette daisy, the greatest concentration of Bradshaw's lomatium occurs near Eugene, Oregon.[8] Critical habitat units for Kincaid's lupine were proposed for Benton, Douglas, Lane, Polk, and Yamhill Counties, Oregon, and Lewis County, Washington. However, the specific habitat characteristics (grasslands and dry fescue prairies) for this plant do not occur in the Fall Creek project area. In addition to the plants, there is no known habitat or records of occurrence in the

[8] http://www.fws.gov/oregonfwo/Species/Data/BradshawsLomatium/

proposed project area or vicinity for the two listed species of butterfly: Fender's blue butterfly *(Icaricia icarioides fenderi)* and the Oregon silverspot butterfly *(Speyeria zerene hippolyta)*. For these reasons, species which occur in Lane County but are not present near Fall Creek or the project area are not further evaluated in this EA.

One bird species, the northern spotted owl (*Strix occidentalis caurina*), and two fish species, bull trout (*Salvelinus confluentus*) and Oregon chub (*Oregonichthys crameri*), may be present in the project area. These three species are discussed in greater detailed below.

Northern Spotted Owl

According to the USFWS (2008), the northern spotted owl is a sub-species of spotted owls which inhabit structurally complex forests from southwest British Columbia through the Cascade Mountains and coastal ranges in Washington, Oregon, and California, as far south as Marin County. Northern spotted owls are mostly nocturnal and while their diet varies, flying squirrels are the most prominent prey in Douglas-fir and western hemlock forests in Washington and Oregon. Structural habitat features which support nesting and roosting owls include a moderate to high canopy closure (60 to 90 percent); a multi-layered, multi-species canopy with large overstory trees (diameter > 30 inches at breast height, or dbh); a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe infections); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy to accommodate flight. Foraging habitat has many attributes similar to those of nesting and roosting habitat, and dispersal habitat consists of forest stands of adequate size and canopy closure to protect young birds from avian predators and provide foraging opportunities. Female spotted owls typically lay eggs in late March or April. After they leave the nest in late May or June, juvenile owls are dependent upon their parents until they can fly and hunt independently.

The USFWS listed the northern spotted owl as threatened under the ESA in 1990 (55 FR 26114). In the 1960s, 1970s and 1980s, spotted owl populations experienced steady declines in conjunction with the widespread loss of suitable habitat as a result of timber harvest and changes in land use. Timber harvest resulted in smaller, isolated patches of suitable habitat, where owls became more susceptible to starvation, increased predation, and competition from aggressive barred owls (*Strix varia*). The listing status was reviewed in 2003, wherein the USFWS maintained the spotted owl should remain listed as threatened under the ESA, citing increased threats to spotted owls from habitat loss and encroaching barred owls. A recovery plan was published in 2008 to guide conservation efforts by describing those actions considered necessary for the recovery of the species, as well as establishing criteria for down-listing or de-listing species under the ESA (73 FR 29471). The recovery plan was most recently revised in 2011 and outlined three overarching recommendations: protect the best remaining spotted owl habitat, revitalize forests through active management, and reduce competition from barred owls (76 FR 38575). The current status of northern spotted owl numbers is declining at an estimated rate of 3 percent annually, and trends suggest that much of the remaining unprotected habitat could disappear within 50 years (USFWS 2008a). Relative to the proposed project area, the closest known nesting owl pair is adjacent to the Cascara Campground in the upstream-most section of the reservoir, approximately 5 miles east of the project area.

In 1992, the USFWS designated 6.9 million acres on federal lands as critical habitat in Washington, Oregon, and California, where these areas were essential for the conservation of the species (57 FR 1796). The critical habitat designation was revised in 2008 and reduced the amount of designated critical habitat to 5.3 million acres across all the three states (73 FR 47325). Following legal challenges, the USFWS revised the designation of critical habitat in 2012 to include approximately 9.6 million acres on state and federal lands in Washington, Oregon, and California meeting the definition of critical habitat for the northern spotted owl (77 FR 71876). The Fall Creek watershed

upstream of the dam and reservoir contains designated critical habitat for the northern spotted owl, however, the closest critical habitat is approximately 6.5 miles east of the dam.

Oregon Chub

Oregon chub are endemic to the Willamette Valley, residing in warm water off-channel habitats, such as beaver ponds, oxbows, side channels, backwater sloughs, low-gradient tributaries, and flooded marshes. Historical populations occurred throughout the Willamette River Valley, from Oregon City to Oakridge, and included populations the Middle Fork Willamette River. The majority of the current distribution is located in the Middle Fork Willamette River sub-basin, with 14 large, stable populations (Bangs *et al*. 2009). Suitable off-channel habitats usually have slow moving or stagnant water, with silty, organic substrates, and aquatic vegetation for refugia and spawning. Suitable Oregon chub habitat has disappeared as a result of changes in the frequency and magnitude of seasonal flows (NPCC 2004a). Furthermore, the overall loss of channel complexity, reduced extent and lateral connection of the floodplain, the presence of non-native predators, further degrades quality habitats for native fish.

The USFWS listed Oregon chub as *endangered* under the ESA in 1993 (58 FR 53800), with only eight known populations. A recovery plan was published in 1998, establishing the criteria for down-listing and de-listing the species (USFWS 1998). The criteria for down-listing included the management of 10 populations of 500 adults, where all populations exhibit stable or increasing abundance trends for 5 years. In addition, three populations needed to occupy each of three sub-basins: the mainstem Willamette, Middle Fork Willamette, and the Santiam Rivers. In 2007, annual surveys reported there were 38 known populations, meeting the criteria for down-listing. The USFWS changed the classification from *endangered* to *threatened* on April 23, 2010 (75 FR 21179).

The delisting criteria in the recovery plan specified that 20 populations of at least 500 individuals should have stable or increasing abundance trends, with four populations located in each of the three sub-basins, where management was guaranteed in perpetuity. Currently, there are 50 known populations of Oregon chub, of which 19 have stable or increasing abundance trends in the mainstem Willamette, Middle Fork Willamette, Santiam, Coast Fork Willamette, and McKenzie Rivers, thereby meeting the delisting criteria. On February 4, 2013, the USFWS announced a proposal to de-list the Oregon chub and its critical habitat from the endangered and threatened species list. The final rule is currently pending.

Two factors implicating in the decline of the chub include the introduction of nonnative predatory species and the loss of preferred habitat consisting of off-channel sloughs, oxbows, and marshes. In 2010, the USFWS designated 132 acres of critical habitat for the species in Benton, Lane, Linn, and Marion counties, based on the physical and biological features necessary to support large populations (>500 individuals) of Oregon chub (75 FR 11010). In 1996, the ODFW reintroduced a population of Oregon chub into the series of ponds located in the spillway channel below Fall Creek dam (south of the project area, see Figure 4). This population of Oregon chub increased to an estimated 6,310 fish by 1999, and annual population estimates have since varied between 2,790 and 7,777 fish (Bangs *et al*., 2009). No chub were collected in the Fall Creek mainstem downstream of the dam during surveys in 2008 and 2009 (Symbiotics 2010). This area was subsequently designated as critical habitat (Unit 3A, Fall Creek Spillway Ponds) and drains the reservoir's emergency spillway, connecting to Fall Creek 1,900 feet downstream of the project area.

Figure 10: Oregon chub critical habitat in spillway ponds downstream of Fall Creek dam

Bull Trout

Bull trout are native to cold-water systems in the Pacific Northwest and western Canada, where they exhibiting resident and migratory life-history strategies through much of their current range. Resident fish complete their entire life cycle in the tributary stream in which they spawn and rear. Migratory fish spawn in tributaries where juveniles rear for a number of years before migrating to a lake, river, coastal areas, or saltwater environments. Bull trout have more specific habitat requirements (compared to other salmonids), and these habitat requirements influence distribution and abundance. Characteristics of high quality habitat include cold waters free of pollution, stable stream channels, clean gravels for spawning and rearing, abundant structural cover for hiding and resting, and lack of barriers to migration. Bull trout prefer cold water and juveniles typically do not thrive where water temperatures exceed 60˚F. Spawning occurs during early fall (August- October) and juveniles feed on macroinvertebrates until they become more predatory as they mature (USFWS 2010).

Bull trout were historically abundant throughout most of the Middle Fork Willamette River. Development of dams for storage, irrigation, hydroelectric production, and flood control fragmented the bull trout populations, in some cases inundating or blocking access to historic spawning and rearing habitats. Subsequent manipulation of stream flows, including extremely low and high releases from dams, caused changes in channel structure, spawning/rearing gravel, stream temperatures, and water quality that contributed to the extirpation of bull trout from many sub-basins by the mid-1950s. Water temperature in Fall Creek above and below the reservoir often exceeds the tolerance of bull trout.

The Columbia River population of bull trout (including the Willamette River basin) was listed as *threatened* under the ESA in 1998, as a result of widespread habitat loss, hybridization, predation and competition from non-native species (brook trout) (63 FR 31647). More recently, the USFWS

completed a 5-year status review in 2008 and recommended retaining the threatened status as bull trout are currently listed. The Willamette River Recovery Unit encompasses an area of approximately 19,312 square miles and includes the Upper Willamette River area (inclusive of the Middle Fork Willamette River and the Fall Creek watershed) and the Clackamas River. Currently, bull trout are only found in the upper portion of the Willamette basin, in the McKenzie and Middle Fork Willamette River basins; historically, populations also occupied the Santiam and Clackamas Rivers.[9] Currently, local populations include the mainstem McKenzie River, Trail Bridge, South Fork McKenzie River, and the Middle Fork Willamette River above Hills Creek Dam. While bull trout historically occurred in the Fall Creek watershed, they are currently believed to have been locally extirpated as conditions do not support foraging, migration, or over-wintering habitats.

The USFWS released a draft recovery plan for bull trout in 2002, identifying recovery actions across the species range and provided a framework for implementing recovery actions. A revised draft plan for the coterminous population of bull trout was released in 2014, updating the recovery criteria original proposed in 2002 and focusing on the effective management of threats while de-emphasizing specific target population numbers in specific areas (USFWS 2014). The status review in 2008 identified connectivity, habitat loss and fragmentation, interaction with non-native species, incidental catch from recreational fishing and a lack of forage fish (anadromous salmon and steelhead) as the most crucial threats affecting the recovery of bull trout. Six recovery units were identified in the 2014 draft plan, reflecting geographical considerations and genetic analysis. Four local populations of bull trout in the Upper Willamette River basin re included in the Coastal Recovery Unit, and these populations are exposed to a greater risk of extinction because of their small population size and physical isolation by dams. Dams act as barriers preventing gene flow between local populations above and below dams throughout the Willamette Valley. Many dams lack volitional upstream passage, so any individuals which survive passage through the dams is genetically lost to the local populations above the dam (USFWS 2002).

The USFWS designated approximately 3,828 miles of streams and 143,218 acres of lakes in Idaho, Montana, Oregon, and Washington as critical habitat for bull trout in 2005 (70 FR 56212). In Oregon, 939 miles of streams are designated as critical habitat, with 111 miles located in the Willamette River basin. The Upper Willamette River critical habitat unit (Unit 4) includes the Fall Creek watershed, however only the McKenzie and Middle Fork Willamette Rivers are designated as critical habitat streams (USFWS 2010).

3.3. Social Resources

3.3.1. Cultural and Historic Sites

At the time of Euro-American contact, the Kalapuya occupied the Willamette Valley from Oregon City to the Umpqua River. Kalapuya subsistence focused on hunting, fishing, and gathering on a bi-seasonal subsistence pattern. Important plant resources included camas, wapato, tarweed, and acorns, and other roots, nuts, berries and seeds. Deer and other game were also important and were supplemented with salmon, steelhead, Pacific lamprey, and other fish taken from rivers and streams. During the winter, Kalapuya bands would congregate in villages consisting of semi-subterranean or earthen houses, but they would separate into smaller groups in the summer. The Kalapuya manufactured a variety of stone, wood, and bone tools and woven baskets (Byram and Purdy, 2008).

[9] The USFWS and ODFW experimentally reintroduced into the Clackamas River in 2011; this population is geographically isolated from the population in the upper Willamette River basin and to date no individuals from the Clackamas population have moved into the mainstem Willamette River.

The Molala resided in valleys and upland of the Cascade Range between the Columbia River and Klamath Lake, and possibly occupied the Fall Creek area during the winter months. The Molala spoke a different language than the Kalapuya, but like the Kalapuya, they gathered valley resources, such as camas, acorns, and berries, and hunted game. The Molala also were known as traders, and access to obsidian sources in their traditional territory provided them with an important trade material (Byram and Purdy, 2008). The project area has been inventoried for archeological resources, and one prehistoric archeological site was identified (Cole 1968). Archeological testing conducted in 2009 confirmed the presence of buried archeological deposits (Purdy *et al*. 2009).

Fur trappers were the first European Americans to explore the Willamette Valley arriving around 1811. However, formal settlement of the region did not begin until the 1840s with the establishment of farms along rivers and streams. Several Donation Land Claims in the 1850s and the passage of the Homestead Act in 1862 resulted in further settlement of the region. In the vicinity of the proposed fish collection facility, farming and the timber industry were the primary economic ventures into the early twentieth century (Byram and Purdy, 2008). In 1933, the Willamette River Waterways Association was created, leading to the development of the Willamette Valley Project dams throughout the Willamette River Basin. Federal funding for Corps assistance was provided for by the Flood Control Act of 1936.

