In cooperation with the U.S. Forest Service

Hills Creek-Lookout Point Transmission Line Rebuild Project

Draft Environmental Assessment

August 2016

DOE/EA-1967

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Acronyms and Abbreviations

ACS	Aquatic Conservation Strategy
BLM	Bureau of Land Management
BPA	Bonneville Power Administration
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
dBA	Decibels on the A-weighted scale
DEQ	Oregon Department of Environmental Quality
DOE	U.S. Department of Energy
DSL	Oregon Department of State Lands
EA	Environmental assessment
EFH	Essential fish habitat
EIS	Environmental impact statement
EMF	Electric and magnetic fields
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily significant unit
FEMA	Federal Emergency Management Agency
Forest Service	U.S. Forest Service
FR	Federal Register
kV	Kilovolt
kV/m	Kilovolts per meter
kW	Kilowatt
LRAPA	Lane Regional Air Protection Agency
MBTA	Migratory Bird Treaty Act
mG	Milligauss
MOE	Margin of Error
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Properties
OAR	Oregon Administrative Rules
ODA	Oregon Department of Agriculture

Acronyms and Abbreviations (continued)

ODFW	Oregon Department of Fish and Wildlife
ORS	Oregon Revised Statutes
PCP	Pentachlorophenol
PM	Particulate matter
PM-2.5	Particulate matter with a diameter of 2.5 micrometers or less
PM-10	Particulate matter with a diameter of 10 micrometers or less
RCRA	Resource Conservation and Recovery Act
SHPO	State Historic Preservation Officer
TMDL	Total Maximum Daily Load
UGB	Urban growth boundary
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Chapter 1. Purpose of and Need for Action

1.1 Introduction

Terms in *bold italics* are defined in Chapter 5 Glossary.

Bonneville Power Administration (BPA) proposes to rebuild its 26-mile-long, 115-kilovolt (kV) Hills Creek-Lookout Point ***transmission line*** generally located between Lowell and Oakridge, in Lane County, Oregon (Figure 1-1). The project would include replacing, wood-pole structures that support the transmission line and other line components as well as enhancing the line's access road and trail system.

This chapter describes the need for the Hills Creek-Lookout Point Transmission Line Rebuild Project (Rebuild Project). This chapter also identifies the purposes that BPA is attempting to achieve while meeting the need and summarizes the public scoping process conducted for this ***environmental assessment (EA)***.

BPA is a federal agency that owns and operates more than 15,000 miles of high-voltage transmission lines. The transmission lines move most of the Northwest's high-voltage power from facilities that generate the power to users throughout the region. BPA has obligations to ensure that its transmission system is safe, reliable, and has sufficient capability to serve its customers. For example, the Federal Columbia River Transmission System Act directs BPA to construct improvements, additions, and replacements to its transmission system that are necessary to maintain electrical stability and reliability, as well as to provide service to BPA's customers (16 United States Code [USC] § 838b(b-d)).

This EA has been prepared to determine whether effects of the proposed activities may be significant enough to warrant preparation of an environmental impact statement (EIS). By preparing this EA, BPA is fulfilling agency policy and direction to comply with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations.

FIGURE 1-1
Project Location Map
Hills Creek-Lookout Point Rebuild Project
Lane County, OR

- Hills Creek-Lookout Point Transmission Line Tower
- Hills Creek-Lookout Point Transmission Line
- BPA Transmission Line
- BPA Substation
- Non-BPA Substation
- BLM
- Corps of Engineers
- State Dept. of Forestry
- U.S. Forest Service

BONNEVILLE POWER ADMINISTRATION

June 1, 2015

1.2 Need for Action

BPA needs to ensure the integrity and reliability of the Hills Creek-Lookout Point transmission line (structure, ***insulators*** (prevent electricity from arcing), ***conductors*** (electrical wires), and other equipment used to transmit power), which serves BPA's utility customers, who in turn serve communities in western Oregon. No major rebuild work has occurred on the Hills Creek-Lookout Point transmission line since it was originally built in 1953. In general, wood poles for transmission lines have a service life of 55 to 60 years, at which point they are usually replaced due to age, rot, or other forms of deterioration. Most structures on the Hills Creek-Lookout Point transmission line have reached the end of their service life, are physically worn, and, in places, are structurally unsound. As the structures age, emergency repairs are needed more frequently; emergency repairs often times do not allow for time to accommodate planning efforts, such as coordination with landowners and minimization of environmental impacts, and are not an efficient and cost effective approach to maintaining the transmission line. Loose rock near ***line mile*** two (the second mile of the transmission line) substantially damaged structure 2/7 in February 2015. Other rocks in this area could damage the structure in the future if it is not relocated. Similarly, three structures in line mile three are susceptible to landslide damage if not relocated.

In addition, many of the poles are made of Douglas-fir in which the center of the pole was not treated with preservative to prevent rot and decay. Poles of this type and age are now experiencing a high frequency of decay at the ground, making them more prone to collapse. Collapse of any poles on the line could lead to failure of the line, which presents safety hazards to the public and BPA workers, as well as risk of ***outages*** (events caused by a disturbance on the electrical system that requires BPA to remove a piece of equipment or a portion of a transmission line from service) that would adversely affect power deliveries to BPA's customers in western Oregon. Similarly, the conductor and ***disconnect switches*** (used for changing connections in a circuit) need to be replaced to modernize the transmission line and to maintain its reliability.

The road and trail system that BPA uses to access the transmission line is in poor condition with uneven and eroded travel surfaces, insufficient water control (e.g. water bars, drain dips, and culverts), and overgrown vegetation, making scheduled maintenance and emergency repairs unsafe. BPA needs safe, prompt access to each transmission structure for transporting crews, material, and equipment in order to rebuild the line, for ongoing maintenance, and for emergency repairs.

1.3 Purposes

The purposes are goals to be achieved while meeting the need for action. BPA has identified the following purposes to help evaluate the proposed alternatives for the Rebuild Project:

- Maintain or improve transmission system reliability to BPA and industry standards
- Continue to meet BPA's contractual and statutory obligations to supply safe, reliable power to serve its customers
- Minimize environmental impacts to the surrounding area

- Demonstrate cost-effectiveness of rebuilding the transmission line instead of performing repairs on an as-needed basis

1.4 Cooperating Agencies

The Council on Environmental Quality (CEQ) regulations implementing NEPA allow for the designation of other federal, state, and local agencies and Indian Tribes as cooperating agencies for an EA where appropriate (CEQ 1981). Agencies or tribes may be designated as a cooperating agency if they have jurisdiction by law or special expertise with respect to any environmental impact involved in a proposed project.

The U.S. Forest Service (Forest Service) is a cooperating agency for this EA because parts of the Rebuild Project and some associated access roads cross Forest Service land in the Willamette National Forest and BPA is requesting (through a right-of-way application SF-299 form) additional access-rights from the Forest Service for some roads, trails, and two short right-of-way realignments (Sections 2.2.2 and 2.2.3). The Forest Service is authorized by the Federal Land Policy and Management Act (43 USC 1701 *et seq.*) and its implementing regulations to issue right-of-way grants for facilities and systems, including transmission and distribution systems. The Forest Service would use this EA to meet its NEPA obligations and to assist in its review of BPA's right-of-way application.

This EA is consistent with the following Forest Service EISs and plans, which are incorporated by reference:

- The Willamette National Forest Land and Resource Management Plan EIS, as amended (U.S. Forest Service 1990; referred to as the "Forest Plan")
- The Northwest Forest Plan and Record of Decision and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Related Species with the Range of the Northern Spotted Owl (U.S. Forest Service and BLM 1994a; U.S. Forest Service and BLM 1994b; referred to as the "Northwest Forest Plan")
- The Forest Plan, as amended by the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (U.S. Forest Service and BLM 2001)
- The EIS and Record of Decision for Preventing and Managing Invasive Plants (U.S. Forest Service 2005)
- Forest Service National Desk Guide to Preparing Vegetation Management Procedures for Power Line Authorizations (U.S. Forest Service 2013)

The Forest Plan for the Willamette National Forest provides management direction through the designation of specific management areas and standards and guidelines specific to these designations. The Northwest Forest Plan amended the Willamette Forest Plan by establishing new and additional management areas, standards, and guidelines. When there is overlap of management allocations, the more restrictive standards and guidelines of both allocations apply (U.S. Forest Service and BLM 1994a). These management plans are relevant to the Rebuild Project because they

establish the management areas and standards and guidelines that apply forest-wide, including the portions of the Willamette National Forest through which the transmission line passes.

The 2001 Record of Decision and Standards and Guidelines amends the Northwest Forest Plan by adopting new standards and guidelines for Survey and Manage, Protection Buffers, and other mitigating measures to more efficiently provide the level of species protection intended in the Northwest Forest Plan. These guidelines are relevant to the Rebuild Project, as the project crosses areas in which Survey and Manage species may be found, as well as the protection buffers established by this document.

The 2005 Record of Decision for Preventing and Managing Invasive Plants adds invasive plant management direction to the Forest Plan, including invasive plant prevention and treatment/restoration standards intended to help achieve desired future conditions. This document is relevant to the Rebuild Project, as BPA would be clearing vegetation and managing areas of invasive plants.

The 2013 Forest Service National Desk Guide to Preparing Vegetation Management Procedures for Power Line Authorizations provides guidance for developing comprehensive vegetation management procedures that help ensure that public energy needs are reliably served without interruption from vegetation interference, while also ensuring that people, wildlife, property, and lands are not harmed or threatened by wildfire caused by trees on power lines or other power line related fires. This guidance document is relevant to the Rebuild Project as tree removal and other vegetation clearing would be needed, as described in Section 2.2.11.

Other federal, state, and local agencies may also be involved in reviewing portions of the EA (see Table 2-6). These agencies may use this EA to fulfill their applicable environmental review requirements for any actions they may need to take in regard to the Rebuild Project.

1.5 Public Involvement and Consultation

1.5.1 Public Involvement and Scoping Issues

To help determine issues to address in this EA, BPA conducted public scoping outreach. BPA mailed letters on August 23, 2013, to potentially interested and affected persons, agencies, tribes, and organizations. The public letter provided information about the Rebuild Project and EA scoping period, requested comments on issues to be addressed in the EA, and described how to comment (mail, fax, telephone, BPA's website, and at scoping meetings). BPA also posted the public letter on a project website, which it established to provide information about the Rebuild Project and the EA process:

http://www.bpa.gov/goto/HillsCreekLookoutPoint

BPA determined that several tribes have a potential interest in this project. BPA requested comments on the Rebuild Project from the tribes, as well as on potential cultural resources to help shape the field investigation.

The public scoping period began on August 23, 2013, and BPA accepted comments until September 26, 2013. BPA held a public meeting in Oakridge on September 11, 2013, to describe the Rebuild Project and to solicit comments. Five people attended the scoping meeting. BPA received four comments during the scoping period and continued to receive comments after the scoping period ended. All comments submitted during the scoping period are located on the project website.

Comments were generally supportive of the Rebuild Project. Specific issues raised during the scoping period included:

- Existing conditions within rights-of-way on private property should be maintained (addressed in Section 3.1.2)
- ***Riparian*** (area between a stream and adjacent upland) vegetation should be enhanced to maintain compliance with Willamette River Total Maximum Daily Load (TMDL) and Clean Water Act (addressed in Sections 3.3.2 and 3.4.2)
- Effects to northern spotted owls resulting from rebuilding, operating, and maintaining the transmission line should be assessed (addressed in Section 3.6.2)
- Road-stream crossings (e.g., culverts) should be designed and maintained to avoid impacts to waterbodies (addressed in Section 3.4.2)

BPA considered all of the public comments in preparing this Draft EA and has addressed them as appropriate in the relevant sections of the document as noted above. There were no unresolved issues, and no issues warranted development of additional alternatives.

1.5.2 Agency and Tribal Consultation

BPA is in the process of consulting with the following agencies: Forest Service, National Marine Fisheries Service (NMFS), Oregon Department of Fish and Wildlife (ODFW), Oregon State Historic Preservation Office (SHPO), and U.S. Fish and Wildlife Service (USFWS). Consultation efforts are summarized below and further detailed in Section 2.7 and Chapter 3 of this EA:

- BPA consulted with USFWS and is currently in consultation with NMFS for ***threatened*** (likely to become endangered) and ***endangered species*** (species in danger of extinction) near the transmission line, pursuant to Section 7(c) of the Endangered Species Act (ESA) and consistent with the Willamette National Forest standards and guidelines (FW-154, FW-157). A Biological Assessment (BA) that addresses project effects on listed fish and wildlife species and their designated ***critical habitat*** (habitat essential for the conservation of an endangered or threatened species) was prepared. BPA received a letter of concurrence from USFWS on July 5, 2016. BPA is currently working with NMFS to prepare a Programmatic Biological Opinion to address potential impacts to ESA-listed ***anadromous*** fish, fish that live in both fresh and salt water, under their jurisdiction.
- Pursuant to the Fish and Wildlife Conservation Act and the Oregon Fish and Wildlife Habitat Mitigation Policy, BPA consulted with USFWS and ODFW to develop measures to avoid and

minimize impacts to fish and wildlife, as documented in this EA, consistent with the Willamette National Forest standards and guidelines (FW-134).

- BPA has consulted with the Forest Service on numerous design aspects of the Rebuild Project and is continuing to consult with the Forest Service as a participating agency. BPA has prepared biological evaluations to address Forest Service sensitive species per Willamette National Forest standards and guidelines (FW-156, FW-157, FW-169).
- BPA submitted a cultural resources survey report to SHPO and tribes for review through the Section 106 of the National Historic Preservation Act (NHPA) process. BPA would coordinate with the SHPO and tribes if any previously undiscovered cultural resources are discovered during construction.

In addition to soliciting comments from tribes during public scoping, BPA also initiated consultation with the following tribes pursuant to Section 106 of the NHPA: Confederated Tribes of Siletz Indians of Oregon, Confederated Tribes of the Warm Springs Reservation, Coquille Indian Tribe, Cow Creek Band of Umpqua Tribe of Indians, The Confederated Tribes of Grand Ronde, and The Klamath Tribe. In addition, BPA also met with members of the Confederated Tribes of Grand Ronde to discuss the project.

BPA will distribute a copy of the Draft EA to all the agencies and tribes consulted. Consultation will be completed before BPA issues a decision document for this project. Chapter 4 includes a list of persons, tribes, and agencies that will receive the Draft EA.

Chapter 2. Proposed Action and Alternatives

This chapter describes the existing transmission line, the Proposed Action, and the No Action Alternative. The chapter also compares how the Proposed Action and the No Action Alternative meet the project purposes and summarizes the potential environmental effects of the alternatives. Figure 1-1 in Chapter 1 and the project maps in Appendix A show the location of the Proposed Action.

2.1 Existing Transmission Line

The existing 26-mile, 115-kV Hills Creek-Lookout Point transmission line extends from BPA's Hills Creek ***Substation*** 5 miles to Lane Electric's Oakridge Substation, then stretches an additional 21 miles to BPA's Lookout Point Substation. Substations are the fenced sites that contain the terminal switching and transformation equipment needed at the end of a transmission line. The transmission line crosses through Lane County and the Willamette National Forest, generally between the cities of Oakridge and Lowell. The transmission line crosses land owned by the Forest Service, U.S. Army Corps of Engineers (Corps), State of Oregon, and private property owners. BPA has ***easements*** (authorization to use land owned by another) or other authorizations with underlying landowners for all of the transmission line right-of-way and for most access roads. The transmission line is generally located in a 100-foot wide right-of-way; the segment of transmission line passing through Oakridge city limits is located in a 50-foot wide right-of-way.

The existing line is made-up of 226 structures—mostly two-pole wood H-frame structures, with some three-pole structures and two lattice-steel towers. Many of the wood-pole structures have ***guy wires***, wire used to increase structure stability. The line has three conductors (electrical wires) and stretches of overhead ***ground wire*** (protective wire strung above the conductors to shield them from lightning) on either side of the substations that it passes through to protect substation equipment from lightning strikes. Photos of the existing transmission line structures are shown in Figure 2-1 through Figure 2-3.

Much of the line crosses steep terrain through the Willamette National Forest. Due to the terrain, there is still not a complete access road system for vehicles to reach every structure—the existing access system consists of about 25 miles of roads and about 1 mile of unimproved footpaths where construction of a road is not possible.

Figure 2-1. Existing Steel-Lattice Tower (Line Mile One)

Figure 2-2. Existing Two-Pole Wood Structure (Line Mile Three)

Figure 2-3. Existing Three-Pole Wood Structure (Line Mile Three)

2.2 Proposed Action

Under the Proposed Action, BPA would replace the wood-pole structures that support the Hills Creek-Lookout transmission line, replace various other line components, and enhance the road and foot trail system that allows BPA access to the line.

The Proposed Action would include the following:

- Removal and replacement of all wood-pole transmission line structures
- Realignment of the transmission line in line mile two
- Realignment of the transmission line in line mile three
- Replacement of wood-pole structures with steel monopole structures in line mile five
- Replacement of existing conductors, overhead ground wire, and ***counterpoise*** (a series of wires, grounding rods, or both)
- Replacement of two disconnect switches
- Establishment of a temporary material storage yard, helicopter landing pads, and ***tensioning sites*** (for pulling and tightening conductors)
- Enhancement of the access road and trail system

- Acquisition of new access road rights along the transmission line and new easements in line miles two and three
- Removal of trees and other vegetation

The line would be rebuilt with a combination of wood-pole structures similar to the existing structures, several steel monopole structures on a stretch where greater height is needed, and one lattice-steel tower. The two existing lattice-steel towers located at the beginning of the transmission line would not be replaced. The transmission line would remain in the existing right-of-way except in two locations where the line would be moved slightly off the existing right-of-way to avoid rock fall and landslide areas.

The line would still be operated at 115-kV and would be designed to be able to carry a fiber optic cable at some future time (no cable would be installed with this project).

The level of access road and trail work along the line would vary by location. New easements or access rights would be acquired for some roads, trails, and for the two segments of the transmission line that would be realigned.

The maps in Appendix A illustrate the Proposed Action, and Table 2-1 provides details of the Proposed Action. Each of the activities associated with the Proposed Action is described in detail in the remaining portions of this chapter.

Table 2-1. Summary of Proposed Action

Description	Quantity
Transmission line elements	
Corridor length	26 miles (no change)
Corridor right-of-way width	50 to 100 feet (no change)
Total number of structures (existing / new)	224 / 223
Existing one-pole wood structures / New one-pole wood structures	13 / 0
Existing two-pole wood-structures / New two-pole wood structures	166 / 151
Existing three-pole wood structures / New three-pole wood structures	43 / 53
Existing steel monopole structures / New steel monopole structures	0 / 16
Existing lattice-steel towers / New lattice-steel towers	2 / 3 (1 new; 2 unchanged)
Structure height range	50 to 178 feet
Wood-pole structures height range[1]	50 to 115 feet
Steel monopole structures height range	60 to 166 feet
Lattice-steel tower height	178 feet
Operating voltage	115-kV (no change)
Number of new structures outfitted with guy wires	67
Conductors	3 (no change)
Conductor diameter (existing/new)	0.563 to 0.806 inch / 0.914 inch
Replaced disconnect switches	2

Table 2-1. Summary of Proposed Action (continued)

Description	Quantity
Access road/trail activities[2]	
Total length of access road activities	57.3 miles
New construction	0.1 mile
Reconstruction	1 mile
Improvement	21.4 miles
Direction of travel	35.0 miles
Access road abandonment and rehabilitation	0.5 mile
Access trail construction	1.7 miles
Construction	1.6 miles
Reconstruction	0.1 mile
Total gates	51
New gates	47
Repaired/Replaced gates	4
Total culverts	38
New culverts	16
Repaired/Replaced culverts	22
Total fords	5
Repaired fords	3
Temporary bridges for construction access	3
Access Rights and Easement Acquisition	
Acquire access road rights and easements for roads and trails	15.7 miles (36 acres)
Acquire new right-of-way for transmission line realignment in line miles 2 and 3	4 acres
Revert right-of-way back to Forest Service	4 acres
Vegetation Removal	
Removal or disturbance of low-growing vegetation within the transmission line right-of-way	About 51 acres
Removal of trees inside and outside transmission line right-of-way[3]	Estimated up to 2,700
Removal of other trees along access roads[3]	About 5

[1.] Rebuilt structures may increase in height by 5 to 35 feet for conductor clearance.
[2.] For details of the differences between the types of access road work discussed, please see Section 2.2.9.
[3.] Removal of trees represents tree cutting; trees may or may not be removed from the site depending on landowner preferences.

2.2.1 Removal and Replacement of all Wood Pole Transmission Line Structures

The transmission line structures are individually numbered by line mile and structure within the line mile (e.g., structure 3/4 is the fourth structure in third mile of the transmission line). Structure 1/1 is at the Hills Creek Substation and structure 26/8 is at the Lookout Point Substation. The Proposed Action would replace all of the existing wood-pole structures on this line with a combination of steel monopole structures, lattice-steel towers, two-pole wood structures, and three-pole structures as shown in Table 2-1. Structure replacement would include wood poles, ***cross arms***, ***cross braces***,

insulators, ***dampers***, ***anchors***, and guy wires. Cross arms hold up power lines; cross braces form an "X" between wood poles for stability; and dampers minimize vibration of wires. Guy wires attach at various points along the structure and are anchored at the ground to lend stability to structures subject to stress. The two existing lattice-steel towers would not be replaced. Spans between individual structures range from 90 to 1,400 feet, with about 8 to 10 towers in each line mile.

Two-pole wood structures are used where the structures are in a straight alignment or where turning angles are small (less than 3 degrees). They are the lightest structures because they do not have to withstand the stresses created by angles in the conductors (Figure 2-4).

The three-pole wood structures are stronger and are placed at intervals along the line to independently hold the weight and tension of the conductors. They are also used at turning angles greater than 3 degrees or on longer spans such as river crossings (Figure 2-4).

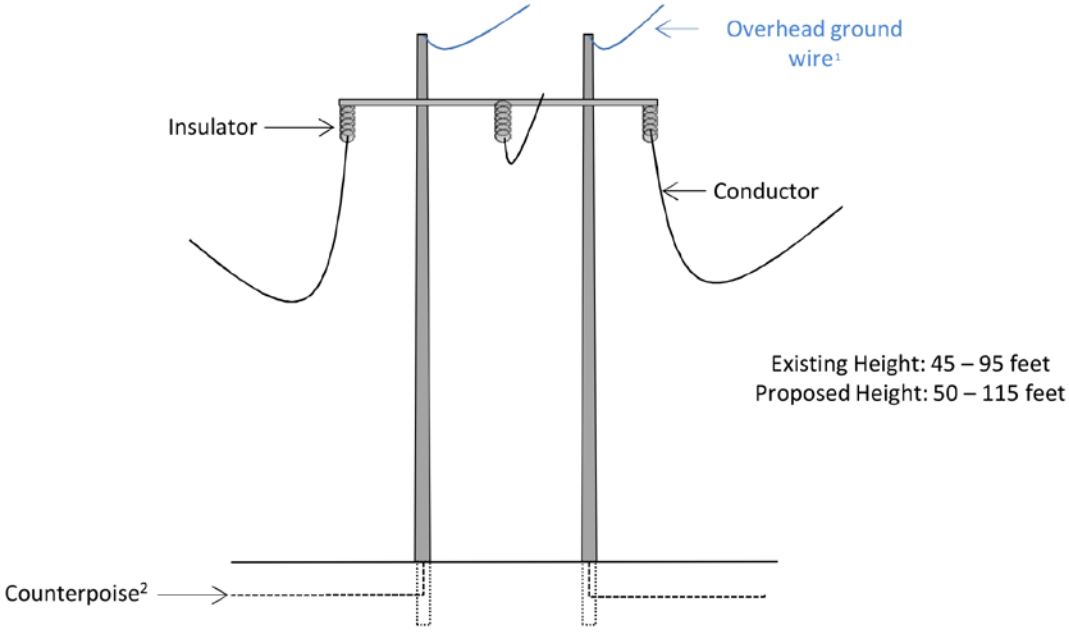
The height of the new wood-pole structures would be similar to the existing structures in most cases, ranging from 50 to 115 feet above ground depending on terrain, requirements for road crossings, and the distance between the top of vegetation and the conductor. Proposed wood-pole structure heights in some locations would be increased by about 5 to 35 feet to provide increased clearance from the conductor to the ground.

Steel monopole structures are about the same size as wood poles but are heavier and stronger. Using steel poles can greatly reduce or eliminate the need for guying that would not be possible using a wood pole (Figure 2-5). A stretch of the existing structures in line mile five would be replaced with steel monopole structures (see Section 2.2.5). The new steel monopole structures would range from 60 to 166 feet tall depending on the specific location (see Sections 2.2.2 and 2.2.4).

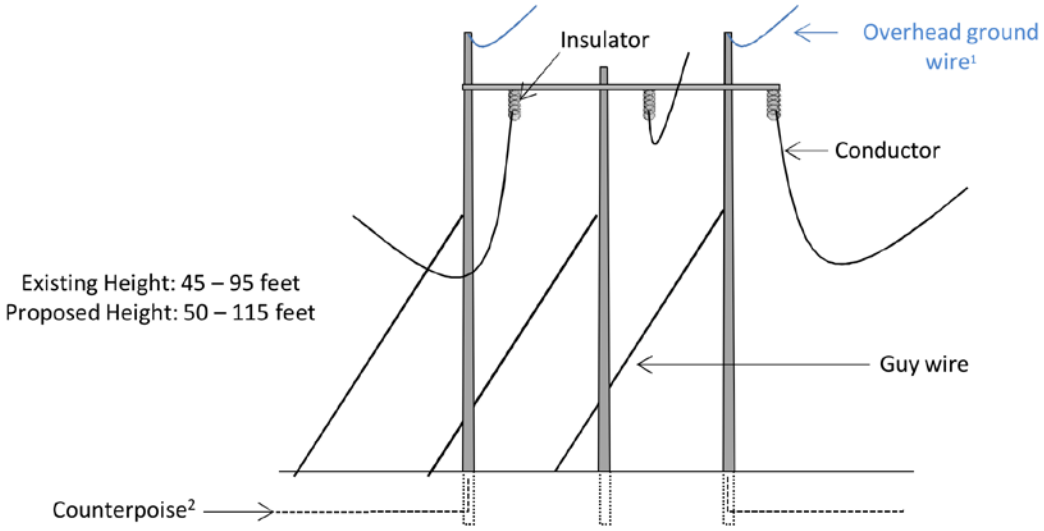
Lattice-steel towers are larger and heavier than the wood-pole structures and are used for the longer and higher spans needed to cross canyons or steep terrain (Figure 2-5). The one new lattice-steel tower in line mile three would be 178 feet tall (see Section 2.2.3).

Except in the two locations where the line would be moved approximately 50 to 100 feet out of the existing BPA right-of-way, structures would be placed in or near the holes of the existing poles. The existing holes would be cleaned-out and re-augered to a total depth of 7 to 12 feet. Additional soil removed by the auger would be used as overburden at the base of the poles and spread evenly around the structure sites. If the existing hole could not be reused, then the structure would be located as close to the existing hole as feasible and sensitive resources (e.g., ***wetlands***) would be avoided, if practicable. No blasting would be anticipated for structure replacement activities.

Some of the existing structures have guy wires. The existing guy wires would be cut off and dug out and BPA would install replacement guy wires and plate anchors in the same location as they currently exist, where applicable. Guy wire anchors would be set in crushed rock about 10 feet deep and the remainder of the hole would be backfilled with native soil.



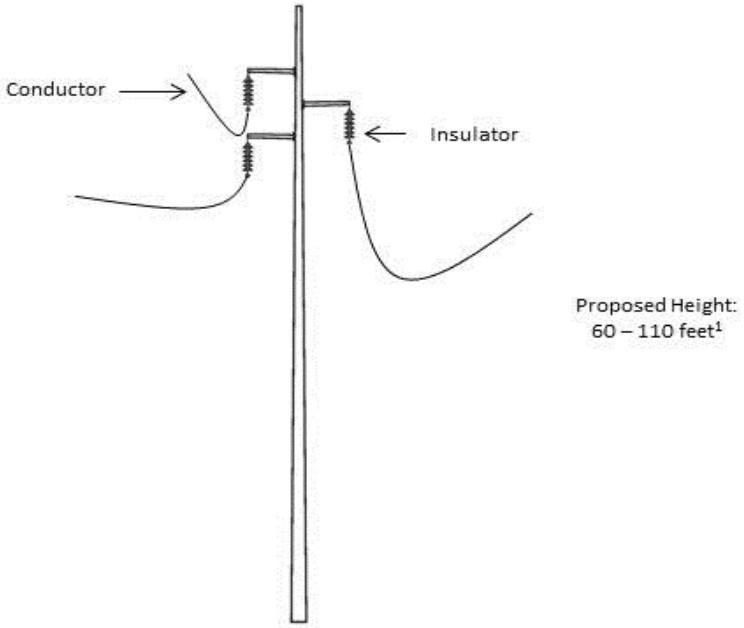
Existing and Proposed
2-Pole Suspension Structures



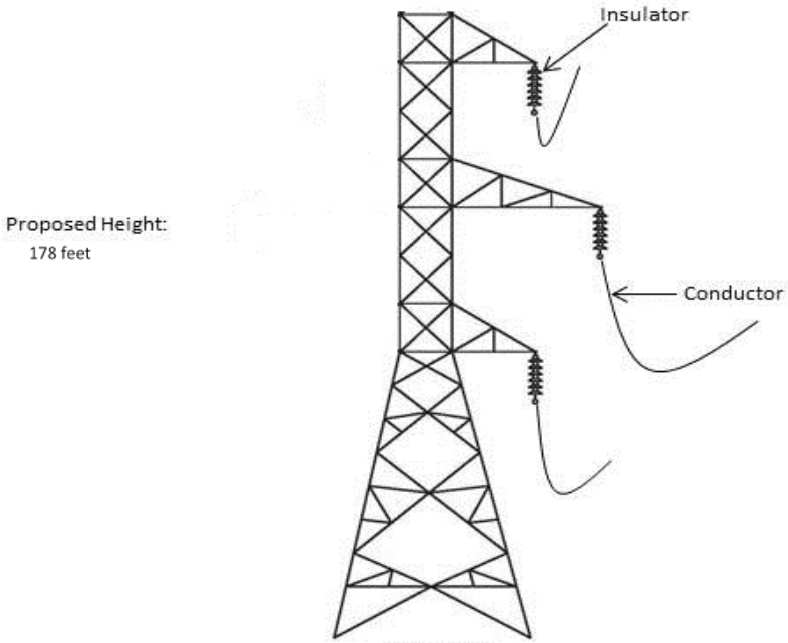
Existing and Proposed
3-Pole Wood Dead-End and Angle
Structures

Notes:
1. Proposed overhead ground wire would extend only 0.5 mile from the Hills Creek, Oak Ridge, and Lookout Point substations.
2. Counterpoise would be installed at all structures supporting overhead ground wire within 0.5 mile of a substation.

Figure 2-4. Existing and Proposed Wood-pole Structures



Proposed Steel Monopole Structure
with "Delta" Configuration[2]



Proposed
Lattice Steel Tower in Mile 3

Notes:
1. Structure 3/2 would be 166 ft. tall, all other monopoles within Line Mile 5 would be within the height range shown above.
2. Arms supporting conductors on Structure 3/2 would be on one side of the structure, as opposed to the "Delta" configuration shown above.

Figure 2-5. Proposed Steel Structures

Structure replacement activities would disturb an area up to about 100 feet by 100 feet (0.2 acre). However, the disturbance area could be reduced to a 25-foot radius from the structure center point (0.05 acre) where work is near sensitive sites such as wetlands. Like most wood poles used for utility or telephone lines, the replacement wood poles would be treated with a preservative called pentachlorophenol (PCP) to lessen wood rot and extend the life of the poles. Pole wraps would be installed for wood poles located within 50 feet of wetlands or streams or within the 100-year floodplain to prevent leaching of PCP into wetlands and streams.

2.2.2 Realignment of the Transmission Line in Line Mile Two

A 0.2-mile segment of line mile two, between structures 2/6 and 2/7, would be realigned slightly north of the existing right-of-way to avoid a rock fall area, as shown in Figure 2-6. The existing structure 2/7 is a three-pole wood structure and was damaged by a loose rock in February 2015 (Figure 2-7). Other rocks in this area could damage the structure in the future if it is not relocated. Structure 2/7 would be relocated away from the rock fall (about 100 feet ahead on the transmission line), structure 2/8 would be relocated (approximately 20 feet west), and an additional two-pole wood structure would be installed (about 350 feet ahead of structure 2/6). Because an additional structure would be added, the structure numbers would be adjusted—the new structure would become structure 2/7 and the two subsequent structures would increase by one (i.e., existing structure 2/7 would become 2/8 and existing structure 2/8 would become 2/9). BPA would construct about 220 feet of new access road, and improve another 225 feet of existing access road to reach the relocated the new and relocated structures in this realignment area. Approximately 80 feet of the new access road construction would be located within a wetland. Because this realignment would move approximately 50 feet off the existing right-of-way, about 1 acre of new access rights from the Forest Service would be required.

About 130 trees would be removed for the line mile two realignment, the majority of which are Douglas-Fir, big leaf maple, and red alder.

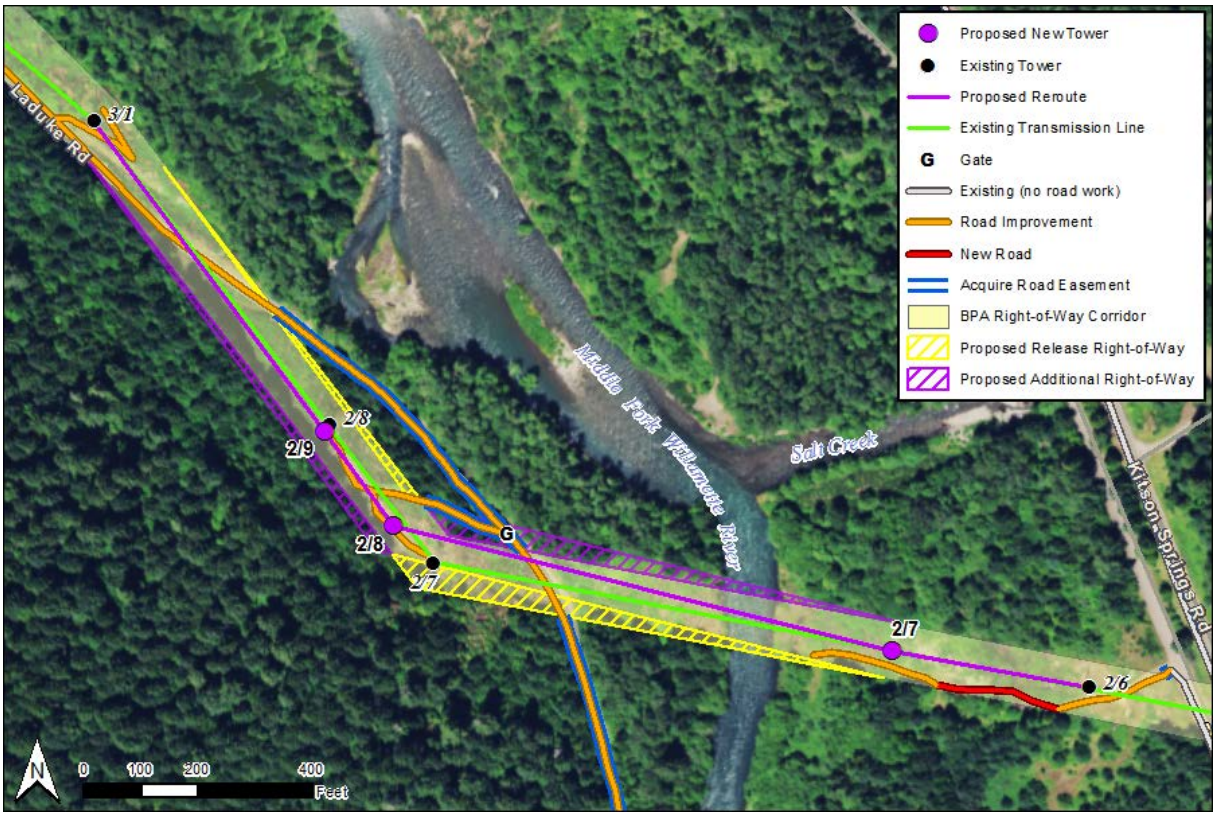


Figure 2-6. Line Mile Two Realignment

Figure 2-7. Damage to Existing Structure 2/7 (three-pole structure) from Rock Fall

2.2.3 Realignment of the Transmission Line in Line Mile Three

Three structures (3/2, 3/3, and 3/4) located in line mile three would be realigned approximately 50 to 100 feet northeast of the existing right-of-way to avoid a landslide near the structures, as shown in Figure 2-8. The realignment would replace three existing wood-pole structures with one new steel monopole structure (3/2) and one new lattice-steel tower (3/3) (Figure 2-9).