The Corps began construction of Fall Creek Dam for flood control purposes in 1964 and completed the Fall Creek dam in 1966.[10] The dam represents the Corps' second phase of multi-purpose dam development in the Willamette River Basin. The Corps has determined Fall Creek as eligible for the National Register of Historic Places under criterion A for Conservation; the retention structure works in concert with other Corps-built and managed dams within the Willamette River Basin to safeguard lives and property from heavy winter rains and flooding, and augments overall basin goals to improve wildlife habitat, as well as provide large water bodies for recreation. Fall Creek Dam also merits eligibility under the areas of Biology and Engineering (criterion C). The dam's mostly intact fish collection and juvenile fish passage facility (fish horns) is a benchmark in the history of migratory fish management, and expresses mid-nineteenth century science regarding the best measures to rectify harm posed to fisheries and aid the healthful movement of salmon, trout, and other fish above and below the dam. Fall Creek is the best remaining example of this type of fish passage among the Willamette dams, since the other period examples at Green Peter and Cougar dams have either been removed or altered. The lack of success demonstrated by the fish horn system in passing juvenile fish led to the redesign of contemporary fish passage measures that are being implemented throughout the Pacific Northwest.

3.3.2. Socio-economics

The Middle Fork watershed supports the economy of the Willamette Valley and more widely, Oregon, due to its natural resources. Timber harvest, agriculture, industrial and urban development, dispersed recreation use (fishing, hunting, sightseeing, etc.), and the generation of clean water for downstream beneficial uses, including drinking water and fish and wildlife are many of the economic features present in the Middle Fork Willamette River sub-basin. Water storage and the amount and timing of water flow from the Corps' dams also greatly affect local communities and the people who travel to the area to recreate.

Incorporated cities in the Middle Fork Willamette River sub-basin include portions of south Springfield and Pleasant Hill, Lowell, Westfir, and Oakridge; unincorporated communities include

[10] http://www.nwp.usace.army.mil/Portals/24/docs/pubs/pamphlets/FallCreek.pdf

Jasper, Fall Creek, Trent and Dexter. Population data for incorporated cities in the sub-basin are shown in Table 6.

Table 6. Population Data for Incorporated Cities in Project Vicinity

City	2000 Population	2010 Population	Population Change 2000-2010	Percent Change 2000-2010
Lowell	880	1,045	165	19%
Westfir	280	253	-27	-10%
Oakridge	3,172	3,205	67	2%

Source: Cia 2006; US Census 2012

The City of Lowell is approximately 20 miles southeast of Eugene and borders the north shore of Dexter Lake (approximately 3 miles southwest of the project area). According to the Lane Council of Governments (LCOG 2000), the majority of workers living in Lowell commute to the Eugene-Springfield area. The major route to the city is on Interstate 5 by way of Highway 58, passing Dexter and Pleasant Hill. Highway 58, a major freight route, continues past Lowell, southeast through Oakridge, and later intersects with Highway 97 in central Oregon. Employment in Lowell is largely provided by the U.S. Forest Service, two manufacturers, the high school, and several small retailers. Employment oriented around forestry and forest products has declined in recent years, and small independently-owned businesses have grown. Specialty agriculture also has growth potential for the local economy. Lowell enjoys ready access to water-oriented recreational such as boating, fishing, swimming, and kayaking (LCOG 2000).

The City of Westfir is located in the forested hills along the western slopes of the Cascade Mountains approximately 20 miles southeast of the project area. The small residential community centers on the North Fork of the Middle Fork Willamette River, which flows through town before converging with the Middle Fork Willamette. Surrounded by the Willamette National Forest, the area has historically supported the wood products industry and now supports expanding recreational activities. Highway 58 links Westfir to the Eugene-Springfield area about 40 miles to the northwest, and to the City of Oakridge about 5 miles to the southeast. Travel to Oakridge or to Eugene-Springfield is necessary for access to goods, services, and jobs. Most Westfir residents are employed in manufacturing, agriculture/forestry/fisheries, retail, or construction trades. The largest employers in the area are the Oakridge/Westfir School system and the U.S. Forest Service (LCOG 2000b).

The City of Oakridge is located approximately 5 miles east of Westfir, Oregon, and borders the Middle Fork Willamette River. Hills Creek Reservoir lies just south of Oakridge, and Salt Creek Falls (the second highest waterfall in Oregon) is 16 miles east on Highway 58. State Highway 58 links Oakridge to points east, including the Willamette Pass ski area and State Highway 97 and points west including Interstate 5 and the Eugene-Springfield area. The Aufderheide National Scenic Byway links the Oakridge area with the McKenzie River corridor and the Three Sisters Wilderness Area (LCOG 2000c). Oakridge serves as the basic services center for residents of Westfir and surrounding rural areas. The main industries include manufacturing, retail, agriculture, forestry, fisheries, and construction. The largest manufacturers are Armstrong Wood Products, Oakridge Sand and Gravel, Davidson Construction, and Diamond Traffic Products. The largest local employer is School District 76 (LCOG 2000c).

An evaluation was conducted to determine the presence of Environmental Justice/Title IV Populations within the Fall Creek watershed. The EPA's "EJview" tool was used for this evaluation and the results from the 2010 U.S. Census indicate environmental justice populations are distributed throughout the watershed. According to the census block-group, there are between 0 and 40 persons per square mile in the Fall Creek watershed, which is entirely rural. Between 10 and 20 percent of

the population is below poverty, and less than 10 percent of the overall population are of minority descent. Seniors and disabled persons, in addition to households living below the federal poverty line are present throughout the watershed. The per capita income of the census tract encompassing the Fall Creek watershed is $16,000 to $26,000. These results demonstrate that while the area is not densely populated, some environmental justice communities are distributed throughout the Fall Creek watershed.

3.3.3. Recreation

The 1,582 acre Fall Creek Lake has 22 miles of forested shoreline and is a popular destination for fishing, boating, kayaking, water skiing, swimming, camping and picnicking. The Corps prioritizes reservoir management during the summer to support recreational opportunities, which also provide a major socio-economic resource for the area. The area has a moderate level of recreation facilities with two public day-use areas operated by Lane County and a campground operated by the Corps. Public recreation areas average nearly 270,000 visits annually (Willamette Basin Reservoir Study 1999), and campgrounds are generally used to full capacity on summer weekends when the reservoir water level is up and the boat ramp and swim areas are functional. During these times, boating demand can push Fall Creek reservoir's physical capacity (OPRD 2006). Consequently, the lake has a low drawdown priority for augmenting stream flows on the mainstem Willamette River in the summer, reflecting its relatively high priority for recreation. Fall Creek has high capability for future expansion of camping and other recreation facilities. The ODFW uses Fall Creek reservoir as a rearing facility for spring Chinook salmon. Some bank fishing occurs above the dam where access is available, however, in the vicinity of the project, most occurs downstream of the project.

3.3.4. Aesthetics

Fall Creek Reservoir is noted as being somewhat visually isolated among the surrounding wooded foothills. The shoreline is mostly undeveloped, with the exception of the existing park facilities. In the immediate project area, lands and views have been disturbed, as Fall Creek dam is almost a mile long and visible from local roads and informal points along the river downstream. In addition to the existing dam, other existing facilities, such as the outlet works, a stilling basin, and other Corps facilities are visibly present. The Corps' facilities include the gravel parking area and several buildings, all of which are fenced and gated to prevent public access.

The reservoir annually experiences a dramatic change in visual character as the reservoir is drained to facilitate fish passage and accommodate the winter flood season. The drawdown begins in late summer (September) and gradually exposes a lakebed, rendering most of the access facilities inaccessible during the winter.

Plant communities at the parks around the reservoir include mixed upland forests, which are mostly dominated by conifer species. Small, remnant oak woodlands are present near the dam and many of the forest communities reflect disturbances that occurred during reservoir construction and logging. Some natural forests remain in good condition (preserved largely as a result of the Corps and other public ownership and management policies), albeit most are somewhat isolated between the reservoir and the adjacent upland areas which are privately managed for commercial timber production (OPRD 2006).

3.3.5. Land Use

The Willamette Basin is the largest river basin encompassed within Oregon, and supports approximately 70 percent of the state's population. The river valley is agriculturally productive and sustains 16 of the largest 20 cities in the state. The Fall Creek watershed is dominated by federal

and private forests and some agriculture (see Figure 11 and Figure 12). Land use in project area is predominantly forest, farms, parks or recreational areas, and rural residences. Implementation of the Preferred Alternative would occur on lands owned (in entirety) by the Corps, which Lane County has designated as "forest" (see Figure 12).

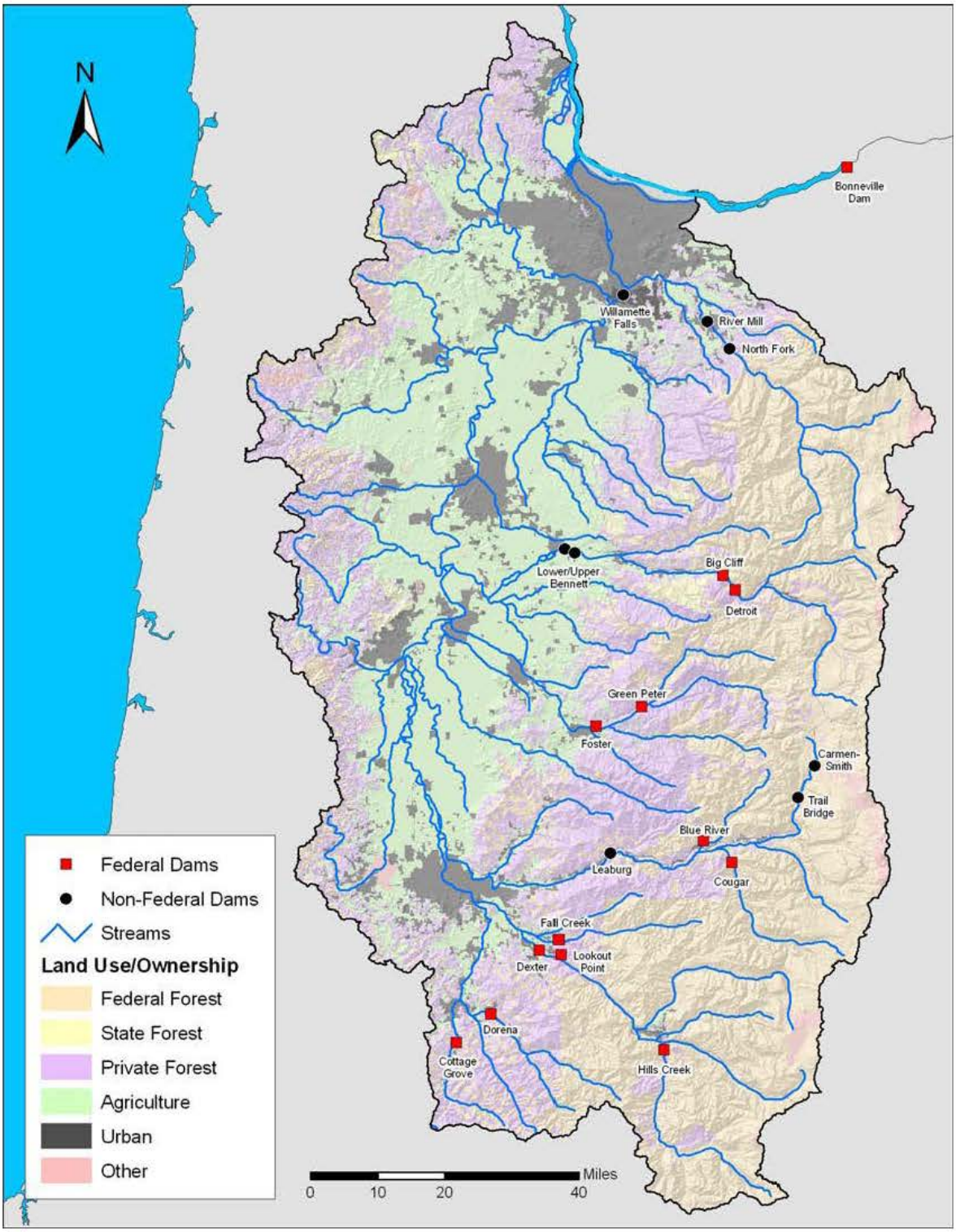


Figure 11: Land use and flood control/hydropower infrastructure in the Willamette Basin, courtesy of the Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead.