The heights of the new steel monopole structure and lattice-steel tower in line mile three would be 166 feet and 178 feet above ground, respectively; an increase of about 101 to 113 feet above the existing wood-pole structures. The new steel monopole structure and lattice-steel tower would be taller than the existing structures to accommodate the new, heavier conductor and because the existing alignment in line mile three passes over the top of the hill (a landslide area), whereas the proposed realignment would go around the side of the hill and span the landslide area. Due to the topography in this area, taller structures would be needed to cover the longer span and provide the appropriate ground clearance over the side hill.

Realignment of this portion of the transmission line would require 3 acres of new right-of-way from the Forest Service, as well as construction of two new access roads on Forest Service lands, totaling about 0.1 mile, to access the new structure locations. Approximately 970 trees would be removed for the line mile three realignment.

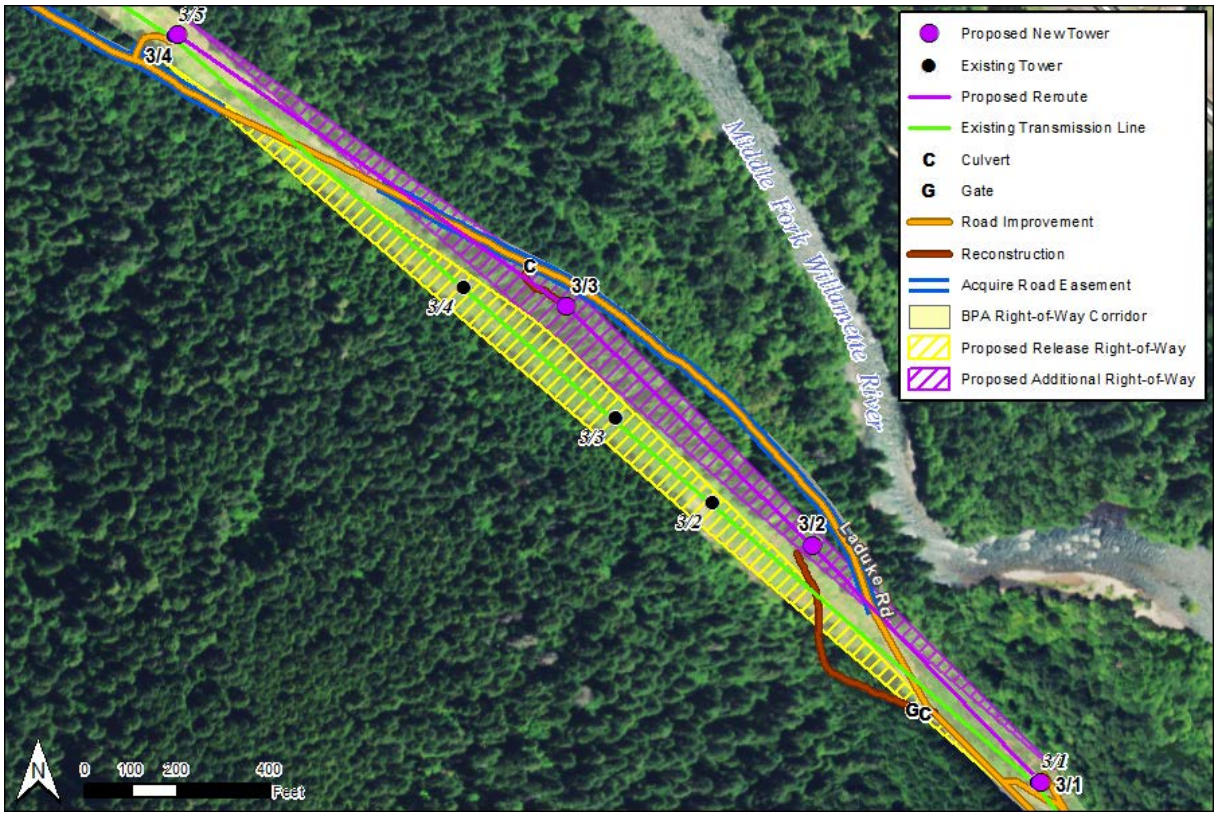


Figure 2-8. Line Mile Three Realignment

Existing Transmission Line *Photo Simulation*

Figure 2-9. Photo Simulations of Line Mile Three Realignment and Structure Replacement

2.2.4 Replacement of Wood-Pole Structures with Steel Monopole Structures in Line Mile Five

Fifteen wood-pole structures (5/2 through 5/16) in line mile five would be replaced with steel monopole structures, as shown in Figure 2-10. Steel monopole structures in line mile five would range from 61 to 106 feet above the ground; an increase of up to 31 feet above the existing wood-pole structures. This height increase is needed for some structures in this segment to accommodate the new, heavier conductor and to ensure sufficient clearance over railroad tracks and Lane Electric's local power line.

Existing Transmission Line *Photo Simulation*

Figure 2-10. Photo Simulation of Line Mile Five Structure Replacement

2.2.5 Replacement of Conductors, Overhead Ground Wire, and Counterpoise

Conductors are the wires on the structures that carry the electrical current. The transmission line carries three conductors that range from 0.563 to 0.806 inch in diameter. The conductors would be replaced with conductors that are 0.914 inch in diameter. The connecting hardware and insulators, which are bell-shaped devices that prevent electricity from arcing from the conductors to the structures and traveling to the ground, would also be replaced.

For safety reasons, the National Electric Safety Code establishes minimum conductor heights. BPA requires the conductors to be at least 24 feet from the ground, which exceeds National Electric Safety Code's minimum conductor height of 21.6 feet for 115-kV construction, for most of the transmission line because of past safety and landform variation concerns. Additional clearance would be provided over roadway and river crossings. Per BPA's standard practices, the rebuilt transmission line would be designed to accommodate a fiber optic cable, should BPA choose to install one in the future. As described above, installation of a fiber optic cable is not part of the Proposed Action.

In addition, dampers may be added on the conductors. Dampers suppress wind-induced vibrations on taut conductors for better protection against storms. If necessary, dampers would be located within 15 feet of the insulators and would help protect the conductors from wear and premature fatigue failures.

Replacement components would be compliant with the *Suggested Practices for Avian Protection on Power Lines* prepared by the Avian Power Line Interaction Committee (2006). ***Bird diverters***, devices placed on a transmission line to help birds see power lines and avoid potential collisions, would be placed on the conductors on spans where an increased risk of bird strikes exists (e.g., wetlands and rivers) and where technically feasible.

Overhead ground wire that protects substation equipment from lightning strikes would be replaced on the first 0.5 mile of the existing line out of the Hills Creek, Oakridge, and Lookout Point substations.

Additionally, a series of wires, grounding rods, or both (called counterpoise) would be buried in the ground at each structure with overhead ground wire. Structures with counterpoise would include 1/3 through 1/5, 5/10 through 5/16, 6/1 through 6/5, and 26/3 through 26/8. These wires are used to establish a low resistance path to earth for lightning protection. Counterpoise would be installed in trenches about 30 inches deep and 24 inches wide and vary in length from 15 to 100 feet.

2.2.6 Replacement of Two Disconnect Switches

Disconnect switches are power system switches used for changing connections in a circuit (open or closed) or for isolating a circuit or piece of equipment from the source of power. Both of the disconnect switches in the Oakridge Substation would be replaced on the existing switch stands, both of which are located inside the substation fence. Ground disturbance would be minimal for these replacements since the existing switch stands would remain in their existing locations. Construction

equipment would be situated on the substation rock areas to lift the existing switches off the stands and locate the new switches on the stands.

2.2.7 Installation of Temporary Load Banks

As discussed in Section 2.2.12, the existing transmission line would be taken out of service temporarily in two segments during construction. One segment would be Hills Creek Substation to Oakridge Substation; the other would be Oakridge Substation to Lookout Point Substation. When the Oakridge Substation to Lookout Point Substation segment is out of service, the city of Oakridge would be "islanded" from the main electrical grid and the only source of power available to serve Oakridge would be the two hydroelectric generators at Hills Creek Dam. The two generators, which can operate independently or together, each require a continuous minimum electrical load (demand) of 8,700 kilowatts (kW). If this minimum demand is not met, the generators can be damaged. The total daily electrical demand of Oakridge generally fluctuates between 2,200 kW and 6,000 kW; as such, the demand is not sufficient to prevent damage to the generator. To compensate for this difference between the generators' required minimum electrical demand and Oakridge's actual demand, BPA would install three ***load banks*** adjacent to structure 1/1 outside Hills Creek Substation. A load bank is a device that creates additional electrical demand and dissipates the excess power. For example, when the Hills Creek generator is producing the minimum 8,700 kW and the Oakridge demand is only 6,000 kW, the load banks would compensate by producing an additional 2,700 kW of demand to prevent damage to the generator. Each load bank would be capable of creating up to 2,500 kW of demand, so one or more units would operate at a given time depending on actual demand in Oakridge. The load banks and associated equipment (e.g., transformers, jumper cables that connect to the transmission line) would occupy an area about area about 150 feet by 210 feet (0.75 acre) adjacent to structure 1/1. The area would be graded and leveled with crushed rock and soil to provide a suitable base upon which to place the equipment. The loads banks would operate 24 hours per day for the estimated three to four months required to rebuild the Oakridge Substation to Lookout Point Substation segment of the transmission line. During operation the load banks would each produce between 82 to 84 dBA of noise at 10 feet.

2.2.8 Establishment of a Temporary Material Storage Yard, Helicopter Landing Pads, and Tensioning Sites

A temporary material storage yard outside of BPA's right-of-way would be needed to store and stockpile materials, trucks, and other equipment during construction. The storage yard size would be based on the area needed to accommodate new and replaced poles, typically 3 to 5 acres. Although a storage yard has not yet been identified, it would likely be in Oakridge or Westfir on an existing flat, paved, or graveled lot, most likely in an industrial or commercial area. The storage yard would be identified by the construction contractor prior to construction and BPA would conduct appropriate environmental review and approval of the identified sites.

Replacement of the conductor and overhead ground wire requires pulling and tensioning. Sites selected for tensioning can accommodate pulling and tensioning equipment but may need to be cleared of interfering vegetation (using a chainsaw, mowers, brushing machines, heavy equipment,

or hand tools) to position pulling/tensioning equipment. Tensioning sites would be located within the right-of-way where possible or in rare cases just outside of the right-of-way where the transmission line would make a sharp turn or angle. Up to 10 tensioning sites would be needed for the Proposed Action; each site would utilize an area about 150 feet by 100 feet (about 0.3 acre), although ground disturbance would be minimal at these sites. Linemen must climb each tower within the segment and replace the hardware that clips the overhead ground wire or conductor to the structure with a pulley or sheave (known as a traveler). A pulling/tensioning rig (resembling a large winch that turns large spools) would be located on each end of the line segment and positioned far enough away from each structure that the angle from the top of the tower to the rig is not too severe as shown in Figure 2-11.

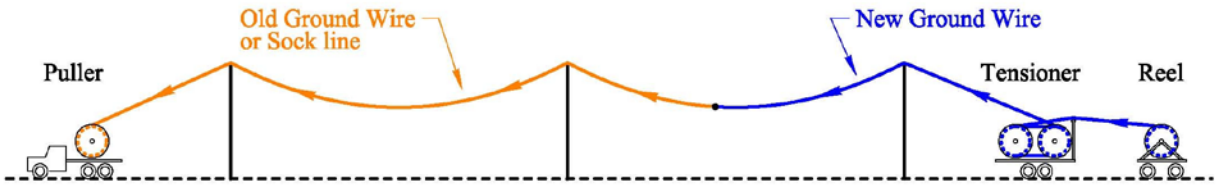


Figure 2-11. Typical Stringing Operation

Often a piece of heavy equipment, such as a bulldozer, is used to anchor the pulling/tensioning rigs. A lighter weight line, called the ***sock line***, is spooled onto one of the pulling/tensioning rigs and attached to one end of the old overhead ground wire or conductor. The other end of the old overhead ground wire or conductor is attached to the other pulling/tensioning rig. As the old overhead ground wire or conductor is wound onto spools, the sock line takes its place. Once the sock line is in place, the new overhead ground wire or conductor is attached to the sock line and pulled through the span. If the old overhead ground wire or conductor is not overly worn, it may be used to directly pull in the new overhead ground wire or conductor. The correct line sag and tension is adjusted, and then linemen permanently affix the new overhead ground wire or conductor to each tower.

A helicopter (***Type 2 helicopter*** (with seats for 9 to 14 passengers) or smaller) would be used to deliver equipment and materials to locations that are inaccessible by vehicles, including structures 9/1, 9/2, 11/6, 15/3, 15/6 through 15/10, and 18/6 through 19/1. These areas are primarily located on rocky outcrops and are located outside of riparian areas. Landing pads for the equipment may be constructed within BPA's right-of-way adjacent to the structures being replaced. The landing pads would be about 10 feet by 10 feet (less than 0.01 acre) and would be cleared and leveled. The helicopters would lower equipment and materials down to the landing pads; however, the helicopter itself would not land on the pads and instead would return to a Federal Aviation Administration-approved helicopter landing facility. Except when avoiding sensitive areas or where prohibited by the Federal Aviation Administration, helicopter flight paths would follow BPA's right-of-way when in the project area.

Guard structures are temporary wood-pole structures with cross arms placed on either side of a facility (distribution lines, roads, railroad crossings, navigable rivers) to catch conductors, ground

wire, or fiber optic cable in the unlikely event that the conductors/wires fall while being removed or installed. Guard structures would be installed during construction and removed after the conductor was strung.

2.2.9 Enhancement of the Access Road and Trail System

Access Roads

The system of roads and trails that provide access to the transmission line would be enhanced in order to facilitate rebuilding the transmission line structures and for ongoing operation and maintenance activities. The access road system consists of a mix of permits or access road easements across public and private land; access roads are located within the transmission line right-of-way as much as possible, but some are located outside the right-of-way. Generally, BPA obtains a 20-foot wide easement for access road rights.

Typical BPA access roads are built 14-feet wide with an additional 3-foot offset from each side of the road for slopes or drainage ditches. The total disturbance width for typical BPA access roads is about 20 feet. Additional widths would be disturbed during access road construction in areas with curves or on steep slopes because cut and fill would be required. In specific wetland areas, the width of new access roads would be reduced to a total disturbance area of 16 feet to minimize impacts, depending on the site-specific conditions. BPA's road standards include water bars, drain dips, and cross drain culverts to manage surface water runoff. Consistency with the Aquatic Conservation Strategy and the Willamette National Forest's related standards and guidelines (RF-1 through RF-3) is discussed in Appendix D.

There would be a total of about 57 miles of access roads used for the project—about 22 miles of access roads would need work (either new, reconstructed, or improved) and 35 miles of roads would be used as is (***direction of travel*** roads). Access roads fall into the following categories (see Table 2-1):

- Access road construction – About 0.1 mile of new access roads would be constructed on Forest Service land to provide access to the relocated structures in line miles two and three, as described in Sections 2.2.2 and 2.2.3. Construction activities would include vegetation removal, shaping road prism, grading, gravelling, installing drainage features, and other actions.
- Access road reconstruction – About 1 mile of existing access road that has deteriorated to the point of being unusable by construction equipment would be reconstructed, including vegetation removal, road prism reconstruction, grading, widening to original conditions, gravelling, installing drainage features and/or crossings; this would be consistent with the Willamette National Forest standards and guidelines (FW-097). This includes about 0.6 mile on Forest Service land, and 0.03 mile on private property; there is no proposed road reconstruction on Corps land.
- Access road improvements – About 21 miles of existing access roads would be improved with minor adjustments, including cleaning, shaping, and compacting existing road surface, widening to original conditions, gravelling, or installing drainage features. This includes about 9 miles of

access road improvements on Forest Service land, about 6 miles on Corps lands, about 0.3 mile on state land, and 6 miles on private property.

- Direction of travel – About 35 miles of ***direction of travel road*** would be accessed for the construction activities. Direction of travel roads are existing roads that would be used in their current condition without any improvements or upgrades (e.g., West Boundary Road). No new easements or right-of-way would have to be acquired for direction of travel roads. Direction of travel includes about 11 miles on Forest Service land, about 18 miles on Corps lands, about 0.02 mile on state land, and 6 miles on private property.

Up to 0.5 mile of BPA's existing access roads would no longer be needed with the proposed access road system and would be abandoned and rehabilitated. BPA would use native seed, weed-free straw, and cover abandoned road segments with slash from tree removal to revegetate these abandoned roads as part of the Proposed Action. Species compositions and quantities would be determined in coordination with the Forest Service. Similarly, 4 acres of BPA's right-of-way would be abandoned for the realignments in line miles two and three (as described later in Section 3.1.2), would also be rehabilitated and reverted to forest lands.

Access Trails

Access trails would be constructed so work crews could reach structures that are inaccessible by vehicles (structures 9/1, 9/2, 11/6, 15/3, 15/6 through 15/10, 18/6 through 19/1); a helicopter would deliver equipment and materials to these structures. There are no existing trails, although unimproved paths through vegetation do exist in some locations along the line. Construction workers would travel on foot along the access trails and the helicopter would be used to deliver equipment and materials to these areas. A total of 1.6 miles of access trails would be constructed; about 0.6 mile of these trails would be located on Forest Service lands, 0.9 mile would be located on Corps lands, and 0.1 mile on private land. An additional 0.1 mile of existing access trail on Forest Service land would be reconstructed. Generally, BPA obtains a 10-foot wide easement for access trails. BPA access trails would have a tread width of up to 3 feet with additional clearing on both sides to accommodate the backslope and embankment. The total clearing width would be up to 5 feet for the access trails. Some of the access trails would begin from a gated BPA access road, while others would start from a direction of travel on a publicly accessible roadway.

Trails would be constructed as specified in BPA's *Access Road Master Specifications*, which are consistent with the Willamette National Forest standards and guidelines (e.g. FW-050). Trail construction work would consist of new construction of trailbeds, clearing and grubbing, weed treatment, grading, constructing switchbacks, installing culverts, waterbars, timber and rock stairs, retaining walls, railings, and enhancements to existing trails.

Gates, Culverts, and Bridges

Other access road work would include the replacement of 4 gates and installation of 47 new gates (for a total of 51 gates) at the entrances to access roads and trails to prevent public access to private lands and to the transmission line right-of-way. Gate locks would be coordinated with appropriate landowners to ensure that both BPA and the landowner can unlock them.

About 16 new culverts would be installed at existing stream or drainage crossings, 22 existing culverts would be repaired or replaced, and three existing fords (low water crossings) would be repaired. Three temporary bridges (simple flat bridges 20 to 53 feet in length and 24 inches thick) would be installed for construction access in locations where there are existing fords. These three existing fords would be repaired as part of the project. Following construction, the temporary bridges would be removed and BPA maintenance staff would use the repaired fords in those locations for subsequent maintenance and line emergencies.

2.2.10 Acquisition of New Access Road Rights Along the Transmission Line and New Easements in Line Miles Two and Three

Although most of the transmission line would remain in the existing right-of-way and would not require new easements, BPA would need to obtain new rights for the two segments proposed for realignment (line miles two and three, as described in Sections 2.2.2 and 2.2.3). In addition, BPA would need to obtain access-rights to use existing roads on Forest Service, Corps, and private land, and for new road construction on Forest Service land.

As part of the Proposed Action, BPA will submit an Application for Transportation and Utility Systems and Facilities on Federal Lands Applications (SF-299) to the Forest Service and to the Corps. These applications request right-of-way grants for new access-rights on about 7.4 miles of road and 1.5 miles of trails on Forest Service land and 3.5 miles of road on Corps land so that crews can access the transmission line structures for construction and yearly operation and maintenance activities. In addition, 0.3 mile of right-of-way would be acquired on lands owned by the State of Oregon and 3 miles of easements would be obtained on private lands, for a total of 15.7 miles (36 acres) of rights-or-way and easements that would be acquired.

2.2.11 Removal of Trees and Other Vegetation

As part of the Proposed Action, vegetation would be removed to facilitate construction and ensure safe operation of the line. A total of about 51 acres of grasses, low-growing shrubs, and trees would be disturbed or cleared for construction activities. Trees identified for removal would be directionally felled away from access roads and would be left on-site. Removal of trees as described in this EA represent tree cutting; trees may or may not be removed from the site depending on landowner preferences. The Forest Service would be responsible for determining how trees removed from Forest Service land would be disposed of – this could include, but is not limited to firewood cutting, stockpiling for stream projects, or leaving it in place as coarse woody debris (consistent with the standards and guidelines of the Northwest Forest Plan (RA-2)).

Trees identified for removal within the right-of-way are referred to as "***Corridor Trees,"*** while trees outside the right-of-way are called "***Danger Trees***." BPA estimates that up to 2,700 trees would require removal – about 1,200 trees adjacent to the transmission line right-of-way (danger trees)***,*** 1,500 trees that are within the right-of-way (corridor trees), and 5 trees along access roads. The majority of trees identified for removal are Douglas-fir trees and cottonwood trees ranging from 2 to 48 inches in diameter; approximately 2,600 trees are 7 inches or greater in diameter, which are considered ***merchantable*** trees – that is, large enough to be of commercial value. The corridor trees

for removal include approximately 1,100 trees that would be removed in line miles two and three where BPA would acquire new right-of-way. Most of the corridor trees that would be removed outside of line miles two and three are located along the edge of the right-of-way and have not been removed during routine vegetation management activities in recent years. Danger trees are trees located adjacent to the right-of-way that have the potential to fall or grow into or grow too close to the conductor and cause flashovers or line outages. Table 2-2 summarizes the number of trees to be removed within the late successional reserves of the Willamette National Forest (described later in Section 3.1.1); most of these trees are located along the edge of BPA's right-of-way.

Table 2-2. Tree Removal by Diameter within Late Successional Reserves

Diameter (dbh)	Number of Trees to be Removed[1]
7 inches or less	2
8 to 10 inches	77
11 to 14 inches	21
15 to 18 inches	15
19 to 22 inches[2]	3
23 to 26 inches[2]	3

Notes:
1. Most of the trees to be removed within late successional reserves are located along the edge of BPA's right-of-way
2. Trees greater than 20 inches would be left on-site.

Five trees in line miles 8, 17, and 19 would be removed for the access road work. These trees include three western redcedars (5-inches, 18-inches, and 26-inches in diameter ranging from 10 to 80 feet in height), and two Douglas firs (25-inches and 45-inches in diameter approximately 100 and 110 feet in height). BPA would remove these trees so that long construction vehicles, such as trucks with trailers carrying the structures, could navigate turns along the access road system.

All areas disturbed during construction would be reseeded as appropriate. The Forest Service would provide a seed source for revegetating disturbed areas on Forest Service land.

Consistent with the *Forest Service National Desk Guide to Preparing Vegetation Management Procedures for Power Line Authorizations* and BPA's lop and scatter specification, wood products (slash) left on-site would be handled to minimize the risk of fire. Deck locations for trees removed would be approved by the Forest Service in advance.

2.2.12 Construction Activities

A typical construction crew for a wood-pole replacement project consists of 50 to 80 people, including transmission line and access road construction workers, inspectors and administrative personnel, surveyors, and other support personnel.

Construction vehicles required for structure replacement could include a bucket truck, a dump truck, an excavator, cranes, and/or a digger derrick. In addition, a helicopter (Type 2 or smaller) would be used for structure replacement in areas inaccessible by vehicles (structures 9/1, 9/2, 11/6, 15/3, 15/6 through 15/10, 18/6 through 19/1). A helicopter (Type 2 or smaller) would also be used for

restringing conductors; a helicopter could be used for restringing the conductors for the entire transmission line or just along certain segments of the transmission line. The construction contractor would pull out the old conductor with a smaller steel cable and pull the steel cable out with a high strength nylon rope. After the structures were replaced, the helicopter would fly in a nylon rope, pull in a steel cable, which then pull in the new conductor.

Equipment that would be used for access road work would include any combination of dump trucks, rollers, graders, bulldozers, and excavators.

The existing transmission line would be taken out of service temporarily in two segments, and existing conductors, insulators, and attachment hardware would be removed. One segment would be Hills Creek Substation to Oakridge Substation; the other would be Oakridge Substation to Lookout Point Substation. The new conductor would be installed along the line once the structures are replaced and pulled to the appropriate tension from tensioning sites. During construction of the Oakridge Substation to Lookout Point Substation segment, the City of Oakridge would receive electricity from the two existing generators inside Hills Creek Dam, which are currently undergoing rehabilitation by the Corps. Construction on the transmission line project would not begin until the two Hills Creek Dam generators are fully rehabilitated and can provide a reliable power source to Oakridge while the transmission line between the Oakridge Substation and Lookout Point Substation is out of service.

The wood-pole structures, hardware, conductors, disconnect switches, culverts, and gates that are removed would be trucked off site for recycling or disposal at an appropriate facility. Prior to and concurrent with pole replacement, access road work and other improvements would be implemented. If any damage to crops, timber, or property occurs as a result of BPA's construction activities, BPA would compensate landowners for the damage as appropriate.

Anticipated Construction Schedule

The schedule for construction of the Proposed Action would depend on the completion and outcome of the environmental review process, including the duration of regulatory agency reviews and timing of permit approvals. It would also depend on the completion of the generator rehabilitation work at the Hills Creek Dam. Construction work would be done in phases, with construction occurring on more than one structure at a time in different parts of the transmission line right-of-way. One construction season would be needed to complete the Proposed Action. The current schedule calls for construction to begin around May 2018 and last for about six months, with the majority of work taking place during dry summer months.

The following seasonal construction restrictions would be implemented for the Proposed Action to avoid or minimize impacts to fish and wildlife:

- In-water work:
  - Buckhead and Burnt Bridge creeks: In-water work allowed August 1 to August 31 or during agency approved extensions

  - All other streams: In-water work allowed July 1 to August 31 or during agency approved extensions

- Other wildlife restrictions:
  - During critical breeding period for northern spotted owl (March 1 to July 15), no transport of heavy equipment, helicopter use, transmission line construction activities, danger and corridor tree removal, or blasting within 0.25 miles of northern spotted owl sites ((structures 13/3 through 13/8 and 14/2 through 14/7)
  - Avoid tree removal between April 1 and July 15 to minimize displacement of nesting birds
  - If construction coincides with emergence of western pond turtle hatchlings at a known pond turtle site, conduct pre-construction surveys by visual observation for nesting activity, including checking for evidence of nesting and hatchling emergence, in April to July of the year of construction. If nests are identified in or near the work areas, mark those areas as no work zones and relocate any hatchlings and adult turtles to suitable habitat outside the work area.

2.2.13 Ongoing Operation, Maintenance and Vegetation Management

BPA conducts routine periodic inspections, maintenance, and vegetation management of the 15,000-mile federal transmission system in the Pacific Northwest. BPA has operated and maintained the Hills Creek-Lookout Point transmission line since it was built in 1953. This ongoing operation and maintenance would continue whether or not the Proposed Action was implemented. However, because the Proposed Action is essentially a major maintenance project and includes replacement of worn parts of the existing transmission line and enhancements to the access road system, the need for future maintenance and repairs would be less frequent and on a smaller scale than currently required.

BPA conducts vegetation management along the Hills Creek-Lookout Point transmission line right-of-way every 3 to 5 years to keep vegetation a safe distance from the conductor, maintain access to structures, and to help control invasive plants. BPA most recently conducted vegetation management along the line in the 2012-2013 season. Vegetation management is guided by BPA's *Transmission System Vegetation Management Program Final EIS/Record of Decision* (BPA 2000). Depending on the vegetation type, environment, and landowner, a number of different vegetation management methods could be used: manual (e.g., hand-pulling, clippers, chainsaws), mechanical (e.g., roller-choppers, brush-hog), or chemical (e.g., herbicides).

Vegetation management generally includes keeping trees and other tall growing vegetation from growing within the transmission line right-of-way, invasive plant control, and removing trees inside and outside the right-of-way that have the potential to grow or fall into the line. BPA identifies trees requiring removal by evaluating tree height and growth potential, how the tree leans, stability and health (e.g., root pathogen damage), and whether it is located in areas with severe storm damage potential. Much of the Hills Creek-Lookout Point transmission line right-of-way passes through

forested areas, including the Willamette National Forest, where tree removal is continually evaluated.

When line and access road maintenance or vegetation management is required for a BPA transmission line, BPA conducts environmental review for those site-specific maintenance activities as appropriate.

2.3 No Action Alternative

Under the No Action Alternative, BPA would not rebuild the transmission line or upgrade access roads, or culverts, as a single coordinated project. Construction activities associated with the Proposed Action would not occur. However, the reliability and safety concerns that prompted the need for the Proposed Action would remain. The structures that are currently located in the rock fall area of line mile two and the landslide area of line mile three would be repaired in their current locations, but would be susceptible to future damage from rock falls and landslides. BPA would continue to operate and maintain the existing transmission line in its current condition, replacing aged and rotting structures as they deteriorate, maintaining access roads to allow access to structures on an as-needed basis, and managing vegetation for safe operation.

Given the current poor condition of the transmission line, the No Action Alternative would likely result in more frequent and more disruptive maintenance activities than has been required in the past. It might be possible to plan some repairs, but many would likely occur on an emergency basis as the transmission line continues to deteriorate.

The overall scale and scope of the repairs that would be done under the No Action Alternative would be smaller than what is planned under the Proposed Action. The maintenance program addresses immediate needs to keep the transmission line functioning, and would likely not include more comprehensive improvements such as access road work to improve water runoff and fish-passable culvert replacements. Access road work under the No Action Alternative would be limited to enhancements necessary to allow access to specific structures for as-needed repairs and maintenance.

2.4 Alternatives Dismissed from Further Consideration

In addition to the Proposed Action and the No Action Alternative, BPA considered rebuilding the existing transmission line along its existing alignment without realignments in line miles two and three. This alternative was dismissed from further consideration because it would have remained susceptible to landslides and potential damage in the rock fall area, thereby jeopardizing the line's reliability.

2.5 Comparison of Alternatives

Table 2-3 compares the Proposed Action and the No Action Alternative by the purposes of the Proposed Action described in Section 1.3. Table 2-4 summarizes the potential environmental

impacts of these two alternatives. Environmental design features and ***mitigation measures*** (steps taken to lessen the potential impacts) included as part of the Proposed Action are described in Section 2.6.

Table 2-3. Comparison of the Proposed Action and No Action Alternative in Meeting Project Purposes

Purpose of Project	Proposed Action Alternative	No Action Alternative
Maintain or improve transmission system reliability to BPA and industry standards	Replacing deteriorating structures and associated equipment would help enhance reliability by reducing the risk of unplanned outages and the need for emergency repairs. Enhanced access roads would help ensure that emergency repairs could be made quickly.	Outdated and physically worn structures and associated equipment would pose a greater risk for unplanned outages and unreliable service. Emergency response times could increase due to access roads that are in poor condition.
Continue to meet BPA's contractual and statutory obligations to supply safe, reliable power to serve its customers	The rebuilt transmission line would help ensure that BPA will continue to meet its obligations to maintain a safe and reliable transmission system and to deliver power to its customers in and around Oakridge.	The existing line would continue to deteriorate and threaten system reliability and subsequent power delivery to customers in and around Oakridge.
Minimize environmental impacts to the surrounding area	Environmental impacts due to rebuilding the line would be primarily short-term and would be mitigated through appropriate mitigation measures described in Chapter 3. (See Table 2-4 for a summary of impacts for each resource.)	There would be no construction-related environmental impacts, but impacts would still occur and would be spread out over time as BPA has to replace deteriorating structures and associated equipment and repair access roads. As some of these repairs would likely be done on an emergency basis, there may not be time to accommodate planning efforts to coordinate with landowners or avoid or lessen impacts to environmental resources. Therefore, impacts to resources could eventually be greater with the No Action Alternative than with the Proposed Action. (See Table 2-4 for a summary of impacts for each resource.)
Demonstrate cost-effectiveness of rebuilding the transmission line instead of performing repairs on an as-needed basis	Total costs would be about $6 million to $8 million.	The cost of rebuilding the transmission line would not occur at one time, but would be spread over years as repairs are required. Because repairs and mobilization of construction crews would be done on an as-needed basis, the No Action Alternative would be less efficient and could eventually cost more than the Proposed Action.