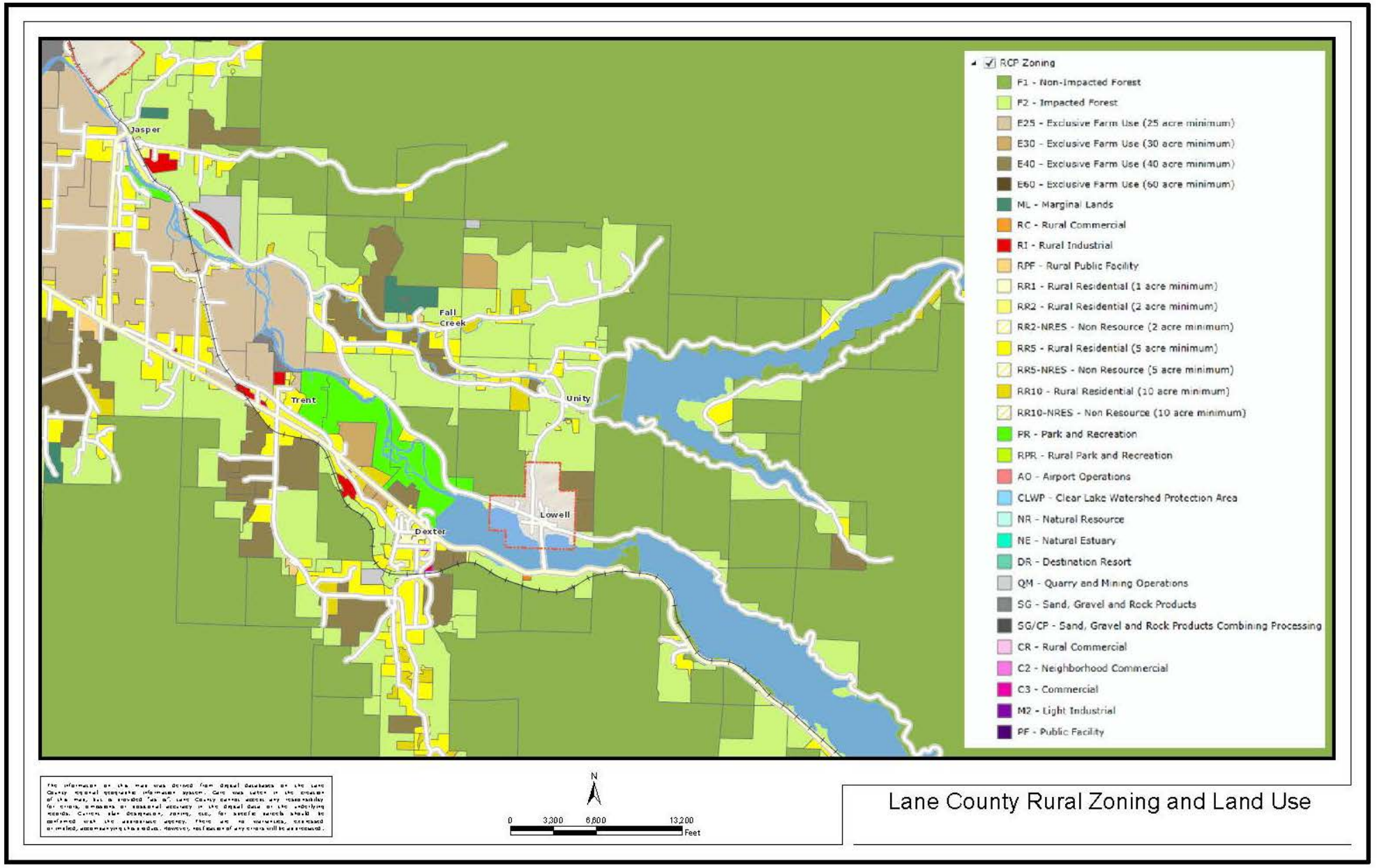


Figure 12: Land use categories in Lane County near project area, courtesy of Lane County's Land Management Department, using the Zone and Plan Map viewer.

4. ENVIRONMENTAL CONSEQUENCES

Potential impacts on the environmental resources discussed above in Chapter 3 were analyzed for each of the alternatives presented in Chapter 2 (the No Action Alternative and the Preferred Alternative). These effects described at length below.

This section also describes the expected impacts with respect to the overall context and intensity the proposed action would have on each of the above listed resources in the Fall Creek watershed. In addition, effects are categorized as either direct or indirect, where direct effects occur at the same time and in the same place as the action; or where indirect effects occur later or at a location away from the action. Cumulative effects, which are additive and include those effects which occur in the past, present, and reasonably foreseeable future, are discussed at the end of this section.

4.1. Physical Processes

4.1.1. Geology and Soils

The stream banks within the project area vary from a 10- to 60-percent slope as described for the Ochrepts and Umbrepts complex soils, and they are highly erodible. Areas observed downstream from the tailrace of Fall Creek dam, however, are well vegetated, and the stream banks have little or no erosion. About 150 to 200 feet downstream of the existing stilling basin is lined with large riprap to stabilize the stream banks. Areas surrounding the Fall Creek reservoir are heavily forested, and some areas have been developed for recreational use. Very little, if any, large-scale slumping is occurring at the proposed project site.

No Action Alternative

Under this alternative there would be no new work proposed. The current geology and geologic process would remain the same, and the project area would experience no direct or indirect changes from the present operation of the fish facility.

Preferred Alternative: At-Grade Fish Facility

The Preferred Alternative would require excavation, whereas the No Action Alternative requires none. The area immediately to the west of the existing fish facility would be excavated for footings and a concrete pad would be required for the operations building. Some excavation would be necessary in the unpaved area immediately to the west of the existing pavement. The elevated berm in this area would be removed, which is side-cast material from construction of the dam and the existing fish facility.

Total excavation and general construction disturbance under this alternative would equal be approximately 1 acre, much of which is currently paved or disturbed as part of the existing fish facility. Excavated material would not be disposed in waters of the United States, including wetlands. Instead, materials would be transported to existing commercial quarries in the area which may accept excess material and supply structural fill as required. The contractor would be required to provide proof of evidence that selected quarries are permitted for site use and placement of excavated materials.

Direct impacts to geology and soils would be minor, as these would be limited to construction activities and much of the project area was disturbed during the original construction of the dam and fish facility. Construction related effects are expected to be short-term in duration and temporary in nature. All soils would be stabilized prior to completion of construction, and no indirect effects

would occur as a result of operating the fish facility. All areas used for staging and stockpiling of construction materials would occur in areas previously disturbed and maintained onsite by the Corps for materials storage.

A new access road would be constructed to connect the existing roadway to the fish ladder and collection facility to facilitate the transport of fish to upstream spawning sites. Some excavation would occur in association with road construction, and the road would be a permanent feature in the project area amounting to approximately 0.05 acre of disturbance. Much of the area is previously disturbed from construction of the existing fish facility. The location and placement of the road would be designed to minimize adverse effects to the project area.

4.1.2. Hydrology and Hydraulics

Under current operations, the reservoir is drained to its lowest elevation during the fall and winter months to accommodate fish passage and provide storage capacity for the flood season. Dam operations would not change under either of the alternatives considered.

No Action Alternative

Under the No Action Alternative, no construction work would occur. There would be no changes to dam operations, reservoir regulation, or water supply via the fish horns. The project area would remain unchanged and there would be no direct or indirect effects to the hydrology and hydraulics of Fall Creek or current dam operations. Natural flows and reservoir releases would remain consistent with the current peaks and minimums.

Preferred Alternative: At-Grade Fish Facility

The existing fish collection facility would be operated during construction of the Preferred Alternative, and dam operations would not change to accommodate construction of the new facility. Construction would occur when the existing facility is shut down annually (mid-October to mid-March), eliminating the need to alter water supply or dam operations to accommodate construction activities. In addition, construction of the facility would not change the movement of water across the project area or impact the flow in Fall Creek. The new fish facility would utilize the existing gravity-fed water supply system and local hydrology would not change.

Flow that is currently diverted into the facility would continue to be routed into the existing auxiliary water system supply pool and used to augment entrance attraction flow. Therefore, implementation of the Preferred Alternative would have no direct or indirect effects on the hydrology or hydraulics of Fall Creek or the dam/reservoir.

4.1.3. Water Quality

As described above, the Middle Fork Willamette River and some of the tributaries do not meet the ODEQ water quality standards for some parameters. Fall Creek has been identified as water quality limited for temperature, both above and below Fall Creek Dam. Specific water quality parameters of concern include turbidity and suspended sediments. A high concentration of suspended sediments can injure aquatic organisms, reduce primary and secondary production due to increased turbidity, and alter migration patterns of some fish species. High levels of suspended sediments are also known to smother salmon redds.

No Action Alternative

Under the No Action Alternative, no work would occur and water quality conditions would be the same as under current operations. There would be no direct or indirect effects of the No Action

Alternative, and water quality would remain limited for temperature. Existing regulations which limit source pollution are expected to continue into the future. Water quality trends are not expected to change under the No Action Alternative.

Preferred Alternative: At-Grade Fish Facility

The operation of construction equipment requires use of fuel and lubricants that could harm aquatic organisms if spilled into the river. Implementation of best management practices (BMPs) to avoid and minimize impacts to water quality from construction activities would be required by the Corps' contractor. Concentrations of DO, nutrients, mercury, and bacteria would not measurably increase or decrease in response to construction and operation of the fish facility. Construction and operation of a new fish facility would have negligible impacts on temperature, pollutant loads, and other water quality parameters when compared to the current conditions described above in Section 3.1.3.

Any construction impacts would be temporary and of short-term duration, and in-water work would be timed to coincide with the IWW window. Adverse effects to water quality would be muted against background levels in the RO channel. Any increases in turbidity and/or suspended sediments from in-water construction and removal are expected to be minor and of short-term duration. In order to minimize turbidity and suspended sediments in Fall Creek during construction, stormwater would be controlled via an erosion and sediment control plan, which would be developed prior to the start of construction. Disturbed work areas would be mulched and unused material stockpiles would be covered to reduce runoff during rain events. Sediment and erosion control measures would be renewed until permanent vegetation and/or other control measures are effective following construction. Water quality would be monitored during construction to ensure water quality standards are not exceeded and construction-related impacts do violate permit conditions.

As described in the project description above, a rain garden would be constructed as a component of the Preferred Alternative to handle stormwater and other drainage from the site. The swale would be planted with native vegetation to slow water and filter sediments via infiltration into the ground. An overflow mechanism would be included as part of the rain garden, directing flows into the RO channel during high rain/flood events. Vegetation would help to mitigate stormwater pollutants through absorption, improving out-flowing water quality and minimize the overall long term impacts from post-construction operation and maintenance of the facility.

As a result, there would be no long term indirect impacts to water quality and all construction related impacts would results in temporary direct effects to water quality. Similar to the effects from implementing Alternative A, turbidity and suspended sediment loads may increase slightly during construction, but the effects on overall water quality would be muted against existing conditions and these effects would be inconsequential.

4.1.4. Air Quality, Noise

Existing air quality and noise pollution of the project area, and across Lane County, is considered very good. While some increases in air pollution occur during periods of air stagnation, Lane County in its entirety is in attainment with the federal ozone standards for particulate matter.

Ordinances exist for sensitive areas or a public right-of-way where noise which exceeds 50 dBA throughout nighttime hours or 60 dBA during the day.

No Action Alternative

Under the No Action Alternative, no construction activities would occur. The existing fish facility would continue to operate under current conditions and there would be no direct or indirect effects to air quality or noise standards under this alternative.

Preferred Alternative: At-Grade Fish Facility

Impacts to air quality and noise standards would be primarily due to construction activities. There would be a small, localized reduction in air quality via the generation of greenhouses gases (CO_2) due to emissions from construction equipment. There would also be localized increases in noise levels from construction equipment. However, these impacts would be minor and temporary in nature and would cease once construction is completed. Operation of the new fish facility would not be different or greater than noise emitted during operation of the existing facility under the No Action Alternative. Similarly, regional air quality would not be impacted from long term operation of the upgraded facility compared to the existing facility. Limited security lighting would be used at the facility, however all lighting would be covered to direct light downward and away from areas exposed to the fish ladder.

As a result of these impacts, there would be minor direct impacts to air quality and noise pollution during construction. The long term operation of the fish facility would have minor indirect impacts on regional air quality and noise pollution. Operation of the fish facility would not exceed noise ordinances; there would be no effect (beneficial or adverse) to air quality from the long term operation of the facility.

4.2. Biological Resources

4.2.1. Vegetation

Vegetation in the immediate vicinity of the project area includes Douglas fir forests, riparian communities, and low functioning wetlands.

No Action Alternative

Under the No Action Alternative, there would be no changes to riparian areas or vegetation along Fall Creek or its watershed. No water would be diverted from the creek, and as a result there would be no changes to downstream habitats. Flows would remain consistent with the current peaks and minimums, to which the vegetative resources are adapted to normal seasonal variations.

The structure and function of these habitat features would not change in response to implementing the No Action Alternative. Therefore, there would be no direct or indirect effects from this action.

Preferred Alternative: At-Grade Fish Facility

Construction of the facility under the Preferred Alternative would result in direct impacts to vegetation but would not result in long term indirect impacts when compared to the No Action Alternative. The fish facility would be constructed in the vegetated area west of the existing facility where less than 1 acre of vegetation (trees, shrubs, grasses, invasive weeds) would be removed for construction of the new facility. Mature trees would be avoided to the extent practicable, but some trees would be removed from the berm to accommodate the new facility. In response, trees would be planted elsewhere on-site to replace lost habitat and improve shade conditions of the creek channel to benefit fish and wildlife.

All areas disturbed during construction for equipment staging and the new facility would be replanted with an appropriate native vegetation mix as the end of construction. Sterile seed would be

mixed with an erosion control fiber mulch to protect cut slopes and disturbed areas until native vegetation could be established. Vegetation would be planted to minimize leaves and branches from blowing into the fish ladder and pools, creating a potential maintenance issue.

As described in the project description, a rain garden would be constructed as a component of the Preferred Alternative to handle stormwater and other drainage issues from the site. The swale would be planted with native vegetation to slow water and filter sediments before draining into the RO channel, increasing the coverage of vegetation relative to current conditions. Vegetation would also help absorb stormwater pollutants and improve out-flowing water quality, minimizing the overall long-term impacts from operation and maintenance of the facility. Sterile native seeds would be used to control erosion until permanent vegetation is established.

As a result of these measures, while the direct effects to vegetation would include the removal of some trees, shrubs and grasses where the facility would be constructed, replanting areas with native vegetation and planting additional trees near the RO channel would enhance the composition of native species diversity, resulting in a net benefit to vegetation. Relative to the No Action Alternative, the long-term operation of the fish facility under the Preferred Alternative would have no adverse effect on the structure of vegetation or its function in providing habitat for the area's fish and wildlife.

4.2.2. Wetlands

A narrow, linear wetland (approximately 0.02 acres) was identified in the roadside ditch north of RO Road. The wetland is approximately 90 meters north of the existing facility. Wetland hydrology is artificially supported from a black pipe outlet (approximately 6-inch) and a white pipe outlet (approximately 2-inch), which drain upslope hills.

No Action Alternative

Under the No Action Alternative, there would be no changes to the existing wetland at the Fall Creek fish facility. The existing hydrology, vegetation, and soils would not change from existing conditions, and the existing ditch-wetland would maintain its existing footprint.

The functional value of the wetland would not change in response to implementing the No Action Alternative, and as a result, there would be no direct or indirect effects from this action to wetlands in the project area.

Preferred Alternative: At-Grade Fish Facility

Construction of the fish facility under the Preferred Alternative would not result in direct effects to the wetland located in the project area. While additional ground disturbance and excavation would occur as compared to the No Action Alternative, the wetland would be flagged and avoided during construction. Sufficient space is available for construction equipment and staging to avoid impacting the wetland. Much of project area and the berm west of the existing facility is previously disturbed and currently covered in non-obligate grasses and forbs. Drainage in the wetland area would not be altered by the construction, and soil chemistry would also not be impacted. Consequently, there would be no direct effects to wetlands in the project area from implementation of the Preferred Alternative, and the wetland would retain its functional value similar to existing conditions. No changes would occur as an indirect result of project construction.

The rain garden constructed to manage stormwater from the project area and water discharged during truck loading may function as a wetland as vegetation and soil characteristics develop over time. As the rain garden develops into a wetland feature, the spatial extent and functional value of wetlands in

the project area could increase, resulting in beneficial indirect effects to wetlands under the Preferred Alternative as compared to the No Action Alternative.

4.2.3. Fish and Wildlife

As describing in Section 3.2 above, common wildlife species in the Fall Creek area include 75 mammals, 15 reptiles, 20 amphibians, and more than 200 birds (Noyes *et al*. 1985).

No Action Alternative

Under the No Action Alternative, there would be no changes to fish and wildlife use of the project area. No vegetation would be disturbed or removed via construction and the existing fish facility would continue to handle native and non- native fish. Adult salmonids migrating upstream would continue to experience injury and stress from navigating the existing fish facility, leading to pre-spawn mortality in upstream reaches after release. Nesting songbirds would not be impacted by the operation and maintenance of the fish facility. In addition, there would be no changes to aquatic and terrestrial habitats associated with the No Action Alternative. Consequently, there would be no effects to fish, reptiles and amphibians present in the project area, including the northwestern pond turtle, western painted turtle, native warm-water fishes, or the northern red-legged frog.

Preferred Alternative: At-Grade Fish Facility

There would be some negligible direct effects to fish and wildlife or their habitats from implementing the Preferred Alternative. Effects would be short-term and temporary in nature, associated with active construction, in-water work, and ground disturbing activities. Short-term environmental impacts due to construction such as noise, ground disturbance, and increased turbidity would likely cause avoidance behavior by fish and wildlife in the project area. These activities would be temporary and minor in context, lasting only for the duration of the construction. Erosion control and stormwater management plans are incorporated into the project design to minimize impacts to the river and would also function to protect aquatic organisms and habitats.

In-water work would be limited to the IWW window as specified by ODFW (July 1st to August 31st). While both osprey and bald eagles are known to nest in the area around Fall Creek reservoir, neither species would be directly impacted by implementation of the Preferred Alternative. Due to the construction schedule and IWW windows, construction activities could occur on some component of the proposed facility year-round. However, because these birds nest several miles away from the project area, there would be no direct impacts to nesting eagles and osprey as a result of implementing the Preferred Alternative.

Upland wildlife species may be temporarily displaced during construction where vegetation is removed for site preparation. However, trees and vegetation would be replanted following construction, replacing lost or damaged habitat. There would temporary adverse impacts to fish and wildlife during construction, as areas are disturbed, removed, or become unsuitable due to the immediate habitat conditions (turbid, noisy, frequent human presence, etc.). However, these effects would be temporary in nature and last only for the duration of construction.

Post-construction operations and maintenance of the facility would not result in long-term effects to fish and wildlife, as the operations and maintenance of the upgraded facility would be similar to the No Action Alternative. Furthermore, the upgraded facility constructed under the Preferred Alternative would improve passage conditions for native and non-native fish, whereas individuals would continue to sustain injuries during passage and handling under the No Action Alternative.

4.2.4. Threatened and Endangered Species

Juvenile and adult UWR Chinook salmon and steelhead are present in the project area, and adults of both species are transported upstream for spawning. However, as described above, Fall Creek is designated as critical habitat only for UWR Chinook. The watershed upstream of the dam and reservoir contains designated critical habitat for the northern spotted owl, however, the closest critical habitat is approximately 6.5 miles east of the dam. The nearest known owl pair is adjacent to the Cascara Campground in the upstream-most section of the reservoir. While bull trout historically occurred in the Fall Creek watershed, they are currently believed to have been locally extirpated as conditions do not support foraging, migration, or over-wintering habitats. The ODFW reintroduced a population of Oregon chub into the series of beaver ponds below Fall Creek dam and this area is designated as critical habitat (see Figure 4).

No Action Alternative

Under the No Action Alternative, upstream fish passage would continue to occur via the existing fish facility. Passage through the existing facility induces stress and injury to adult UWR Chinook salmon and steelhead, influencing survival and spawning success following out-planting at upstream spawning sites. For this reason, the No Action Alternative would directly result in adverse effects to adult Chinook and steelhead as they navigate the existing fish facility, indirectly contributing to declines observed in Chinook and steelhead populations and their recovery. For these reasons, the Corps has determined the No Action Alternative ***may affect, and would likely adversely affect*** UWR Chinook salmon and their critical habitats. Similar, steelhead (which not formally listed in the project area) would also be adversely affected under the No Action Alternative.

The No Action Alternative would not change the physical, chemical, or biological habitats important to fish and wildlife, and as such, current conditions would remain the same. No construction activities would occur, and consequently upland species would not be impacted by the continued operation and maintenance of the existing collection facility. There would be no direct or indirect effects to northern spotted owls because no individuals are present in the action area; further, the No Action Alternative would not change habitat conditions in which owls forage. As a result, the Corps has determined there would be ***no effect*** to northern spotted owls, or the critical habitat necessary to support them as a result of implementing the No Action Alternative.

Habitat conditions in the project area do not support suitable habitat criteria for bull trout or Oregon chub. The No Action Alternative would have no effect velocities or temperatures in the mainstem Fall Creek channel below the dam, which are respectively needed to support Oregon chub and bull trout. As a result, it is highly unlikely that either bull trout or Oregon chub would be present in the project area. Consequently, the Corps has determined there would be ***no effect*** to bull trout or Oregon chub, or their critical habitats, under the No Action Alternative.

Preferred Alternative: At-Grade Fish Facility

Upgrading the fish facility would not impact individual northern spotted owls or their critical habitat because no birds are present in the immediate vicinity of the project area. Construction work would occur during the winter season, but may extend into the breeding season during the spring and late summer. However, there would be no direct or indirect effects to northern spotted owls and their critical habitats, because the closest owls nest several miles east of the project area and construction impacts would not affect birds across the reservoir. While the nearby forested areas could potentially be used as foraging or dispersal habitat for young owls, it is highly unlikely given the current level of human activity at the facility and habitat quality of the surrounding forest. For these

reasons, the Corps has determined there would be ***no effect*** to northern spotted owls or their critical habitat as a result of implementing the Preferred Alternative.

Similar to the No Action Alternative, construction of the upgraded fish facility would not change the physical, chemical, or biological habitats important to fish and wildlife, and as such, current conditions would remain the same following completion of the upgraded facility. Water quality and hydrological conditions would continue to limit access and suitability of habitat for bull trout and Oregon chub, wherein temperatures and velocities limit dispersal and occupancy for each species. Implementation of the Preferred Alternative would not change these factors. Therefore, construction of the upgraded fish facility would not result in direct or indirect effects to bull trout or Oregon chub in the project area. The Corps has consequently determined there would be ***no effect*** to bull trout or Oregon chub, or their critical habitats, as a result of constructing the Preferred Alternative.

The effects from implementing the Preferred Alternative are described at length in the NMFS BiOp. Construction and the long-term operation and maintenance of an upgraded fish collection facility would effectively pass, handle, and temporarily hold fish for transport to upstream spawning sites, resulting in overall benefits UWR Chinook and steelhead. Construction activities for the Preferred Alternative would be limited to the immediate project area and the area of impact would be limited to areas previously disturbed during construction of the existing fish facility and parking area, including the berm of side-cast materials west of the existing facility. An upgraded collection facility and water-to-water transport of adult fish would minimize stress and injury and improve upstream fish passage and survival for UWR Chinook and steelhead. While some handling of adult fish would still occur, the extent would be much less than current conditions (the No Action Alternative), minimizing the amount of time fish are out of the water and possible injuries from handling. In-water construction of the facility would result in direct, albeit minor, adverse effects on any fish present in the action area. However, these effects would be minimized through the timing of construction, use of stormwater BMPs, and working within the established IWW window.

While the project area does not support spawning in Fall Creek adjacent to the fish collection facility, the facility facilitates the collection and transport of adult Chinook and steelhead to upstream spawning habitats, thereby supporting spawning in the upstream reaches of Fall Creek and the PCEs for UWR Chinook salmon. Upgrading the fish collection facility would improve collection, handling, and transport conditions for adult salmonids, further benefitting spawning in the watershed. The portion of Fall Creek adjacent to the fish collection facility supports juvenile rearing, but some juveniles passing through the fish horns sustain lethal injuries during out-migration. Upgrading the fish facility would not improve juvenile passage, and would also not degrade rearing habitat in Fall Creek. The fish collection facility facilitates the upstream and downstream migration for adult and juvenile salmonids. The section of Fall Creek adjacent to the collection facility serves as a migratory corridor and is partially lined with riprap and supporting natural vegetation.

An upgraded fish facility would improve fish passage opportunities at Fall Creek Dam for UWR Chinook and steelhead, and additionally facilitate the passage of lamprey and other native species, resulting in long-term beneficial effects for all fish species present in the project area. Compared to the No Action Alternative, the long term effects of a new facility are expected to be beneficial, as upgrading the adult fish collection facility would result in improved passage conditions, leading to increased survival of fish released upstream for spawning.

4.3. Social Resources

4.3.1. Cultural and Historic Sites

There is one known prehistoric archaeological site in the project area. Recent archeological testing for an unrelated project demonstrated intact buried deposits at the site (Purdy, *et al*, 2009). While a formal determination of eligibility (DOE) has not been completed for this archeological site to assess its eligibility on the National Register of Historic Places (NRHP), the Corps currently manages this site as if it were eligible.

Construction of Fall Creek Dam and Fish Facility was completed in 1966, and the facility will be 50 years when construction begins. The Corps is completing a Multiple Property Listing for all of the dams and facilities it currently operates as part of the Willamette Basin Project. As described above, the Corps has determined Fall Creek as eligible for the National Register of Historic Places (NRHP) under criterion A for Conservation. The dam also merits eligibility under the areas of Biology and Engineering (criterion C), as the fish collection and juvenile bypass facility represent a benchmark in the history of migratory fish management.

The Corps is moving ahead with finalizing the Multiple Property Listing and has reached a determination of adverse effects for any construction or alteration to the existing fish facility. The Corps has initiated consultation with the Oregon State Historic Preservation Office (SHPO) and interested Native American Tribes. Through this consultation the Corps has requested the SHPO enter into a Memorandum of Agreement (MOA) to mitigate any adverse effects through agreed upon measures.

No Action Alternative

No construction activities would occur under the No Action Alternative. Until determined otherwise, the Corps would continue to manage the existing archaeological site as if it were eligible for the NRHP. Continued operation of the existing fish facility and Fall Creek dam would not impact this site, and as a result, there would be no direct or indirect effects under the No Action Alternative.

The Corps is completing a Multiple Property Listing for all of the dams and facilities it currently operates as part of the Willamette Basin Project. The Corps has determined Fall Creek as eligible for the NRHP under criterion A and C. Under the No Action Alternative there would be no effect to the Fall Creek Dam and Fish Facility.

Preferred Alternative: At-Grade Fish Facility

The existing archaeological site would be avoided during all ground disturbing activities during construction of the fish facility, per Preferred Alternative. Construction disturbances would be primarily to the existing fish facility, parking area, and the berm west of the existing facility. The berm is disposed materials from the original construction of the dam and fish facility, and this area is not expected to contain cultural or historic resources.

The Corps is completing a Multiple Property Listing for all of the dams and facilities it currently operates as part of the Willamette Basin Project. The Corps has determined Fall Creek as eligible for the NRHP under criterion A and C. The Corps is moving ahead with finalizing the Multiple Property Listing and has reached a determination of adverse effects for any construction or alteration to the existing fish facility. The Corps has initiated consultation with the SHPO and interested Native American Tribes. Through this consultation the Corps has requested the SHPO enter into a MOA to mitigate any adverse effects through agreed upon measures.

4.3.2. Socio-economics

Regional socio-economics are a factor of population size, the economy, and other indicators of social well being. The existing fish facility and its operation are isolated from surrounding communities and are not accessible to the public for security reasons.

No Action Alternative

No changes to existing socio-economic resources would occur by implementing the No Action Alternative, resulting in no direct or indirect effects to the socio-economics of the region. Recreational opportunities of the reservoir draw visitors to the area, and this supports small businesses in the surrounding communities.