Table 2-4. Comparison of the Potential Environmental Impacts by Alternative

Environmental Resource	Impacts of the Proposed Action Alternative	Impacts of the No Action Alternative
Land Use, Recreation, and Transportation		
Overall potential impact	*Low*	*Low*
Conversion of forested land for realignments of line miles two and three, and new access roads	4 acres of forested land converted	0 acres of forested land converted
Abandonment of BPA right-of-way and rehabilitation to revert back to forest lands	4 acres	0 acres
Construction of new roads/ Abandonment of roads	0.1 miles of new access roads 0.5 miles of road abandonment and rehabilitation	0 miles of new access roads 0 miles of road abandonment and rehabilitation
Park closures during construction	Temporary traffic and/or noise increase to parks during construction Temporary but planned partial park closures (up to 2 days per structure; up to 3 days per mile of access road work)	Unplanned park closures as needed for emergency repairs
Traffic delays during construction	Temporary but planned traffic delays near roadway and rail crossings associated with structure replacement Temporary delays to traffic	Unplanned traffic delays
Geology and Soils		
Overall potential impact	*Low*	*Low-to-moderate*
Soil disturbance/compaction from construction activities for access roads	1 acre disturbance from new roads 1.5 acres disturbance from reconstructed roads	0 acres disturbance from new roads 0 acres disturbance from reconstructed roads
Soil disturbance from construction activities for structure replacement	51 acres soil disturbance total (0.2 acres per structure/0.05 acres per structure in sensitive areas)	Soil disturbance during routine maintenance and emergency repairs
Temporary erosion or dust generated during construction	Low risk of erosion on slopes less than 30 percent Low-to-moderate risk of erosion on slopes greater than 30 percent	Increased number of visits to deteriorating structures could lead to greater erosion and compaction, especially during wet conditions
Soil contamination	Pole wraps to prevent PCP leaching within 50 feet of streams and wetlands	Pole wraps might be used when replacing poles on an emergency basis
Risk of landslides and rockfalls	Could be increased due to new roads and reconstructed roads Reduced risk of damage to structures in realigned portions of line miles two and three	Increased risk of structure failure due to landslides and/or rock falls

Table 2-4. Comparison of the Potential Environmental Impacts by Alternative (continued)

Environmental Resource	Impacts of the Proposed Action Alternative	Impacts of the No Action Alternative
Vegetation		
Overall potential impact	*Low*	*Low*
Vegetation disturbance and clearing	51 acres	Vegetation clearing and disturbance as needed for emergency repairs
Tree removal	2,700 trees	Tree removal during routine maintenance activities and as needed for emergency repairs
Spread of invasive plants	Increased potential for spread of invasive plants, particularly in the line mile two realignment	Increased potential for spread of invasive plants during emergency repairs
Streams and Fish		
Overall potential impact	*Low*	*Low-to-moderate*
Construction work within 100 feet of waterways	3 structures 0.3 mile access road work	As needed for maintenance and emergency repairs
Permanent impacts to streams	3,700 sq ft (0.08 acres)	Impacts during maintenance and emergency repairs
Temporary impacts to streams	1,500 sq ft (0.03 acres)	
Tree removal within 150 feet of streams	325 trees	Tree removal during routine maintenance activities and as needed for emergency repairs
Culvert/ford replacements on fish-bearing streams	3 fords 1 culvert with improved fish passage	None
Erosion, runoff, sediment deposition, and turbidity impacts	During and immediately after construction	During emergency repairs
Changes to stream flow and fish passable	Improved flow control and localized habitat improvements	No replacement of undersized and impassable culverts
Disturbances to fish and fish habitat	Temporary disturbances to fish habitat and individual fish during construction	Fish mortality and habitat impacts during emergency repairs
Wetlands, Floodplains and Groundwater		
Overall potential impact	*Low-to-moderate – Wetlands* *Low – Floodplains and Groundwater*	*Low-to-moderate – Wetlands* *Low – Floodplains and Groundwater*
Permanent impacts to wetlands	0.8 acre	Impacts during maintenance and emergency repairs
Temporary impacts to wetlands	1.3 acre	
Impacts to wetland functions	Loss of function from road construction and improvement; Temporary disruption during construction	Loss and disruption during maintenance and emergency repairs
Impacts to wetland vegetation	Soil compaction and crushing of wetland vegetation Removal of up to 50 danger trees located in wetlands	Potential soil compaction, damage to vegetation, and tree removal during maintenance and emergency repairs

Table 2-4. Comparison of the Potential Environmental Impacts by Alternative (continued)

Environmental Resource	Impacts of the Proposed Action Alternative	Impacts of the No Action Alternative
Wetlands, Floodplains and Groundwater (continued)		
Permanent disturbance area in floodplain for access roads	5.2 acres	Disturbance during maintenance and emergency repairs
Temporary disturbance area in floodplain for structure replacement	1 acre	
Impacts to groundwater quality	Potential for accidental chemical spills and PCP leaching from wood poles	Potential for accidental chemical spills during maintenance and emergency repairs
Wildlife		
Overall potential impact	*Low – Habitat alteration* *Moderate – Noise and activity levels*	*Low*
Conversion of habitat	5.5 acres	0 acres
Tree removal in riparian areas	325 trees	Tree removal during routine maintenance activities and as needed for emergency repairs
Removal of snags	21 snags	
Removal of coniferous trees from northern spotted owl habitat	202 trees	
Disturbances to wildlife and habitat	Temporary noise and human intrusion, during construction	Noise
Potential for bird collision	Reduced through the installation of 19 bird diverters	No bird diverters installed
Cultural Resources		
Overall potential impact	*No Impact – Archaeological* *No Impact – Historic*	*Low*
Ground disturbance of archaeological sites	None	Disturbance during routine maintenance and emergency repairs
Alteration of historic resources	Low - Alteration of the existing transmission line (historic resource)	Potential for alteration of the existing transmission line (historic resource)
Visual Quality		
Overall potential impact	*Low*	*Low*
Permanent changes in forested visual environment	Additional cleared areas for realignments in lines miles two and three 3 wood poles replaced with 1 steel monopole and 1 lattice steel structure with an increased height of 101 to 113 feet in line mile three	Vegetation clearing during routine maintenance and emergency repairs
Permanent changes in urban visual environment	15 wood poles replaced with steel monopoles up to 31 feet taller than existing structures	None anticipated

Table 2-4. Comparison of the Potential Environmental Impacts by Alternative (continued)

Environmental Resource	Impacts of the Proposed Action Alternative	Impacts of the No Action Alternative
Visual Quality (continued)		
Temporary visual changes	Temporary presence of workers, equipment, materials, signage; movement of vehicles and traffic congestion during construction	Temporary presence of workers, equipment, materials, signage; movement of vehicles and traffic congestion during maintenance and emergency repairs
Socioeconomics and Public Health		
Overall potential impact	*Low*	*Moderate*
Permanent changes to socioeconomic conditions	None	Reduced reliability of transmission line as a power supply
Temporary changes in socioeconomic conditions	Temporary increase in population, stimulation of the economy, demand for lodging	Power outages, voltage fluctuations
Impacts to environmental justice populations	No long-term disproportionately high and adverse impacts	None – impacts would be the same for all residents
Noise, Public Health and Services		
Overall potential impact	*Low*	*Low – Noise* *Moderate-to-high – Public Health and Safety*
Temporary noise impacts	80 to 92 dBA within 50 feet of construction Over 100 dBA when helicopters are near the ground	Construction noise during maintenance and emergency repairs
Impacts to public health and safety	Potential spills of hazardous materials during construction	Increased risk of line failure and power outages potentially disrupting services of public safety agencies and health providers Risk of fire or electrocution from structure failures
Audible noise within transmission line right-of-way	17.0 to 19.6 dBA	24.7 to 27.3 dBA
Electric field values within transmission line right-of-way	0.4 to 1.5 kV/m	0.4 to 1.4 kV/m
Magnetic field values within transmission line right-of-way	2.0 to 30.4 mG	1.9 to 30.4 mG
Air Quality		
Overall potential impact	*Low*	*Low*
Impacts to air quality	Temporary increase in dust and contaminants, reduction in visibility during construction	Dust and emissions from equipment during routine maintenance and emergency repairs

Table 2-4. Comparison of the Potential Environmental Impacts by Alternative (continued)

Environmental Resource	Impacts of the Proposed Action Alternative	Impacts of the No Action Alternative
Greenhouses Gases		
Overall potential impact	*Low*	*Low*
Carbon dioxide emissions	2,700 metric tons	Emissions from vehicles and equipment during routine maintenance and emergency repairs
Loss of carbon sequestration from tree removal	8,300 metric tons carbon dioxide equivalent	Loss of carbon sequestration due to tree removal during routine maintenance activities and as needed for emergency repairs

2.6 Mitigation Measures

Mitigation measures have been identified to avoid or minimize potential impacts of the Proposed Action, as listed in Table 2-5. Based BPA's previous experience rebuilding transmission lines in a similar environment, BPA has determined that the following mitigation measures effectively avoid and minimize project impacts. The Proposed Action has been developed consistent with the standards and guidelines outlined in the Forest Plan and the Northwest Forest Plan, as referenced in the mitigation measures below and elsewhere in this EA.

Table 2-5. Mitigation Measures for the Proposed Action

Land Use, Recreation and Transportation
• Provide a construction schedule to all potentially affected landowners. • Post a construction schedule at Oakridge Airport and all potentially affected recreational areas. • Coordinate the construction schedule with Forest Service recreation specialists to post alerts for construction activities that may impact users of recreational facilities. • Maintain existing access to residences and other areas during construction. • Coordinate with commercial timber landowners to ensure that access road enhancements, gates, and construction and maintenance activities would minimize disruptions to commercial forestry operations. • Compensate landowners for the value of any property damaged by construction activities, as appropriate. • Coordinate with local agencies to avoid construction activities that could conflict with their own construction activities. • Prepare a notice about construction activities and a proposed schedule for posting on the ODOT's traffic advisory web site called Trip Check (http://www.tripcheck.com). • Schedule construction activities at the transmission line crossings of Highway 58 to avoid lane closures during peak travel times, as determined in coordination with ODOT. • Use traffic safety signs and flaggers to inform motorists and manage traffic during construction activities on affected roads. • Install permanent gates at selected locations to minimize unauthorized use of BPA access roads and unauthorized entry to BPA right-of-way. • Where existing rural roadways are narrow, provide traffic control to ensure traffic safety. • Follow the applicable state, county, city, and railroad requirements for traffic control and lane closures.

Table 2-5. Mitigation Measures for the Proposed Action (continued)

Geology and Soils
• Stabilize permanent disturbance areas by applying a weed-free gravel top layer, as certified by the Forest Service, to the roadways and trailbeds.
• Place new structures in existing structure holes to the maximum extent practicable to reduce ground disturbance.
• Conduct project construction, including tree removal, during the dry season when rainfall, runoff, and stream flow are low to minimize erosion, compaction, and sedimentation, to the extent practicable.
• Contact BPA geotechnical specialists if geotechnical issues, such as new landslides, arise during construction.
• Install appropriate erosion-control devices where needed to minimize soil transport (FW-079).
• Retain vegetative buffers where possible to prevent soil from entering waterbodies.
• Design access road enhancements using low grades, water bars, and drain dips to help control runoff and prevent erosion.
• Properly space and size culverts on access roads.
• Use water trucks on an as-needed basis to minimize dust and reduce erosion due to wind.
• Revegetate disturbed areas to help stabilize soils as soon as work in that area is completed and appropriate environmental conditions exist, such as moderate temperatures and adequate soil moisture.
• Inspect revegetated areas to verify adequate growth and implement contingency measures as needed.
• Inspect and maintain access roads and cross-drains to ensure proper function and nominal erosion levels after construction.
• Salvage, stockpile, and solarize (for 2 to 4 weeks with plastic to kill weeds) selected topsoil where practicable for replacement on cut/fill slopes to improve site restoration and plant establishment.
• Install pole wraps on structures located within 50 feet of wetlands or streams or within the 100-year floodplain.
Vegetation
• Use existing road systems, where practicable, to access structure locations.
• Minimize the construction area (footprint) and disturbance to vegetation to the extent practicable, especially within wetlands and adjacent waterbody crossings.
• Locate materials storage and staging areas in previously disturbed areas.
• Conduct as much work as possible, including tree removal during the dry season to minimize erosion, and soil compaction.
• Conduct tree removal in a manner that minimizes disruption to remaining trees and shrubs.
• Cut trees and leave existing root systems intact to help prevent erosion.
• Return temporarily disturbed areas to their original (pre-construction) contours and conduct site restoration and revegetation measures before or at the beginning of the first growing season following construction.
• Revegetate disturbed areas with native grasses and forbs to ensure appropriate vegetation coverage and soil stabilization prior to rainy season (November 1).
• Keep pulling/tensioning equipment inside the transmission line right-of-way.
• Conduct post-construction site restoration monitoring with at least three field visits per year until site stabilization is achieved.
• Prior to construction, flag noxious weed infestation areas for avoidance (as practicable) and/or treat noxious weeds adjacent to access roads and structure sites (FW-259).
• Perform follow-up monitoring and treat infestation areas after construction if needed (FW-261).
• Implement measures to minimize noxious weed spread–inspect vehicles before entering construction areas, install and use weed wash stations, or use other appropriate equipment cleaning measures.
• Perform weed treatment in disturbed areas along trails as needed for up to 3 years following construction.

Table 2-5. Mitigation Measures for the Proposed Action (continued)

Streams and Fish
• Conduct in-water work in the Middle Fork Willamette River subbasin between August 1 and August 31 in Buckhead and Burnt Bridge creeks, and between July 1 and August 31 in all other streams, or during ODFW biologist-approved extensions. • Divert stream flow around the work area and maintain downstream flow during construction. • Isolate in-water work areas prior to culvert and ford installations. Dewater work area as necessary for construction and to minimize turbidity. Do not discharge turbid water to streams. • Conduct fish salvage according to NMFS/ODFW requirements (NMFS, 2000; ODFW, 2014). • Install culverts and fords in accordance with NMFS/ODFW fish passage requirements (RF-6). • Comply with applicable Clean Water Act permits for work in wetlands or streams (FW-088). • Restrict construction vehicles and equipment to access roads and designated work areas. • Return temporary disturbance areas for ford, culvert, and road work to pre-construction contours; mulch, seed, and plant as per plans and specifications. • Dispose of waste material generated from access road work in a stable upland site approved by a geotechnical engineer or other qualified personnel, smooth to match adjacent grades, and seed for stability. • Conduct soil-disturbing activities during dry conditions to the greatest extent practicable. • Outslope access roads (e.g., 2 to 5 percent), maintaining natural drainage patterns and minimizing interceptions and concentration of upgradient runoff when practicable (RF-5). • Design headwaters culverts (non-fish drainages) for the 100-year storm event to minimize future maintenance needs (RF-4). • Develop and implement a spill prevention and spill response plan (FW-091). • Store, fuel, and maintain all vehicles and other heavy equipment (when not in use) in a designated upland staging area located a minimum of 150 feet away from any stream, waterbody, or wetland or where any spilled material cannot enter natural or manmade drainage conveyances. • Confirm equipment is clean (e.g., power-washed) and that it does not have fluid leaks prior to contractor mobilization of heavy equipment to site. Inspect equipment and tanks for drips or leaks daily and make necessary repairs within 24 hours. • In the event of a spill, immediately contain the spill, eliminate the source, and deploy appropriate measures to clean and dispose of spilled materials in accordance with federal, state, and local regulations. • Maintain emergency spill control materials, such as oil booms and spill response kits, on-site at each ford or culvert replacement site at all times and ready for immediate deployment. • Install cross-drains per BPA access road design specifications. • No use of fertilizers when revegetating disturbed areas. • Locate water drafting sites (locations where contractor may fill water trucks) to minimize adverse effects on stream channel stability, sedimentation, and in-stream flows (RA-4).
Wetlands, Floodplains and Groundwater
• Avoid and minimize wetland impacts where possible by using temporary equipment mats, or only crossing wetlands during the dry season. • Obtain and comply with applicable Corps Clean Water Act and State of Oregon removal/fill permits for all work in wetlands or streams (FW-088). • Install erosion-control measures prior to work in or near wetlands (e.g., silt fences, straw wattles, and other sediment control measures) and reseed disturbed areas as required (FW-079). • Do not deposit excavated material in wetland areas. • Do not locate construction staging, equipment or materials storage, or vehicle fueling in or adjacent to wetland areas.

Table 2-5. Mitigation Measures for the Proposed Action (continued)

Wetlands, Floodplains and Groundwater (continued)
• Use existing roads to access structure locations. Clearly mark road sections to be decommissioned before construction. • Remove any temporary equipment mats and revegetate. • Restore all temporary disturbance areas to original contours and decompact, if necessary. • Replant all temporary disturbance areas within wetlands with native species and remove or control invasive plants until native plants are well-established. Monitor revegetated wetland areas to ensure adequate cover. Use herbicides to control vegetation near wetlands in accordance with BPA's Transmission System Vegetation Management Program Final Environmental Impact Statement/Record of Decision (BPA 2000) and the Forest Service's EIS and Record of Decision for Preventing and Managing Invasive Plants (U.S. Forest Service 2005) to limit impacts to water quality. • Revegetate decommissioned road segments through wetlands. • Purchase 0.7 wetland mitigation bank credits at the Coyote Prairie North Mitigation Bank to replace lost wetland area, functions and values for 0.69 acres of wetlands impact in the Middle Fork Willamette River watershed that are within the service area of the bank (west of Oakridge). • Purchase 0.07 credits from Oregon Department of State Lands' Payment-in-Lieu Program to compensate for lost wetland area, functions and values outside to service area of any mitigation bank or fee-in-lieu program (east of Oakridge). • Limit the placement of fill for access road work in floodplains to the minimum required. • Install erosion-control measures prior to work in or near floodplains (FW-079). • Prepare and implement a storm water pollution prevention plan. • Use pole wraps on structures located within 50 feet of wetlands or streams or within the 100-year floodplain.
Wildlife
• Install bird diverters where the line crosses rivers, wetlands, or other high bird-use areas, and it would be technically feasible: transmission line spans 1/1-2/4, 2/4-2/7, 3/1-3/2, 4/4-5/1, 6/2-7/4, 7/4-8/1, 8/1-8/4, 9/3-10/1, 10/1-11/1, 11/1-11/7, 12/3-12/5, 12/8-12/10, 14/1-14/7, 15/10-16/5, 17/2-17/6, 18/5-19/1, 20/8-20/9, 22/3-22/4, and 23/1-23/2. • Trim or girdle up to 20 of the trees identified for removal on Forest Service land between line miles 9 and 16 within the right-of-way to provide habitat/structure for wildlife, particularly northern spotted owls, small mammals and amphibians (FW-128, FW-129). • Trim or girdle up to 35 of the trees identified for removal on Forest Service Corps land between line miles 15 and 22 within the right-of-way to provide habitat/structure for wildlife. • Restore areas disturbed by construction to pre-construction condition. • Avoid tree removal between April 1 and July 15 to minimize displacement of nesting birds (FW-133). • Provide maps of areas to be avoided by helicopters to minimize impacts to wildlife. • If spotted owl nest sites are discovered prior to construction, implement the following restrictions: • Avoid all work within 0.25 mile of occupied northern spotted owl sites during the critical breeding period: March 1 and July 15 (FW-170, FW-173). • If construction coincides with emergence of western pond turtle hatchlings at a known pond turtle site, conduct pre-construction surveys by visual observation for nesting activity, including checking for evidence of nesting and hatchling emergence, in April to July of the year of construction. If nests are identified in or near the work areas, mark those areas as no work zones and relocate any hatchlings and adult turtles to suitable habitat outside the work area.
Cultural Resources
• Locate transmission structures, equipment and material storage area, and access roads so as to avoid known cultural resource sites and limit ground disturbance.

Table 2-5. Mitigation Measures for the Proposed Action (continued)

Cultural Resources (continued)
• Provide cultural resource monitors, as necessary, to observe ground-disturbing activities in areas of previously documented cultural sites (FW-263, FW-267). • Develop an Inadvertent Discovery Plan that details crew member responsibilities for reporting in the event of a discovery during construction. In the event of an inadvertent discovery, stop work immediately and notify appropriate BPA personnel, land management agency (e.g., Forest Service, Corps), the Oregon SHPO, and the interested tribes. • Stop construction in the area immediately should human remains or burials be encountered. Secure the area, placing it off limits for anyone but authorized personnel, and immediately notify proper law enforcement, the BPA archaeologist, the Oregon SHPO, and the tribes. • Implement any additional cultural resource mitigation measures identified through the Section 106 consultation process (FW-273).
Visual Quality
• Locate construction staging and storage areas away from locations that would be clearly visible from residences and recreation facilities. • Use non-reflective insulators (e.g., non-ceramic insulators or porcelain) to reduce refraction and glare. • Focus security lighting at staging areas and the material storage yard inward to minimize spillover of light and glare. • Require that contractors maintain a clean construction site and remove all construction debris.
Socioeconomics and Public Health
• Maintain access to all businesses, residences, and public facilities during construction. • Notify local agencies, residences, and business owners of upcoming construction activities and potential disruptions associated with the Proposed Action. • Coordinate with utility providers that share BPA right-of-way to determine the exact locations of utilities and minimize service disruptions to other utility lines. • Compensate landowners at market value for any new land rights required for new, temporary, or permanent access roads on private lands and apply for applicable permits to obtain new access rights on public lands.
Noise, Public Health and Services
• Use sound-control devices on construction equipment with gasoline or diesel engines and limiting construction noise to daylight hours (7:00 a.m. to 5:00 p.m.) to reduce noise impacts. • Implement spill prevention and response plan (FW-091).
Air Quality
• Use water trucks or other dust control measures to control dust during construction. • Keep all vehicles in good operating condition to minimize exhaust emissions. • Turn off construction equipment during prolonged periods of non-use. • Drive vehicles at low speeds (less than 5 mph) on access roads to minimize dust during high dust conditions.
Greenhouse Gases
• Locate staging areas as close to construction sites as practicable to minimize driving distances between staging areas and construction sites. • Locate staging areas in previously disturbed or graveled areas to minimize soil and vegetation disturbance where practicable. • Encourage the use of the proper size of equipment for the job to maximize energy efficiency. • Recycle or salvage non-hazardous construction and demolition debris where practicable. • Dispose of wood poles off-site at an appropriate facility in the local area where practicable. • Use local rock sources for road construction where practicable.

2.7 Environmental Consultation, Review, and Permit Requirements

Table 2-6 summarizes the major environmental consultation, review, and permit requirements for the Rebuild Project and the relevant project information that demonstrates compliance with those requirements.

Table 2-6. Environmental Consultation, Review, and Permit Requirements for the Rebuild Project

Permit, Consultation, or Compliance	Relevant Project Information
All Resources	
National Environmental Policy Act (NEPA) of 1969 42 U.S.C. § 4321 *et seq.*	BPA has prepared this EA pursuant to regulations implementing NEPA, which requires federal agencies to assess, consider, and disclose the impacts that their actions may have on the environment before decisions are made or actions are taken.
National Forest Management Act of 1976	This Act establishes standards for how the Forest Service manages the national forests, requires the development of land management plans for national forests and grasslands, and directs the Forest Service to develop regular reports on the status and trends of the Nation's renewable resources on all forest and rangelands. As demonstrated throughout this EA, the Proposed Action is consistent with Forest Service management policies specified in the standards and guidelines of the Forest Plan and the Northwest Forest Plan.
State and Local Plan and Program Consistency	
Oregon Statewide Planning Goals 2005-2014 Oregon Statewide Trails Plan 2008-2012 Oregon Statewide Comprehensive Outdoor Recreation Plan ORS 197.298 Lane County Code Lane County Comprehensive Plan Rivers to Ridges Vision and Strategies Oakridge-Westfir Community Trails Plan City of Oakridge, Oregon Strategic Plan 2013-2018 City of Oakridge Subdivision Code City of Oakridge Zoning Ordinance Oakridge Comprehensive Plan Westfir Comprehensive Plan Westfir Land Development Code	BPA strives to meet or exceed the substantive standards and policies of state and local plans and programs to the maximum extent practical. The project would not conflict with state of local planning as there would be no change in local land use due to the project—the work would mostly be within the existing transmission line right-of-way and access road footprint. BPA would coordinate with state and local agencies to obtain the necessary access and alert them of potential impacts from the Proposed Action, such as to utilities or floodplains. BPA would also coordinate with ODOT for modification to or any new access roads requiring access off an ODOT-managed state roadway.

Table 2-6. Environmental Consultation, Review, and Permit Requirements for the Rebuild Project (continued)

Permit, Consultation, or Compliance	Relevant Project Information
Forest Plan Northwest Forest Plan	The Proposed Action is consistent with the relevant Forest Plan and Northwest Forest Plan standards and guidelines that have been referenced and discussed and disclosed throughout the EA.
Vegetation, Wildlife, and Fish	
Endangered Species Act (ESA) of 1973 16 U.S.C. § 1531 *et seq.*	BPA prepared a Biological Assessment to address potential impacts on to ESA-listed fish, wildlife, and plant species. BPA received a letter of concurrence from USFWS on July 5, 2016. In October 2014, BPA initiated consultation with NMFS to prepare a Programmatic Biological Opinion to address potential impacts to ESA-listed anadromous fish under their jurisdiction. Biological Opinions would likely be developed by NMFS and USFWS where incidental ***take*** (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct) authorization is necessary. Take authorization is anticipated for Upper Willamette River Chinook because in-water work (fish salvage) would occur in an area where juvenile Chinook could be present. The likely outcome of the consultation would be an incidental take permit authorized by Section 10(a)(1)(B) for impacts related to listed fish, wildlife, or plant species during construction. To date, BPA has met with and/or communicated via telephone or phone on fifteen (15) separate occasions with USFWS, Forest Service, ODFW, and NMFS to discuss project impacts on ESA-listed species and to determine mitigation and minimization measures. A summary of this consultation can be found in Exhibit 2 of the project's Biological Assessment.
Fish and Wildlife Conservation Act 16 U.S.C. § 2901 *et seq.* Fish and Wildlife Coordination Act 16 U.S.C. § 661 *et seq.*	BPA has consulted with the USFWS and ODFW and incorporated recommendations to avoid and minimize potential impacts on fish and wildlife resources. Low-to-moderate impacts on fish and wildlife resources, and minimization and mitigation measures for those impacts, are described in Sections 3.4 and 3.6.
Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) of 1976 16 U.S.C. 1801 *et seq.*	Essential Fish Habitat (EFH) is administered under the amended Magnuson-Stevens Act; EFH for Upper Willamette River Chinook salmon is found within streams in the project area. Compliance with the Magnuson-Stevens Act for Upper Willamette River Chinook salmon has been satisfied by utilizing BPA's forthcoming Programmatic Biological Opinion (and the associated impact analysis of the EFH) for this project during Section 7 Consultation with NMFS.
Migratory Bird Treaty Act (MBTA) of 1918 16 U.S.C. § 703-712 Responsibilities to Federal Agencies to Protect Migratory Birds Executive Order 13186	One-hundred twenty-four species of birds protected under the MBTA have been observed within and adjacent to the transmission line right-of-way and access road areas (Appendix E). Possible impacts on nesting birds are described in Section 3.6. BPA would lessen potential impacts to migratory birds through the measures to schedule tree removal after August 15 to minimize displacement of nesting birds, as well as installing bird diverters on conductors where there is a potential risk of bird-conductor collisions (FW-133, FW-134).

Table 2-6. Environmental Consultation, Review, and Permit Requirements for the Rebuild Project (continued)

Permit, Consultation, or Compliance	Relevant Project Information
Vegetation, Wildlife, and Fish (continued)	
Bald Eagle and Golden Eagle Protection Act (Eagle Act) of 1940 16 U.S.C. § 668-668d	Compliance with the Bald Eagle and Golden Eagle Protection Act would be required to address potential impacts to bald eagles due to proximity to known or potential bald eagle nesting habitat within 2 miles of the transmission line. While about 75 cottonwood trees that provide potential habitat for bald eagles would be removed along the Lookout Point Lake, the impacts of the Proposed Action would be low because cottonwood trees are abundant in the immediate vicinity, and known bald eagle nests are located about 1 mile from where construction would take place (Section 3.6).
Oregon Fish Passage Law ORS 509.580 - 509.910 OAR 635, Division 412	BPA has consulted with ODFW and incorporated the ODFW biologist's recommendations to avoid and minimize potential impacts to fish and wildlife resources. Two culverts would be reconstructed to be fish passable as part of the Proposed Action and three ford crossings would be improved. Site restoration measures would also be implemented after project construction according to prescriptions for re-seeding and mulching disturbed areas, replanting trees and shrubs removed adjacent to culvert installations, and installation of native, low-growing shrubs in disturbed riparian areas within areas where BPA is releasing its easement (e.g., line mile three re-route). As a federal agency, BPA is not required to comply with state and local approvals or permits; however, BPA strives to meet or exceed these substantive standards and policies of state and local plans and programs to the maximum extent practicable. Based on initial ODFW biologist input, the mitigation proposed by BPA would be consistent with ODFW's fish and wildlife habitat mitigation policy.
Northwest Forest Plan: Survey and Manage	The Proposed Action complies with Survey and Manage standards and guidelines. Pre-disturbance surveys for the Great Grey Owl were conducted in 2014, as described in Section 3.6.1.
Executive Order 12962: Recreational Fishing Executive Order 13443: Facilitation of Hunting Heritage and Wildlife Conservation	Executive Order 12962 requires government agencies to strengthen efforts to improve fisheries conservation and provide for more and better recreational fishing opportunities, and to develop a new policy to promote compatibility between the protection of endangered species and recreational fisheries, and to develop a comprehensive Recreational Fishery Resources Conservation Plan. Executive Order 13443 requires Federal agencies to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat. The Proposed Action would protect sport fishing opportunities and provide better hunting opportunities by replanting the existing and proposed rights-of-way in line miles two and three with shrub species that provide forage for elk and deer. Additionally the surface water controls (e.g., waterbars, cross drain culverts) proposed in the road improvements would reduce the amount of sediment entering local streams which would benefit native fish populations.

Table 2-6. Environmental Consultation, Review, and Permit Requirements for the Rebuild Project (continued)

Permit, Consultation, or Compliance	Relevant Project Information
Waters, Wetlands, and Floodplain Protection	
Clean Water Act 33 U.S.C. § 1251 *et seq*. Floodplain/Wetlands Environmental Review Requirements 10 CFR 1022.12 Floodplain Management Executive Order 11988 Protection of Wetlands Executive Order 11990 OAR 141-085-690 (12)	Wetland management, regulation, and protection are addressed in several sections of the Clean Water Act, including Sections 401, 402, and 404. Project area wetlands were delineated in 2014 (PBS Engineering & Environmental 2014a). Potential impacts on floodplains and wetlands from the Proposed Action and mitigation for these impacts are described in detail in Section 3.5. This EA serves as the notice of floodplain and wetlands actions as required under 10 CFR 1022.12(b). BPA will be obtaining the necessary permits for this project. For federal facilities in Oregon, the EPA has delegated National Pollutant Discharge Elimination System (NPDES) enforcement and permitting authority to the State. BPA, being a government agency, obtained and maintains an agency NPDES General Storm Water 1200-CA Permit (File No.: 111769; EPA No.: ORR10-4145) from DEQ. Authorized agency permits as of December 31, 2005 were administratively extended by DEQ. Until the permit extension is terminated or modified or revoked, BPA or BPA's contractor is authorized to construct, install, modify, or operate erosion and sediment control measures and stormwater treatment and control facilities, and to discharge stormwater to public waters in conformance with all the requirements, limitations, and conditions set forth within the NPDES permit. BPA would prepare a Stormwater Pollution Prevention Plan to meet the requirements of the EPA Construction General Permit (February 16, 2012) at the direction of DEQ. The EPA Construction General Permit also requires that BPA construction projects comply with water quality standards set by the state in OAR 340 Division-41. Applicants receiving a Section 404 permit from the Corps are required to obtain a Section 401 water quality certification from DEQ through a joint application process. BPA will prepare a joint permit application for this project, which would be reviewed by the Corps and DSL. BPA would not begin construction until after the application is approved by both regulatory authorities.
Northwest Forest Plan Aquatic Conservation Strategy	The Aquatic Conservation Strategy was developed to maintain and restore the ecological health of watersheds and aquatic ecosystems on public lands through implementation of four components: 1) riparian reserves 2) key watersheds 3) watershed analysis 4) watershed restoration. Based on the analysis presented in this EA and Appendix D, the objectives of the Aquatic Conservation Strategy would be met by the Proposed Action.
Cultural and Historic Resources	
Antiquities Act of 1906 16 U.S.C. § 431-433 Historic Sites Act of 1935 16 U.S.C. § 461-467 National Historic Preservation Act (NHPA), as amended, inclusive of Section 106 16 U.S.C. § 470 *et seq.*	BPA provided information about the Proposed Action and requested input on cultural resources from the following tribes: The Confederated Tribes of Siletz Indians of Oregon, Coquille Indian Tribe, Confederated Tribes of the Warm Springs Reservation, Cow Creek Band of Umpqua Tribe of Indians, the Confederated Tribes of Grand Ronde, and the Klamath Tribe. BPA also conducted field surveys of the area of potential effect to identify potential impacts to cultural resources from the Proposed Action (see Section 3.7). BPA's cultural resources contractor (Heritage Research Associates) obtained ARPA permits from the Forest Service and U.S. Army Corps of Engineers prior to conducting cultural surveys. Cultural resource surveys were conducted along the entire transmission line right-of-way and the access road system as described in Section 3.7.

Table 2-6. Environmental Consultation, Review, and Permit Requirements for the Rebuild Project (continued)

Permit, Consultation, or Compliance	Relevant Project Information
Cultural and Historic Resources (continued)	
Archaeological Data Preservation Act of 1974 16 U.S.C. § 469 a-c Archaeological Resources Protection Act (ARPA) of 1979, as amended 16 U.S.C. § 470 aa-mm Native American Graves Protection and Repatriation Act (NAGPRA) 25 U.S.C. § 3001 *et seq.* American Indian Religious Freedom Act of 1978 42 U.S.C. § 1996 Indian Sacred Sites Executive Order 13007	BPA is working with the Forest Service, Corps, and Oregon SHPO to determine the appropriate mitigation measures at any sites that could be affected by the Proposed Action. Mitigation measures would likely include additional site characterization before construction, and on-site monitoring during construction. If, during construction, previously unidentified cultural resources that would be adversely affected by the Proposed Action were found, BPA would follow all required procedures set forth in the NHPA, NAGPRA, Archaeological Resources Protection Act, and the American Indian Religious Freedom Act. The following summarizes coordination to date about the project: • 11/26/2013: BPA met with David Harrelson (Tribal Historic Preservation Office Program Manager Confederated Tribes of Grand Ronde) to discuss project. • 3/27/2014: BPA initiated consultation with Oregon SHPO, Confederated Tribes of Siletz Indians of Oregon, Coquille Indian Tribe, Confederated Tribes of the Warm Springs Reservation, Cow Creek Band of Umpqua Tribe of Indians, the Confederated Tribes of Grand Ronde, and the Klamath Tribe. • 4/22/2014: Confederated Tribes of the Warm Springs Reservation responded to BPA's initiation letter requesting that they receive a copy of the survey report. • 4/28/2014: Oregon SHPO responded to BPA's initiation letter and concurred with the area of potential effect. • 5/29/2014: Cow Creek Band of Umpqua Tribe of Indians responded that the proposed undertaking is outside the tribe's area of interest and therefore they defer comment to other interested tribes. • 9/14/2014: BPA executes a contract with the Confederated Tribes of Grand Ronde to research known, suspected, and potential gathering sites for culturally significant plants. • May 2016: Anticipated date for submitting survey report to Oregon SHPO and tribes.
Environmental Justice	
Federal Actions to Address Environmental Justice in Minority and Low-Income Populations Executive Order 12898 Civil Rights Act, 1964	The Proposed Action has been evaluated for potential disproportionately high environmental effects on minority and low-income populations and none were identified, as discussed in Section 3.9. Contracting procedures would ensure that projects made available to contractors through this project would be advertised and awarded in a manner that gives proper consideration to minority and women-owned business groups. Because of this consideration, there would be no direct, indirect, or cumulative effects to consumers, civil rights, or minority groups with implementation of any of the alternatives.
Noise	
Noise Control Act of 1972 42 USC § 4901 *et seq*.	As described in Section 3.10, the Proposed Action would have primarily temporary and low noise impacts, would meet state noise level regulations, and mitigation measures are identified to further reduce noise impacts.

Table 2-6. Environmental Consultation, Review, and Permit Requirements for the Rebuild Project (continued)

Permit, Consultation, or Compliance	Relevant Project Information
Public Health and Safety	
Spill Prevention Control and Countermeasures Rule 40 CFR 112 Comprehensive Environmental Response, Compensation, and Liability Act 42 USC § 9601 *et seq*. Resource Conservation and Recovery Act (RCRA) 42 USC § 6901 *et seq*. Federal Insecticide, Fungicide and Rodenticide Act 7 USC § 136 (a-y) Safe Drinking Water Act 41 USC § 300f *et seq.* Federal Communications Commission (FCC) Federal Aviation Administration (FAA) The Toxic Substances Control Act 15 U.S.C. 2601 *et seq*.	Various provisions of the Spill Prevention Control and Countermeasures Rule (40 CFR 112), the Comprehensive Environmental Response, Compensation, and Liability Act (42 USC § 9601 et seq.), and the Resource Conservation and Recovery Act (RCRA [42 USC § 6901 et seq.]) may apply to the Proposed Action, depending upon the exact quantities and types of hazardous materials stored on-site. RCRA, in particular, is designed to provide a program for managing and controlling hazardous waste by imposing requirements on generators and transporters of this waste. Small amounts of hazardous waste may be generated by the Proposed Action. Typical construction wastes may include motor and lubricating oils and cleaners. If wood poles are temporarily stored on site, approval of landing areas must be obtained, and compliance with federal, state, and local requirements for environmental protection, cleanup, and restoration of landing areas is required. These materials would be disposed of according to state law and RCRA. Solid wastes would be disposed of at an approved landfill or recycled. When BPA uses herbicides, the date, dose, and chemical used are recorded and reported to state government officials. Herbicide containers are disposed of according to RCRA standards and consistent with BPA's Transmission System Vegetation Management EIS/Record of Decision (BPA 2000); in addition, BPA only uses EPA-approved herbicides. BPA would comply with state and local public drinking water regulations. The Proposed Action would not affect any sole source aquifers or other critical aquifers, or adversely affect any surface water supplies. There would be no interference with radio, television, or other reception as a result of the Proposed Action. BPA would comply with FCC requirements relating to radio and television interference from the Proposed Action if any such interference occurs (see Section 3.12, Noise, Public Health, and Safety for an EMF discussion). While the Proposed Action does not appear to be within any of the specified distances from airports, final locations of structures, structure heights, and conductor heights would be submitted to the FAA for approval. BPA adopted guidelines to ensure that polychlorinated biphenyls (PCBs) are not introduced into the environment. Equipment used for the Proposed Action would not contain PCBs. Any equipment removed that may have PCBs would be handled according to the disposal provisions of the Toxic Substances Control Act.

Table 2-6. Environmental Consultation, Review, and Permit Requirements for the Rebuild Project (continued)

Permit, Consultation, or Compliance	Relevant Project Information
Air Quality and Greenhouse Gases	
Clean Air Act, as revised in 1990 42 USC § 4701 Final Mandatory Reporting of Greenhouse Gases Rule 40 CFR 98 Strengthening Federal Environmental, Energy, and Transportation Management Executive Order 13423 Federal Leadership in Environmental, Energy, and Economic Performance Executive Order 13514	Air quality impacts of the Proposed Action would be low, localized, and temporary, as discussed in Section 3.11. Mitigation measures are identified to further reduce air quality impacts during construction. Greenhouse gas emissions were calculated for the Proposed Action construction activities that would produce greenhouse gases: construction of the transmission line and permanent vegetation removal, as discussed in Section 3.12. Greenhouse gas emissions would be below EPA's mandatory reporting threshold. The impact of the Proposed Action on greenhouse gas concentrations would be low.

Chapter 3. Affected Environment and Environmental Consequences

This chapter describes the existing environmental resources that could be affected by the Proposed Action and the potential impacts the Proposed Action would have on those resources. Mitigation measures and best management practices (BMPs) that would help reduce or avoid impacts are identified in Table 2-5 in Chapter 2. For each resource, existing information from previous studies, reports, and plans, in combination with site visits was used to describe the affected environment, and maps showing the location and extent of the proposed action were used to assess impacts. For some resources – including vegetation, fish, wetlands, wildlife, and cultural resources – in-depth technical reports were prepared which include additional detail on analysis methodology. Those reports include the invasive species report, biological assessment, wetland delineation report, wildlife biological evaluation, northern spotted owl survey report, peregrine falcon report, and cultural resource report.

Replacement of the disconnect switches, as described in Section 2.2.6, would result in minimal ground disturbance since the existing stands would be used, so no impacts to any resources from replacing the disconnect switches are anticipated or discussed in this chapter.

3.1 Land Use, Recreation, and Transportation

3.1.1 Affected Environment

The transmission line is located within Lane County, beginning about 4 miles southeast of Oakridge at the Hills Creek Substation and continuing generally northwest to the Lookout Point Substation about 1 mile east of Lowell, by way of the Oakridge Substation. Structures 5/1 through 6/3 are located within the Oakridge city limits and urban growth boundary (UGB). Structures 8/3 and 8/4 are located within the city limits and UGB of Westfir. The first 19 miles of line are located within the boundaries of the Willamette National Forest, although the boundaries of the forest also include privately-owned, non-Forest Service land.

The transmission line generally runs parallel to Oregon Highway 58 and the Middle Fork Willamette River. The transmission line crosses the Middle Fork Willamette River between structures 1/1 and 1/2, between 2/6 and 2/7, and between 4/9 and 5/1 and crosses Oregon Highway 58 once between structures 5/8 and 5/9.

The predominant land uses crossed by the transmission line and access roads are forestry outside of Oakridge and Westfir, and urban development within Oakridge and Westfir. Figure 3-1 illustrates existing land uses crossed by the transmission line.

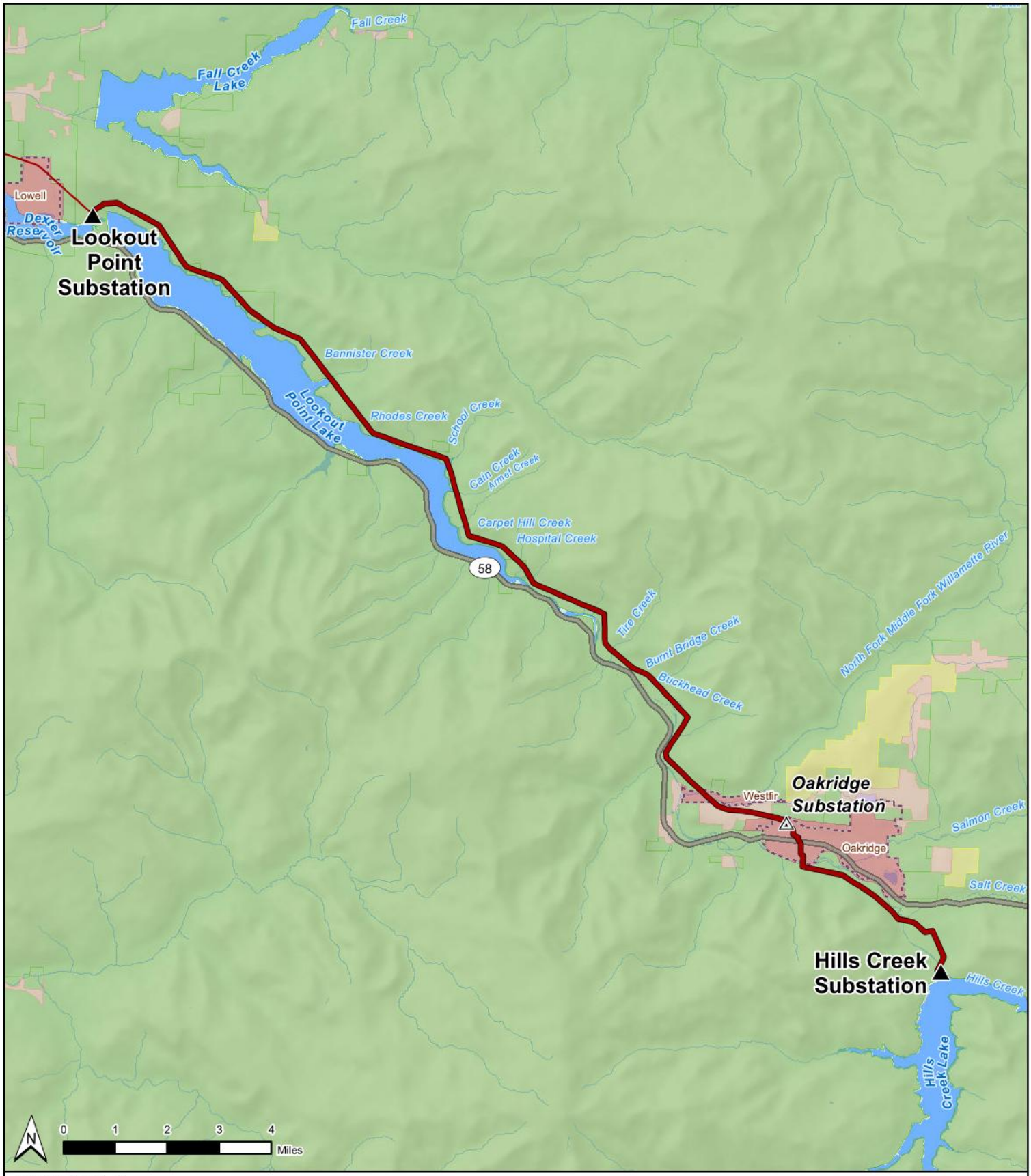


FIGURE 3-1
Land Use
Hills Creek-Lookout Point Rebuild Project

- BPA Substation
- Non-BPA Substation
- Hills Creek-Lookout Point Transmission Line
- BPA Transmission Line
- 2011 Urban Growth Boundary
- Urban
- Agriculture
- Rural Development
- Forestry
- Park and Recreation
- Water

BONNEVILLE POWER ADMINISTRATION

June 15, 2015

Land uses outside of the transmission line right-of-way are regulated by the ***comprehensive plan***, a document setting forth general policies for the long-term physical development of a jurisdiction, and by a ***zoning*** ordinance that implements the comprehensive plan. The transmission line and access roads are located within a series of county and city zoning districts (areas reserved for different land uses), which are listed in Table 3-1.

Table 3-1. County and City Zoning Districts Crossed by the Transmission Line and Access Roads

Jurisdiction	Zoning district
City of Oakridge	C3 – Highway Commercial District
	I1 – Limited Industrial
	R1 – Low-Density Residential
City of Westfir	CR – Community
	PRO – Parks, Recreation, Open Space
Lane County	AO – Airport Operations District
	F1—Important (Non-Impacted) Forest Land District
	F2—Forest (Impacted) Land District
	RI—Rural Industrial
	RR-10—Rural Residential (10-acre minimum)

Source: City of Oakridge 2008; City of Westfir 2012; Lane County 2014c.

Land ownership crossed by the transmission line and access roads is a mix of public and private ownership, as shown in the project maps included in Appendix A. Publicly-owned parcels include parcels owned by the City of Oakridge, City of Westfir, Lane Electric, Oregon Department of Aviation, Oregon Department of State Lands (DSL), Forest Service, and Corps. Many of the privately owned parcels crossed by the line that are located outside of the urban areas are owned by private timber companies.

The Forest Service parcels crossed by the transmission line and access roads are part of the Willamette National Forest. These lands are managed by the Forest Service under the 1990 Land and Resource Management Plan for the Willamette National Forest as amended by the 1994 Northwest Forest Plan. The plans designate four types of land allocations for Forest Service lands that cross the transmission line and access roads: Late Successional Reserves, Matrix, Administratively Withdrawn Areas, and Riparian Reserves. They are managed with the following objectives:

- Late Successional Reserves: These areas provide ***habitat*** (ecological area inhabited by a particular species) for northern spotted owl, as well as other species associated with late successional and old growth habitat. About 2.7 miles of transmission line and 2.5 miles of access road or trail crosses through this type of managed land.
- Matrix: These areas provide a sustainable supply of timber and other forest commodities; provide connectivity between late successional reserves; provide early-successional habitat; and provide for important ecological functions. About 8.2 miles of transmission line and 7.2 miles of access road or trail crosses through this type of managed land.

- Administratively Withdrawn Areas: These areas are managed as recreational and visual areas, backcountry, and other areas not scheduled for timber harvest. Administratively withdrawn areas crossed by the transmission line or access roads include the following:
  - Special Use Permit Areas (access road: LaDuke Road leading to structure 4/8)
  - Ferrin Picnic Area (access road: Old Willamette Highway leading to structure 8/3)
  - Westfir Seed Orchard (structures 9/3 through 9/7)
  - Wildlife Habitat Special Area (structures 13/2 through 14/7)
  - Major waterbodies (the transmission line crosses portions of Lookout Point Lake between structures 17/5 and 17/6 and again between 18/5 and 18/6)
- Riparian Reserves (overlay): These areas provide habitat for ***special-status*** (threatened or endangered species, proposed threatened or endangered species, ***candidate species*** [species not yet listed], state listed species, Forest Service sensitive species) and other terrestrial species; these are a component of the Northwest Forest Plan's Aquatic Conservation Strategy.

Existing developments in Late Successional Reserves such as campgrounds, recreation residences, ski areas, utility corridors, and electronic sites are considered existing uses with respect to Late Successional Reserve objectives, and may remain, consistent with other standards and guidelines. Routine maintenance of existing facilities is expected to have less effect on current old-growth conditions than development of new facilities. Maintenance activities may include felling hazard trees along utility rights-of-way, trails, and other developed areas (U.S. Forest Service and BLM 1994a).

In addition, the Forest Plan outlines the primary goals for Special Use Permit Areas as follows: Provide safe and efficient sites for permitted facilities and improvements to promote the public welfare in an environmentally sound manner; and to maximize consistency of permitted uses with surrounding land uses. The desired future condition is a pattern of special uses established to provide services in the public interest in a manner that reflects environmental sensitivity to other resource values. Examples of such special uses include railroad and State highway rights-of-way, communication towers, and power transmission lines. These general types of uses are recognized as fulfilling special needs for public convenience (U.S. Forest Service 1990).

Table 3-2 summarizes the project elements that would be constructed on Forest Service land by land use allocation and by riparian reserve classification.

An access road to structure 7/1 traverses the east end of the Oakridge State Airport property, located west of the City of Oakridge UGB and south of the City of Westfir UGB. The transmission line right-of-way (structures 7/1 through 8/1) is located about 250 feet north of the airport. The Oakridge State Airport was acquired by the State of Oregon in 1967 from a private owner and is important to the State's airport system from a geographic coverage and access standpoint. The airport plays a supportive role in the current network of airports in Oregon, providing access to recreational areas, including the Willamette National Forest, Hills Creek Lake, and Lookout Point Lake (Oregon Department of Aviation 2014). There are 33 aircraft operations per week on average at the Oakridge State Airport (AirNav 2014).

Table 3-2. Project Elements on Forest Service Land by Land Use Allocation and Riparian Reserve Classification

Project Element	All Public and Private Lands	Forest Service Lands – by Land Use Allocation										Forest Service Lands – by Riparian Reserve Classification				
		Administratively Withdrawn				Late Successional Reserve		Matrix			All Forest Service Lands	Class 1	Class 2	Class 3	Class 4	All Riparian Reserves
		9D	12A	13B	WA	16A	16B	11A	11C	11F						
Road Construction (miles)	0.1	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	-	-		<0.1
Road Reconstruction (miles)	1	-	-	-	-	<0.1	-	-	0.3	0.3	0.6	<0.1	-	-	-	<0.1
Road Improvements (miles)	20	1.5	-	1.0	-	4.0	0.5	-	-	9.0	16.0	2.5	1.5	0.1	1.4	5.5
Direction of Travel (miles)	35	0.2	0.2	0.1	0.3	3.0	0.1	0.5	1.0	11.0	16.4	-	-	-	-	-
Road Abandonment and Rehabilitation (miles)	0.5	-	-	-	-	-	-	-	-	0.5	0.5	-	-	-	-	-
Access Trail Construction (miles)	2	-	-	-	-	0.5	-	-	-	1.5	2.0	-	-	-	-	-
Access Trail Reconstruction (miles)	0.1	-	-	-	-	-	-	-	-	0.1	0.1	-	-	-	-	-
Structures (number of structures)	223	11	-	4	-	24	-	-	-	68	107	11	13	1	14	39
Tree Removal Outside of Reroute Areas in Miles 2 and 3 (number of trees)	2,700	20	-	-	-	120	5	-	110	290	545	80	95	40	25	240
Tree Removal Reroute Mile 2 (number of trees)		-	-	-	-	20	-	-	-	110	130	110	-	-	-	110
Tree Removal Reroute Mile 3 (number of trees)		-	-	-	-	-	-	-	-	970	970	320	-	-	-	320

Notes:
1. Dashes represent zero values.
2. Removal of trees as described in this EA represents tree cutting; trees may or may not be removed from the site depending on landowner preferences. The Forest Service would be responsible for determining how trees removed from Forest Service land would be disposed of – this could include, but is not limited to firewood cutting, stockpiling for stream projects, or leaving it in place as coarse woody debris

The transmission line is visible from several park and trail facilities that either cross the transmission line right-of-way or are located adjacent to the right-of-way, as described Table 3-3. There are no other public uses, such as libraries and town halls, located within or adjacent to the right-of-way.

Table 3-3. Park and Trail Facilities Where the Transmission Line is Visible

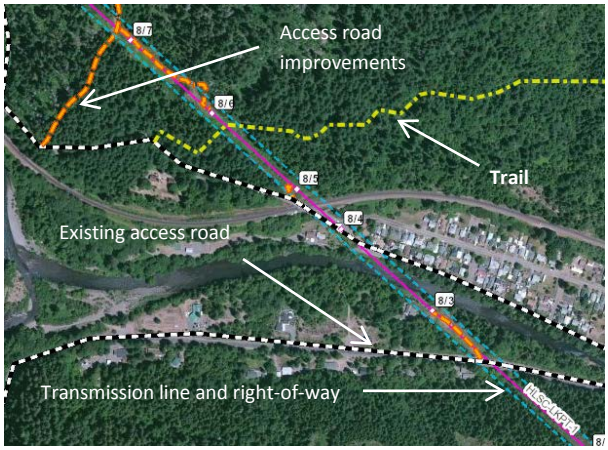
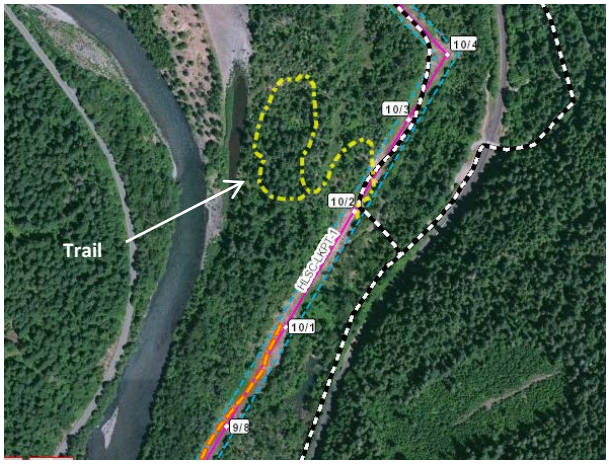
Facility Description	Map
Alpine Trail is located within the Willamette National Forest and is managed by the Forest Service (Trail 3450). The trailhead is located about 400 feet south of the transmission line (structure 8/6) off North Shore Road, which would be used as a direction of travel access road under the Proposed Action. The transmission line is not visible from the trailhead, but is visible where the trail crosses under the transmission line near structure 8/6.	
Buckhead Nature Trail is located within the Willamette National Forest and is managed by the Forest Service (Trail 3474). This 0.5-mile paved trail includes interpretive signage through the Buckhead Wildlife Area. The trailhead provides restrooms and parking, as well as picnic areas, and is accessible from North Shore Road, which would be used as a direction of travel access road under the Proposed Action. The trail crosses under the transmission line between structures 10/2 and 10/3. The transmission line is visible from the trail.	
City of Oakridge In-Town Pathways: The Oakridge-Westfir Community Trails Plan (2008) identifies a series of in-town pathways envisioned for Oakridge and Westfir. These planned pathways would be comprised of sidewalks and bike lanes to provide pedestrian and bicycle connectivity to parks, neighborhoods, commercial centers, and schools. The plan proposes a mulch or other permeable surface trail next to Commercial Street and bicycle lanes or sidewalks. This path would provide a pedestrian and bicycle connection to Diamond Park. The transmission line is located near, but does not cross, Commercial Street where it bends at the west end of Oakridge. A portion of Commercial Street would be used as a direction of travel access road under the Proposed Action. A number of local utility lines, as well as the Hills Creek transmission line structures are visible from Commercial Street, including structures 5/11 through 5/16.	

Table 3-3. Park and Trail Facilities Where the Transmission Line is Visible (continued)

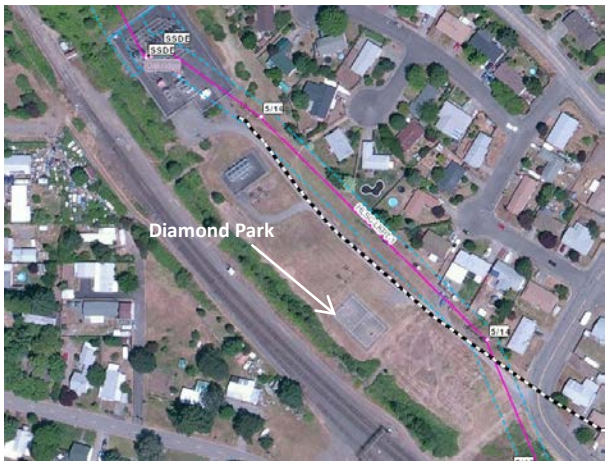
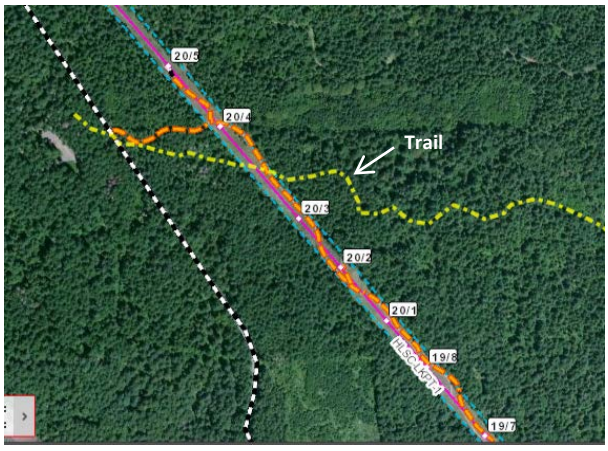
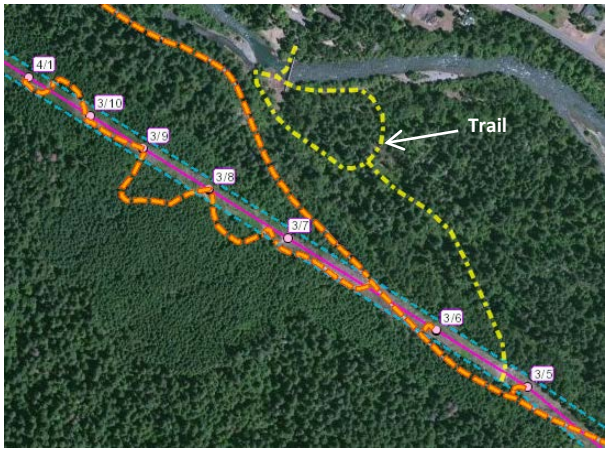
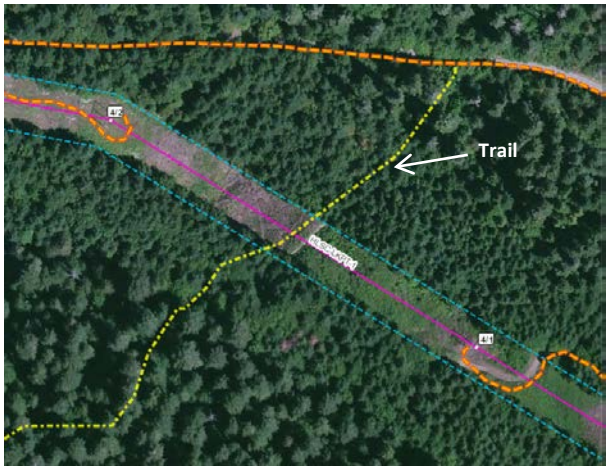
Facility Description	Map
Diamond Park is owned and managed by the City of Oakridge. The facility includes a mountain biking practice area, basketball hoops, picnic tables, and parking. The park is accessible from Commercial Street, which would be used as a direction of travel access road under the Proposed Action. The Oakridge-Westfir Community Trails Plan identifies this park as a gateway in the trails network. About 750 feet of the transmission line right-of-way traverses the northern portion of the park, and structures 5/14 and 5/15 are located within the park. Structures 5/13 and 5/16 are also visible from the park.	
Eugene to Crest Trail is 108-mile long trail that connects Eugene to the Pacific Crest Trail. The trail segment near the transmission line is located within the Willamette National Forest and managed by the Forest Service (Trail 3559). This trail has 17 access points, including access from North Shore Road, which would be used as a direction of travel under the Proposed Action. There is no developed trailhead and there are no parking or restroom facilities located along North Shore Road. The trail passes through the transmission line right-of-way between structures 20/3 and 20/4. The transmission line is visible where the trail crosses under it.	
Greenwaters Trail is located within the Willamette National Forest and is managed by the Forest Service (Trail 4250). Visitors must cross through the transmission line right-of-way to walk from the small parking area to the trailhead, located near structure 3/5. This trail connects to the City of Oakridge's Greenwaters Park via a footbridge across the Middle Fork Willamette River. There are no facilities located at the trailhead beyond the unimproved parking area adjacent to LaDuke Road. LaDuke Road would be improved as an access road under the Proposed Action. The transmission line is visible from the parking area and trailhead.	

Table 3-3. Park and Trail Facilities Where the Transmission Line is Visible (continued)

Facility Description	Map
Landax Landing Park is located along the north side of the Lookout Point Lake and is managed by the Corps. This park is accessible from West Boundary Road, which would be used as a direction of travel access road under the Proposed Action. This day-use park provides a hiking trail and access to the Lookout Point Lake. The transmission line crosses the park. The segment of the conductor between structures 23/1 and 23/2 is visible across the inlet and beach area of the park.	
Larison Rock Trail is located within the Willamette National Forest and is managed by the Forest Service (Trail 3607). The main trailhead is located about 9,300 feet southwest of the transmission line; however, the trail crosses under the transmission line (between structures 4/1 and 4/2) and ends at the LaDuke Road trailhead. LaDuke Road would be improved as an access road under the Proposed Action. The transmission line is not visible from the ends of the trail, but is visible where the trail crosses under the transmission line.	
Meridian Park is adjacent to the north end of Lookout Point Lake and West Boundary Road, which would be used as a direction of travel access road under the Proposed Action. This day-use park is managed by the Corps and provides restrooms, hiking trails, and a boat launch. The park is located about 700 feet south of the transmission line (structures 26/3 through 26/5) and about 1,500 feet east of the Lookout Point Substation. The transmission line is visible from the park through the trees, but the substation is not visible because it is located downhill on the opposite side of Lookout Point Dam.	

Sources: Oakridge-Westfir Community Trails Committee 2008; Parsons Brinckerhoff 2014; U.S. Army Corps of Engineers 2009; and U.S. Forest Service 2014h.

Additional park and trail facilities adjacent to direction of travel access roads include:

- Ferrin Picnic Area: The north side of this Forest Service picnic area is adjacent to North Fork Road, about 2,500 feet south of the transmission line (structure 7/6).
- Ivan Oakes Campground: The north side of this Corps campground is adjacent to West Boundary Road along the north side of the Lookout Point Lake, about 1,300 feet southwest of the transmission line (structures 20/9 and 20/10).
- Lower Middle Fork Trail: North Fork Road is located adjacent to a portion of this Forest Service trail (Trail 3676), which passes through Ferrin Picnic area and is located about 2,400 feet south of the transmission line (structures 7/1 through 8/3).
- Signal Point Boat Ramp: The entrance to this Corps boat ramp area is located on West Boundary Road and is directly across West Boundary Road from an access road planned for improvement to structure 22/3. The boat ramp is located about 400 feet south of the transmission line (structures 22/2 and 22/3).

There are numerous additional parks and recreation facilities located within 1 mile of the transmission line and access roads; however, the transmission line and access roads are not visible from any of these facilities due to topography and the tree cover. These facilities include Black Canyon Campground and Black Canyon Nature Trail, Deception Butte Trail, Eula Ridge Trail, Greenwaters Park, Hampton Campground, Hardesty Trail, Orchard Park, Osprey Park, and Shady Dell Campground.

The Hills Creek Substation and transmission line are not visible from park and recreation facilities on the south side of the Hills Creek Dam, such as CT Beach Park and Cline Clark Park, because of the elevation of the dam. Similarly, there are additional trails and recreational facilities located throughout the Willamette National Forest. Because of the forested topography, the transmission line is not visible from these facilities.

The transmission line can be accessed by a series of gravel and paved roads where existing traffic volumes are generally low. State highways that experience greater traffic volumes near the transmission line are limited to Highway 58, which the transmission line crosses once in Oakridge. Forest Service and county roads provide limited access to the transmission line right-of-way in the unincorporated portions of Lane County. Low-volume residential city streets in Oakridge and Westfir provide access to portions of the right-of-way in these urban areas. In addition, BPA maintains more than 60 miles of access roads across public and private lands so that maintenance crews can get to the transmission line right-of-way in areas where Forest Service, county, and local roads do not provide access.

3.1.2 Environmental Consequences—Proposed Action

Forestry Uses

Although the transmission line corridor traverses forested areas and the Forest Service's lands, the transmission line right-of-way is managed and generally kept cleared of tall growing vegetation that could threaten the lines as a part of BPA's routine vegetation management. The majority of the trees

to be removed would be merchantable (7 inches or greater in diameter). Landowners would be permitted to keep trees removed from their property, including merchantable trees. Structures would be replaced in roughly their current locations within the transmission line right-of-way, with the exceptions of the realignments in line miles two and three (as described in Sections 2.2.2 and 2.2.3) and structure 9/2, which would be relocated 90 feet west of its current location. The realignments of line miles two and three would result in the conversion of about 4 acres of forested Forest Service land to transmission line right-of-way, including approximately 0.5 acre of late successional reserve land and 3.5 acres of matrix land. The realignments would also require removal of approximately 1,100 trees; however, about 4 acres of existing transmission line right-of-way would be abandoned and rehabilitated (as described in Section 2.2.9), reverting these areas back to forestlands, including approximately 1.2 acres of late successional reserve lands and 2.8 acres of matrix land. The net impact would be a small increase in late successional reserve forest land and a small loss of matrix forest land. In addition, individual tree removal along BPA's right of way is anticipated to total an additional 2 acres of forest land that would be removed, but this area is already BPA right-of-way rather than land designated for forestry purposes, so it is not a conversion of land uses.

Disruptions to existing forestry activities would primarily be in the form of potential schedule conflicts if harvesting or other forestry management activities were occurring at the same time as construction of the proposed action. These forestry activities could be disrupted by tree removal; temporary access changes to properties; access road work, and use of roads during project construction. However, tree removal along the corridor through forested public or privately owned lands would not differ from BPA's typical vegetation management activities along the line and would not result in a substantial change to ongoing forestry activities. Property owners would be allowed to keep felled trees. Access changes to properties would be short-term, and BPA would coordinate with property owners in advance to ensure access to properties would be maintained during construction. Some of the planned access roads are also used for forestry activities, so traffic for forestry activities could experience delays during construction of the Proposed Action. In addition, forestry workers could experience temporary noise, dust, and air quality impacts during construction activities.

The enhanced access road network could potentially increase public access to Forest Service land or other public or private lands. Unauthorized use of BPA's access roads could result in activities such as off-road vehicle use, illegal dumping, and trespassing on private properties. However, BPA would install or replace 51 gates at the entrance to access roads to deter unauthorized access.

While construction would take several months, individual private forest landowners would likely be affected for only a few months when nearby segments of the Proposed Action are underway. The Proposed Action would have a low impact on forestry land uses because the net loss of small amount of matrix land is very small in the context of the Willamette National Forest's total size of 1,675,407 acres; disruptions to existing forestry activities would be temporary and short-term; and landowners would be able to keep or sell merchantable trees removed from their lands.

Commercial Uses

The few commercial uses adjacent to the transmission line in Oakridge, such as the gas station, fast food restaurant, and retail stores near the intersection of Highway 58 and Rainbow Road where the transmission line crosses Highway 58, could experience temporary disturbances during construction activities, including increases in noise and dust in the vicinity. The fast food restaurant near the intersection of Highway 58 and Rainbow Road would likely have one of its three access points temporarily closed and a few parking spaces would be unavailable during construction. Because the construction impacts would be short-term, and would still allow for the continuance of existing land uses, the Proposed Action would have a low impact on commercial and industrial land uses.

Airport Uses

Improvement and use of the access road on the west end of the Oakridge State Airport property could result in temporary traffic delays for traffic accessing the airport. In addition, workers and visitors to the airport could experience noise and dust during access road work and replacement of structures near the airport (structures 6/5 through 8/2). Construction disturbances would be of short duration (on average up to 2 days total per structure replacement, and 1 to 3 days per mile of access road work). Because the line would remain in the same location and would generally be the same height, there would be no impact to flight traffic and impacts to airport uses would be low.

Residential Uses

About 1 mile of the transmission crosses through residential areas in Oakridge and Westfir, most of which is located along streets in front of homes. Impacts to residences adjacent to the transmission line would be limited to temporary noise, dust, and access disruptions due to construction activities. Construction hours would adhere to local requirements as well as Forest Service restrictions. The impacts would be short-term, and would not change the use of the land, the Proposed Action would have a low impact on residential uses.

Recreation

Impacts to recreation would be limited to temporary disturbances near the transmission line and access roads. The Proposed Action would result in temporary construction-related impacts to parks adjacent to or within the transmission line right-of-way. These park and trail facilities include the Alpine Trail, Buckhead Trail, Diamond Park, Eugene to Crest Trail, Greenwaters Trail, Landax Landing Park, and Larison Rock Trail, as described in Table 3-3. These impacts may include temporary closures of portions of the facilities to ensure the safety of recreational users during replacement of structures, the conductor, hardware, and insulators. Other impacts could include traffic delays to access the parks from public roadways, and dust and noise from construction activity. Diamond Park and Buckhead Trail include picnic areas, restrooms, basketball courts, and a mountain biking area where visitors might be disturbed during their stay. For most trail facilities, visitors would only be temporarily disturbed while they are using the portion of the trail near and crossing through the transmission line right-of-way.

In the City of Oakridge, impacts to the planned In-Town Pathway (if the path is constructed before construction of the Proposed Action) along Commercial Street to Meridian Park would be limited to

construction disturbances—temporary noise, dust, and visual impacts due to construction equipment.

Park and recreation facilities adjacent to access roads could experience an increase in traffic volumes and noise during construction. Impacts to park and recreation facilities located within 1 mile of the project, but not within or adjacent to the transmission line right-of-way, would be limited to minor noise and dust impacts. Construction disturbances to recreation users would be of short duration (on average up to 2 days total per structure replacement, and 1 to 3 days per mile of access road work), so impacts to recreational uses would be low.

The construction of access trails, as described in Section 2.2.8, would not add to the overall network of recreation trails, as these trails would be short in length, un-marked, and not intended for public use.

Transportation

During project construction there would be a temporary increase in traffic on nearby roads from construction vehicles delivering equipment and materials. Deliveries of equipment and materials to construction areas could cause short-term traffic delays along nearby roads and state highways. Temporary traffic impacts from traffic delays are anticipated along local streets adjacent to the transmission line in Oakridge and Westfir, including Rainbow Road, Clark Street, W Commercial Street, W 2nd Street, and Winfrey Road. In unincorporated Lane County, however, impacts to roadway users would be low due to the rural nature and limited public use of the area near the transmission line. Where existing rural roadways are narrow, BPA would provide traffic control to ensure traffic safety. Traffic delays could also be experienced at roads near construction staging areas, but these would be temporary and limited to the vicinity of staging areas.

At roadway and rail crossings, structure replacement could temporarily affect traffic flow. Traffic control and lane closure would follow the applicable state, county, city, and railroad requirements.

The improvement or reconstruction of access roads, and construction of new access roads, would result in short-term impacts to transportation from construction related delays and detours; however, most access roads are currently gated and not used by the general public, or would be gated if requested by the underlying landowner. Improvements to LaDuke Road, a public roadway, would provide long-term benefits to other roadway users by enhancing the condition and safety of this road. Construction equipment would be parked adjacent to local roads and highways to avoid blocking access, where feasible.

Overall, impacts to the transportation system would be low because the increase in traffic and traffic delays would be temporary.

3.1.3 Environmental Consequences—No Action Alternative

Under the No Action Alternative, impacts to land uses, recreation, and transportation associated with the construction of the new structures and structure components would not occur at this time. However, as existing structures continue to deteriorate line repairs could increase, resulting in more frequent disruptions to landowners and intermittent traffic increases from maintenance vehicles

accessing the areas of repair. Potential impacts to landowners could be similar to the Proposed Action (disturbance of area near individual structure sites and access road work areas, interference of access to individual properties, and noise and dust), but spread out over time. Emergency repairs could be needed and if conditions prevent access along existing access roads, and new impacts to land use and recreation, such as vegetation removal and traffic delays, could occur. Temporary closures and periodic disruptions to traffic flow from continued maintenance of the line could occur as additional maintenance requirements are needed or when emergency repairs are needed. Although the No Action Alternative would result in fewer impacts per entry because the disturbance area would be limited to the area needing maintenance or emergency repairs, the impacts in that area could be greater if there is an inadequate road system in place to reach the transmission line, and the disruptions would be more frequent than under the Proposed Action; therefore, overall impacts to land uses, recreation, and transportation would still be anticipated to be low.