Operation of the existing fish facility does not involve discharges of pollutants or contaminants, and no detrimental human health side effects occur as a result of the existing facility. The continued maintenance of the project area would not negatively affect property values in the area or socially stigmatize local residents or businesses. No interference with local Native American Nation's treaty rights would result from implementing the No Action Alternative. All construction activities would be coordinated with local tribes so as not to physically interfere with tribal resources.

Implementing the No Action Alternative would not result in a disproportionately high or adverse effect on minority populations or low-income populations (i.e. environmental justice communities). The continued operation and maintenance of the existing facility would not result in any direct or indirect impacts to socio-economics in the area, as no additional jobs would be created or lost as a result of operating the dam, reservoir, or fish facility. Utilities and public services in the area are not impacted by operation of the existing fish facility, and no changes are expected to occur as a result of the long term operation and maintenance of the facility.

Preferred Alternative: At-Grade Fish Facility

Effects to socio-economic resources would occur by implementing the Preferred Alternative. Job growth and population trends in the surrounding communities would be maintained, wherein the reservoir would continue to provide recreational opportunities which draw visitors to the area. Construction activities would result in jobs being resourced locally, and construction would occur over a relatively short timeframe, during which businesses in the surrounding communities would experience a temporary increase in economic benefits. Commercial use of the adjacent forests would continue to support timber harvest, further supporting the local economy similar to existing conditions.

Operation and maintenance of an elevated fish facility would not discharge pollutants or contaminants, and no detrimental human health side effects would occur as a result of implementing the Preferred Alternative. The continued maintenance of the project area would not negatively affect property values in the area, or socially stigmatize local residents or businesses. No interference with local Native American Nation's treaty rights would occur, and all construction activities would be coordinated with local tribes so as not to physically interfere with tribal resources.

Construction of an upgraded fish facility would not result in a disproportionately high or adverse effect on environmental justice communities. Utilities and public services in the area would not be affected by the long term operation of an elevated fish facility. For these reasons, the long term operation and maintenance of an elevated fish facility would not result in any direct or indirect impacts to socio-economics in the local area.

4.3.3. Recreation

Fall Creek Reservoir is heavily used for recreation, especially boating, swimming, and fishing. The Corps prioritizes reservoir management during the summer to benefit recreational opportunities and support local economics.

No Action Alternative

No changes to existing conditions would occur by implementing the No Action Alternative. The reservoir would continue to provide recreational opportunities, and no public access would be granted to the existing fish collection facility. The continued operation and maintenance of the facility would not result in any direct or indirect impacts to recreation in the area.

Preferred Alternative: At-Grade Fish Facility

Constructing an elevated fish facility would result in no direct or indirect impacts to recreational opportunities in the project area. The Fall Creek reservoir would continue to provide opportunities for boating, swimming, and fishing, similar to existing conditions. Construction activities would occur when seasonal use is lowest, and no public admission to the project area would be allowed (similar to current conditions).

The long term operation and maintenance of the facility would not result in any impacts to recreation, and no changes to the dam and reservoir operations would occur. Consequently, no indirect impacts to recreation would occur as a result of implementing the Preferred Alternative.

4.3.4. Aesthetics

Fall Creek Dam is a rock filled embankment, 205 feet high and 5,050 feet long (Figure 13). At almost a mile in length, the dam structure presents an imposing presence readily visible from downstream viewpoints. The regulating outlets consist of two rectangular gates and a primary and secondary stilling basin separated by a concrete wall. The Corps facilities include a fish collection facility, gravel parking area, and several buildings which are enclosed by a security fence to prevent public access.

No Action Alternative

No changes to the aesthetic value of Fall Creek Dam would occur by implementing the No Action Alternative. The dam and reservoir would not be visually altered during construction of the facility. The reservoir would continue to provide recreational opportunities during the summer, and dam operations would lower the lake elevation during the winter to provide fish passage during the winter flood season. The continued operation and maintenance of the existing fish facility would not result in any direct or indirect impacts to aesthetics in the project area. Under current conditions, the facility is closed to the public and access is restricted.

Preferred Alternative: At-Grade Fish Facility

Upgrading the current facility would result in no impacts to visual aesthetics in the project area. Construction of project features would be situated at or near the toe of the dam structure, immediately downstream of the dam, and these actions would pose little (if any) adverse impacts on visual resources. The Fall Creek dam and reservoir would not be altered during construction, and activities would be limited to the fish horns, existing fish facility, and the berm west of the existing facility. While the visual aesthetic of the existing fish collection facility would change, the long term operation and maintenance of the facility would not alter the aesthetical value of the project area, as

no changes to the area's view-shed would occur. Consequently, no indirect impacts to aesthetics would occur as a result of implementing the Preferred Alternative.

Figure 13: Aerial view of Fall Creek Dam

4.3.5. Land Use

As noted above, the major land use in the project area and immediate vicinity is predominantly forest and agricultural. The Fall Creek watershed is largely rural and populated with small towns and communities.

No Action Alternative

Under the No Action Alternative, there would be no construction and no changes to existing land use in the project area. The existing footprint would not change its land use designation and Lane County zoning would not be impacted by the continued and long-term operations and maintenance of the existing facility. Consequently, there would be no impacts to land use in the project area or in Lane County.

Preferred Alternative: At-Grade Fish Facility

Under the Preferred Alternative, the upgraded fish facility would be constructed on lands owned entirely by the Corps, and no land use zones would be changed or altered as a result of construction. Forested areas surrounding the project area would not be impacted and the long-term operations and maintenance of the upgraded facility would not result in subsequent changes to land use designations

or zones in Lane County or the Fall Creek watershed. As a result, there is no effect to land use from implementing the Preferred Alternative.

4.4. Climate Change

Climate is governed by incoming solar radiation and the associated greenhouse effects which influence short-term, seasonal, and long-term weather patterns. Greenhouse gases include (in the order of importance to the greenhouse effect): water vapor, carbon dioxide, methane, nitrous oxide and ozone. Anthropogenic activities, such as the burning of fossil fuels and the clearing of forests, adds additional greenhouse gases to the atmosphere and create a natural sink for carbon dioxide, intensifying natural greenhouse effects, and ultimately altering global, regional, and local climates.

Executive Order 13514 and subsequent guidance from the Council on Environmental Quality (CEQ 2011a and 2011b) led to development of Corps policy and planning documents: the *Climate Change Adaptation Policy Statement* and the *Climate Change Adaptation Plan and Report* (Corps 2011, 2012, and 2013, respectively). The policy states, "mainstreaming climate change adaptation means that it will be considered at every step in the project lifecycle for all projects, both existing and planned . . . to reduce vulnerabilities and to enhance the resilience of our water resource infrastructure." In its *2013 Climate Change Adaptation Plan*, the Corps identified four categories of climate change effects which have the potential to impact its national mission and operations (Corps 2013). These four categories include:

- increasing air temperatures,
- changing precipitation,
- increases in extreme events, and
- sea level change and associated tides, waves, and surges

Climate change is widely recognized as a critical issue with potentially wide-ranging effects on water resources, fish and wildlife species and their habitats, and other natural resources. It has also been suggested that the effects of climate change will exacerbate temperatures; the timing and magnitude of stream flow; habitat loss, isolation and degradation; invasive species; and drought. According to the U.S. Global Change Research Program (USGRP), the average regional air temperatures have increased by an average of 1.5°F over the last century (up to 4°F in some areas), with warming trends expected to continue into the next century (2009). Precipitation trends during the next century are less certain than those for temperature, but increased precipitation is likely to occur during October through March and less during summer, with more winter precipitation falling as rain rather than snow (ISAB 2007, USGCRP 2009).

The effects of climate change in the project area could lead to a change in the timing of precipitation, the extent of snowpack, and rain-on-snow events, all of which culminate in changes to the timing and magnitude of stream flows and water temperatures during the spring and summer months (ISAB 2007, USGCRP 2009). These changes will not be spatially homogeneous across the Willamette River basin, but could influence stream flows during the summer low-flow period. Low-lying areas, which contribute little to total stream flows are likely to be more affected by changing hydrologic conditions at higher elevations. The potential direct and indirect effects of climate change to the No Action Alternative and the Preferred Alternative would be immeasurable. Operation of the fish collection facility (either the existing facility or an upgraded, improved facility) would continue under a wide range of environmental conditions and how the facility is maintained would not be altered in response to changes in the timing or magnitude of stream flows.

4.5. Cumulative Effects

Cumulative effects are defined as, "the impact on the environment which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 Code of Federal Regulations [CFR] § 1508.7). Cumulative impacts can result from individually minor actions, but which can collectively have a measurable impact over a period of time in a specific geographic area. This section analyzes the potential cumulative impacts that may occur following implementation of the proposed fish facility upgrade when considered with other past, present, and reasonably foreseeable actions.

The geographic boundaries and cumulative effects vary for each resource, but the boundary for this analysis has been limited to the Fall Creek watershed and the project area as described in Section 1.1. Analogous to the resources evaluated in Section 3, only those resources which could reflect a measurable, cumulative impact in the Fall Creek watershed were evaluated in this analysis. Resources excluded from analysis include: geography and geology, topography, and sediment quality. Furthermore, this analysis uses the same measurable threshold(s) to assess the social and environmental impacts for the No Action Alternative and the Preferred Alternative. In general, effects of a particular action or group of actions would be considered to have a measurable cumulative impact if one of the following conditions are met:

- Effects of several actions occur in a common location;
- Effects are not localized and contribute to effects of an action in a different location;
- Effects on a particular resource are similar in nature or affect the same specific resource element; and
- Effects are long-term or permanent.[11]

Environmental impacts may result from many diverse sources and processes, and the Council on Environmental Quality (CEQ) has guidance which states "….no universally accepted framework for cumulative effects analysis exists," but certain principles have gained acceptance and "the list of environmental effects must focus on those that are truly meaningful." Assessing the cumulative impacts from an action may also involve assumptions and uncertainties because data on the environmental effects of other past, present, and reasonably foreseeable future actions are often incomplete or unavailable. As a result, impacts on resources are often expressed in qualitative terms or as a relative change. This EA uses the CEQ framework for assessing cumulative effects, and as a result, the potential impacts on resources are expressed in qualitative terms or as a relative change from current conditions of the existing fish collection facility.

4.5.1. Past Actions

The CEQ issued a memorandum on June 24, 2005 regarding analysis of past actions. This memorandum states, "…agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions." For the purpose of this analysis, past actions are those which occurred in the past, but which have lasting effects on one or more resources relevant to the proposed action.

[11] By definition, short-term impacts tend to dissipate over time and cease to contribute to the cumulative effects as the effects subside or become inconsequential.

Thus, this section characterizes the existing conditions of the affected resources and discusses how the direct and indirect effects from implementing the proposed fish facility upgrade may contribute to lasting impacts from past actions.

Past actions are summarized below and their effects, which have results in the existing conditions, are described in this document.

- Construction of Fall Creek Dam and the Adult Fish Collection Facility;
- Human use and modification of the Fall Creek watershed, surrounding area, and upstream tributaries. This includes silvicultural and agricultural practices, construction of roads and highways, establishment of towns and cities, and the utilities supporting them;
- Recreational facilities established for federal, state, and local agencies;
- and federal permits for aquatic and wetland impacts in the Fall Creek watershed.

Existing conditions in the Fall Creek watershed include the past construction of the Fall Creek dam and reservoir, and construction of the larger Willamette Valley Project dams across the Willamette Basin. The construction fundamentally altered the character of the watershed, moderating flood flows during the winter by strategically storing and releasing water across the basin to minimize downstream flooding. To address fish passage to upstream spawning habitats that were functionally lost during construction of the dam, the existing fish collection facility was constructed to mitigate for volitional fish passage.

In addition to actions specific actions in the project area, regional development for residential, industrial and recreation use has occurred in upland areas, establishing communities and recreational facilities. As described in Section 3.3, the Middle Fork Willamette River and Fall Creek watershed are also highly used for recreation, resulting in anthropogenic impacts to habitats and land uses. Together, these actions have resulted in the existing conditions of the project area.

4.5.2. Present Actions

Present actions are those which are currently occurring and also result in impacts to the same resources as would be affected by the No Action Alternative or the Preferred Alternative. These include:

- Routine operation and maintenance of Fall Creek Dam;
- Routine operation and maintenance of the Willamette Valley Project dams and reservoirs;
- Routine operation and maintenance of the Adult Fish Collection Facility;
- and on-going recreational use activities.

Present actions include the operation and maintenance of the Fall Creek dam and reservoir, as well as the operation and maintenance of the adult fish collection facility. As described in earlier sections of this EA, the fish facility is operated between the months of March and November to transport adults upstream to spawning habitats. Current dam operations include the annual drawdown of the reservoir during the winter months to run-of-river for the purpose of improving passage efficiency for out-migrating juveniles through the dam's regulating outlets.

4.5.3. Reasonably Foreseeable Future Actions

While present and ongoing activities could continue for many years into the future, and which could contribute to cumulative impacts, it is speculative to consider actions beyond what is reasonably foreseeable. The reasonably foreseeable nature of future actions promotes a forward-looking perspective, and the temporal boundary for this analysis has been established for 50 years. This timeframe captures the effects of future actions within the operational timeframe relevant to the fish collection facility and the continued operation and maintenance of the Fall Creek dam.

Those reasonably foreseeable future actions under consideration in this analysis are identified below. The consideration of a future action rests upon a level of certainty that it would occur. The certainty of a future project occurring in the project area is based upon a formal project proposal or application to the appropriate jurisdictional agency, approval of such a proposal or application, inclusion of the future action in a formal planning document, or other similar evidence. In addition, a future action must be sufficiently defined in terms of location, scope, and design to allow for meaningful consideration in the cumulative effects analysis. The listing below includes relevant foreseeable actions in and near the Fall Creek project site, including those by the Corps, other federal agencies, state and local agencies, and private/commercial entities.