3.2 Geology and Soils

3.2.1 Affected Environment

Geology and Topography

The transmission line is located in the central region of the Western Cascades physiographic province (a geographic region in which climate and geology have given rise to an array of landforms different from those of surrounding regions). The geology along the alignment consists of sedimentary and volcanic rocks overlain by deposits of gravels, sand, silt, and clay (Orr and Orr 2012; Walker and Macleod 1991). The elevation along the transmission line ranges from about 830 feet at the Lookout Point Substation to a maximum elevation of about 1,550 feet northwest of Oakridge. Steep slopes occur along much of the alignment.

Three existing structures (3/2, 3/3, and 3/4) are located within a known landslide area, and one additional structure (2/7) is located in a rock fall area. In addition, there are several other areas mapped as landslide hazards near the transmission line right-of-way (within 0.25 to 1 mile), but that do not cross the transmission line right-of-way (Oregon Department of Geology and Mineral Industries 2014). Site-specific landslide hazard data is not available beyond line mile five.

Soils

There are 35 soil types identified within 100 feet of the existing structures. Of these soils, 18 are classified as prime farmland or farmland of statewide importance (Natural Resources Conservation Service 2015).[1] On slopes less than 30 percent, these soils are susceptible to slight-to-moderate levels of ***erosion*** when exposed to water or wind; erosion hazard areas, slopes greater than 30 percent, are susceptible to severe-to-very severe levels of erosion when exposed to water or wind (NRCS 2015). Seventy-six structures, 0.2 miles of reconstructed access roads, and 1.3 miles of new access trails would be located on slopes greater than 30 percent (Figure 3-2).

[1] Due to varying coverage of available soils data, there is only data for structures 1/1 through 3/8, 4/8 through 9/2, 20/4 through 26/8 (or 126 of the structures).

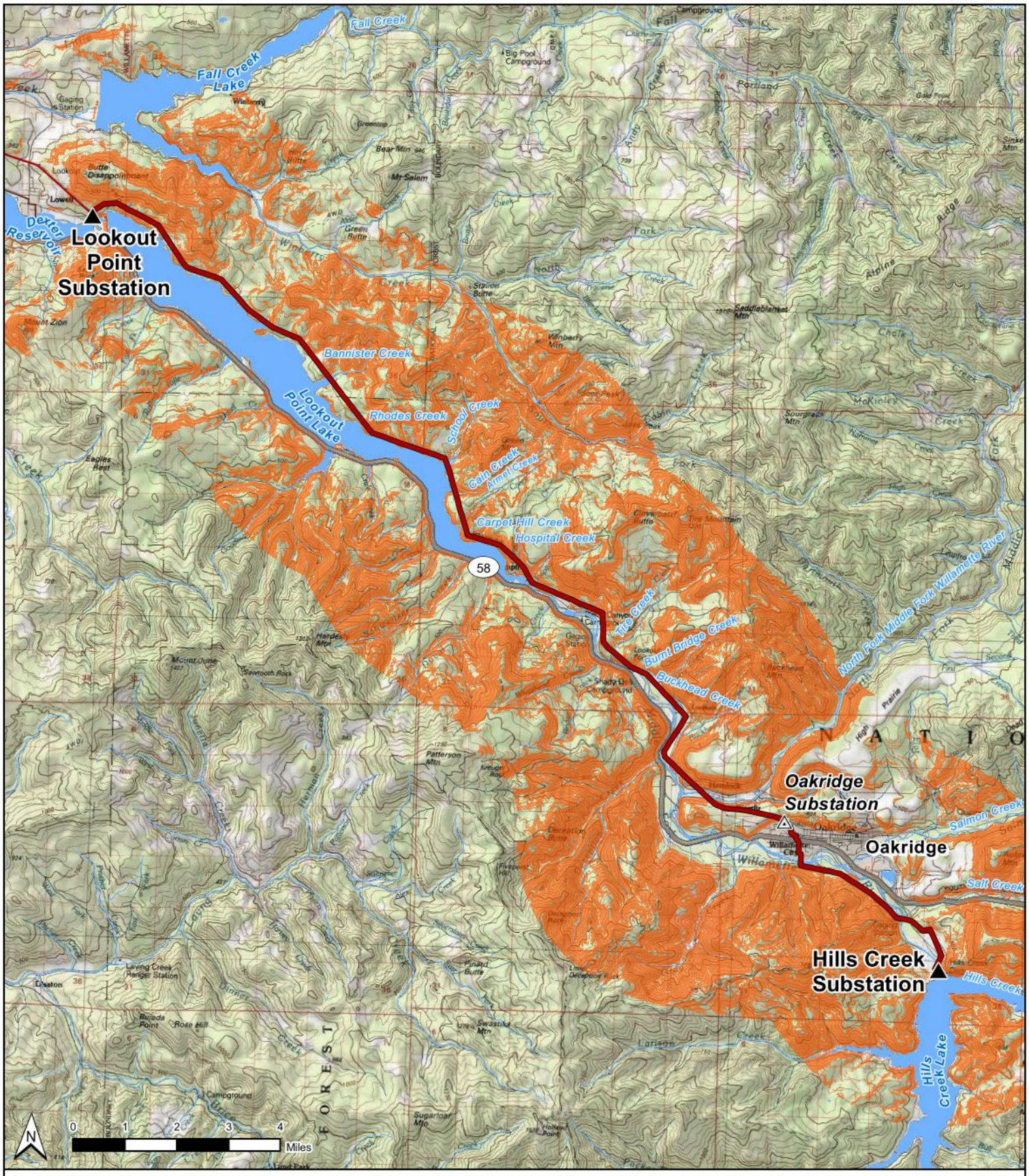


FIGURE 3-2
Erosion Hazard Areas
Hills Creek-Lookout Point Rebuild Project

- BPA Substation
- Non-BPA Substation
- Hills Creek-Lookout Point Transmission Line
- BPA Transmission Line
- Slope, 30% or greater
- River
- Water Body

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3.2.2 Environmental Consequences—Proposed Action

Impacts to soils would occur due to auguring of structure holes; removal of vegetation; grading of roads; temporary soil piling; compaction or rutting from heavy equipment; spreading of excess soils around the base of the structure; compaction in areas used as storage yards, helicopter landing pads, and tensioning sites; burying guy wires; or potential contamination from wood-pole preservative or accidental equipment spills. Ground that has been cleared of vegetation could be susceptible to erosion and establishment of invasive plants (Section 3.3). Ground compaction (squeezing or compressing soil) could degrade the soil structure and reduce soil productivity and the soil's ability to absorb water.

Construction of new access roads and trails would disturb about 1 acre of soil and reconstruction of deteriorated access roads would disturb about 1.5 acres of soil. These permanent disturbance areas would be stabilized by applying a certified weed-free gravel top layer to the roadways and trailbeds. New construction and reconstruction of access roads and trails would increase the risk of erosion; however, BPA would implement erosion control measures to reduce impacts so there would be a low risk of erosion on slopes less than 30 percent and a low-to-moderate risk of erosion on slopes greater than 30 percent.

At most structure sites, structure replacement activities would disturb an area about 100 feet by 100 feet per structure (about 0.2 acre) through auguring of structure holes and soil compaction resulting from construction equipment usage. In sensitive habitats, such as wetlands, this area would be reduced to a 25-foot radius around the structure (about 0.05 acre). ***Temporary equipment mats*** would be used to provide ground stabilization under the weight of large construction equipment, minimizing disturbance to soils in wetlands (Section 3.5). In total, the removal and installation of transmission structures would temporarily disturb about 51 acres of soils.

The existing structure holes would be reused where possible for the new structures, minimizing potential soil disturbance. Additional soil removed by the auger would be used as overburden at the base of the poles and spread evenly around the structure sites. Temporary soil compaction from the use of heavy machinery at each structure site would be limited to areas immediately adjacent to the structures.

Prompt mulching and seeding of exposed soils would help reduce the potential for erosion from disturbed sites. Until vegetation becomes reestablished, which could take up to four months, soil erosion could occur; however, once vegetation is established erosion would be unlikely. With the implementation of BMPs and conducting peak construction work during the dry season, impacts to soils would be low. Erosion and compaction impacts at staging areas would also be unlikely since the area used would likely be previously disturbed, level, and already paved or graveled. Because erosion or dust impacts would be short-term and in a relatively small area, the impacts to soils would be low.

Impacts on soils due to tree removal would include soil erosion and dust generation. In combination with mitigation measures listed below, these impacts would be low.

New construction and reconstruction of access roads and trails within landslide hazard areas and steep terrain could increase the risk of landslides. However, BPA would follow geotechnical BMPs and would repair slumps during construction to avoid overburdening unstable areas. Therefore, there is a low risk for landslides to occur from access road construction work.

The wood-pole structures would be treated with PCP, a wood preservative commonly used for treatment of utility poles. PCP contains chlorinated dibenzodioxins and chlorinated dibenzofurans that have the potential to leach into adjacent soils or water (such as in a wetland). PCP can move through the pole and leach from the bottom of the pole into the soil near the underground portion of the pole (EPA 2008). PCP tends to move through the pole rapidly for the first few years of use, and then becomes relatively constant with time (EPA 2008). PCP tends to rapidly degrade in the environment, and concentrations decrease rapidly with distance by as much as two orders of magnitude between 3 inches and 8 inches from the wood pole, but that migration is dependent on localized factors such as soil type, soil chemistry, local weather and topography, initial level of pole treatment, and age of pole (Electrical Power Research Institute 1995). Pole wraps would be used on structures located within 50 feet of wetlands or streams or within 100-year wetlands to contain PCP and help prevent it from leaching into surrounding soils (see Section 3.5). Steel monopole structures and lattice-steel towers, which would be installed in line miles three and five, do not contain PCP and therefore present no contamination risk.

3.2.3 Environmental Consequences—No Action Alternative

Under the No Action Alternative, construction would not take place at this time and, thus, no construction-related impacts would occur to geology or soils. Increases in the number of visits to repair deteriorating structures could lead to more soil disturbance, erosion, and compaction than under the Proposed Action, especially if repairs require access to portions of the transmission line during wet or muddy conditions. In addition, road upgrades that would include improvements to water runoff (water bars, drain dips, etc.) would likely not be completed. Although leaving the existing structures in the landslide and rock fall areas would not necessarily change the erosion potential or movement of soil, the structures themselves could be susceptible to further damage. Overall, impacts to geology and soils under the No Action Alternative could be low to potentially moderate if one or more structures fail as a result of the landslide and/or rock fall conditions.

3.3 Vegetation

3.3.1 Affected Environment

General Vegetation

The transmission line crosses two distinct ***ecoregions*** in Oregon. Ecoregions are areas defined by geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The majority of the transmission line falls in the Western Cascades Lowlands and Valleys ecoregion of the Cascades. About 4 miles of the northernmost portion of the transmission line falls in the Valley Foothills ecoregion of the Willamette Valley.

The Western Cascades Lowlands and Valleys ecoregion is located in the western Cascade Mountains and includes elevations up to 3,000 feet. It is characterized by many steep canyons with large streams that are tributaries to the Willamette River. Upland forest composition in this area mainly consists of the Douglas-fir (*Pseudotsuga menziesii*) association. Incense cedar (*Calocedrus decurrens*) is common with Douglas-fir along the transmission line and access roads. Sugar pine (*Pinus lambertiana*) and western white pine (*Pinus monticola*) are distributed throughout the area. A true fir (*Abies* spp) component is also present, often as the regenerative layer beneath an overstory of Douglas-fir. Historically, wildfires would clear forested areas and allow Douglas-fir to regenerate in open areas. Riparian areas (areas between a waterbody and the adjacent upland, including wetlands) near the transmission line and access roads are primarily composed of red alder (*Alnus rubra*), big leaf maple (*Acer macrophullum*), and black cottonwood (*Populus balsamifera* L. ssp. *trichocarpa)*, with western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) occurring in the cooler riparian areas.

The Valley Foothills ecoregion is a transitional zone characterized by rolling hills between the prairies of the Willamette Valley and Cascades Mountains. Woodlands of Oregon white oak (*Quercus garryana*) and forests of Douglas-fir, western hemlock, and western redcedar dominate the natural vegetation. Scattered stands of ponderosa pine (*Pinus ponderosa*, occur here in modest numbers. Openings in woodland habitat occasionally contain moderate numbers of native prairie species including ookow (*Dichelostemma congestum*), Oregon sunshine (*Eriophyllum lanatum*), and California oatgrass (*Danthonia californica*). In much of the Valley Foothills ecoregion, agricultural and other human activities have altered vegetation communities, which include pastureland, conifer and deciduous forests, orchards, and vineyards. Topography is moderate, with rolling hills interspersed by narrow stream valleys. Land use in this ecoregion is mixed and includes residential development, grazing, and small-scale silviculture.

The transmission line runs through public and private lands managed for forestry and recreation with rural residential use in the valleys. Plant communities within or adjacent to the transmission line and access roads are described in Table 3-4 and consist of non-native and native plants. These plant communities have already been substantially altered from the original clearing on BPA's right-of-way and through ongoing operations and maintenance activities.

Special-Status Plant Species

Special-status plants are those identified to deserve special protection or management as conferred either by the Endangered Species Act of 1973 (ESA), by the Oregon Department of Agriculture's (ODA) Native Plant Conservation Program, or by the USDA Forest Service's Regional Forester Sensitive Plant List or the Willamette National Forest Survey and manage botanical species list.

Several special-status plant species have the potential to occur within the transmission line right-of-way and access road areas (Appendix B, Table B-1) because they are known to exist within the West Cascades and Willamette Valley ecoregions or are documented or suspected to occur within the Willamette National Forest.

Table 3-4. Plant Communities in the Transmission Line Right-of-Way and Access Road Areas

Plant Community	Description
Evergreen forests	Young and old evergreen coniferous forests comprised of Douglas-fir, western hemlock, western redcedar, vine maple (*Acer circinatum*), and sword-fern (*Polystichum munitum*).
Deciduous forest	Broadleaf deciduous forests comprised of big-leaf maple (*Acer macrophyllum*), Oregon white oak, Pacific madrone (*Arbutus menziesii*), and western red alder (*Alnus rubra*).
Mixed coniferous/ deciduous forests	Mixed forests of Douglas-fir, big-leaf maple, Oregon white oak, Pacific madrone, western red alder, and poison oak (*Toxicodendron diversiloba*).
Shrub/Scrub	Areas dominated by woody vegetation less than 5 meters tall including shrubs and young trees in an early successional stage comprised of Scotch broom (*Cytisus scoparius*), manzanita (*Arctostaphylos spp.*), Himalayan blackberry (*Rubus armeniacus*), and poison oak.
Wetland areas	Herbaceous wetlands with perennial herbaceous vegetation and woody wetlands forest or scrubland vegetation comprised of reed canarygrass (*Phalaris arundinacea*), bentgrass species (*Agrostis spp.*), soft rush (*Juncus effusus*), foxtail species (*Alopecurus spp.*), cattails (*Typha latifolia*), clustered wild rose (*Rosa pisocarpa*), Nootka rose (*Rosa nutkana*), Scouler's willow (*Salix scouleriana*), Sitka willow (*Salix sitchensis*), red-osier dogwood (*Cornus sericea*), Oregon ash (*Fraxinus latifolia*),Giant horsetail (*Equisetum telmateia*),Small-fruited bulrush (*Scirpus microcarpus*), and Salmonberry (*Rubus spectabilis*).
Riparian areas	Interspersed riparian communities comprised of Oregon ash, big-leaf maple, vine maple, western red alder, and Himalayan blackberry.
Urban/developed	Areas cleared for commercial, industrial, or residential structures, with associated lawns, and parking lots that include a mix of introduced and native plants in managed and unmanaged urban settings.
Upland grassland/ herbaceous	Areas dominated by graminoids or herbaceous vegetation, such as California oat-grass, sedge species (*Carex spp)* (dense-head sedge), slender rush (*Juncus tenuis*), bracken fern (*Pteridium aquilinum*), and bentgrass species, that can be used for grazing, but is not subject to intensive management such as tilling.

Sources: National Agricultural Imagery Program 2014 and 2014 field observations.
Note: Some of the species listed in this table are non-native invasive species.

Forest Service botanists conducted a pre-survey review in order to determine the presence of known sites or habitat for special-status plants, lichens, and bryophytes within the project area. Forest Service botanists also conducted a botanical plant survey of the project area during April and May 2014 and July of 2015 using the R6 Regional Forester's 2012 Sensitive Species list and the 2001 Survey and Manage ROD list. The results of the pre-field review and botanical surveys are described in a Biological Evaluation, which is incorporated by reference into this EA (U.S. Forest Service 2014b). No special-status plant species were found within the transmission line right-of-way and access road areas. In addition, no designated critical habitats for listed plant species overlap the transmission line right-of-way and access road areas. Surveys for rare fungi were not deemed practical, and unlikely to be found in the project area.

Noxious Weeds

Noxious weed surveys were conducted to determine the extent of "A," "B," and "T" list noxious weed infestation within the transmission line right-of-way and along the access road areas. Noxious weed surveys took place April through June 2014. The 26 weed species encountered in the survey area are summarized in Appendix B, Table B-2. ODA categorizes noxious weeds as follows:

- A-list weeds are weeds of known economic importance that occur in small enough infestations to eradicate or contain. Eradication or intensive control are the recommended actions.
- B-list weeds are weeds of economic importance that are abundant in the region but may have limited distribution. Intensive control is recommended at the state, county, or regional level determined on a case-by-case basis.
- T-list weeds pose an economic threat to the state and are a priority species for prevention and control.

No A-list species were found within the project area. The Willamette National Forest categorizes invasive plant species as new invaders or established invaders. New invaders are those weed species just entering the National Forest and whose populations are possible to eradicate; whereas, established infestations include weed species that are so widespread on the Forest they are not likely to eradicate. Some species can have both new invader populations that are fewer than 10 plants and are outliers as well as established infestations such as those that border streams at lower elevations.

Several conspicuous "invasive" plants are not listed officially by ODA including reed canarygrass, foxglove (*Digitalis purpurea*), cut-leaf blackberry (*Rubus laciniatus*), and sweetclover (*Melilotus officinalis*). These unlisted plants can displace native species and reduce the productivity of forest and farmland. ODA recommends that land managers treat the above species as they would B-list noxious weeds, controlling existing populations, and reducing the spread of seeds and ***propagules*** (small pieces of plant that can germinate). Willamette National Forest considers knapweed species, false brome, Japanese knotweed, and blackberry species to be highest priority for treatment because they have the greatest ability to alter our native ecosystems.

3.3.2 Environmental Consequences—Proposed Action

General Vegetation

Construction impacts would be generally associated with tree and vegetation clearing, soil compaction, and invasive plant propagation. Although the removal of trees would be spread over the length of the transmission line, it would potentially alter adjacent vegetation communities by increasing available sunlight, water and nutrients, increasing temperature variability, and diversifying the age structure of the adjacent riparian and forested communities. Given the density of vegetation in the areas, it would be expected that trees and shrubs would quickly revegetate areas where trees would be removed. Residual dormant seeds in the soil would also contribute to subsequent shrub and tree recruitment and disturbed site revegetation.

Within about 26 native wetland and riparian zones, construction activities would include clearing or crushing vegetation in order to replace wood-pole hardware, such as guy wires and guy wire anchors. Vegetation would be removed along the margins of the existing access roads and at the base of structures to aid in construction and safe operation of the line. As described in Section 2.2.11, a total of 51 acres of vegetation would be disturbed or cleared for construction activities, and up to 2,700 trees would require removal. Consistent with the Forest Service National Desk Guide to Preparing

Vegetation Management Procedures for Power Line Authorizations, BPA would lop and scatter debris from tree and vegetation removed in order to reduce the risk of creating fuels for wildfire.

Additional impacts could occur from the use of heavy equipment on local soils, including compaction and physical movement of soils. Compaction of soils could prevent precipitation from infiltrating plant root zones. Decreases in groundcover from vegetation removal could cause increases in erosion during storm events and correspondingly less infiltration to support remaining plant communities. Compaction could also inhibit germination of seeds in the upper soil horizon, favor the development of bare-soil areas, or foster compaction-tolerant annual grass and ***forb*** (non-grass-like herbaceous plant) species, many of which are invasive.

Soil disturbance resulting from construction activities could eliminate plant cover and change the ability of some plant communities to reestablish. Areas cleared of vegetation could be overtaken by non-native species, including invasive and noxious weeds, which could preclude growth of native vegetation.

As noted earlier, plant communities in the transmission line right-of-way have already been substantially altered from the original clearing on BPA's right-of-way and through ongoing operations and maintenance activities. The effects of the Proposed Action on additional soil disturbance and plant cover changes would be reduced or avoided through a variety of mitigation measures and environmental design features described later in this section; therefore, impacts to upland grassland/herbaceous, wetland, urban/developed, and agricultural/pastoral plant communities would be low. The disturbance to common plant species in the immediate vicinity of construction would be temporary and those temporary effects would be minimized through planning and implementation of the mitigation measures.

Potential accidental spills of hazardous materials (e.g., hydraulic fluids, petroleum products) that would be used during construction could result in vegetation impacts including mortality, reduced viability for some species, and reduced potential for successful revegetation within spill areas. Because potential spills would be small and localized, and mitigation measures would be implemented to reduce the possibility of spills affecting vegetation, the impact to general vegetation would be low.

Special-Status Plant Species

Since no special-status (including ESA-listed plants), sensitive species, or critical habitat were historically documented or found during surveys for the project, there would be no expected impact to these species.

Invasive Plants

There is potential for construction activities to disrupt and disturb vegetation and soils, increasing potential for the spread of noxious weeds and other invasive plants. Invasive plants could colonize road edges disturbed by access road work activities, and construction vehicles or materials could inadvertently transport seeds or propagules to the transmission line right-of-way and access road areas. If conditions are appropriate, these species could take advantage of disturbed soils and the lack of competing vegetation in recently cleared areas and establish new populations. Appendix B,

Table B-2 lists invasive plant species found within the transmission line right-of-way and access road areas.

Removal of 51 acres of vegetation spread out over 26 miles of the transmission line has the potential to provide new seedbeds for invasive species to become established. The Proposed Action would affect no special-status plant species; and mitigation measures would be utilized to minimize the potential colonization and spread of invasive species, so the overall impacts from invasive species would be low-to-moderate. The transmission line right of way in line mile two has a high level of infestation of Himalayan blackberry and reed canarygrass, so the risk of infestation in the new alignment (as described in Section 2.2.2) is high in this area. The right-of-way for line mile three has very few invasive species, so the risk of infestation in the realigned portion of line mile three (as described in Section 2.2.3) is low to moderate.

3.3.3 Environmental Consequences—No Action Alternative

Under the No Action Alternative, impacts to vegetation due to construction and access road work would not occur. The ongoing operation and maintenance of the existing structures would still occur, potentially on a more frequent basis as structures deteriorate. Maintenance activities could be more disruptive and take place more frequently on an emergency basis, resulting in vegetation clearing and disturbance, tree removal, and the increased potential for spread of invasive plants. The No Action Alternative would be anticipated to have a low impact on vegetation because changes would be temporary in nature and limited to a relatively small area.

3.4 Streams and Fish

3.4.1 Affected Environment

Streams

The transmission line lies within the Middle Fork Willamette River subbasin (Figure 3-3). The transmission line crosses several streams and rivers, including the Middle Fork Willamette River, North Fork Middle Fork Willamette River, Buckhead Creek, and Hospital Creek and parallels the Lookout Point Lake for much of its distance. A complete list of named and unnamed streams in the project area is included as Appendix C.

The Middle Fork Willamette River subbasin is located in the southeastern portion of the Willamette Basin and drains the Cascade Range. Formed at the confluence of several small headwater streams near Emigrant Pass in northeastern Douglas County, the Middle Fork Willamette River joins the Coast Fork Willamette River in Springfield to form the mainstem of the Willamette River at river mile 186. The Middle Fork Willamette River subbasin contains four reservoirs: Hills Creek Lake (south of Hills Creek Substation), Lookout Point Lake (parallel to transmission line), Dexter Lake (north of Lookout Point Substation) on the Middle Fork Willamette River, and the Fall Creek Lake (beyond the transmission line) on Fall Creek.

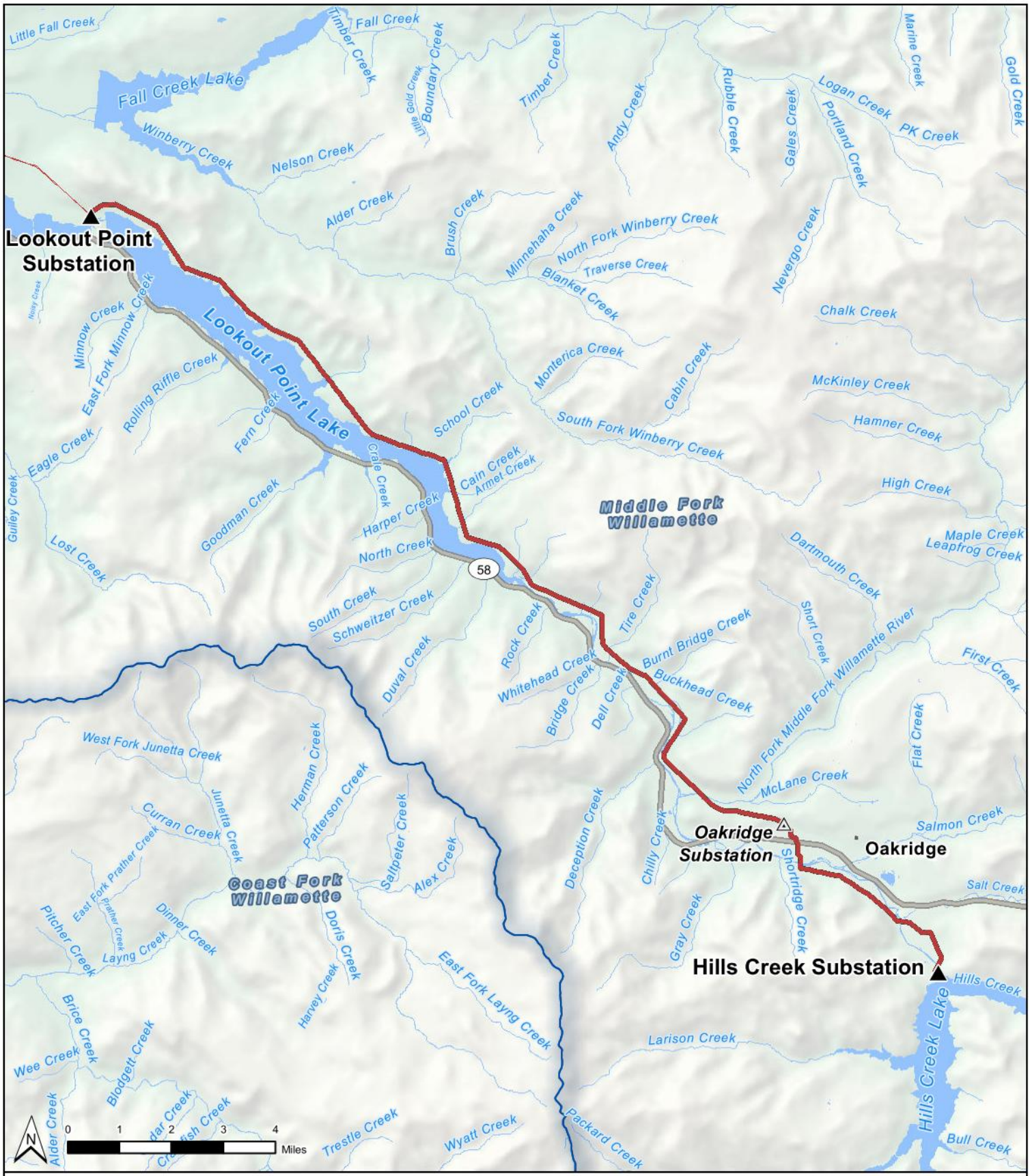

FIGURE 3-3
Watershed Subbasins
Hills Creek-Lookout Point Rebuild Project

- BPA Substation
- Non-BPA Substation
- Hills Creek-Lookout Point Transmission Line
- BPA Transmission Line
- Subbasin Boundary
- River
- Water Body

BONNEVILLE POWER ADMINISTRATION

June 15, 2015

The subbasin's 867,110 acres includes three watersheds crossed by the transmission line: Hills Creek Lake, North Fork Middle Fork Willamette River, and Lookout Point/Middle Fork Willamette (DEQ 2006). Of the three subwatersheds crossed by the transmission line, 94 percent is forestland, mostly under public ownership managed by the Forest Service in the Willamette National Forest and the Bureau of Land Management (BLM), with some land managed by the Corps.

The most dominant landscape features relevant to watershed health and condition include the presence of multiple dams associated with the Corps Willamette River Basin Flood Control Project. Dams within or immediately adjacent to the transmission line right-of-way include Hills Creek Dam (line mile 1) and Lookout Point Dam (line mile 26). The transmission line spans several streams, rivers, or their headwaters, and there are several access road crossings of smaller creeks, as listed in Table 3-5 . Appendix A includes project maps with project elements as well as land ownership, Forest Service land use allocations, and riparian reserve classifications; and Appendix C includes a list of all named and unnamed streams in the project area.

The Middle Fork Willamette Subbasin has rivers and streams that do not meet Oregon Department of Environmental Quality's (DEQ) water standards for temperature and dissolved oxygen. Failure to comply with these standards results in listing on DEQ's ***303(d), water quality limited waters*** (303[d]) list. Total Maximum Daily Loads (TMDLs) are developed for temperature but not for dissolved oxygen. Mercury is a parameter of concern throughout the Willamette Basin and addressed in a basin-wide TMDL. Table 3-6 lists the streams on DEQ's 303(d) list within the project area and the standards not met by each stream in the Middle Fork Willamette Basin.

Table 3-5. Named Streams Crossed by Transmission Line or Access Roads

Named Streams	Nearest Structure(s)	Fish Presence[1]	Activity	In-Water Work?
Middle Fork Willamette River	1/1 - 1/2 2/6 - 2/7 4/9 - 5/1	Chinook, bull trout, rainbow trout, Oregon chub and other fish species	Transmission line spans river	No in-water work
North Fork Middle Fork Willamette River	8/3 - 8/4	Chinook, rainbow trout, cutthroat trout, brook trout and other fish species	Transmission line spans river	No in-water work
Buckhead Creek	Line miles 9 - 11 10/8 - 10/9 11/2 - 11/3	Chinook, rainbow trout, cutthroat trout, Oregon chub and other fish species.	Transmission line spans multiple crossings of creek; Access road crossing of creek	Yes - in-water work proposed (ford to be improved) and temporary construction bridge to be installed
Burnt Bridge Creek	11/2 - 11/3	Chinook, rainbow trout, cutthroat trout, Oregon chub, and other fish species	Transmission line spans creek; Access road crossing of creek	Yes - in-water work proposed (ford to be improved) and temporary construction bridge to be installed
Tire Creek	12/3 - 12/4	Cutthroat trout, rainbow trout and other fish species	Transmission line spans creek	No in-water work
Hospital Creek	14/6 - 14/7	Cutthroat trout, rainbow trout, Oregon chub and other fish species	Transmission line spans creek	No in-water work
Carpet Hill Creek	15/2 - 15/3	Cutthroat trout, rainbow trout and other fish species	Transmission line spans creek	No in-water work
Armet Creek	16/4 - 16/5	Cutthroat trout, rainbow trout and other fish species	Transmission line spans creek	No in-water work
Cain Creek	17/2 - 17/3	Cutthroat trout, rainbow trout and other fish species	Transmission line spans creek	No in-water work
School Creek (Alcove of Lookout Point Lake)	17/5 - 17/6	Chinook, rainbow trout, cutthroat trout and other fish species	Transmission line spans creek/lake alcove	No in-water work
Rhodes Creek	18/5 - 18/6	Rainbow trout, cutthroat trout and other fish species	Transmission line spans creek/lake alcove	No in-water work
Bannister Creek	20/8 - 20/9	Chinook, rainbow trout, cutthroat trout and other fish species.	Transmission line spans creek	No in-water work

1. The Middle Fork Willamette River/Lookout Point Lake and some tributaries may provide seasonal habitat for a variety of species, including spring Chinook, summer/winter steelhead, rainbow trout, cutthroat trout, western brook lamprey, mountain whitefish, redside shiner, sculpin, dace, large scale sucker, northern pike minnow, largemouth bass, smallmouth bass, walleye, crappie, bullhead, and others (U.S. Forest Service 1995a, 1995b, 1997, and 2012; Reis 2015).

Table 3-6. Streams with Water Quality Limited Parameters Crossed by the Transmission Line and Access Roads

Waterbody Name	Water Quality Limited Parameters	Established TMDLs	Effect of Proposed Action on TMDLs
Middle Fork Willamette River (river mile 52.3 to 82.2)	Temperature	Temperature	Little to no impact on stream temperature
Middle Fork Willamette River (river mile 0 to 82.2)	Mercury	—	—
Middle Fork Willamette River/Hills Creek Lake (river mile 44.3 to 52.3)	Aquatic Weeds or Algae	—	—
Middle Fork Willamette River/Lookout Point Lake (river mile 18.7 to 30.3)	Aquatic Weeds or Algae	—	—
North Fork Middle Fork Willamette River (river mile 0 to 28.3)	Temperature	Temperature	Little to no impact on stream temperature
Buckhead Creek (river mile 0 to 3.6)	Temperature	Temperature	Little to no impact on stream temperature

Source: DEQ 2012.

Fish

The affected environment for fish includes the riparian and aquatic areas that provide habitat for fish species that may be directly or indirectly affected by the Proposed Action.

Many fish species occur in streams within the transmission line right-of-way and access road areas. Rainbow trout (*Oncorhynchus mykiss*), cutthroat trout (*O. clarkii*), steelhead trout (*O. mykiss*), Chinook salmon (*O. tshawytscha*), western brook lamprey (*Lampetra richardsonii*), Oregon chub (*Oregonichthys crameri*), and a variety of other common native and introduced fish species occur within these streams. Bull trout (*Salvelinus confluentus*) and Chinook salmon are ESA-listed fish species that occur within streams crossed or near the project. Current Forest Service Management Indicator Species include anadromous and resident salmonids (U.S. Forest Service 1990) while lamprey and Oregon chub are proposed Management Indicator Species under the 2012 Forest Plan Revision (U.S. Forest Service 2015).

The transmission line spans several streams, rivers, or their headwaters, and there are several access road crossings of smaller creeks and unnamed drainages. Project biologists coordinated with Forest Service, ODFW, USFWS, and NMFS biologists, evaluating streams and drainages along the 26-mile transmission line to assess potential fish presence and impacts. Fish presence in the transmission line right-of-way and access road areas is often precluded by natural barriers (e.g., steep slopes, waterfalls) and the physical position of the corridor high on hillslopes in the upper reaches of the watersheds.

Bull Trout (Salvelinus confluentus)

Bull trout are members of the salmon family native to Washington, Oregon, Idaho, Nevada, Montana, and western Canada. Bull trout are listed as a threatened species under ESA, and critical

habitat has been designated. Bull trout are also a Forest Service Management Indicator Species on the Willamette National Forest (U.S. Forest Service 1990).

Historically, bull trout were present within much of the Willamette River basin, including the mainstem of the Middle Fork Willamette River, North Fork Middle Fork of the Willamette River, Salt Creek, Swift Creek, Staley Creek, and Hills Creek Lake. Bull trout have the most specific habitat requirements of all the salmonid, requiring cold, clean water with high habitat complexity and connectivity to other quality habitats (USFWS 2008; USFWS 2014a).

Bull trout reintroduction has occurred upstream of Hills Creek Lake, a complete upstream fish passage barrier. Bull trout are known to utilize Middle Fork Willamette River tributaries including Swift Creek, Bear Creek, Indigo Springs, and other higher elevation, north-slope, spring-fed tributaries, well above the transmission line (Ziller and Reis 2014). Bull trout may be present within the Middle Fork Willamette River adjacent to the transmission line right-of-way. ODFW has documented bull trout below Hills Creek Dam in the Middle Fork Willamette River and in Salt Creek near its confluence with the Middle Fork Willamette River. However, ODFW records indicate a total of only 12 bull trout have been documented below Hills Creek Dam (Zymonas 2014).

Bull trout are most likely to be encountered above Hills Creek Dam (above the transmission line), with low potential for encountering bull trout in the Middle Fork Willamette River between Lookout Point Lake and Hills Creek Dam. Bull trout use of Lookout Point Lake is possible, but limited to potential feeding and overwintering given habitat and temperature constraints (Zymonas 2014). Water temperatures within the Middle Fork Willamette River are generally high enough to inhibit bull trout spawning (USFWS 2002).

Chinook Salmon (Oncorhynchus tshawytscha), Upper Willamette River Evolutionarily Significant Unit

The Upper Willamette River Chinook salmon ***evolutionarily significant unit (ESU)*** (a population substantially reproductively isolated from other populations) is listed as a threatened species under the ESA, with designated critical habitat present within the transmission line right-of-way and access road areas. Designated critical habitat includes Lookout Point Lake, the Middle Fork Willamette River, the North Fork Middle Fork Willamette River, Bannister Creek, School Creek, and Buckhead Creek (NMFS 2005). Chinook salmon are also a Forest Service Management Indicator Species on the Willamette National Forest (U.S. Forest Service 1990).

Protected fish include all naturally spawned spring-run populations of Chinook salmon (and their progeny) residing in streams in the Upper Willamette River Basin of western Oregon, upstream of Willamette Falls (64 FR 14308). This includes the mainstem Willamette River and its tributaries. Currently, six artificial propagation programs (i.e., hatcheries) are also considered to be part of the ESU. This includes the Willamette Hatchery, a spring-run Chinook salmon hatchery program located near Salmon Creek (tributary to Middle Fork Willamette River) located near Oakridge (70 FR 37160 and 79 FR 20802).

ODFW also operates the trap and haul program at the Dexter satellite facility, collecting adult Chinook at Dexter Dam below the transmission line from late May to October (mostly June through

August) and then hauling them upstream around the dams via truck and releasing them above Lookout Point and Hills Creek dams (Ziller and Reis 2014).

Oregon Chub (Oregonichthys crameri)

The Oregon chub is a small minnow found in the Willamette River basin. The USFWS recently removed Oregon chub, and its critical habitat, from the list of Endangered and Threatened species due to species recovery (80 FR 9126). This species is a proposed Forest Service Management Indicator Species (U.S. Forest Service 2015).

Historically, Oregon chub were distributed throughout lowland areas of the Willamette River drainage in off-channel habitats such as sloughs, alcoves, and overflow ponds. The Middle Fork Willamette River is a stronghold for Oregon chub, with 33 documented populations, an abundance estimate of approximately 45,000, and a range on the Middle Fork Willamette River from near the confluence with the Coast Fork, upstream to 9 miles east of Oakridge (79 FR 7136; Bangs 2014).

There are known populations in the project area including Buckhead Creek (line miles 9 through 11), Burnt Bridge Creek (line mile 11), and Hospital Pond (adjacent to line mile 14). Additionally, ODFW also confirmed the potential for Oregon chub use of small alcoves associated with Lookout Point Reservoir that are frequently spanned by the existing transmission line (Bangs 2014).

Pacific lamprey (Entosphenus tridentatus) and Western Brook Lamprey (Lampetra richardsonii)

The Pacific lamprey is a federal species of concern and a Forest Service sensitive species. Pacific lamprey is an anadromous species with habitat and spawning requirements similar to salmonids. Existing barriers (Dexter Dam and Lookout Dam) preclude Pacific lamprey from reaching project area streams, and ODFW has not passed Pacific lamprey above the dams as part of their trap and haul program for Chinook (Reis 2015). Western brook lamprey are a proposed Forest Service Management Indicator Species (U.S. Forest Service 2015). Resident (western brook) lamprey have been documented above Hills Creek Dam and could be present in downstream tributaries, including streams crossed by the existing transmission line (Reis 2015). For additional information on the life history of the Pacific lamprey and western brook lamprey, refer to mitigation measures for the Pacific lamprey (USFWS 2010) and the Federal Register (69 FR 77158).

Rainbow Trout (Oncorhynchus mykiss) and Cutthroat Trout (Oncorhynchus clarkii clarkii)

Rainbow trout and coastal cutthroat trout are found in many of the streams spanned by the existing transmission Line. These common resident trout species are considered Management Indicator Species by the U.S. Forest Service (Forest Service 1990). With respect to distribution, the majority of trout within the larger streams and rivers are rainbow trout, while the upper, higher gradient streams primarily have cutthroat trout (U.S. Forest Service 1997).

3.4.2 Environmental Consequences—Proposed Action

Streams

In general, vegetation removal and soil disturbance from the Proposed Action work could increase the rates of wind and water erosion, resulting in sediment deposition directly into surface water and increased turbidity. Three structures (8/3 near North Fork Middle Fork Willamette River and 10/9 and 11/2 near Buckhead Creek) that would be replaced and about 0.3 mile of access road work are located within 100 feet of named waterways where increased erosion and subsequent runoff could occur.

Runoff from eroded soils and the subsequent decrease in water quality in nearby streams would depend on the timing of construction, weather conditions, local topography, the erosion potential of soils, and the effectiveness of mitigation measures implemented during construction to minimize soil erosion. The amount of fine sediment introduced to streams during grading, gravelling, and road prism construction for access road work would be similar to natural erosion processes during the dry season because there would be little or no flowing water on road surfaces, and temporarily disturbed soils would be mulched, reseeded and/or replanted, thereby minimizing erosion of soils. Culvert and ford installation and replacements, also part of access road work for the project, would require in-water work in fish-bearing streams and could temporarily disturb bank soils and streamside vegetation, which could result in eroded soils entering streams. Trees and other vegetation would need to be removed around culvert installation and replacement areas; however, most of these streams are intermittent and are dry during the summer construction season. These areas would also be mulched, seeded and/or replanted based on site conditions to minimize temporary impacts and facilitate site restoration.

Traffic on gravel roads during the wet season has the largest potential to deliver sediment to stream channels. However, wood-pole replacement projects usually only involve about eight vehicle trips per day (four vehicles to and from the transmission line) so the amount of rock fines running off into streams and increasing sedimentation would be low. In addition, the design features would minimize turbidity and sediment runoff into streams from construction activities (see Mitigation Measures). Further, erosion rates would likely return to their current levels once vegetation is reestablished.

Structure replacement work has the potential to cause erosion and sedimentation to nearby streams—possible sedimentation from excavation of existing structure holes would be expected to be low because excess uncontaminated native soil, beyond the needs of backfill or restoration, would be disposed of in an upland areas outside of floodplains and at least 100 feet from wetlands and waterbodies. Excess potentially contaminated soil, beyond the needs of backfill, would be properly handled and disposed of according to all applicable regulations at a permitted facility that accepts these materials. Given that only three structure replacements and 0.3 mile of access road work would occur within 100 feet of streams and that the transmission line is generally designed to provide wide spans over waterways, impacts to most named drainages would be avoided. Impacts to streams are summarized in Table 3-7.

Table 3-7. Impacts to Streams from Project Activities

Access road activity	Waters			
	Permanent		Temporary	
	Square feet	Acres	Square feet	Acres
Structure replacement	--	--	--	--
Road improvement	2,300	0.05	--	--
Road reconstruction	--	--	--	--
Culverts, fords, bridges	1,400	0.03	1,500	0.03
Tree removal	--	--	--	--
Total for all activities	3,700	0.08	1,500	0.03

Other than sedimentation from temporary erosion, the Proposed Action would not be expected to contribute to impaired water quality for the parameters identified in Table 3-6. No metals, fecal coliform, and temperature loading discharges would be used as part of the Proposed Action, and the Proposed Action would not affect dissolved oxygen levels or contribute to nitrogen, phosphate, or algae. The installation of culverts, including fish-passable culverts, would improve flow control and would provide localized habitat improvements. With implementation of erosion control measures described in the mitigation measures below, the amount of sedimentation potentially entering streams would be low and the Proposed Action would not inhibit any water quality recovery efforts on streams crossed by the transmission line.

Potential impacts to surface water quality resulting from accidental oil or fuel spills into streams from construction equipment used adjacent to streams would be low because mitigation measures would be implemented, including setback distances for fueling and staging areas from waterbodies to minimize spills, and contractor requirements for spill kits and spill containment materials to be present onsite.

As listed earlier in Table 3-6, tree removal would have little to no temperature impact on streams with TMDL limits for temperature. Removal of trees throughout the length of the transmission line corridor is unlikely to reduce stream shading because most tree removal would not be immediately adjacent to streams, as defined by a setback distance equal to the stream width. At the three crossings of the Middle Fork Willamette River (Table 3-5), a total of seven trees would be removed adjacent to the stream. No trees would be removed adjacent to the North Fork Middle Fork Willamette River. Furthermore, the understory would be left in place and weed free mulch (or equivalent erosion barrier) would be placed on temporarily disturbed areas adjacent riparian areas per BMPs and project specifications. As such, the ground surface would remain intact and post-removal site runoff would not be expected to increase from existing conditions. In addition, tree stumps would remain in place after tree removal and further minimize ground disturbance. Mitigation in the form of riparian plantings at selected ford and culvert replacement sites could eventually increase shading and help to offset potential temperature impacts to habitat.

Overall, impacts to streams from the Proposed Action would be low.

Fish

Pursuant to the requirements of Section 7(c) of the ESA, a BA that addresses project effects on listed fish species and their designated critical habitat was prepared, and BPA consulted with USFWS for Bull Trout (Threatened). BPA is currently in consultation with NMFS for Upper Willamette River Chinook (Threatened). A Biological Evaluation (BE) to address potential impacts to Forest Service Sensitive fish species is also being prepared, while U.S. Forest Service Aquatic Conservation Strategy objectives are addressed separately in Appendix D. BPA will comply with all conditions of the BA and BE, as required by USFWS and NMFS.

Potential impacts to resident fish and anadromous fish (those that breed in fresh water but live their adult life in the sea) could occur due to changes in stream habitat or water quality (sedimentation, shade or cover removal, contamination) or from direct disturbances to individual fish during in-water work activities. Increases in turbidity, erosion, and sedimentation could negatively affect fish due to loss of habitat and available food. The extent of the impact would depend upon the fish species present at the time of construction and the level of disturbance to their habitat. However, most drainages where project actions are proposed are seasonal (intermittently flowing) and are higher gradient non-fish bearing waterways that would be dry during project construction.

As summarized in Table 3-5 and Table 3-8, in-water work within fish-bearing streams consists of only three ford improvements (and temporary construction bridge installations) on Buckhead and Burnt Bridge Creeks (line miles 10 and 11), plus the replacement of one undersized culvert on a higher gradient unnamed intermittent tributary to Lookout Point Reservoir (line mile 19). All other culvert replacements are on non-fish bearing drainages, minimizing potential for direct and indirect impacts to fish.

Changes in riparian vegetation that affect shade, cover, and recruitment of wood into streams also have the potential to affect fish and fish habitat. Increases in stream water temperatures could result from vegetation removal, which could reduce habitat quality (causing fish to leave the habitat) and alter food availability; however, only 670 trees would be felled within Forest Service designated Riparian Reserves, with only about 325 trees felled within 150 feet of mapped streams along the entire 26-mile corridor. This very minor reduction in potential shading combined with the limited hydraulic residence time within the transmission line right-of-way indicate stream water temperature increases would be unlikely to result from the proposed tree removal. Table 3-8 and Appendix A provide additional detail on project actions within each Forest Service land use allocation and Riparian Reserves.

During construction, vegetation removal would be limited to the project footprint, and riparian areas would be restored and replanted with native plants. Tree roots would be left in place to maintain soil stability and allow for re-sprouting, and felled trees would be left within the riparian area to provide habitat. Additionally, enhanced access road conditions and drainage features would facilitate more natural infiltration and sediment trapping functions, providing associated temperature and water quality benefits to fish by reducing direct runoff from access roads into streams. The temporary bridges placed across Buckhead Creek and Burnt Bridge Creek for

construction would also reduce potential for both direct and indirect impacts to fish resulting from construction vehicle crossing of the existing ford.

Although Chinook salmon, bull trout, and other fish species may be present within various streams crossed by the transmission line right-of-way and access road areas, most structure-replacement activities would occur away from streams where both topography and existing vegetation would reduce the ability of sediment to enter adjacent streams, consistent with Willamette National Forest standards and guidelines (FW-175), while proposed road and drainage improvements will yield subsequent benefits to fish present in downstream receiving waters. Some in-water work would be required for culvert installations, ford improvements, and temporary construction bridge installations; however, most drainages where this work would occur are intermittent and would be seasonally dry or have very low flow during construction (Table 3-8). Equipment moving across a stream and excavation necessary to install culverts and improve fords could disturb the substrate and release sediments or result in compaction, disturbing nearby fish and reducing an area's ability to support vegetation after construction. Fish salvage activities (removing fish from in-water work/construction areas) could also harm or harass fish, including ESA-listed Chinook. In addition, petroleum fuel products, hydraulic oil, and other hazardous materials typically associated with construction activities could enter a stream, causing fish kills, aquatic invertebrate kills, and death or injury to a number of other species that fish depend on for food. However, mitigation measures would be implemented during construction of the Proposed Action to reduce the risk of hazardous materials entering streams, minimizing potential for impacts to fish in downstream waters.

Table 3-8. Culvert/Ford Replacements and Improvements on Fish-Bearing Streams

Structure ID[1]	Nearest Structure	Stream	Potential ESA fish present[3]	In-water work	Fish salvage required	Tree removal
F-010-080	10/9	Buckhead Creek	Upper Willamette River Chinook	Yes/Ford	Yes	None
F-011-020	11/2	Burnt Bridge Creek (side channel)	Upper Willamette River Chinook	Yes/Ford	Yes	None
F-011-030	11/3	Buckhead Creek	Upper Willamette River Chinook	Yes/Ford	Yes	None
C-019-062	19/6	Unnamed tributary to Middle Fork Willamette River/Lookout Point Lake	None	No[2]	No	None

Source: Site visits, StreamNet, and discussions and onsite meetings with ODFW, USFWS, U.S. Forest Service, and NMFS biologists as well as BPA Project Engineers/Foresters.
1. Structure IDs starting in "F" are existing fords to be improved, structure IDs starting in "C" are existing culverts to be replaced.
2. No in-water work would be required because this stream would be dry during construction.
3. Based on construction timing for in-water work.

Beneficial effects of the Proposed Action would include improved fish passage and fish access to additional upstream aquatic habitats (culvert C-19-062), improved channel condition and more natural hydraulic conditions at stream-road crossings, reduced sediment inputs to streams based on enhancements to existing access road conditions, and increased access controls (e.g., gates) to minimize unauthorized and off-road vehicle use of BPA access roads. Detailed mitigation measures

proposed as part of the project are summarized in Section 2.6. With the implementation of erosion control and spill control measures, designing new and replacement culverts and fords using fish passage design criteria from NMFS (NMFS 2008) and ODFW (ODFW 2006a), conducting work during ODFW in-water work windows, isolating work areas, and conducting fish salvage if necessary, the overall impacts on fish and fish habitat would be low.

ESA-listed fish species, Management Indicator Species as designated by the Forest Service, and other native and non-native fish species potentially present within project streams will continue to persist as viable populations given the proposed action, project specifications, and mitigation measures. In addition to the mitigation measures listed in Section 2.6, BPA will implement any other measures that stem from consultation with USFWS and NMFS.

3.4.3 Environmental Consequences—No Action Alternative

Streams

There would be no construction impacts to streams from the No Action Alternative at this time. The number of maintenance activities, and thus the level of impact, could increase as structures deteriorate. Areas where structures are located within 100 feet of named waterways, especially those without existing access, could require off-road vehicle travel and pose a greater risk of causing sedimentation from maintenance around these structures, especially during winter months when most structure failures have historically occurred during or after spawning when eggs and alevin may be present. Tree removal near streams could be required during routine maintenance, as needed for emergency repairs, and to address federal mandates for line safety and clearance. Temporary soil erosion and sedimentation of waterbodies could potentially occur as soils are exposed during repair activities.

Fish

There would be no construction-related impacts from the No Action Alternative at this time. Undersized and impassable culverts would not be replaced and fords would not be improved. Therefore, fish would not have improved access and the proposed channel improvements at stream-road crossings would not occur. Access roads would not be enhanced to help reduce runoff and potential sediment delivery to streams. In addition, if emergency access road repairs or culvert replacement was required, there could potentially be greater fish mortality or stream habitat impacts if repairs were required during high flow conditions or periods when ESA-listed fish species are present. Impacts to fish from the No Action Alternative could potentially be low to moderate.

3.5 Wetlands, Floodplains, and Groundwater

3.5.1 Affected Environment

Wetlands

Wetlands are defined as those areas where surface water or groundwater saturates the soils for sufficient duration during the growing season, and at a frequency to support vegetation adapted to saturated soil conditions [Clean Water Act, 40 Code of Federal Regulations (CFR) 230.3(t)]. Wetlands

perform a number of functions that are considered valuable to society, including water storage, water filtration, and biologic productivity. Wetlands can support complex food chains that provide valuable sources of nutrients to plants and animals. Wetlands also provide general and specialized habitat for a wide variety of aquatic and terrestrial species. Wetlands are protected on the Willamette National Forest as special habitats per the Forest Service's *Special Habitat Manual*.

Wetland scientists conducted a field investigation for the project and identified 70 ***jurisdictional wetlands*** (protected under the Clean Water Act Section 404 or under state or local regulations) totaling 7 acres (PBS 2014b). The survey area included all areas possibly affected by structure replacement and access road work. All wetlands were assumed to be subject to federal and State of Oregon jurisdiction. Delineation of wetlands was conducted in accordance with current Corps protocols (U.S. Army Corps of Engineers 2010). Assessments of wetland function were conducted in the field using best professional judgment. Representative wetlands were assessed using the Oregon Rapid Wetland Assessment Protocol (Adamus 2010). Wetlands were also classified using the Cowardin Classification of Wetlands and Deepwater Habitats.

Wetlands in the transmission line right-of-way and access road areas are associated with river floodplains, riparian areas, hill slopes, ravines, and drainage swales. Most of the wetlands are located on slopes and categorized as slope wetlands under the Hydrogeomorphic Wetland Classification System (Adamus 2001). Dominant hydrologic sources to these wetlands include direct precipitation and surface and shallow subsurface flow. A seasonally perched water table resulting in saturation or surface ponding during the winter months is present in areas with heavy clay soils or other restrictive soil layers. This seasonal ponding may be more prevalent where disturbance has led to soil compaction. Riverine wetlands are present along the Middle Fork Willamette River, Buckhead Creek, and several smaller streams. The dominant water sources for riverine wetlands are overbank flow from the channel, or subsurface water flow between the stream channel and wetland. Wetlands have also formed in old floodplain scour features on the historic Middle Fork Willamette floodplain. With the construction of the Hills Creek Dam, much of the original floodplain no longer experiences regular flooding and the wetlands that have formed in the old scour features now function as depressional or slope wetlands.

Most of the wetlands identified within the transmission line right-of-way and access road areas during the field investigation fall into the Cowardin category of ***palustrine*** wetlands. Palustrine wetlands are non-tidal wetlands that are not associated with lake shores or located within active river channels. They may be dominated by herbaceous vegetation (palustrine emergent), shrubs and low trees (palustrine scrub-shrub), forest (palustrine forested), or open water (palustrine open water). Since the transmission line right-of-way is maintained free of trees, the majority of the wetlands identified were classified as palustrine emergent. Some of the emergent wetlands have a scrub-shrub component or extend out of the right-of-way as forested wetlands.

Common native and non-native herbaceous species found in palustrine emergent wetlands within the transmission line right-of-way and access road areas include velvetgrass (*Holcus lanatus*), soft rush (*Juncus effuses*), slough sedge (*Carex obnupta*), common horsetail (*Equisetum arvense*), tall fescue (*Schedonorus arundinaceus*), Watson's willow-herb (*Epilobium ciliatum*), slender rush (*Juncus*

tenuis), spreading rush (*Juncus patens*), ladyfern (*Athyrium filix-femina*), chamisso sedge (*Carex pachystachya*), awlfruit sedge (*Carex stipata*), bentgrasses (*Agrostis* spp.), birdsfoot trefoil (*Lotus corniculatus*), largeleaf avens (*Geum macrophyllum*), bluegrasses, (*Poa* spp.), and pennyroyal (*Mentha pulegium*). Reed canarygrass (*Phalaris arundinacea*) is a dominant species in about 10 percent of the wetlands in the transmission line right-of-way and access road areas, where it forms monotypic stands. Himalayan blackberry (*Rubus armeniacus*) is present in over half the wetlands and often occurs at the transition between wetland and upland. Both reed canarygrass and Himalayan blackberry are considered invasive species.

With the exception of the Himalayan blackberry, shrubs are not prevalent in the wetlands identified in transmission line right-of-way and access road areas. Only two wetland plots had greater than thirty percent cover of native shrubs. Willow species (*Salix sitchensis* and *Salix lasiandra*) are the most common shrub species. Other shrub species include snowberry (*Symphoricapos albus*), cascara (*Frangula purshiana*), thimbleberry (*Rubus parviflorus*), and beaked hazelnut (*Coylus cornuta*). Forested wetlands are present at the edges of the corridor and along the access roads. The forested wetlands are dominated by Oregon ash (*Fraxinus latifolia*) and black cottonwood (*Populus balsamifera* L. spp. *Trichocarpa*), with red alder (*Alnus rubra*) and Scouler's willow (*Salix scouleriana*) also present.

Floodplains

The Federal Emergency Management Agency (FEMA) identifies areas with a 1 percent chance of being flooded in a given year as 100-year floodplains. The transmission line crosses the mapped 100-year floodplains of the Middle Fork Willamette River and the North Fork of the Middle Fork Willamette River, as shown in Figure 3-4.

FEMA mapping is only available for the area around the towns of Oakridge and Westfir (structures 2/7 to 9/2) and the lower portion of the Lookout Point Lake (structures 20/4 to 26/8). No structures are within the boundary of the FEMA mapped floodplain. Portions of existing access roads, however, are present within the mapped floodplain.

FEMA has not mapped the floodplains where the transmission line passes through the Willamette National Forest (structures 9/2 to 20/4). Near Oakridge, FEMA mapped flood level is generally 10 to 15 feet above the identified ordinary high water level of the Middle Fork Willamette River. Based on these flood levels, topography, and historic aerial photographs, it is assumed that most of the Buckhead Creek portion of the transmission line (structures 9/5 to 11/5) is located in the 100-year floodplain.

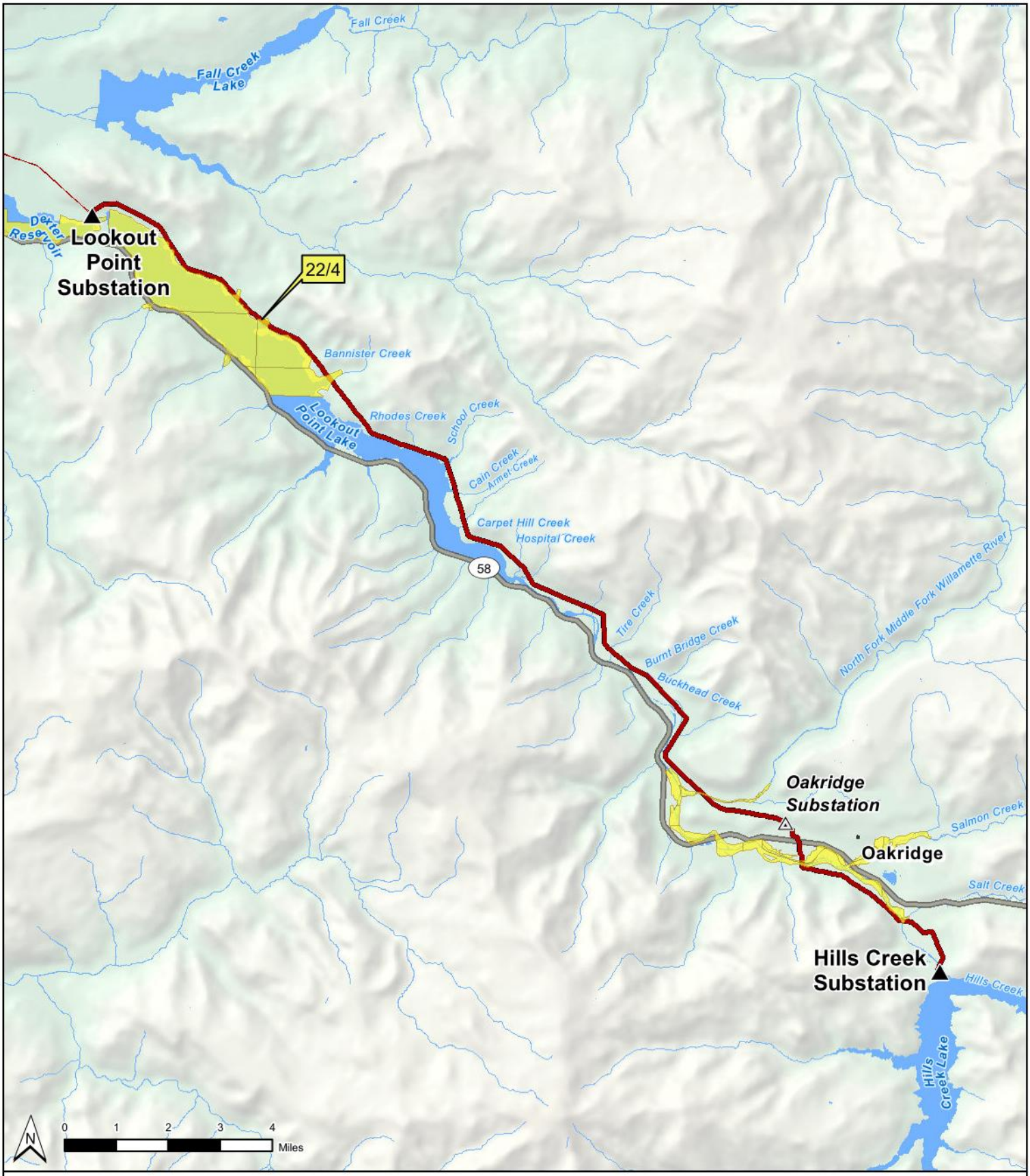

FIGURE 3-4
FEMA Mapped 100-Year Floodplains
Hills Creek-Lookout Point Rebuild Project

- BPA Substation
- Non-BPA Substation
- Hills Creek-Lookout Point Transmission Line
- BPA Transmission Line
- FEMA 100 year Flood Zone*
- River
- Water Body

*FEMA data shown where available

BONNEVILLE POWER ADMINISTRATION

June 15, 2015

Groundwater

Groundwater is heavily used as the domestic water supply in the majority of the transmission line right-of-way and access road areas. Five public wells located near Salmon Creek supply drinking water to the City of Oakridge (City of Oakridge 2013b). Well logs maintained by the Oregon Water Resources Department note the vicinity of the Hills Creek Substation as having encountered first water at a depth of about 12 feet below ground surface with most static water levels at depths between 12 feet and 52 feet below ground surface. Near the Oakridge Substation, well logs show encountering first water at depths between 16 feet and 91 feet below ground surface with most static water levels less than 20 feet below ground surface. Between the Oakridge and Lookout Point substations, well logs show encountering first water depths between 30 feet and 80 feet below ground surface with static water levels less than 20 feet below ground surface. Near the Lookout Point Substation, well logs show encountering first water at depths between 36 feet and 130 feet below ground surface with static water levels ranging from about 24 feet to 100 feet below ground surface (Oregon Water Resources Department 2014). There are no groundwater management areas or sole source aquifers along the transmission line.

3.5.2 Environmental Consequences—Proposed Action

Wetlands

Impacts to wetlands from the Proposed Action would primarily be a result of enhancements to existing access roads and replacement of existing structures that are located within or adjacent to wetlands. One new road section would be built through a wetland in line mile two to access a new tower location. Table 3-9 shows impacts to wetlands by type of project related activity and impact location.

Table 3-9. Impacts to Wetlands from Project Activities

Access road activity	Number of Impact Locations	Line Miles with Impacts	Wetlands			
			Permanent		Temporary	
			Square feet	Acres	Square feet	Acres
Structure replacement	11	2, 3, 4, 5, 10, 11, 14, 22	20	<0.001	24, 570	0.56
Road Construction	1	2	2,780	0.06	--	--
Road improvement	32	2, 3, 7, 9, 10, 11, 12, 13, 14, 15, 17, 20, 22, 23, 24, 26	28,013	0.64	--	--
Road reconstruction	0		--	--	--	--
Culverts, fords, bridges	5	7, 9, 11, 13, 24	2,130	0.05	200	0.004
Tree removal	10	3, 4, 10, 11, 19, 20	--	--	30,000	0.7
Total for all activities			32,950	0.76	54,750	1.26

Enhancements to existing access roads would largely consist of placing about 3 inches of road rock on top of the existing access road surface. Impacts would occur where the roads cross wetlands or where wetlands have developed in the roadbed as a result of compaction and poor drainage. These impacts would occur throughout the length of the transmission line corridor. Under guidance from DSL, no mitigation would be necessary if the activity occurs on a constructed roadbed and does not expand the roadbed by more than 20 percent of the original width (DSL 2013). However, mitigation for these impacts could still be required by the Corps. BPA would reduce potential impacts to wetlands through minimizing access road work near wetlands and by reducing the roadway width to 12 feet near wetlands. Access road work would result in some permanent loss of wetland area and/or function. Impacts that are not exempt under federal or state regulations would be mitigated through the use of an approved ***mitigation bank*** (formally established area for restoration, creation, enhancement, or preservation designed to offset adverse impacts nearby) or the Oregon ***Payment-in-Lieu Program*** (similar to mitigation bank but can accept funds). ***Mitigation credits*** can be purchased at a mitigation bank or through the Payment-in-Lieu Program to offset impacts. Existing access road segments in line miles 9, 11, 20, and 24 would be left as is to avoid impacts to wetlands.

The project would replace two culverts in jurisdictional wetlands. Impacts from culvert replacement and ford repair are included as part of the road work permanent impact. Three rebuilt fords are proposed where access roads cross wetlands and culverts are not practical. The fords would be about 12 to 14 feet wide and constructed of rock embedded in the wetland such that the ground elevation remains the same; rebuilt fords would be the same width as the existing fords. The fords would be considered permanent impacts because fill material would be placed in the wetland.

Replacement of wood-pole structures would result in minor temporary and permanent wetland impacts. There are four structures located in wetlands (structures 2/5, 14/1, 14/2, and 22/6) and another seven structures (structures 2/6, 3/6, 4/8, 4/9, 6/1, 10/5, and 11/2) located within 25 feet of a wetland or within a line tensioning site (see discussion of tensioning site later in this section). New structures would be placed in the same holes from which old structures were removed. To prepare for installation, each existing hole would be cleaned out and re-augered so that it is about 8 inches larger in diameter. Permanent impacts resulting from removal and replacement of the four wood-pole structures located in wetlands would be negligible at about 20 square feet (less than 0.001 acre) distributed across four different wetlands. Excess uncontaminated native soil, beyond the needs of backfill or restoration, would be disposed of in an upland areas outside of floodplains and at least 100 feet from wetlands and waterbodies. Excess potentially contaminated soil, beyond the needs of backfill, would be properly handled and disposed of according to all applicable regulations at a permitted facility that accepts these materials. The portion of the pole below the ground surface would be wrapped with a pole wrap, which all but eliminates movement of preservative from the treated wood into the wetland.

As described in Section 2.1.2, the area of potential disturbance around each structure to be replaced would be limited to a 25-foot radius in or near wetlands. Temporary impacts associated with pole replacement would consist of construction access by heavy equipment and installation of guy wire

anchors and grounding wires at some structures. Temporary impacts from the four structure replacements in wetlands would be less than 25,000 square feet (about 0.56 acre).

Tensioning of the line can temporarily impact an area 100 feet wide and extending up to 150 feet from the tower both ahead and behind on the line. There are several locations where tensioning could result in impacts to wetlands that are situated in this potential impact zone. Impacts to wetlands would occur as wetland vegetation is crushed and soil is compacted or disturbed by construction equipment. Impacts would be avoided if possible and temporary equipment mats would be used to prevent damage where needed.

Most of the wetland vegetation that would be disturbed during the project construction consists of grasses and forbs within the maintained transmission line right-of-way. In some areas, minor grading and re-contouring could be necessary to re-establish preconstruction contours. All disturbed areas would be revegetated with native grasses and forbs and revisited after one growing season. Any areas observed not to have sufficient vegetation coverage or soil stabilization would be reseeded. Monitoring would continue until perennial vegetation provides 70 percent or more of the density of coverage that was provided by vegetation prior to commencing earth-disturbing activities.

The wetland areas that would be disturbed are dominated by a mix of native and non-native forbs and grasses common to disturbed sites within the region. Therefore, the goal of the monitoring would be to ensure there is sufficient vegetative cover to prevent erosion, and not to re-establish native vegetation. Construction of the Proposed Action would temporarily disrupt wetland function, but functions would return to pre-construction conditions after construction and restoration.

Up to 50 dispersed danger trees, mostly black cottonwood, would be removed from wetlands. To minimize impacts to the soil and understory vegetation, heavy equipment would not be allowed to enter the wetland areas. Trees would be directionally felled away from access roads. The removal of trees from wetlands would result in a temporary loss of wetland habitat function associated with loss of tree canopy. Impacts associated with tree removal would be considered temporary since the trees would be allowed to grow back. No mitigation is proposed for this activity.

In summary, impacts to wetlands from the Proposed Action would be low to moderate after mitigation.

Floodplains

About 950 feet of access road work would occur within the FEMA mapped floodplain and 2.0 miles within the unmapped potential 100-year floodplain of the Middle Fork Willamette River under the Proposed Action. Construction activities would be limited to the placement of several inches of rock on the existing roadbed, with some minor grading. Road work would have a total disturbance area of about 5.2 acres within the floodplain. Up to 2,100 cubic yards of rock would be placed in the floodplain. Access road work would only minimally decrease flood-storage capacity and would not alter the course of floodwaters.

Replacement of the 20 structures (9/3 to 11/5) located in the unmapped potential 100-year floodplain in the Buckhead Creek area would temporarily disturb up to 1 acre of floodplain. Any impacts associated with structure replacement within floodplains would be short-term and would

likely not alter the floodplain function or have any impact on flood elevation. The proportion of the floodplain within the transmission line right-of-way and access road areas potentially cleared or compacted would be small (less than 0.5 percent). The floodplain impacts associated with wood-pole structure replacement would be short-term and minimal. Therefore, impacts of the Proposed Action to floodplains would be low.

Groundwater

Groundwater flows could be impacted by soil compaction during construction of structures and access roads, which would reduce infiltration capacity and increase surface runoff to streams in localized areas. However, the roads would not be paved with an impermeable surface so some infiltration would still occur through the roads and the addition of drain culverts, water bars, and drain dips, designed in accordance with BPA's *Design Manual*, would convey water from the roads into nearby permeable (uncompacted) soil. Soil compaction from the Proposed Action would be temporary and occur in a relatively small area during construction, and would be expected to return to pre-construction conditions after project completion.

Impacts on groundwater quality from accidental petroleum spills could occur where groundwater levels are shallow, but spill containment mitigation measures would be implemented as described later in Section 2.6. Any chemical spills would be of a small volume that could be contained and cleaned up quickly. Any impacts to groundwater quality would be localized, short-term, and likely would not exceed state or federal water quality criteria.