- Operation and maintenance of the Fall Creek Dam and reservoir, and other Corps-owned recreational facilities for all authorized project purposes;
- Routine operation and maintenance of the Willamette Valley Project dams and reservoirs;
- Protection and restoration of existing natural areas and potential acquisition, restoration and protection of natural areas in the Middle Willamette watershed by federal, state, and local land-management agencies;
- Silvicultural and agricultural activities;
- Continued use and development of the Fall Creek watershed and Middle Fork Willamette River sub-basin for residential, commercial and industrial purposes relative to expected population growth throughout the area;
- Implementation of a statewide, comprehensive land-use management program to protect natural resources;
- Implementation of the Reasonable and Prudent Alternative in the 2008 NMFS BiOp to minimize adverse effects to ESA-listed salmonids and protect critical habitat;
- and implementation of water quality improvements for more stringent non-point source pollution standards, such as the Three Basin Rule and TMDLs.

The Corps intends to continue operating and maintaining the Fall Creek dam and reservoir into the future, and it is assumed that recreational and commercial use of the reservoir and surrounding area (timber harvest) would continue where activities are authorized. While historic development in the watershed has caused losses of aquatic and riparian habitats, especially in the lower watershed, with resulting adverse impacts to fish and wildlife resources, these actions occurred in a regulatory landscape that is very different from that which exists today.

Future federal and possible state initiatives would operate to mitigate the unavoidable environmental impacts of any future development. There are a number of actions that are ongoing or are planned that will provide a cumulative, long-term improvement to water quality, fish resources, and habitat, especially for ESA-listed salmonid species, including the implementation of the RPAs specified in

the 2008 NMFS BiOp and more stringent non-point source pollution standards, such as TMDLs. These include operational or structural changes to the Corps dams and projects currently under investigation by the Corps and the implementation of more stringent non-point source pollution standards by the state, such as the Three Basin Rule and TMDLs. These actions and stricter controls placed on foreseeable future projects would reduce short-term, adverse impacts and are anticipated to provide a long-term, cumulative benefit to the water quality in the watershed.

4.5.4. Cumulative Effects Summary

The cumulative effects analysis provided below evaluates the effects of implementing the No Action Alternative and the Preferred Alternative in association with past, present, and reasonably foreseeable future actions described above in and near the project area. The effects of these actions have resulted in the introduction and spread of non-native, invasive species; physical alterations to rivers, streams, lakes, wetlands, and floodplain habitats supporting fish and wildlife; degradation of water quality throughout the basin from increased pollutants, altered temperature regimes, and the widespread loss of ecosystem processes supporting water quality.

Direct effects from the Preferred Alternative are limited to the short-term construction related impacts. There would be minor adverse impacts to geology and soils, water and air quality, and vegetation and a small amount of fish and wildlife habitat. However, these impacts are considered negligible as they are temporary and not contextually intense when considered alongside the past, present and reasonably foreseeable future actions. The potential cumulative effects associated with the proposed action were evaluated with respect to each resource category listed below.

4.5.4.1. Physical Processes and Resources

Geology and Soils

As discussed above, the direct impacts to geology and soils from implementing the Preferred Alternative would be minor and limited to construction activities. Construction related effects are expected to be short-term in duration and temporary in nature. Present actions consist largely of operations and maintenance actions which, with the exception of the annual drawdown of the reservoir, do not impact geology or soil characteristics. In addition to improving passage conditions, the annual drawdown also increases the delivery of bed load material to Fall Creek downstream of the dam, supplementing sediment delivery and improving the overall quality of aquatic and riparian communities (Columbia Basin Bulletin, 2012). Despite the increase of bedload material, the effects of past, present, and reasonably foreseeable future actions, when combined with the No Action Alternative or the Preferred Alternative would have negligible effects on local geology or soil characteristics in the immediate project area.

Hydrology and Hydraulics

The combined effects from past, present and reasonably foreseeable future actions would have negligible impacts to the hydraulics and hydrology of Fall Creek. Past actions fundamentally altered flow regimes in the watershed, and current and future actions are not expected to cumulatively impact the course of Fall Creek or magnitude of flows. The dam and reservoir are operated to regulate downstream flows in conjunction with the other WVP dams and reservoirs to minimize adverse impacts to downstream reaches. Because the WVP is operated as a collective system, while future actions may influence water resources, the operation of the WVP would not to allow these resources to result in cumulative impacts. As a result, the cumulative effect of past, present, and

reasonably foreseeable future actions in combination with the No Action Alternative or Preferred Alternative would have negligible effects on hydrology or hydraulics of Fall Creek.

Water Quality

Water quality in Fall Creek is currently limited for water temperature. Project operations at Fall Creek Dam have altered the pre-dam seasonal thermal regimes in the river, and this altered temperature regime has negatively affected the productivity of ESA-listed fish. Water quality impacts (turbidity increases) are expected to be localized and short-term and are not expected to result in negative cumulative impacts to water quality.

A number of ongoing or planned actions in the watershed focus on improving water quality. These include operational or structural changes to the WVP under investigation by the Corps and the implementation of more stringent non-point source pollution standards by the state, such as the Three Basin Rule and TMDLs. These actions and stricter controls on foreseeable future projects would reduce short-term, adverse impacts and are anticipated to provide a long-term, cumulative benefit to the water quality in the watershed.

Future development, construction activities, and other foreseeable future projects, in combination with population growth, would produce changes in the amount of impervious surfaces and associated runoff in the watershed. While future development could have localized negative impacts on these resources, even with the current regulatory regime, these resources are likely to suffer substantial cumulative losses. However, all projects, regardless of sponsor, are required to adhere to local, state, and federal stormwater control regulations and best management practices designed to limit surface water inputs. Future actions would add a negligible amount of impervious surfaces, in addition to the other existing and anticipated construction activities, thereby minimizing future adverse effects to water quality. As a result, the combined effects from present and reasonably foreseeable future actions, in combination with the No Action Alternative or Preferred Alternative described above would have negligible effects on water quality.

Air Quality, Noise

Impacts to air quality and noise pollution standards from present and reasonably foreseeable future actions are not expected to result in substantial losses or degradation to regional air quality. While there may be localized reductions in air quality from the generation of greenhouses gases (CO_2) due to emissions from construction and general development actions, these impacts are not expected to fundamentally alter air quality in the Fall Creek watershed. Federal air quality standards would serve to minimize adverse impacts to air quality from future development. As a result, cumulatively, regional air quality is not likely to be adversely impacted from the No Action Alternative or Preferred Alternative in combination with the long term operations and maintenance actions at the dam or future development and use of the watershed.

4.5.4.2. Biological Resources

Vegetation

While historic development in the watershed has fundamentally changed the vegetative characteristics of the Willamette Valley, these actions occurred in a regulatory landscape that is different from that which exists today. With the exception of silvicultural practices and agriculture, the current operational and maintenance actions described above do not have substantial impacts on vegetation throughout the watershed. Silvicultural and agricultural practices have become routine

actions throughout the Willamette Valley and the Fall Creek watershed, and these actions and corresponding habitat types are considered part of the existing baseline for the project area.

Future development would likely increase the spread of invasive species. However, non-native, invasive species are currently present in almost all habitat types throughout the watershed, some of which alter functional vegetative characteristics and ecosystem processes. Reasonably foreseeable future action would not likely have cumulatively substantial impacts on vegetative resources. In addition, initiatives by federal, state, and local agencies operate to reduce the spatial extent of non-native species through restoration and best management practices for future development. As a result, the combined effects to vegetation from implementing the No Action Alternative or Preferred Alternative, in combination with the past, present, and reasonably foreseeable future actions is not likely to have substantial impacts on vegetation resources or functional processes in the Fall Creek watershed.

Wetlands

Similar to vegetation, the quality and quantity of wetlands throughout the watershed have been substantially reduced through development and various land use practices present today. While these actions occurred in the past, current regulatory mechanisms serve to prohibit the continued loss of high quality wetland habitats unless such losses otherwise unavoidable. Mitigation efforts are required where wetland losses are unavoidable, and it is expected that these measures would prevent the widespread, cumulative loss or destruction of wetlands from any future actions in the watershed. Given the existing regulatory environment, implementing the No Action Alternative or Preferred Alternative in combination with the past, present and reasonably foreseeable future actions would not result in cumulatively adverse effects to the quantity or quality of wetland habitats in the Fall Creek watershed.

Fish and Wildlife

While historic development in the watershed has caused losses of aquatic and riparian habitats, especially in the lower watershed, with resulting adverse impacts to fish and wildlife resources, these actions occurred in a regulatory landscape that is different from that which exists today. While future development will likely have localized impacts on these resources, under the current regulatory regime these resources are unlikely to suffer substantial losses. Moreover, initiatives by federal, state, and local agencies and non-governmental groups would operate to mitigate unavoidable environmental impacts of future development and restore the extent and quality of habitats important to the region's fish and wildlife.

Continued and future development of the Fall Creek watershed would continue to impact fish and wildlife and the habitats upon which they depend. However, restoration actions throughout the Willamette Valley attempt to mitigate for these impacts and improve the spatial extent, connectivity and quality of aquatic, riparian, and terrestrial habitats. Given these measures, implementing the No Action Alternative or Preferred Alternative, in combination with the past, present, and reasonably foreseeable future actions would have negligible cumulative impacts on fish and wildlife habitat throughout the Fall Creek watershed.

Threatened and Endangered Species

Project operations at Fall Creek Dam have altered the pre-dam seasonal thermal regimes in the river, and the altered temperature regime has negatively affected the productivity of ESA-listed fish. In response, there are a number of actions that are ongoing or are planned that will provide a cumulative, long-term improvement to fish resources and habitat, especially for ESA-listed salmonid

species, including the implementation of the RPAs specified in the 2008 NMFS BiOp and more stringent non-point source pollution standards, such as TMDLs. The annual drawdown has reduced the number of resident, non-native fish in Fall Creek reservoir, further benefiting the juvenile salmonids by decreasing the risk of predation.

The operations and maintenance of the existing fish collection facility has had lasting impacts on adult ESA-listed fish populations. Together with other present and reasonably foreseeable future actions, the No Action Alternative would continue to have lasting impacts on these fish populations. The Preferred Alternative, in combination with the number of other actions that are either on-going or planned in and near the fish collection facility would provide a long-term, cumulative improvement to passage efficiency and ESA-listed fish resources throughout the watershed. Any future federal actions would require additional evaluation under the National Environmental Policy Act at the time of their development.

4.5.4.3. Social Resources

Cultural and Historical Sites

Cumulatively, no cultural and historic resources are expected to be impacted from implementing the No Action Alternative or the Preferred Alternative in combination with past, present, or reasonably foreseeable future actions. Present operations and maintenance actions do not impact cultural or historic resources in the project area, and all reasonably foreseeable future actions would be subject to review and approval by State Historic Preservation Officer. There would be no effects from implementing the No Action Alternative and all construction activities associated with the Preferred Alternative would avoid any cultural resources present in the action area. Consequently, the cumulative effects would be negligible.

Socio-Economic

Past actions in the Fall Creek watershed have fundamentally changed the character of the watershed and allowed for the development of local communities and a regional economy through various land use practices and industries (silviculture and agricultural practices). Present actions in the watershed include operations and maintenance of the dam and reservoir, which support these communities and local economies. Current land use practices support the socio-economics of the region, funding local businesses and fueling the economy. The effects of future activities and the continued development and use of the watershed are not expected to measurably change from current conditions.

Implementing the No Action Alternative or the Preferred Alternative is not expected to cumulatively effect local populations or other indicators of social-well being when evaluated in combination with past, present, and reasonably foreseeable future actions. Population growth trends and other indicators of social well being are expected to remain consistent with existing conditions and upgrading the fish collection facility under the Preferred Alternative would not result in a disproportionately high or adverse effect on minority populations or low-income populations. Construction effects would not adversely impact communities in adjacent areas. The benefits implementing the Preferred Alternative are not expected to be substantial relative to normal trends (the No Action Alternative) and the cumulative effects of future actions and development activities is not expected to be measurable.

Recreation

While the effects of the Corps' annual drawdown of the Fall Creek reservoir have been evaluated in a separate NEPA document, the effects are included in the analysis of cumulative effects because the

drawdown is considered an annual action occurring now and into the future. As a result, the cumulative effects on recreation from implementing the No Action Alternative or the Preferred Alternative, in combination with past, present, and reasonably foreseeable future actions must take into consideration the effects of the drawdown.

Recreational use of the Fall Creek reservoir is highest in the summer months. Present actions, including the annual drawdown of the reservoir, are likely to result in short-term interference to recreation. However, these effects are not expected to greatly affect socio-economics of the region since the drawdown occurs primarily in the fall and winter months when recreational use of the reservoir is lowest. Construction of the Preferred Alternative would have no measurable effect on recreational activities since the action area is not accessible to the public and all construction activities would be limited to the area immediately around the existing facility. Construction traffic would increase in the vicinity of the fish facility, but these effects are not expected to substantially impact recreational use of the watershed.

Future population growth and development of the watershed would likely increase the amount of recreation occurring in the watershed. However, any increase in recreation is not expected to increase to such a degree as to inhibit use by members of the public or result in restrictions to recreation in the area. As a result, the cumulative effects from implementing the No Action Alternative or the Preferred Alternative, when combined with the past, present, and reasonably foreseeable future actions are not expected to measurably impact recreational use of the reservoir and surrounding forested landscape.