Once constructed, the new structures would have the potential to impact water quality by leaching PCP, a general biocide that is commonly used as a wood preservative treatment for utility poles. However, U.S. Environmental Protection Agency (EPA) studies estimate that the level of PCP in waters due to utility poles is a fraction of the levels that create health concerns. EPA has assessed the potential for PCP to occur in surface waters and impact drinking water as a result of PCP-treated poles. For adults, the calculated level of concern for acute and chronic dietary risk from PCP in drinking water is 10,465 parts per billion of PCP; for children, this level is 2,990 parts per billion. Using modeling, available environmental fate data, and conservative assumptions, EPA has estimated that environmental concentrations of PCP for surface water due to PCP-treated poles are less than 1 parts per billion (EPA 2008). Pole wraps would be used on structures located within 50 feet of wetlands or streams or located within the 100-year floodplain to contain PCPs and prevent them from leaching into surrounding soils. Therefore, potential risk of impacts to drinking water and groundwater would be low.

3.5.3 Environmental Consequences—No Action Alternative

Under the No Action Alternative, there would be no construction impacts at this time. Wood-pole structures would be replaced and roads reconstructed or improved as needed over time, which could potentially create impacts that are similar to those described for the Proposed Action. However, because the work could be needed on an emergency basis during the wet season, it could result in greater impacts, require multiple trips through one or more wetlands, or necessitate emergency construction of temporary access roads. Since impacts would be incremental and undertaken on an

emergency basis, there is also the potential that individual repairs would fall below regulatory thresholds resulting in less overall regulatory review and less mitigation, resulting in an incremental loss of wetland functions and values that is not replaced through mitigation.

Similarly, maintenance and emergency repairs of the transmission line could result in disturbance of areas within the mapped or unmapped floodplain, and there would be the potential for accidental chemical spills from refueling of equipment, resulting in a low impact to floodplains and groundwater.

Impacts to wetlands, floodplains, or groundwater could potentially be slightly higher than under the Proposed Action, but still low to moderate.

3.6 Wildlife

3.6.1 Affected Environment

Wildlife evaluated in this section includes common wildlife, as well as state and federal threatened species, endangered species, candidate species, and special-status wildlife species. The emphasis of the wildlife evaluation is to determine potential use of the land adjacent to the transmission line right-of-way and access road areas by special-status species, though an account of common wildlife species is included to provide a comprehensive description of existing habitat conditions found in the land adjacent to the transmission line right-of-way and access road areas.

Wildlife habitat includes areas used for breeding and rearing young, feeding, migration, and dispersal. Periodic variations in habitat may result in stochastic or predictable seasonal absence of species. Vegetation type, climate, and habitat continuity vary dramatically along the transmission line and are important drivers in determining composition of local and migratory wildlife. The transmission line crosses two local ecoregions, Western Cascades Lowlands and Valleys of the Cascades and the Valley Foothills of the Willamette Valley (also described in Section 3.3).

Common Wildlife

The land adjacent to the transmission line right-of-way and access road areas supports over 300 species of wildlife (Appendix D, Table D-1). Common wildlife species known to occur within 5 miles of the transmission line and access roads were identified from incidental observations during site visits, the Geographic Biotic Observations Database maintained by the BLM, and the Integrated Biodiversity Information System Database maintained by the Northwest Habitat Institute.

Western Cascades Lowlands and Valleys

The majority of the transmission line and access road areas (85 percent) is located in the Western Cascades Lowlands and Valleys ecoregion. Forested lands in this ecoregion are devoted to recreation on federal lands and timber production on private lands; thus, prevailing management practices have a major impact on the types of habitat available to wildlife.

Reserves of late-seral forest found near the transmission line in lines miles 1 through 4 and 11 through 20 and are predominantly located on Forest Service lands specifically set aside for recreation

and the protection of wildlife and ecological processes unique to old-growth habitat. Late successional reserves, as described in Section 3.1.1, intersect the transmission line in two sections, from structures 2/6 to 4/4 and from structures 9/7 to 11/7. Habitat alterations caused by timber harvest benefit some species; notable examples are browsers such as elk (*Cervus elaphus*), who forage on the new growth of regenerating shrubs, and mountain beavers (*Aplodontia rufa*) that feed on ferns and other plants that rapidly colonize recently logged stands (Csuti et al. 1997).

Within and adjacent to the transmission line right-of-way and access road areas, the topography of the Western Cascades Lowlands and Valleys is moderately steep and dissected with many small drainage courses. Riparian areas along the numerous small waterways are often rich in songbird habitat hosting Wilson's warbler (*Cardellina pusilla*), Swainson's thrush (*Catharus ustulatus*), Pacific wren (*Troglodytes pacificus*), and black-headed grosbeak (*Pheucticus melanocephalus*). Small wetlands formed from overbank flooding and impounded waterways offer habitat for amphibians including rough-skinned newt (*Taricha granulosa*), northern red-legged frog (*Rana aurora*), and Pacific chorus frog (*Pseudacris regilla*). The Middle Fork Willamette River and adjacent wetlands provide habitat for belted kingfisher (*Megaceryle alcyon*), red-winged blackbird (*Agelaius phoeniceus*), green heron (*Butorides virescens*), great blue heron (*Ardea herodias*), common merganser (*Mergus merganser*), bald eagle (*Haliaeetus leucocephalus*), river otter (*Lontra canadensis*), American mink (*Neovison vison*), muskrat (*Ondatra zibethicus*), and northern raccoon (*Procyon lotor*). Natural clearings and recently logged areas serves as habitat for rufous hummingbird (*Selaphorus rufus*), song sparrow (*Melospiza melodia*), band-tailed pigeon (*Patagioenas fasciata*), ruffed grouse (*Bonasa umbellus*), elk, Columbian black-tailed deer (*Odocoileus hemionus columbianus*), mountain beaver, western pocket gopher (*Thomomys* spp.), American black bear (*Ursus americanus*), western fence lizard (*Scheloporus occidentalis*), and common garter snake (*Thamnophis sirtalis*). Conifer-dominated forests are commonly inhabited by varied thrush (*Ixoreus naevius*), red crossbill (*Loxia curvirostra*), chestnut-backed chickadee (*Poecile rufescens*), Steller's jay (*Cyanocitta stelleri*), dusky grouse (*Dendragapus obscurus*), barred owl (*Strix varia*), Cooper's hawk (*Accipiter cooperii*), pileated woodpecker (*Dryocopus pileatus*), northern flicker (*Colaptes auratus*), Townsend's chipmunk (*Neotamias townsendii*), and Douglas squirrel (*Tamiasciurus douglasii*). Moist microclimates within coniferous forests, such as ephemeral stream courses and decaying trees, offer habitat to amphibians including ensatina (*Ensatina eschscholtzii*), western red-backed salamander (*Plethodon vehiculum*), and northwest salamander (*Ambystoma gracile*).

Valley Foothills

The northwestern portion of the transmission line passes through the Valley Foothills ecoregion, a zone characterized by rolling hills interlaced with small westward-draining streams, and a transition between the Willamette Valley and the Coast Range. In the Valley Foothills, habitat for wildlife can be found in mixed stands of conifer and hardwood trees, and linear corridors such as riparian areas. Dominant land use in the Valley Foothills ecoregion is a mix of forestry, agriculture, and rural residential development. Habitats are varied in the Valley Foothills zone, ranging from upland grasslands to woodlands and forests of Oregon white oak and Douglas-fir.

The land adjacent to the transmission line right-of-way and access road areas within the Valley Foothills ecoregion are predominantly coniferous forestlands dominated by Douglas-fir. The forested areas are intertwined with riparian areas that encompass streams connected to Lookout Point Lake. These riparian areas provide forage and shelter and act as wildlife corridors that facilitate the movement of a wide variety of wildlife species, including terrestrial and aquatic mollusk and amphibian species. Riparian zones also feature many common birds and mammals, including willow flycatcher (*Empidonax trailii*), common yellowthroat (*Geothlypis trichas*), red-winged blackbird, belted kingfisher, great blue heron, northern harrier (*Circus cyaneus*), mallard (*Anas platyrhynchos*), Townsend's vole (*Microtus townsendii*), nutria (*Myocastor coypus*), and North American beaver (*Castor canadensis*). Remnant oak woodlands are fairly common and harbor white-breasted nuthatch (*Sitta carolinensis*), western bluebird (*Sialia mexicana*), and western gray squirrel (*Sciurus griseus*). Mature conifer forest habitat with decadent trees and snags may provide roost structures for a variety of bat species, including fringed myotis (*Myotis thysanodes*), Yuma myotis (*M. yumanensis*), silver-haired bat (*Lasionycteris noctivagans*), and the long-legged bat (*M. volans*).

Big Game Habitat

Deer and elk are the most visible big game species in the project area, can be found there year-round, and are also considered Forest Service Management Indicator Species (MIS). Big game species are of economic interest in the vicinity of the project area. Important habitat characteristics of big game species include thermal cover (i.e. canopy cover), hiding cover (i.e. shrub cover), and forage quality (i.e., forbs and shrubs). The forested habitat immediately adjacent to the transmission line corridor and access roads provide important cover, while the open and shrub-dominated habitats within the transmission line corridor provide foraging and hiding cover. Within the project area, all habitat types identified represent either suitable migratory, foraging, or cover habitat for elk and deer.

Dead Wood Habitat

Dead wood habitat includes standing dead trees (snags) and downed woody debris. Bird, mammal, mollusk, and amphibian species heavily rely on dead wood for key stages of their lifecycle.

Standing Snags

Danger tree specialists gathered snag density information while assessing danger trees within the transmission line right-of-way. They identified 21 snags representing, three percent of all danger trees in the project area. Avoiding tree removal during the peak breeding period for bird and bat species (April 1 to July 15), specialists would cut and fell danger trees by lopping and scattering in place. The Proposed Action would include snag creation for up to 55 danger trees that are eligible to top, trim, and girdle. Snag creation would occur in line miles 9 through 16.

Downed Wood

A renewable supply of large down logs is critical for maintaining populations of fungi, arthropods, bryophytes and various other organisms, including predator species, such as American marten and fisher. These animals need coarse woody debris well distributed across the landscape that provides for ecological functions. The Proposed Action includes the creation of substantial amounts of

downed wood by cutting and felling up to 2,700 trees, the majority of which would be lopped, cut and scattered in place. Tree removal is further described in Section 2.2.11.

Special-Status Wildlife Species

Special-status species are those that have been identified for protection and listed or proposed for listing as threatened or endangered under the federal ESA and/or as sensitive species in the Regional Forester's List, Forest Service management indicator species, or Survey and Manage Species. Oregon Biodiversity Information Center is the key natural history institute in Oregon for the development and distribution of biodiversity information, and the primary source for distribution and classification of species that may occur near the transmission line. The likelihood in which a particular species is known to occur within and adjacent to the transmission line right-of-way and access road areas is determined by an analysis of distribution maps, documented sightings, and by determining whether suitable habitat for the species exists within the affected environment.

Special-status species with the potential to occur within and adjacent to the transmission line right-of-way and access road areas are summarized in Appendix E, Table E-2. Of a total of 64 wildlife species listed as threatened, endangered, candidate, and special-status that could occur within and adjacent to the transmission line right-of-way and access road areas, 33 are actually likely to use these areas (13 migratory and 9 resident bird, 5 amphibian and reptile, 4 mammal, and 2 invertebrate species). Of those 33 species, one, the northern spotted owl, is an as ESA-listed species.

Threatened, Endangered, and Sensitive Wildlife Species

Fisher

The fisher (*Martes pennanti*) is proposed for listing as a threatened species under the ESA, and is generally nocturnal and utilizes snag habitat within dense forests. This species has a very low likelihood to occur within and adjacent to the transmission line right-of-way and access road areas or within typical dispersal distance of documented populations. They are not expected to use the lands within and adjacent to the transmission line right-of-way and access road areas for denning or resting, as they typically avoid using areas with little or no forest structure and avoid areas of human activity; however, the fisher may pass through at night to forage.

Bald Eagle

Eagles are protected under the Bald and Golden Eagle Protection Act. Nesting activities for bald eagles (*Haliaeetus leucocephalus*) occur from January through August in forested areas near large bodies of water. Bald eagles winter in coastal areas and along large rivers, such as the Middle Fork Willamette River. Suitable nesting and foraging habitat exists in the lands adjacent to the transmission line right-of-way and access road areas. The Forest Service and Oregon Biodiversity Information Center databases have records of three known bald eagle nest sites located on the south side of the Lookout Point Lake within 1 mile of the transmission line near line mile 26.

American Peregrine Falcon

The peregrine falcon (*Falco peregrinus anatum*) is a Forest Service sensitive-species as identified in the Willamette National Forest standards and guidelines (FW-162). Preferred nesting sites for the

peregrine falcon are sheer cliffs (greater than 75 feet high) with horizontal ledges or small caves. Foraging is associated with a variety of open and forested habitats. Falcons are also closely associated with riparian settings. Potential peregrine falcon nest sites occur in the Hospital Cliffs near line miles 13 and 14, about 0.1 mile from the transmission line; however, no peregrine falcons were observed during field surveys conducted in April and May 2014 and 2015.

Northern Spotted Owl

The northern spotted owl (*Strix occidentalis caurina)* is a federally-threatened bird under the ESA; therefore, the main effects analysis has been documented through the preparation of a BA and consultation with the USFWS. There are 17 documented observations of northern spotted owls within one home range radius (1.2 miles) of the transmission line right-of-way and access road areas in line miles 1 through 20. Northern spotted owls likely use the forested stands adjacent to the transmission line as habitat for nesting, roosting, and foraging. Additionally, designated critical habitat for northern spotted owl crosses the transmission line right-of-way and access road areas.

Northern spotted owls are strongly associated with old-growth forests containing a large-diameter Douglas-fir providing of structural variety and features such as cavities and an abundance of snags and down logs. Stands with all these characteristics provide the best suitable habitat for northern spotted owls. Generally, these stands are over 80 years old with multi-storied structure, high canopy closure exceeding (over 60 percent), with sufficient snags and down wood that provide nesting, roosting, and foraging opportunities.

Surveys were conducted in 2014 and 2015 for northern spotted owls in potential nesting, roosting, and foraging habitat within a half-mile of the transmission line right-of-way and access road areas and within the core areas of nearby spotted owl home ranges. BPA will continue surveys with spot-checks in early spring 2016 and 2017 if construction is not yet complete within the immediate vicinity (0.25 mile) of the transmission line right-of-way and access roads. Spotted owls were detected during both the 2014 and 2015 breeding seasons (March through September), including two territorial, but non-breeding pairs. One of the pairs is located within 0.25 miles of the transmission line corridor in line mile 13.

Critical habitat for the northern spotted owl was designated in 1992 and revised in 2008. In March 2012, the USFWS proposed a revised critical habitat for the northern spotted owl. Designated critical habitat includes the primary constituent elements (physical and biological features needed for life and reproduction) that support nesting, roosting, foraging, and dispersal. Designated critical habitat also includes forest land that is currently unsuitable, but has the capability of becoming suitable habitat in the future.

Primary constituent elements of spotted owl critical habitat are those physical and biological attributes that are essential to species conservation. Such physical and biological features include, but are not limited to the following:

- Space for individual and population growth, and for normal behavior
- Food, water, or other nutritional or physiological requirements

- Cover or shelter
- Sites for breeding, reproduction, rearing of offspring
- Habitats that are protected from disturbance or are representatives of the historic geographical and ecological distribution of the species

Designated critical habitat for the northern spotted owl (West Cascades South Subunit WCS-4) crosses the transmission line right-of-way and access road areas along two distinct segments: line miles 2 through 4 and line miles 11 through 15.

Fringed Myotis, Pallid, and Townsend's Big-eared Bats

Although fringed myotis bat (*Myotis thysanodes*), pallid bat (*Antrozous pallidus pacificus*), and Townsend's big-eared bat (*Corynorhinus towsendii*) are typically associated with caves and buildings, they also nest and roost in tree and snag cavities and under loose bark. On the west-side Cascades, snags are the primary roosting habitat for fringed myotis and a minor roosting component for Townsend's big-eared bats. These bats forage over large areas and in a variety of habitats, but may have strong fidelity to natal roost sites. Pups are generally born in late June or early July, and stay in the roost site until as late as September. The project area contains some large snags and decadent features that provide potential tree roost sites for bats; however, no documented roost sites occur within the project area. These bats are uncommon and natal colonies occur at low densities, therefore the probability of roost trees in the project area is low.

Foothill Yellow-Legged Frog

Foothill yellow-legged frogs (*Rana boylii*) inhabit small, ephemeral streams to large rivers within many types of plant communities, primarily living sections of low-gradient streams with exposed bedrock or rock and gravel substrates. They attach their eggs to the bottom of quiet scour-pools or riffles in gentle-gradient streams, often where there is only slight flow from the main river.

Foothill yellow-legged frogs were not observed during field investigation, and there are no documented occurrences in project area; however, three historical populations from over 50 years ago are documented within 5 miles of project area (ORBIC 2015). There is suspected occurrence in the Middle Fork Ranger District in the Fall Creek watershed (U.S. Forest Service 2014e). Thus, the potential for the occurrence of foothill yellow-legged frog within the project area is very low.

Pacific (Western) Pond Turtle

Pond turtles (*Actinemys marmorata marmorata)* inhabit marshes, sloughs, moderately deep ponds, and slow moving portions of creeks and rivers. They require basking sites, such as partially submerged logs, vegetation mats, rocks, and mud banks. They use upland habitats within 1,500 feet of waterbodies for egg laying, overwintering, and dispersal. Two populations of western pond turtle occur within the project area, in the Buckhead Wildlife Area and Banister Pond, which are notable hotspots for western pond turtle (U.S. Forest Service 2014c). If construction coincides with hatchling emergence at one of the known sites, then BPA would conduct pre-construction surveys by visual observation for nesting activity, which includes checking for evidence of nesting and hatchling emergence, in April to July of the year of construction. If nests are identified in or near the work

areas, BPA would mark those areas as no work zones. Any hatchlings and adult turtles encountered would be relocated to suitable habitat outside the work area.

Cascade Axetail Slug

The Cascade axetail slug (*Carinacauda stormi*) is a recently described species that is endemic to the northern west side of the Oregon Cascade Range (Young and Doerr 2011). The slug is associated with needle litter duff in the western hemlock forest zone and has been found in forests ranging in age from about 30 years to old growth (Young et al. 2010). Although it has a regionally restricted range, it appears to be relatively common within its range on the Forest (Doerr and Young 2009; Young et al. 2010).

Western Bumblebee

The western bumblebee (*Bombus occidentalis*) was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area; furthermore, the western bumblebee has only been documented on the Forest based on sparse historic and recent observations. Bumblebees visit a range of different plant species and are important generalist pollinators of upland grassland and herbaceous flowering plants. Suitable habitat for western bumblebee exists within the project area, as there are available food resources and nesting habitat that can support bumblebee populations; however, this species has a low likelihood of using the project area, with no documented occurrences within 5 miles.

Johnson's Hairstreak

Johnson's hairstreak (*Callophrys johnsoni*) is associated with older western hemlock forests and relies on dwarf mistletoe on western hemlock trees as a host plant for its larval stage (Davis et al. 2011). The species is difficult to detect because it spends much time in the upper canopy. The larger-diameter western hemlock trees are more susceptible to dwarf mistletoe infestations; furthermore, the species is closely associated with late-successional and old-growth forests.

Management Indicator Species

Management indicator species include northern spotted owl, bald eagle, deer, elk, Peregrine falcon, pileated woodpecker, and American marten. Management indicator species represent all animals that depend on mature and old-growth forests. Northern spotted owl, peregrine falcon, and bald eagles are discussed in Section 3.6.1 Threatened, Endangered, and Sensitive Species; whereas, habitat for elk and deer is discussed in section 3.6.1 Big Game Habitat.

Pileated Woodpecker and Other Primary Cavity Excavators

Pileated woodpecker is the largest woodpecker in North America and typically inhabits forested areas with old-growth characteristics. The forest stands in the project area are young-to-mature and do not generally provide characteristics associated with old-growth forests, and therefore are not prime habitat for pileated woodpecker. However, dead wood habitat should be available to support the local wildlife community, including MIS such as pileated woodpecker and primary cavity nesters that are key to creating habitat for secondary cavity nesters.

American Marten

American marten (*Martes americana*) are associated with old-growth forest structure with large-diameter trees, multiple canopy layers, and significant amounts of down wood, generally located above 4,000 feet above mean sea level. The project area is located between 900 and 1,600 feet above mean sea level, well below the elevational range that is primarily associated with marten occupancy. Forest stands within the project area are young-to-mature, which do not generally provide characteristics associated with old-growth forests, and therefore are not prime habitat for American marten.

Survey and Manage Species

Survey and manage species applicable to this project area include great gray owl and red tree vole, which require mature and old-growth conifer forests for feeding, resting, and breeding habitat.

Great Gray Owl

Great gray owls (*Strix nebulosa*) forage in meadows and other openings, primarily preying on rodent species, such as voles and pocket gophers. Great gray owls nest in old-growth conifer forests or in younger forests with older remnant trees or snags that are located in close proximity to foraging habitat. BPA and Forest Service wildlife biologists identified potential foraging and adjacent nesting habitat near structures 15/9 through 16/5, which is a site where great gray owls historically occurred. Wildlife biologists conducted protocol surveys during the 2014 and 2015 breeding seasons; however, no great gray owls were detected. The potential habitat consists of approximately 20 acres of meadow and an adjacent 65 acres of mature forest.

Red Tree Vole

Red tree voles (*Phenacomys longicaudus*) are arboreal and inhabit younger forests with legacy structures or more typically old-growth Douglas-fir forests with tall, multi-layered canopies that retain humidity and intercept fog, which functions as a source of water for a species that spends the majority of its life in the upper canopy. Forest stands within the project area are young-to-mature and are beginning to develop into suitable habitat for tree voles, but generally lacking the characteristics of high quality habitat such as deep crowns, large limbs, and deformities.

3.6.2 Environmental Consequences—Proposed Action

Impacts to wildlife could occur from habitat loss or degradation (tree removal and possible noxious weed infestations), disturbances or direct mortality during construction (noise and use of heavy equipment), or avian collisions with the conductor.

Common Wildlife

Because most structures and road work would be located in existing disturbed footprints, there would be minimal additional habitat loss due to the project. The new access road construction and the slight realignment of the line in line mile three would convert about 5.5 acres of previously undeveloped habitat to structure sites and access roads; however, the area that would be converted would be at the edge of existing road and cleared right-of-way habitat and would be a relatively small amount compared to existing surrounding undeveloped habitat. Species that could be

displaced would be expected to find habitat in adjacent forested areas and impacts from loss of habitat would be low.

Tree removal and vegetation clearing could affect common wildlife species in areas that have been subject to ongoing periodic vegetation management activities since the transmission line was originally constructed. Trees of various sizes and species would be removed under the Proposed Action, including about 325 trees located in riparian areas. Trees would be directionally felled away from access roads and left on site. Wildlife, especially nesting birds, could be temporarily displaced by the removal of trees. However, tree removal would not be conducted between April 1 and July 15 to minimize displacement of nesting birds and to avoid injuring bat individuals inhabiting trees that contain cavities or other features that could support bat natal colonies. Because most of the land adjacent to the transmission line and access roads is forested, it is unlikely that nesting habitat is limited by the availability of suitable trees for use as roosts, perches, nests, or foraging locations. Thus, the impacts of tree removal and other vegetation clearing on wildlife species would be low.

Degradation of wildlife habitat could occur if invasive plants establish themselves in areas disturbed by construction activities. Non-native plants provide poor forage for grazing animals, and impenetrable thickets of weed species can impede wildlife movement. Because weed control activities would be conducted, as described in Section 3.3.2, degradation of habitat below existing conditions is not expected. Therefore, impacts on wildlife species from degradation of habitat would be low with implementation of appropriate weed control measures.

Impacts from noise and activities would vary depending on the proximity of construction areas to wildlife and the duration of the noise disturbance. Construction noise, human intrusion, and other short-term disturbances could temporarily displace wildlife. Increased noise from heavy equipment during construction activities, as well as the transportation of equipment to and between sites, would temporarily exceed ambient noise conditions. Disturbance from pole replacement would generally take up to 2 days total per structure. Wildlife would likely avoid construction areas during construction activities. Because the transmission line is located near Highway 58, some animals living in the vicinity may already be habituated to sound associated with motorized vehicles, reducing their susceptibility to construction noise. Because noise and activity levels would be temporary and expected to return to ambient levels after construction is complete, impacts would be low.

Birds could collide with the conductors and structures installed under the Proposed Action. The spacing of conductors on 115-kV transmission lines is far enough apart that electrocution of raptors and large birds is rare. Most of the line would have the same flat line conductor configuration (the conductors are on the same horizontal plane) as the existing line. The flat line configuration is easier for birds to avoid and since the configuration would not change, there would be no addition or change to the existing potential for bird-conductor collisions. There have been no known bird collisions with the existing line. In line mile five, BPA is proposing to use steel monopole structures (about 15 of them in a 1-mile stretch). The steel monopole structures have a stacked conductor configuration (the conductors are in the same vertical plane) which can create a fence effect and be harder for birds to avoid.

Bird-conductor collisions are more likely in areas in which the line crosses rivers or ridges that can be flyways for birds. BPA consulted with Forest Service and identified areas with wide spans over waterways that would be crossed by conductors in the flat configuration (none of these areas would be crossed by vertical configured conductors). These areas are likely to be frequented by birds, including Aleutian cackling geese (*Branta hutchinsii leucopareia*), migratory breeding birds, and other species. BPA is proposing to place spiral bird diverters on the conductors in 19 locations to make them more visible to birds and lessen potential collisions. Since the existing line does not have bird diverters, the Proposed Action would help reduce the current potential for avian collisions and therefore could have a beneficial impact on wildlife species by reducing potential avian collisions compared with the No Action Alternative.

Big Game Habitat

Tree removal along the right-of-way and access roads will cause little if any change in habitat type or value. In the realignment areas of line miles two and three, BPA would continue to maintain 4 acres of the abandoned and rehabilitated right-of-way (as described in Section 2.2.9) as foraging and hiding cover; additionally, BPA would convert 4 acres of thermal cover to foraging and hiding cover by planting woody shrubs where forest would be removed. Due to ongoing maintenance of the transmission line corridor, foraging and hiding habitat will continue to and will not be converted thermal habitat over time.

The Proposed Action would include installing or fixing gates, which could improve habitat for deer and elk by limiting motorized access. Limiting vehicular access would reduce disturbance to big game and promote conditions that would improve health, reproductive success, and survival rates. Limiting vehicular access would also reduce opportunities for poaching where animals are concentrated and movement is limited. The reduced poaching opportunities, in conjunction with hiding habitat and forage creation in the realignment areas, would result in the Proposed Action having a positive overall cumulative effect on big game habitat.

Dead Wood Habitat

Standing Snags

The Proposed Action would maintain existing levels of snags, because the removal of 21 snags along the transmission line right-of-way would be offset by the creation of up to 55 large snags on Forest Service and Corps lands. Creating snags would mitigate the loss of some existing roosting habitat for bats and some existing perch, foraging, and potentially nesting habitat for land birds and neo-tropical migrants. Within the project area, snags densities would remain near current levels once snag removal and mitigations are completed.

Downed Wood

The Proposed Action would greatly increase the existing levels of downed woody material by cutting and felling of up to 2,700 danger trees along the right-of-way and access roads. Firewood cutting along roadways open to the public may slightly reduce down wood levels adjacent to roads; however, the majority of danger trees would be converted to down wood.

Special-status Species

Threatened, Endangered, and Sensitive Species

Fisher

Fishers are generally nocturnal, and construction activities would not occur during times when fisher may travel through the transmission line right-of-way and access road areas; therefore, disturbance or disruption of natural behaviors from construction of the Proposed Action would be unlikely.

Snags are one important component of fisher habitat; although the project would remove 21 snags as hazard trees, these snags are located near regular human activity making the likelihood of use by fishers extremely unlikely. BPA has identified 55 hazard trees for potential snag creation to maintain the available snag densities that currently exist in the project area. Additionally, tree and snag removal would be limited to the transmission line right-of-way and areas immediately adjacent to it, totaling less than 12 acres throughout the 26-mile length of transmission line. These areas have been previously disturbed and do not provide the complex forest structure necessary for fisher use. The effects of snag removal would not contribute to a trend towards federal listing or cause a loss of viability to the population or the species; therefore, the Proposed Action would have low impacts to fishers.

Bald Eagle

Construction noise or the removal of nesting habitat during the bald eagle breeding season would be unlikely to disturb nesting bald eagles because the three known bald eagle nest sites are located about 1 mile from where construction activities would take place—nesting is more likely affected by noise within 0.25 mile.

The Proposed Action would remove potential future nesting and roosting trees, including about 75 cottonwood trees with diameters of 12 inches to 28 inches along the edges of the Lookout Point Lake. The removal of cottonwood trees would be a minor impact on bald eagles as cottonwood trees are abundant in the immediate vicinity.

The low likelihood of disturbance and minor effects of habitat removal would not contribute to a trend towards federal listing or cause a loss of viability to the population or the species; therefore, the Proposed Action would result in low impacts to bald eagles.

American Peregrine Falcon

The Proposed Action would not alter or affect potential peregrine falcon nesting sites in the cliffs near line miles 13 and 14. Because no peregrine falcon nests were found in these areas, construction noise would likely not disturb nesting peregrine falcons. Project effects would not contribute to a trend towards federal listing or cause a loss of viability to the population or the species; therefore, impacts to peregrine falcons from project activities would be low.

Northern Spotted Owl

Nesting northern spotted owl and their young are generally limited to the immediate vicinity of the nest. The USFWS suggests that continuous loud activities within 0.25 mile of a northern spotted owl

nest patch would disturb natural behavior, and that construction activities and associated noise within 35 yards of a nest is generally considered disruptive to nesting during the critical breeding period (March 1 to July 15). There is one active northern spotted owl nest site located within 0.25 mile of the transmission line right-of-way or access roads. Effects from noise during construction activities would be temporary and episodic because activities are expected to occur on different days (work periods interspersed with some days of no construction activity), except for the load banks that will operate continuously. Because suitable northern spotted owl habitat within and adjacent to the transmission line right-of-way and access road areas is adjacent to Highway 58 and a public use area, it is likely that northern spotted owl in these areas are habituated to vehicles and human presence. Construction-related noise would not represent a substantial increase over ambient noise conditions; therefore, impacts from noise disturbance would likely be low. BPA would apply seasonal timing restrictions on construction and enact no-fly zones for helicopter use during the critical breeding season areas within 0.25 mile of the active nest site.

Tree removal could downgrade some older forest structure or delay the progress of young forests on the trajectory to becoming dispersal or suitable nesting, roosting, and foraging habitat. Approximately 200 coniferous trees would be removed from suitable nesting, roosting, foraging, and dispersal habitat. All but one of the 17 known home ranges would experience minimal loss (less than 1 acre per home range) of habitat trees near the margins of the home range. One home range would experience slightly greater impacts with the removal of 50 trees. Tree removal would not reduce canopy cover below the recommended threshold of 60 percent canopy cover, and therefore, would not affect the function of nesting, roosting, foraging, or dispersal habitat. No trees would be removed within a 300-meter radius of known northern spotted owl nest patches.

Spotted owl prey species should not be affected because modification to standing forest structure would recruit downed woody material that support prey habitat.

Disturbance and disruption during the northern spotted owl breeding period would be minimized by the implementation of mitigation measures. As a result of the Proposed Action, northern spotted owls would not be expected to permanently abandon the land within and adjacent to the transmission line right-of-way and access roads and no reduction in the abundance or distribution of the species is expected. No nesting, roosting, foraging, or dispersal habitat would be downgraded.

Spotted owl critical habitat would be impacted through the removal of trees that either currently provide habitat or are on the trajectory to becoming suitable habitat for northern spotted owl. Several actions included in the design of the Proposed Action would minimize adverse impacts to northern spotted owl critical habitat, including: minimizing the clearing of tree species most commonly used by spotted owls (Douglas-fir, Sitka spruce, western hemlock, or western redcedar) to the greatest extent possible, and topping mature conifer trees within designated critical habitat when feasible, where they would have otherwise been removed.

Because of the small scale of these impacts (removal of about 0.8 acre), the Proposed Action would have limited effects on the survival and recovery functions of northern spotted owl designated critical habitat, within the West Cascades South Subunit 4 of critical habitat, which contains 379,022 acres. Tree removal along existing access roads and transmission line would be negligible to spotted

owl designated critical habitat because suitable habitat within designated critical habitat would be maintained, and the amount of recruitment or capable habitat would not considerably change, so project effects would not contribute to a trend towards federal listing or cause a loss of viability to the population or the species. Therefore, with implementation of mitigation measures, as agreed upon with USFWS, impacts on northern spotted owl and its critical habitat would be low.

Fringed Myotis, Pallid, and Townsend's Big-eared Bats

Tree removal could directly harm individual bats or indirectly harm bats by significantly altering foraging and roosting habitat. Canopy cover reduction would be minor except in the realignment areas where the young forests do not provide high quality bat habitat. The Proposed Action would remove about 15 large-diameter (≥30-inch diameter) trees and 1 large-diameter snag, which may provide roosting habitat for bats. Creating up to 55 snags would mitigate the loss of some existing roosting habitat for bats. The possibility of tree removal harming a natal colony is very low because no trees would be removed from April 1 to July 15, the bats are uncommon, natal colonies occur at low densities, and very few potential roost trees would be removed. Because effects to bat foraging and potential tree roosting and natal habitat would be minor, and the probability of falling a tree or snag containing a natal colony or family is very low, project effects would not contribute to a trend towards federal listing or cause a loss of viability to the population or the species; therefore, the Proposed Action would have no-to-low impact for fringed myotis, pallid bat, and Townsend's big-eared bats.

Foothill Yellow-Legged Frog

Because the Proposed Action would not alter the low-gradient streams within the project area, and the likelihood of occurrence is very low, project effects would not contribute to a trend towards federal listing or cause a loss of viability to the population or the species; therefore the Proposed Action would have no-to-low impacts on foothill yellow-legged frog.

Pacific (Western) Pond Turtle

The Proposed Action could directly affect Pacific pond turtles with road improvements and increased vehicular traffic near the known nest sites, if individuals are present during construction; however, Proposed Action would not alter pond turtles by altering stream or pond habitat. Monitoring and avoiding individuals during ground-disturbing activities within 1,500 feet of known nest sites during the hatchling emergence would ensure the survival of any individuals present during construction. Because the Proposed Action would not harm individuals or alter the low-gradient stream and pond habitat, project effects would not contribute to a trend towards federal listing or cause a loss of viability to the population or the species; therefore, the Proposed Action would have low impacts to Pacific pond turtle**.**

Cascade Axetail Slug

Tree removal for the Proposed Action would minimally degrade habitat for Cascade axetail slugs, because the removal would be spread over 20 miles would not significantly reduce the canopy and alter terrestrial mollusk habitat. Tree removal at this scale (similar to thinning) may degrade habitat for axetail slugs but is not expected to result in loss of the species at the stand level because the

species occurs in a wide-range of forest age classes, so project effects would not contribute to a trend towards federal listing or cause a loss of viability to the population or the species; therefore, the Proposed Action would have low impacts on Cascade axetail slug.

Western Bumblebee

The Proposed Action could modify plant cover and temporarily decrease the availability of upland grasslands, herbaceous, and forested habitat with flowering shrub understory plant communities. Areas cleared of vegetation could be invaded by non-native species, including noxious weeds, which could preclude growth of native vegetation; however, the effects to plant cover changes would be reduced or avoided through BMPs and environmental design features, which include revegetating disturbed areas. Because the project would have a low impact to suitable habitat and the likelihood of western bumblebee occurrence within the project area is very low, project effects would not contribute to a trend towards federal listing or cause a loss of viability to the population or the species; therefore the project would have no-to-low impact on western bumblebee.