Aesthetics

The aesthetical value of the Fall Creek watershed is not expected to change under present or future actions. Upgrading the Fall Creek fish facility would replace the existing structure with a larger facility, but much of the area is not within view of the public. Present actions in the watershed are largely operations and maintenance activities associated with the dam and reservoir, as well as land use practices and development. The annual drawdown of the Fall Creek reservoir exposes much of the lakebed when the reservoir is drawn down to run-of-river, but the aesthetic effects from the drawdown are temporary in nature and occur during a timeframe when public use of the area is low. As a result, present actions have little measurable impact on the aesthetical value of the action area.

While future actions, including the continued development of the Fall Creek watershed and silvicultural practices, may effect to aesthetical value of the watershed, these actions occur in a regulatory climate where these resources are regulated to minimize adverse effects to the human environment. As a result, the cumulative effects from implementing the No Action Alternative or the Preferred Alternative are not expected to have measurable impacts on aesthetics when evaluated in the context of past, present, and reasonably foreseeable future actions.

Land Uses

While future growth and development are reasonably foreseeable to occur over the period of analysis, the socio-economic impacts that would occur following construction of the fish collection facility would not likely result in changes to the region's long-term socio-economic status. Local and state land use restrictions and planning guidelines offer a multitude of conservation measures to protect vital natural resources and prevent the functional loss of these resources. The Oregon Department of Land Conservation and Development (DLCD) maintains a program dedicated to land use planning for the state and has described 19 statewide planning goals, policies, and guidelines which are achieved through comprehensive local planning (DLCD 2010). Specific to the resources evaluated in this draft EA, Goal 5 of the statewide planning goals and guidelines intends "to protect

natural resources and conserve scenic and historic areas and open spaces", which includes riparian areas (inclusive of water, riparian areas, and fish habitat), wetlands, wildlife habitat, natural areas, and several other natural resources (DLCD 2010). All future projects or changes to land use would necessarily require coordination with federal, state and local resource agencies to adhere to regulatory conservation measures and permitting requirements. As a result, the cumulative effects to land use in the Fall Creek watershed from implementing the No Action Alternative or the Preferred Alternative, when evaluated in combination with the past, present, and reasonably foreseeable future actions is not expected to measurably impact land uses or result in changes to land use designations or zoning laws.

4.5.4.4. Climate Change

As noted above, the effects of climate change in the project area could lead to a change in the timing of precipitation, the extent of snowpack, and rain-on-snow events, all of which culminate in changes to the timing and magnitude of stream flows and water temperatures during the spring and summer months (ISAB 2007, USGCRP 2009). However, the present and reasonably foreseeable future actions would not influence local climate or result in changes to the timing and magnitude of precipitation, the extent of snowpack, and rain-on-snow events in the Fall Creek watershed. These factors are controlled at much larger spatial and temporary scales than what is relevant for the Fall Creek watershed for the planning horizon of this evaluation (50 years). As a result, the cumulative effects from implementing the No Action Alternative or the Preferred Alternative, when combined with the past, present, and reasonably foreseeable future actions would not have measurable effects on characteristics influencing climate.

Further, the effects of a changing climate on present and future actions in the project area are not expected to influence how actions are implemented or design. Because Fall Creek is heavily regulated as part of the WVP, downstream flows are monitored and controlled to minimize the extent and magnitude of flood events. In addition, flows are timed to benefit fish and wildlife, as well as support recreational activities in the reservoir.

In conclusion, this cumulative effects analysis considered the effects of implementing either the No Action Alternative and the Preferred Alternative in association with past, present, and reasonably foreseeable future Corps' and other parties' actions in and near the Fall Creek dam and reservoir. The potential cumulative effects associated with the Preferred Alternative were evaluated with respect to each resource evaluation category and no cumulatively significant, adverse effects were identified. However, ongoing or planned restoration actions and dam operations at Fall Creek and throughout the WVP would provide a long-term, cumulative improvement to water quality and fishery resources in the Fall Creek watershed.

5. COORDINATION

Public concerns identified in comments would aid in determination of whether or not an EIS is necessary for the proposed Fall Creek Fish Facility Upgrade. If it is determined that an EIS is not required, a FONSI would be prepared and signed, concluding the NEPA process.

The Corps issued a notice of preparation to solicit preliminary comments from 10 May to 10 June 2013. Two comments were received. One comment was received from the Confederated Tribes of the Grand Ronde, and another from the Confederated Tribes of the Warm Springs Reservation of Oregon. Both comments request the cultural resources inventory report for this project. When complete, the report will be made available to the requestors.

This draft EA is being issued for a 30-day public review period, beginning 12 November 2014 and ending 12 December 2014. Review comments are being requested from federal and state agencies, interested Tribes and other interested parties. A public notice was sent to interested persons, agencies, and groups, including, but not limited to those parties shown below. The draft EA is available for review on the Portland District's website at: (http://www.nwp.usace.army.mil/environmental).

National Marine Fisheries Service

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service

U.S. Forest Service

Bureau of Land Management

Confederated Tribes of the Warm Springs Reservation

Confederated Tribes of Siletz Indians

Confederated Tribes of the Grand Ronde

Columbia River Inter-Tribal Fish Commission

Oregon Department of Environmental Quality

Oregon Department of Land Conservation and Development

Oregon Department of State Lands

Oregon Department of Transportation

Oregon Department of Fish and Wildlife

Oregon Department of Parks and Recreation

Oregon State Historic Preservation Office

Oregon State Marine Board

Middle Fork Willamette Watershed Council

6. ENVIRONMENTAL COMPLIANCE

The following discussions demonstrate how the proposed Fall Creek Fish Facility Upgrade complies with environmental laws and executive orders.

6.1. National Environmental Policy Act of 1969, 42 U.S.C. § 4321 *et seq*.

Under NEPA, federal agencies are required to identify significant environmental resources likely to be affected by proposed activities as well as make an assessment of the impacts to those resources and consider a full range of alternative actions. Environmental considerations are fully integrated into the decision-making process. The analysis of impacts to the environmental baseline in response to the proposed alternatives, and in consideration of the laws and Executive Orders described herein, this EA furthers the requirements of the NEPA, as discussed within this document.

Finding: This Draft EA has been prepared in compliance with NEPA. After the public comment period for this EA, the Corps would consider their impacts and their level of significance.

6.2. Clean Air Act of 1970, 42 U.S.C. 7401 *et seq*.

The Clean Air Act established a comprehensive program to preserve, protect and enhance air quality throughout the United States based on permitting of stationary sources of air pollution emissions, restricting the emission of toxic substances from stationary and mobile sources, establishing National Ambient Air Quality Standards and noise pollution standards. All federal actions resulting in the emission of air pollutants must comply with all federal, state, interstate and local requirements for control and abatement of air pollution in the same manner and extent as any non-governmental entity, unless the activity is explicitly exempted by the U.S. Environmental Protection Agency (EPA).

Finding: The proposed action does not involve asbestos, a regulated industry, use of an incinerator, or open burning or hazardous materials. Motorized equipment would be used for the removal and excavation actions. However, equipment use is not expected to result in excessive levels of noise pollution or greenhouse gas emissions. All equipment would be required to meet State emission standards, and any low-level noise pollution emitted during the proposed activities would be temporary and localized. Therefore, the proposed action complies with the Clean Air Act.

6.3. Clean Water Act of 1972, 33 U.S.C. 1251 *et seq*.

The Clean Water Act (CWA) established the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. "Clean Water Act" became the Act's common name with amendments in 1977. The CWA made it unlawful to discharge any pollutant into navigable waters, unless a permit was obtained.

Section 401(a)(2)– Requires certification from the state that a discharge to waters of the U.S. in that state will not violate the states' water quality standards. The EPA retains jurisdiction in limited cases. The Corps seeks a state Water Quality Certification per 33 C.F.R. § 336.1 (a)(1) when its activities result in a discharge.

Section 402(a)(1) – Authorizes the EPA, or states to which the EPA has delegated authority, to permit the discharge of pollutants under the National Pollutant Discharge Elimination System (NPDES) program for all land disturbances over an acre in size.

Section 404 – Authorizes the Secretary of the Army to permit the discharge of dredged or fill material into waters of the United states at specified disposal sites based on section 404(b)(1) guidelines. The Corps is not subject to this authorization but complies with all applicable substantive legal requirements including the application of section 404(b)(1) guidelines.

Finding: The Corps applied for a Section 401 Water Quality Certification from ODEQ for the Preferred Alternative in June 2014, which is pending review by the ODEQ. A permit is anticipated in late 2014.

An NPDES general permit (1200-C National Pollutant Discharge Elimination System (Section 402)) permit was obtained for this construction project. The permit addresses stormwater discharges during construction.

A Section 404(b)(1) evaluation would be prepared for the proposed action prior to construction.

Given these actions and permits, the project facility upgrade is in compliance with the CWA.

6.4. Endangered Species Act of 1973, 16 U.S.C. 1531 *et seq*.

The ESA was enacted to protect and conserve endangered and threatened species and critical habitat. Requirements of the ESA ensure activities authorized, funded, and carried out by federal agencies are not likely to jeopardize the continued existence of any listed species or result in adverse impacts to designated critical habitat of a listed species. The USFWS and NMFS share responsibility for the administration of ESA listed species.

Those species and critical habitats which may occur at the project site in Lane County, Oregon are discussed in Section 3.2.3.1.

Finding: The operation and maintenance of the existing fish collection facility were addressed in the NMFS 2008 biological opinion, *Endangered Species Act Section 7(a)(2) Consultation, Biological Opinion and Magnuson-Stevens Fishery Conservation & Management Act Essential Fish Habitat Consultation on the Willamette River Basin Flood Control Project* issued on July 11, 2008 (NMFS 2008). The proposed operations and maintenance actions associated with the upgraded facility are a requirement of RPA, Measure 4.6, and the operations and maintenance would improve passage conditions for migrating adults, providing beneficial effects to passage and upstream survival.

Construction of the upgraded fish collection facility proposed under the Preferred Alternative is consistent with project actions identified in NMFS' 2013 *Programmatic Conference and Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Revisions to Standard Local Operating Procedures for Endangered Species to Administer Stream and Fish Passage Improvement Actions, Version 5* (SLOPES V) programmatic biological opinion, with the exception of screening the auxiliary water supply system (fish horns). In August 2014, the Corps drafted a variance request to implement the Preferred Alternative under SLOPES V without screening the fish horns. The Corps received NMFS' approval that the proposed action was consistent with the use of SLOPES on October 8, 2014 (Marc Liverman, email communication). Consequently, the Preferred Alternative is in compliance with the ESA for the combined effects to listed species

and the PCE's supporting their critical habitats which may be present in the project area, as described in Chapter 4.

The USFWS biological opinion for bull trout and chub, *Biological Opinion on the Continued Operation and Maintenance of the Willamette River Basin Project and Effects to Oregon Chub, Bull Trout, and Bull Trout Critical Habitat Designated Under the Endangered Species Act*, issued in July 2008, addresses effects to these species as a result of operation and maintenance of the fish collection facility (USFWS 2008b). A "***no effect***" determination was made for the species under the jurisdiction of the USFWS (northern spotted owl and its critical habitat, bull trout, and Oregon chub) for construction activities associated with the upgraded fish collection facility based on the lack of presence in the project area and timing of specific project elements.

6.5. Magnuson Fishery Conservation and Management Act of 1976, 16 U.S.C. 1801 *et seq*.

The Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 *et seq*.) (MSA) is designed to actively conserve and manage fishery resources found off the coasts of the United States to support international fishery agreements for the conservation and management of highly migratory species. The MSA established procedures designed to identify, conserve and enhance Essential Fish Habitat (EFH) for fisheries regulated under a federal fisheries management plan. EFH is defined as "…those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Waters include aquatic areas and their associated physical, chemical, and biological properties used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 C.F.R. §600.10 (2010)). Federal agencies must consult with the NMFS on all proposed actions authorized, funded or carried out by the agency which may adversely affect EFH.

Finding: Relevant fish resources pertinent to the project area, based on Oregon coastal fishery resources, include both UWR Chinook salmon and steelhead. Accordingly, Fall Creek is designated as EFH for Chinook salmon, as it provides waters and substrate necessary for spawning, breeding, feeding, and growth to maturity.

The NMFS 2008 BiOp provided conservation recommendations to avoid and reduce adverse effects to EFH (blocking habitat, modifying flows, and degrading water quality), according to the RPA. Pursuant to the adoption and implementation of the RPA, including Section 4.6 which required the agency to upgrade existing fish collection facilities, the adverse effects to EFH would be minimized. The Preferred Alternative is proposed as a method to alleviate fish passage issues and conserve EFH at Fall Creek Dam and improve upstream passage to spawning habitats. As a result, the Preferred Alternative meets RPA 4.6 and is therefore in compliance with this act.

6.6. Fish and Wildlife Coordination Act of 1958, 16 U.S.C. 661 *et seq*.

The Fish and Wildlife Coordination Act directs federal agencies to prevent the loss and damage to fish and wildlife resources; specifically, wildlife resources shall be given equal consideration in light of new water-resource development programs. Consultation with the USFWS is required when activities result in the control of, diversion or modification to any natural habitat or associated water body, altering habitat quality and/or quantity for fish and wildlife. For the Corps, all coordination under this Act is in accordance with the *2003 Agreement between the U.S. Fish & Wildlife Service*

and the U.S. Army Corps of Engineers for Conducting Fish and Wildlife Coordination Act Activities (Corps).

Finding: The proposed project falls under Section 662(a) because water is diverted into the fish collection facility and the natural course of Fall Creek is modified to support the collection of fish for upstream transport. To meet the Corps' requirements under Section 2(b) of this Act, the proposed project has been coordinated with the USFWS and ODFW in the formulation of the alternatives and review of technical documents. In addition, the Corps has fully considered the effects of the Preferred Alternative on fish and wildlife resources within this EA.

6.7. Migratory Bird Treaty Act of 1918, 16 U.S.C. 703 *et seq*.

The Migratory Bird Treaty Act (MBTA) makes it unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. Under the MBTA, "migratory birds" include all birds native to the United States and the Act pertains to any time of the year, not just during migration.

Finding: Construction of an upgraded fish collection facility would require the disturbance and removal of some vegetation on the site. While mature trees would be avoided to the extent practicable, some mature riparian trees would necessarily be removed for construction. However, native vegetation would be reestablished in the project area after construction is complete and any trees removed during construction would be replanted in an appropriate location to facilitate the restoration of nesting habitat.

To the extent practicable, the Corps would limit the removal of vegetation to occur outside of the breeding season (15 March through 31 August), in order to minimize impacts to nesting and migratory birds. If vegetation needs to be removed during the breeding season, a qualified biologist will survey the area and coordinate with a representative of the USFWS prior to removal. While construction-related noise could displace birds by causing flushing, altering flight patterns, or causing other behavioral changes, these actions are not expected to result rise to the level of harm or harassment. For these reasons, the Preferred Alternative is in compliance with the act.

6.8. Safe Drinking Water Act of 1996, 42 U.S.C. 300f *et seq*.

The primary objective of the Safe Water Drinking Act is twofold: (1) to protect the nation's sources of drinking water, and (2) to protect public health to the maximum extent possible, using proper water treatment techniques. The EPA and states established national primary and secondary drinking water standards and established techniques to meet those standards. Facilities that treat drinking water and underground sources of drinking water are regulated by the states through permits. The Corps must ensure that any facility in their jurisdiction that is used, or may be used, for public drinking water complies with the water requirements of the state in which the facility is located. Any Corps activities that may impact or endanger underground drinking water supplies are subject to the requirements of the state program and EPA permit requirements.

Finding: The rain gardens incorporated into the proposed Fall Creek Fish Facility project design do not constitute underground injection control (UIC) points, which contribute to groundwater drinking sources regulated by Oregon DEQ. Stormwater generated onsite from the fish facility and rain events would be captured in the rain gardens and would infiltrate into the water table. The rain gardens include non-perforated pipe outfalls which are used only during extreme flood

events. Because the rain gardens are not considered a UIC by the Oregon DEQ, the proposed upgrade is in compliance with the Safe Drinking Water Act.

6.9. Bald and Golden Eagle Protection Act of 1940, 16 U.S.C. § 668 *et seq*.

This Act provides for the protection of bald and golden eagles by prohibiting the taking, possession and commerce of such birds, except under certain specified conditions. Projects involving forestry practices, use of aircraft (or other motorized equipment), blasting and other work may result in loud or intermittent noises if they occur within 1000-feet of an active or alternate nest time during the breeding season (January 1 through August 15) and could disrupt breeding activity.

Finding: USFWS, National Bald Eagle Management Guidelines (May 2007) and the Corps eGIS Information Portal were aids in evaluating project impacts to bald eagles and known nest locations. In 2000, a nest was discovered on the ridge between the Fall Creek and Winberry Creek arms of the lake. The site has been consistently occupied since 2000, although the pair failed to fledge young in 2004 through 2007 (Symbiotics 2011). This nest tree is over 2.5 miles away from the proposed project area, however, this pair, and/or other individual eagles may use roost trees and/or foraging areas closer to the proposed project site. However, because the proposed action does not involve loud noises within 1000 feet of an active nest, and no aircraft, forestry practices, or blasting will occur within the nesting season. Some construction activities would occur in January, but activities occurring at this time would be limited to normal construction noises and activity. For these reasons, the proposed action will not disturb bald or golden eagles and therefore complies with the Bald and Golden Eagle Protection Act.

6.10. National Historic Preservation Act of 1966, 16 U.S.C. § 470 *et seq*.

This Act is designed to protect and conserve cultural resources and ensure that development does not harm or degrade them. Section 106 of the National Historic Preservation Act (NHPA) requires all Federal agencies to consider the potential effects of their projects and undertakings on historic properties eligible for or currently listed on the NRHP (National Register): http://www.cr.nps.gov/nr/. Historic properties are archaeological sites or historic structures or the remnants of sites or structures. To determine the potential effect of the project on known or unknown historic properties: the nature of the proposed activity and its effect on the landscape is evaluated; the likelihood that historic properties are present within a project area is assessed; an assessment is made as to whether the ground is disturbed by previous land use activities and the extent of the disturbance; and there is a review of listings of known archeological or historic site locations, including site data bases and areas previously surveyed or listings of sites on the NRHP.

Finding: The Corps is completing a Multiple Property Listing for all of the dams and facilities it currently operates as part of the Willamette Basin Project. The Corps has determined Fall Creek as eligible for the NRHP under criterion A and C. The Corps is moving ahead with finalizing the Multiple Property Listing and has reached a determination of adverse effects for any construction or alteration to the existing fish facility. The Corps has initiated consultation with the SHPO and interested Native American Tribes. Through this consultation the Corps has requested the SHPO enter into a MOA to mitigate any adverse effects through agreed upon measures.

6.11. Native American Graves Protection and Repatriation Act of 1990, 25 U.S.C. 3001 *et seq*.

This Act provides for the protection of Native American and Native Hawaiian human remains and cultural items. It also establishes requirements for the disposition of Native American human remains and sacred or cultural objects found on federal lands. The Act also provides for the protection, inventory, and repatriation of Native American human remains and cultural items (funerary objects, sacred objects, and objects of cultural patrimony).

Finding: There is one recorded pre-historic archeological site in the vicinity of the project area. This area would be avoided by all construction activities under the Preferred Alternative. Tribal coordination regarding the current project has been conducted, and in the unlikely event that any human remains are encountered during construction of the project the tribal groups and the Oregon SHPO will be notified immediately and all requirements of the act will be followed.

6.12. Executive Order 11988, Floodplain Management, 24 May 1977

This executive order requires federal agencies to evaluate the potential effects of proposed activities on floodplains and avoid possible long- and short-term adverse impacts associated with the occupancy and modification of floodplains, and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. Federal agencies are directed to develop alternatives to floodplain activities, where practicable, and identify what impacts (beneficial and/or adverse) due to the action.

Finding: The proposed action would not affect development of floodplains or the management of floodplains because the project area is in a steep canyon with a limited floodplain, and the majority of the facility would be located above the 100-year flood elevation. Due to the nature and purpose of the facility, some of the project must extend through the floodplain and into the river. Also, given the steep topography of the area, and the fact that the Corps owns the lands surrounding the facility, no future development in the near-by vicinity of the project is planned. In addition, the location of the Preferred Alternative was chosen, among other reasons, because the area is already impacted and alternative locations would result in greater environmental impacts. The Corps modeled floodplain impacts from implementing the Preferred Alternative and determined the proposed action would not result in a net-rise to the floodplain. As such, the proposed action is in compliance with this executive order.

6.13. Executive Order 11990, Protection of Wetlands, 24 May 1977

The purpose of this executive order is to minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In planning their actions, federal agencies are required to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided.

Finding: A wetland was delineated in the project area and consists of a ditch-swale north of the existing fish facility. No impacts to this wetland would occur during construction, and its functional value would not change in response to the proposed action. The rain garden constructed to manage and control stormwater and water discharged during truck loading could develop into a functional wetland over time if the appropriate soil, hydrology, and vegetation characteristics are present. Consequently, because the proposed action would not result in the loss, destruction, or degradation of wetlands and may enhance the extent and coverage of

wetlands (or areas functioning as wetlands) in the project area, the proposed action is in compliance with this executive order.

6.14. Executive Order 11593, Protection and Enhancement of the Cultural Environment, May 1971

This order ensures Federal agencies provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the Nation. Federal agencies are directed to administer cultural properties under their control in a spirit of stewardship and trusteeship for future generations. Federal agencies shall initiate measures necessary to direct policies, plans and programs in a way that federally owned sites, structures, and objects of historical, architectural or archaeological significance are preserved, restored, and maintained for the inspiration and benefit of the people. In addition, Federal agencies are ordered to consult with the Advisory Council on Historic Preservation to institute procedures to assure that Federal plans and programs contribute to the preservation and enhancement of non-federally owned sites, structures, and objects of historical, architectural or archaeological significance.

Finding: The Corps is completing a Multiple Property Listing for all of the dams and facilities it currently operates as part of the Willamette Basin Project. The Corps has determined Fall Creek as eligible for the NRHP under criterion A and C. The Corps is moving ahead with finalizing the Multiple Property Listing and has reached a determination of adverse effects for any construction or alteration to the existing fish facility. The Corps has initiated consultation with the SHPO and interested Native American Tribes. Through this consultation the Corps has requested the SHPO enter into a MOA to mitigate any adverse effects through agreed upon measures.

6.15. Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, 6 November 2000

The United States has a unique legal relationship with Indian tribal governments as set forth in the Constitution of the United States, treaties, statutes, Executive Orders, and court decisions. This order requires federal agencies to formulate and establish "regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications, to strengthen the United States government-to-government relationships with Indian tribes, and to reduce the imposition of unfunded mandates upon Indian tribes". This consultation is meant to work towards a mutual consensus and is intended to begin at the earliest planning stages, before decisions are made and actions are taken.

Finding: Government-to-government coordination for cultural and natural resources was coordinated via letter correspondence (12 November 2014) with the Confederated Tribes of the Grand Ronde; Confederated Tribes of Siletz Indians; and the Confederated Tribes of the Warm Springs. To date, no response has been received.

6.16. Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, 10 January 2001

This order further strengthens the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, the Fish and Wildlife Coordination Act, the Endangered Species Act and the National Environmental Policy Act. Each Federal agency taking actions that have, or are likely to have, a measureable negative effect on migratory bird populations is directed to develop and implement a

Memorandum of Understanding (MOU) with the USFWS that shall promote the conservation of migratory bird populations and resources.

Finding: The proposed action would not result in the "take" of any migratory bird. However, while some nesting habitat would be removed during construction, the proposed project includes replanting vegetation disturbed during construction. Vegetative communities would be restored and over time nesting habitats would develop to support migratory birds. In addition, construction related activities may displace birds temporarily by causing flushing, altering flight patterns, or causing other behavioral changes, but these activities are not expected to rise to the level of harm or harassment resulting in a measurably negative effect on migratory bird populations. As a result, the proposed action is in compliance with this executive order and a MOU would not be developed or implemented according to this executive order.

6.17. Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance, 5 October 2009

This executive order requires that Federal agencies shall increase energy efficiency; measure, report and reduce their greenhouse gas emissions from direct and indirect activities; conserve and protect water resources through efficiency, reuse and storm-water management; eliminate waste, recycle and prevent pollution; leverage agency acquisitions to foster markets for sustainable technologies and environmentally preferable materials, products and services; design, construct, maintain and operate high performance sustainable buildings in sustainable locations; strengthen the vitality and livability of the communities in which federal facilities are located; and inform federal employees about and involve them in the achievement of these goals.

Finding: There would be a small, localized reduction in air quality, including generation of greenhouse gases, due to emissions from construction equipment. These impacts would be minor and temporary in nature, and would cease once construction is completed. Materials suitable for recycling would be recovered during any required demolition. Also, a comprehensive post-construction stormwater management plan was developed to manage stormwater on-site and reduce runoff by directing the water into a rain garden prior for treatment and infiltration. By rebuilding the upgraded fish facility at the current location, only minimal additional impacts to in-stream and riparian habitats were required.

For these reasons, the proposed action is in compliance with this executive order by restoring functional use of a federal facility, minimizing adverse impacts to the environment, energy, or economic performance of nearby communities. In addition, the proposed action would enhance operating conditions for workers at the facility, fostering health and the welfare of employees.

6.18. Other Laws and Executive Orders

All actions involved in upgrading the adult fish collection facility at Fall Creek Dam are confined to the Fall Creek watershed, including the Fall Creek Dam, reservoir, and area immediately downstream of the dam; the Fall Creek watershed is outside of the coastal zone and downstream barriers and habitat conditions make the area inaccessible to marine mammals. The project area is not listed on the EPA's list of areas designated as Superfund sites. The proposed action would not impact farmlands, as all construction would occur on lands owned by the Corps and operated as part of the existing fish collection facility and no changes in the hydrology of Fall Creek would impact downstream irrigation users. While portions of the Middle Fork Willamette River are designated as a "wild and scenic river", Fall Creek is not designated as such and therefore does not warrant protections provided under the Wild and Scenic Rivers Act of 1968. The proposed action would not

disproportionately affect low income and/or minority populations because no environmental justice communities occur at or near the proposed project area. For these reasons, the following laws do not require further evaluation for impact or assessment for compliance:

- Coastal Zone Management Act, 1972
- Comprehensive Environmental Response, Compensation and Liability Act, 1980
- Farmlands Protection Policy Act, 1994
- Marine Mammal Protection Act, 1972
- Marine Protection, Research and Sanctuaries Act (Section 103), 1972
- Wild and Scenic Rivers Act, 1968
- Executive Order 12898, Environmental Justice, 11 February 1994

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8. APENDICIES

8.1. Appendix A – Fall Creek Fish Facility Operating Procedures

8.2. Appendix B – Technical Memorandum on Alternative Selection Process

8.3. Appendix C – Project Design Drawings

8.4. Appendix D – Agency Project Review and Public Comments