Johnson's Hairstreak

Tree removal would reduce the availability of potential habitat for Johnson's hairstreak by removing about 73 western hemlock trees, the majority of which are relatively young and would readily regenerate in the understory following tree removal. Because the project would only impact a very small amount of the total western hemlock habitat in the project area it would not contribute to a trend towards federal listing or cause a loss of viability to the population or the species; therefore, the project would have low impact on Johnson's hairstreak.

Management Indicator Species

Pileated Woodpecker and other Primary Cavity Excavators

The project would remove trees including 21 snags within young-to-mature forests, which may serve as habitat for pileated woodpecker. The project also includes snag creation for up to 55 hazard trees, which would maintain the overall available snag density. Tree removal could harm nesting pileated woodpeckers and other primary cavity nesters, but this is unlikely because it would not occur during their typical breeding season from April to mid-July. Because the current snag density would not significantly change and direct harm is unlikely, the Proposed Action would not contribute to a trend towards federal listing or cause a loss of viability to the population or the species; therefore the Proposed Action would have low impacts on pileated woodpeckers and other primary cavity excavators.

American Marten

Effects to American marten would be expected to be very minimal in this area which does not provide old-growth characteristics. Project activities would not create a significant change in available snag densities. Construction noise may disturb one or two American marten individuals, but the actions are not likely to affect the American marten population as a whole. Because the Proposed Action is not likely to harm marten individuals and would maintain the current snag and greatly increase the amount downed wood, project effects would not contribute to a trend towards

federal listing or cause a loss of viability to the population or the species; therefore, the Proposed Action would have a beneficial impact to American marten.

Survey and Manage Species

Great Gray Owl

If nesting great gray owls are present during the breeding period (March to July) when they are generally limited to the immediate vicinity of the nest, the Proposed Action could directly harm individuals. Tree removal in suitable great gray owl habitat may adversely affect the 65 acres of potential nesting habitat. However, the all tree removal in the potential nesting habitat is located in the transmission line right-of-way and would also be removed in the No Action Alternative. Because no known nesting sites occur within the disturbance zone of the Proposed Action, there would be no direct impacts from construction. No nesting great gray owls currently occupy the project area and habitat alteration would be minimal, so project effects would not contribute to a trend towards federal listing or cause a loss of viability to the population or the species; therefore, impacts on great gray owl from project activities would be low.

Red Tree Vole

The removal of large-diameter Douglas-fir trees could directly harm red tree voles occupying those trees; additionally, the tree removal could alter the overstory canopy, which provides thermal cover for red tree voles. However, most of the removal trees are located in young to mature forest stands that are not likely to support red tree voles. Tree removal may affect suitable habitat and individuals, but the effects would not contribute to a trend towards federal listing or cause a loss of viability to the population or the species; therefore, the Proposed Action would have low impacts to red tree vole.

3.6.3 Environmental Consequences—No Action Alternative

Under the No Action Alternative, there would be no impacts to wildlife associated with construction or access road work at this time. The ongoing maintenance activities and repair of the existing structures would still occur, potentially on a more frequent and sometimes emergency basis due to the deteriorating condition of the existing transmission line. Emergency repairs could occur during critical breeding seasons, or in sensitive areas. Tree removal would occur during routine maintenance and as needed for emergency repairs. The potential for bird collisions with the conductor over the 19 identified waterways that could be bird flyways would continue, as bird diverters likely would not be installed. Overall, potential impacts to wildlife could be low.

3.7 Cultural Resources

3.7.1 Affected Environment

Cultural resources include things and places that demonstrate evidence of human occupation or activity related to history, architecture, anthropology, archaeology, engineering, and culture. A cultural resource may be a tangible entity or a cultural practice. Tangible cultural resources are categorized as districts, sites, buildings, structures, and as archeological resources, cultural

landscapes, structures, museum objects, and ethnographic resources (National Park Service 1998). Historic properties are a type of cultural resources, and include any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP) maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe and that meet the NRHP criteria.

Under Section 106 of the National Historic Preservation Act of 1966 (NHPA), federal agencies must take into account the effects their projects may have on cultural resources that are listed on or are eligible for listing in the NRHP. Cultural resources are evaluated for eligibility for listing in the NRHP using four criteria commonly known as Criterion A, B, C, and D as identified in 36 CFR 60.4 (a–d). These criteria include an examination of the cultural resource's significance in American culture, association with a significant person, possession of great artistic value, or properties that may yield important information about the past, as well as consideration of the its age, and integrity (of location, design, setting, materials, workmanship, feeling and association). A cultural resource must meet at least one criterion to be eligible for listing. The cultural resource inventory for this undertaking was conducted in accordance with the NHPA, as well as the applicable ARPA permit where the inventory extended onto Forest Service and Corps land. Consistent with the Willamette National Forest standards and guidelines (FW-267), cultural resources found during the investigation that potentially could not be avoided for this project were evaluated for eligibility on the NRHP.

Background

The earliest radiocarbon ages indicate that Native Americans were living in the Willamette Valley by 9,800 before present (O'Neill et al. 2004). During the early portion of this period, the people of the region lived in small groups that were very mobile. Most of their habitation sites were likely situated near stable and predictable food resources. Artifacts that represent this early period consist primarily of stone tools, associated debris from the manufacture of those tools, and diffuse midden materials (i.e., plant remains and organic remains such as shell and bone). By 5,000 before present, the number and variety of site settings indicate an increasing population and regular use of a wide range of resources (Toepel 1985). Ground stone tools are more common and reflect the increased importance of plant resources to the regional diet. Hundreds of camas roasting ovens dating to this period have been documented in the southern and central valley (Connolly et al. 1998; O'Neill et al. 2004). By 2,000 before present, settlement and subsistence practices were similar to those recorded at European contact. A broad range of plant resources, dominated by camas, was exploited, with hunting as an important extra food source. Clusters of camas processing and occupation sites suggest long-term cyclical use of specific locations, possibly by family-based groups (Bowden 1997). Shell ornaments and other artifacts, found at sites such as the Fuller and Fanning mounds on the South Yamhill River, denote increasing trade and exchange with the Oregon coast and Columbia River regions.

The area near the transmission line was historically inhabited by the Kalapuya and Molala Indians. The Kalapuya occupied basins of Willamette River tributaries, with each basin offering a range of riverine, valley, and foothill habitats and resources (Toepel and Beckham 1981). The Middle Fork

Willamette River is within the territory of the Winnefelly band who lived in the southern valley east of the Coast Fork Willamette River. Their territory extended east from the Coast Fork Willamette into the foothills of the Western Cascades, encompassing the drainages of the Coast Fork, Middle Fork, and perhaps the McKenzie rivers (Zenk 1990; Minor et al. 1980b). The Kalapuya took advantage of a diverse resource base and required a scheduled pattern of movement to take advantage of particular seasonal resources as they became available in different areas. Camas was a primary dietary staple, with contributions from other vegetal resources such as hazelnuts, tarweed, lupine, cattail, and various berries. Wapato was an important crop in the northern valley, but was less common in the southern valley. Most Kalapuya groups pursued some fishing and hunted a variety of birds and mammals.

Kalapuya groups were part of the regional trade networks, exchanging a variety of goods and foodstuffs with other Kalapuya bands, as well as Chinookans, Molala, Klamath, and some coastal groups. Bands in the southern Willamette Valley were occasionally victimized by slave raids from some of these same groups. Intermarriage among the Kalapuya bands, and with their trading partners, occurred with some frequency.

The Molala Indians inhabited the uplands of the Western Cascade Mountains when European and American trappers and explorers first entered western Oregon. To the west of the Molala, the Kalapuya lived in the Willamette Valley and used the Western Cascades foothills. The Kalapuya probably made more use of the western end of the BPA Hills Creek-Lookout Point Project area of potential effect (defined in 36 CFR 800.16(d)), while the Oakridge area was usually used by the Molala.

The Molala followed an annual cycle of hunting and gathering similar to that of the Kalapuya and other nearby groups. Extended families generally wintered together, breaking into smaller family units in the summer to travel to varying resource areas. They focused their economic efforts on procuring resources available in the mountains, such as hunting game animals and harvesting berries, roots, and nuts such as huckleberries, serviceberries, camas, acorns, and hazelnuts. Hunting was a mainstay of the economy and probably included a variety of animals, although deer and elk were the most important species. Roots and berries, however, were important seasonal crops and may have brought larger groups together in favored harvesting areas. Molala families probably ascended and descended in elevation in the uplands as the seasons changed and different resources became available at differing elevations.

Direct contact between Oregon Native Americans and Euro-Americans began in 1792, when American Robert Gray located the mouth of the Columbia River. The Lewis and Clark expedition descended the Columbia River to the Pacific Ocean in 1805. Trapping expeditions soon entered the Willamette Valley. Trading posts were first established in 1812 and 1813. Successive waves of introduced epidemic diseases devastated Native Americans living in western Oregon. A Willamette Valley epidemic in the early 1830s, thought to be malaria, resulted in mortality rates as high as 90 percent (Boyd 1990). In 1855, the Kalapuya and Molalla bands signed the Dayton Treaty. They ceded their lands to the United States for specified annuities and were removed to the Grand Ronde Reservation in the foothills west of the Willamette Valley.

Transportation has been a key theme in the Middle Fork Willamette watershed, since the river and its tributaries provide access to usable passes across the Cascades. In the 1860s, the Middle Fork was selected for the route of the Oregon Central Military Wagon Road, to provide better access to eastern Oregon (Beckham 1981b). Built between 1865 and 1867, this wagon road became a significant emigration route as well as a transport route for livestock and goods both east and west. The importance of this route continues to the present, as Highway 58 is one of the principal vehicular routes across the Cascades.

The Middle Fork route across the Cascades continued to attract the interest of railroads. Finally, in 1909, Southern Pacific Railroad began constructing a line up the canyon. By 1912, the line had reached Hazeldell, which was renamed Oakridge at the suggestion of a railroad agent (McArthur 1974). Suspended for several years, the trans-Cascade route was completed in 1926 and remains the primary rail connection to California.

The Corps built the Dexter, Lookout Point, and Hills Creek dams on the Middle Fork Willamette River to control seasonal flooding of the river and provide other services such as irrigation, power generation, and recreation opportunities. Lookout Point and Dexter dams and lakes were completed in the early 1950s and Hills Creek was completed in 1961. Roads and farms in the Middle Fork Valley, as well as the railroad and portions of the city of Lowell had to be relocated to the sides of the valley to avoid inundation by Dexter and Lookout Point lakes. BPA constructed the Hills Creek-Lookout Point 115-kV transmission line, the focus of the current project, in the 1950s to serve the Lookout Point and Hills Creek generation facilities.

Archaeological Resources

A review of Oregon SHPO and Forest Service files revealed that 125 archaeological studies have been conducted within 1 mile of the transmission line right-of-way and access road areas. Of the 125 previous studies, 25 are next to or overlap with the transmission line right-of-way and access road areas.

A total of 68 archaeological sites have been previously recorded within 1 mile of the transmission line right-of-way and access road areas. Of those, four are within the transmission line right-of-way and access road areas. Two additional archaeological sites (35LA1607, 35LA1608) were identified in the right-of-way during project cultural resource surveys. The six sites, comprised of four prehistoric properties and two historic properties, located within the transmission line right-of-way and access road areas are listed in Table 3-10.

In addition, 62 previously recorded archaeological isolates (nine artifacts or less discovered in a location that appears to reflect a single event, loci, or activity) were identified within 1 mile of the transmission line right-of-way and access road areas. Of these, 39 are prehistoric, 17 are historical, and 6 are noted only as isolates.

Table 3-10. Archaeological Resources (Prehistoric and Historic) Within the Transmission Line and Access Roads Rights-of-Way

Site ID	Description	NRHP Status
35LA560	This site is a prehistoric ***lithic scatter*** (a projectile point, several other flaked tools, and a cobble tool); the site has been revisited and updated since the initial recording (Winkler and Exton 1982b, Hamilton et al. 2012a).	Not evaluated
35LA965	This site is a prehistoric lithic scatter; this site was found in shovel probe testing (Winkler and Sinclaire 1990).	Recommended not eligible
35LA1232	This site is a prehistoric lithic scatter (flaked tools, a wooden pointed tool tip, and shell fragment) (McKeehan and Calicher 1998; Davy et al. 2002).	Recommended eligible
35LA1575	This site is the Oregon Central Military Wagon Road. The general route in the Middle Fork canyon is based primarily on historical maps and other information (Beckham 1981b; U.S. Forest Service 2014a).	Eligible
35LA1607	This site is a prehistoric lithic scatter; the site was found in shovel probe testing (Oetting et al. in prep.).	Recommended eligible
35LA1608	This site is a historical mine (Oetting et al. in prep.).	Recommended not eligible

Historical Resources (Structures)

Potentially significant historical structures were identified within the transmission line right-of-way and access road areas by a review of the Oregon SHPO built resources database, review of historical quadrangle maps, and field survey. Four historical built resources were identified during cultural resource surveys within the transmission line right-of-way and access road areas (Table 3-11), including the Hills Creek-Lookout Point transmission line, Hills Creek Substation, Oakridge Substation, and Lookout Point Substation (all integral components of the BPA transmission system and considered eligible for listing in the NRHP). These resources of historic age are considered eligible or recommended eligible for listing in the NRHP.

Table 3-11. Historic Resources (Structures) Within the Transmission Line and Access Roads Rights-of-Way

Year of Construction	Description	NRHP Status
1946	Hills Creek-Lookout Point Transmission Line	Recommended eligible
1961	Hills Creek Substation	
1953	Oakridge Substation	
1954	Lookout Point Substation	

3.7.2 Environmental Consequences—Proposed Action

Archaeological Resources

As previously stated a cultural resources inventory was conducted within the transmission line right-of-way and access road areas in an effort to avoid and minimize effects to archaeological resources. Adverse effects to archaeological resources resulting from material and equipment staging,

replacement of structures, construction of new access roads, access road improvements and reconstruction, and vehicle and heavy equipment access to and from work areas would be avoided at all six sites listed in Table 3-10. Specifically, BPA has designed new access trails routes and eliminated trail proposed trail and road improvements to avoid impacting archaeological resources. Where improvements to existing roads are needed, BPA proposes to protect the archaeological resources by placing geotextile fabric over the ground surface before applying crushed road to the road surface.

Construction activities would not result in ground disturbance at any of the six sites listed in Table 3-10. However, based on the proximity of previous finds, undiscovered artifacts could still be in the ground in these areas and could be moved or physically damaged by construction vehicles and access road work. Installation of new structures generally would not have an impact since they would be placed in the hole from which the existing structures would be removed, to the extent possible, and only a small amount of auguring would be required.

BPA would coordinate with the SHPO, land management agencies (e.g., Forest Service, Corps) and tribes if any previously undiscovered cultural resources are discovered during construction. In addition, given the potential extent of Sites 35LA965, 35LA1232 and 35LA1607, ground disturbance at these locations would be avoided until the boundaries of these sites have been confirmed through archaeological test excavations, and consultation with SHPO is complete. BPA would work with SHPO to determine the appropriate mitigation and avoidance measures needed. Adverse impacts to known resources would be minimized with the mitigation measures, resulting in low impacts, depending on the level and amount of disturbance.

No-to-low impact on cultural resources due to tree removal would be expected because there would be few trees removed in areas of known sites and only surface disturbance would occur.

Historical Resources (Structures)

The Proposed Action would not alter the essential function of the Hills Creek-Lookout Point transmission line but the change from wood to steel monopole structures and lattice-steel towers in specific areas would change the original character of the line. These changes would constitute an adverse effect to the transmission line as a historic resource under the National Historic Preservation Act. However, through consultation with the State historic Preservation Office this effect would be mitigated by documentation of the original line construction.

Of the three remaining historical resources that were determined to be potentially eligible for listing in the NRHP, none would be directly altered in any way—no changes would occur to the aspects of integrity that would qualify the resource for eligibility (i.e., materials, design, workmanship, feeling, association, setting, or location). Therefore, the Proposed Action would have no impact on these historic structures.

3.7.3 Environmental Consequences—No Action Alternative

Under the No Action Alternative, no construction impacts would occur to cultural resources. Impacts to cultural resources from ongoing operation and maintenance and emergency repairs could potentially include alterations to the existing transmission line as a historic resource and ground

disturbance of archaeological sites, which could result in low impacts to cultural resources in the nearby vicinity.

3.8 Visual Quality

3.8.1 Affected Environment

The transmission line is located in the southern portion of the Willamette Valley, which is between Oregon's Coast and Cascade Mountain Ranges. The transmission line is situated in two general visual environments: forested areas and urban areas.

The vast majority of the transmission line is located in the forested visual environment, with the exception of segments that cross through the Cities of Oakridge and Westfir (structures 5/1 through 6/3, 8/3, and 8/4). In the forested visual environment, the topography is rugged and the vegetation primarily consists of dense stands of mature evergreen trees. The transmission line primarily consists of wood-pole structures in a 100-foot wide right-of-way through this visual environment. There is minimal light and glare associated with the existing transmission line. Figure 3-5 shows photographs of some of the representative viewpoints in the forested visual environment.

The forested visual environment is very sparsely populated, as the first 19 miles of the transmission line right-of-way and access road areas are located within the boundaries of the Willamette National Forest. A combination of paved and unpaved roads provides access to portions of the transmission line right-of-way. In addition, the rugged topography and the dense stands of evergreen trees obscure the transmission line right-of-way in most of the forested visual environment. Because of this, the transmission line is rarely visible within the ***foreground*** (within 0.5 mile), ***middle ground*** (0.5 miles to 5 miles), or ***background*** (more than 5 miles) of a ***view*** (scene observed from a given vantage point). Portions of the transmission line would cross through areas identified for retention, partial retention, and maximum modification visual quality objectives by the Willamette National Forest standards and guidelines.

The transmission line runs parallel to the north side of Lookout Point Lake, but is not visible from most viewpoints along Highway 58 on the south side of the lake; one example of where it is visible across the lake is shown in Figure 3-5, View 1. For the short sections where the transmission line and structures are visible, it is visually prominent because the right-of-way is cleared of vegetation, which creates a contrast with the forested landscape. Access roads in this visual environment wind through forested areas adjacent to or within the transmission line right-of-way. Existing access roads are shown in Figure 3-5, Views 3 and 4.

View 1: View from Highway 58, looking north toward structures 18/1 through 18/4.

View 2: View from Buckhead Nature Trail looking northeast toward structure 10/3.

View 3: View from North Shore Road, looking north toward structure 12/9.

View 4: View from West Boundary Road, looking southeast toward structures 20/5 through 20/7.

Figure 3-5. Representative Viewpoints of the Transmission Line in Forested Areas

The urban visual environment of Oakridge and Westfir is characterized by grid-street systems, sidewalks, concentrations of commercial and residential buildings and associated landscaping, individual or small clusters of trees or bushes, parks, vehicles, aboveground utilities, and signs. The portion of Oakridge located between the Middle Fork Willamette River and Highway 58 (structures 5/1 through 5/8) is fairly flat; however, there is a substantial change in topography with a significant hill located immediately north of Highway 58 (structures 5/9 through 6/1). Figure 3-6 shows viewpoints in urban areas along the transmission line corridor. The hill obscures views of the transmission line from the south side of Highway 58 looking north and west. Westfir is located on a flat terrain adjacent to the North Fork Middle Fork of the Willamette River with a substantial hill located immediately north of this small city. Within these urban areas, light and glare typically occur from headlights, taillights, traffic signals, illuminated signs, and building lighting.

View 5: View from Fairy Glen Drive, looking north toward structure 5/2.

View 6: View from Rainbow Road, looking north toward structures 5/3 through 5/8.

View 7: View from Rainbow Road, looking southeast toward structure 5/1 (two-pole wood structure) before the transmission line spans the Middle Fork Willamette River.

View 8: View of Diamond Park, looking northwest toward structures 5/14 through 5/16 and the Oakridge Substation (BPA's structures are shown on the right side of the roadway in the photo below).

Figure 3-6. Representative Viewpoints of the Transmission Line in Urban Areas

The transmission line is visible from residences, businesses, parks, and schools as it extends along streets, crosses over Highway 58 in the center of Oakridge, runs through the north side of Diamond Park, and crosses through a residential area of Westfir. There are other structures and transmission lines that run parallel to the Hills Creek-Lookout Point transmission line through Diamond Park to the Oakridge Substation as shown in Figure 3-6, View 8. Existing structures in urban areas are usually one- and two-pole wooden structures that are generally located close to residences and are not screened by trees, making them more evident within urban views than within the forested views. The linear structures and conductor are visible in the foreground of views from city streets, residences, and businesses; however, because there are so many other structures and visual distractions in the urban environment, the structures and corridor are less noticeable in the middle ground and background of views because they blend in with the other urban development.

Viewers and Visually Sensitive Locations

Viewers along the transmission line include residents, workers, recreational visitors, motorists, bicyclists, and pedestrians. A viewer's activity typically influences sensitivity to the visual environment and visual change. For example, residential viewers and visitors to parks typically have stationary, longer duration views, and viewing nearby scenery is often an important activity to these viewers. Motorists are typically moving adjacent to the transmission line at relatively high speeds and have shorter duration views. Drivers are likely focused on driving, while passengers may be viewing scenery. Alternatively, bicyclists and pedestrians are moving at low-to-moderate speeds and have medium-duration views so part of their activity likely involves viewing scenery.

There are a greater number of residents and workers (sensitive viewers) and residences (***visually sensitive locations***) in the urban visual environment than the forested visual environment. There are numerous parks and trails (sensitive locations) adjacent to the transmission line right-of-way in the forested visual environment where the transmission line is visible, as described earlier in Table 3-3. Buckhead Nature Trail and Meridian Park have developed park facilities with amenities including restrooms, picnic tables, trails, and a boat launch (Meridian Park only). Because of the developed park facilities, recreational visitors (sensitive viewers) would be likely to spend extended periods of time in these locations. In the urban visual environment, Diamond Park also offers a number of amenities, including basketball hoops, picnic tables, and parking that would encourage visitors to spend extended periods of time.

Recreational users of trail facilities without amenities, including Alpine Trail, City of Oakridge In-Town Pathways, Eugene to Crest Trail, Greenwaters Trail, and Larison Rock Trail would be passing under the transmission line for a short period of time where these trails cross the transmission line right-of-way and access road areas.

3.8.2 Environmental Consequences—Proposed Action

During construction, there would be temporary, short-term impacts to visual quality in the both forested and urban visual environments. Overall, these impacts would be low because the change in views would be of short duration (on average less than 2 days total per structure) and relatively un-intrusive for residents and workers (sensitive viewers), who are primarily concentrated in urban areas. The majority of the poles that would be replaced are located outside of urban areas and would be replaced in roughly the same location as existing poles, so impacts would be localized at the structures. Similarly, most of the access road work would take place away from concentrations of sensitive viewers and would be improving or reconstructing roads that already exist, so the overall visual impact resulting from road work would be minimal except where short segments of new roads are built in forested areas. Access road work would also be short in duration (up to 3 days per mile of access road work).

Impacts to visual quality during construction would be associated with the presence of workers and equipment (e.g., boom cranes, helicopters, backhoes, augers, and bucket trucks), material stockpiles, debris, signage, staging areas, access road work, and the removal and insertion of poles. These construction activities, and the associated equipment and stockpiles, would be a temporary change

from the existing visual environment. Dust generated during construction could encroach upon views. Light and glare emanating from security lighting in construction staging areas and the material storage yard also could encroach upon adjacent areas; however, no nighttime work requiring illumination is anticipated. The movement of large construction vehicles could add visually distracting elements to views within both the forested and urban visual environments. Potential traffic congestion associated with work areas would also intermittently intrude upon views for short periods. Construction staging areas and equipment and material stockpiles would be removed after construction. Most of the access road corridors already exist, and access roads would be gated, so most viewers would not see the construction activity associated with the access road system.

In some locations along the transmission line within the forested visual environment, the proposed wood-pole structure heights would be increased by about 5 feet to 35 feet to provide increased distance between the conductor and the ground. This change in height would not be expected to be noticeable in the foreground of a view, and would be barely perceptible within the middle and background of a view because many of the structures in the forested environment are obscured by large stands of dense trees.

The realignment of the transmission line in line mile two would be within the forested visual environment. Both the relocated structure (2/7) and the new structure that would be added between 2/6 and 2/7 would be wood-pole structures like the existing structures in this segment of the transmission line and would be located within the already cleared right-of-way, so they would not result in a substantial visual change to this area. The acquisition and clearing of additional right-of-way would result in a wider cleared area along the transmission line corridor that would be visible to motorists on LaDuke Road when they cross under the transmission line. It would look similar to existing conditions in terms of vegetation removal, but the cleared area would be wider. LaDuke Road is a gravel road without a lot of traffic, however, so the number of sensitive viewers observing permanent changes would be minimal and would represent a low visual impact.

Where the transmission line would be realigned in line mile three within the forested visual environment, three existing wood-pole structures would be replaced with one new steel monopole structure and one new steel-lattice tower resulting in an increase in structure heights of about 101 feet to 113 feet, as described earlier in Section 2.2.3. In addition, new right-of-way for the transmission line would be acquired and cleared of vegetation, and new short access roads would be constructed to access the new structures. The realignment of line mile three would result in a low visual impact for this half-mile segment of the transmission line because there is already an existing transmission line corridor in this area. The view would look similar in terms of vegetation removal under the realignment, but the cleared area along the transmission line would be visibly wider. Similar to the realignment of line mile two, the realignment of line mile three would be visible to motorists where the realigned portion of the transmission line crosses LaDuke Road, but there are relatively few sensitive viewers that would be observing the permanent visual changes. The photo simulations presented in Figure 3-7 show the anticipated resulting change in the visual environment.

Existing Transmission Line looking northwest

Photo Simulation looking northwest

Existing Transmission Line looking southeast

Photo Simulation looking southeast

Figure 3-7. Simulations of Line Mile Three Realignment and Structure Replacement

The realignment areas would fall within areas identified with a visual quality objective of retention under the Forest Plan; changes resulting from the realignments would not be evident from key viewing areas, namely Oakridge and Highway 58, and thus would be consistent with the Willamette National Forests standards and guidelines (e.g. FW-063). Within the areas designated with a visual quality objective of partial retention, the Proposed Action would install/replace gates and road approaches, consistent with FW-065. Under the Proposed Action, road improvements, gates, and fences would be constructed in areas with a visual quality objective of maximum modification, consistent with FW-069.

In line mile five the replacement of 15 existing wood-pole structures with steel monopole structures would occur in the urban environment. The structures would increase in height by up to 31 feet over the existing structure heights, as described in Section 2.2.4. Photo simulations of this change are shown in Figure 3-8. The color of the new steel monopoles would be lighter than the existing wood-pole structures, which could be more visually prevalent particularly when juxtaposed against the forested landscape. The changes to line mile five would result in a low visual impact along this one-mile segment of the transmission line through Oakridge because residents and employees in this

area are already accustomed to the existing above ground transmission line and because there are so many other structures and visual distractions in the urban environment.

Existing Transmission Line *Photo Simulation*

Figure 3-8. Photo Simulation of Line Mile Five Structure Replacement

The Proposed Action would replace existing structures with the same number of structures, and would not add above ground utilities, so the only visual change would be the height and type of the structures. There would be few additional people that would see the line as a result of the Proposed Action.

The removal of trees under the Proposed Action would not create a noticeable visual change. Trees that would be removed from within the transmission line right-of-way would be relatively small and trees that would be removed along the edges of the right-of-way would create an incremental increase in the cleared right-of-way edge and would likely not be discernable. Furthermore, the trees identified for removal are dispersed along the 26-mile long line and their removal would not be concentrated in any one viewshed. Therefore, no single area would be subject to dramatic or long-term noticeable visual change as a result of tree removal.

Upon completion of the project, the overall permanent construction impacts on the visual quality of both the forested and urban visual environments would be low. In both environments, the transmission line would be visually similar to the character and dominance of the existing transmission line as a linear visual element through the landscape. Also, in both the forested and urban visual environments, the transmission line right-of-way would continue to be visible in the foreground or middle ground of the view for a small number of sensitive viewers (residents or park visitors). In the forested visual environment, because of the limited accessibility of the transmission

line right-of-way, the topography, and the dense stands of evergreen trees in this area, visibility of the transmission line would remain minimal.

3.8.3 Environmental Consequences—No Action Alternative

Under the No Action Alternative, there would be no change in the visual impacts of the transmission line at this time. Emergency repairs could potentially have similar construction impacts as those described above in Section 3.8.2, including vegetation clearing in the forested visual environment and the temporary presence of workers, equipment, vehicles, and traffic congestion, potentially resulting in low impacts to visual quality.

3.9 Socioeconomics and Public Services

3.9.1 Affected Environment

Population and Community Character

The transmission line runs through both incorporated and unincorporated portions of Lane County on a mix of public and private land. Segments of the transmission line pass by concentrations of residences and businesses in Oakridge (structures 5/1 through 6/3) and Westfir (structures 8/3 and 8/4). The city of Lowell is located about 1 mile north of the Lookout Point Substation. As shown in Table 3-12, the population of Oakridge and Lane County have grown tremendously since the 1950s when the transmission line was constructed, and have continued to grow in the last 15 years, although Oakridge has grown more slowly than the county and state. Westfir was not incorporated until 1979 when it had a population of approximately 307 (City of Westfir 1980) and has seen a declining population since then.

Informal gathering places near the transmission line include the Mazatlan Mexican (near structure 5/7) and Dairy Queen (near structure 5/8) restaurants, and park and recreation facilities with picnic areas such as Buckhead Nature Trail, Diamond Park, and Meridian Park. The Oakridge-Westfir area is rich in natural amenities with access to over 500 miles of hiking and biking trails, driving and motorcycle routes, birding and wildlife viewing opportunities, fishing, camping, skiing and snowboarding, and more (City of Oakridge 2015a). Lane County stretches from the Oregon Coast to the Cascade Mountains, over 90 percent of which is forested, offering a variety of recreational opportunities (Lane County 2015).

Table 3-12. Population in Oakridge, Westfir, Lane County, and Oregon

Geographic Area	Population 1950	Population 2000	Population 2010	Population Growth 1950-2010	Population Growth 2000–2010
City of Oakridge	1,562	3,148	3,205	105.2%	1.8%
City of Westfir	Not Incorporated	276	253	Not applicable	-14.9%
Lane County	125,776	322,959	351,715	179.6%	8.9%
Oregon	1,524,341	3,421,399	3,831,074	151.3%	12.0%

Source: U.S. Census Bureau 2000; U.S. Census Bureau 2010.

Economy, Employment, and Income

The Oakridge-Westfir area is currently a Rural Oregon Enterprise Zone (2019 termination year), which offers businesses income tax and property tax incentives for growing or relocating in the zoned area. The enterprise zone serves as a focal point for local development efforts in addition to other business revitalization efforts in the area (Business Oregon 2015; Oakridge-Westfir Chamber of Commerce 2015).

The median household income, per capita income, and percent of families and individuals living in poverty in Oakridge, Westfir, Lane County, and Oregon are shown in Table 3-13. The largest employment sectors in Lane County are trade, transportation and utilities, local government, and educational and health services. As shown in Table 3-14, the county has seen a small increase in non-farm employment from 2013 to 2014. Lane County has regained nearly half the jobs it lost to the recession of 2008 through 2010. The county's unemployment rate was the same as Oregon's in December 2014 at 6.7 percent (Oregon Employment Department 2015).

Table 3-13. Income and Poverty Levels in Oakridge, Westfir, Lane County, and Oregon

Geographic Area	Median Household Income (MOE)	Per Capita Income (MOE)	Families Below Poverty Level (MOE)	Individuals Below Poverty Level (MOE)
City of Oakridge	$42,839* (±$17,971)	$21,075 (±$3,790)	19.9%* (±9.1%)	25.9%* (±8.9%)
City of Westfir	$40,357* (±$12,734)	$20,590* (±$5,591)	Not statistically reliable	Not statistically reliable
Lane County	$42,931 (±$803)	$24,224 (±$409)	10.8% (±0.7%)	20.0% (±0.8%)
Oregon	$50,229 (±$278)	$26,809 (±$129)	10.9% (±0.2%)	16.2% (±0.3%)

Source: U.S. Census Bureau 2014, 2009-2013 American Community Survey 5-year summary, Table B17021 Poverty Status of Individuals in the Past 12 Months by Living Arrangement, Table S1901 Income in the Past 12 Months, and Table B19301 Per Capita Income in the Past 12 Months.

Notes:

1. American Community Survey data are based on a sample of the total population, so there is a range of uncertainty in the data. There are substantial margins of error (MOE) for smaller geographies. All published American Community Survey MOEs are based on a 90 percent confidence level. The MOE can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the MOE and the estimate plus the MOE (the lower and upper confidence bounds) contains the true value. There is no MOE for decennial census data since it is based on a 100 percent count rather than a sample.
2. The MOE provided by the U.S. Census Bureau can be used to calculate coefficients of variation, which provides an indication of the reliability of American Community Survey data. Coefficients of variation less than 15 percent are considered generally statistically reliable. Estimates that have a coefficient of variation between 15 percent and 30 percent are somewhat less reliable and are noted with an asterisk (*). Coefficients of variation above 30 percent are considered not statistically reliable.
3. The poverty level threshold varies by household size and the age of household members. In 2013, the poverty level for a single individual under 65 years of age was $12,119; for a household of four (two adults and two children), the poverty level was $23,624 (U.S. Census Bureau 2015).
4. Median household income is household income that is in the middle of the range of total household incomes; it is not the average household income. Per capita income is the average income per person.

Table 3-14. Non-farm Employment and Unemployment Rates in Lane County and Oregon

Geographic Area	Number of Jobs		Change 2013 to 2014		Unemployment
	December 2013	December 2014	Number of Jobs	Percent	December 2014
Lane County	161,216	164,686	3,470	2.2%	6.7%
Oregon	1,784,442	1,829,501	45,059	2.5%	6.7%

Source: Oregon Employment Department 2015.

Public Services, Facilities, and Lodging

The City of Oakridge is the primary provider of public facilities and services near the transmission line, managing the operation and maintenance of potable water, wastewater, roadways, public buildings, parks, levees, and an emergency fire system (City of Oakridge 2015b). The City of Westfir operates and maintains its own public water supply and sewer collection systems (City of Westfir 2015). Oakridge Emergency Services and Police Departments, Westfir Fire Department, Hazeldell Rural Fire District, Lane County Sheriff's Department, Oregon State Police, and Forest Service provide emergency services (City of Oakridge 2015b). The Oakridge School District provides public school services for the Oakridge-Westfir area (Oregon Department of Education 2015). Electricity is provided by Lane Electric Co-op and AmeriGas offers propane (AmeriGas 2015). Cellular phone service in the Oakridge-Westfir area is only available through Verizon and AT&T wireless providers (City of Oakridge 2015b). There is not currently a fiber optic cable attached to the existing transmission line, but the proposed design of the rebuilt line would support fiber optic cable in the future.

The Oakridge-Westfir area has a few social service providers. St. Vincent de Paul Society, a social service provider in Lane County, operates a second-hand store and laundromat near structures 5/9 through 5/12. Health care facilities in the Oakridge-Westfir area include Orchid Health near structures 5/8 and 5/9 and Oakridge Eye Clinic (not adjacent to the transmission line). About 89 percent of housing units in the Oakridge-Westfir area are occupied, two-thirds of which (67 percent) are owner-occupied. Of the vacant 11 percent of housing units in the Westfir-Oakridge area, about one-quarter of these units (23 percent) are used for seasonal, recreational, and occasional use (U.S. Census Bureau, 2010). Thirty-three hotels in Lane County provide accommodations, including three in the Oakridge-Westfir area (City of Oakridge 2015b; ePodunk 2015). In addition, there are about 20 recreational vehicle (RV) parks/campgrounds in Lane County, including three in the near the transmission line (RV Clubs U.S. 2015; RV Park Hunter 2014).

Property Taxes and Value

All federal, state, and local government real property is exempt from paying state and local property taxes. When BPA acquires an easement across private property, the landowner continues to pay property taxes but often at a lesser value based on any limitation of use created by the encumbrance.

If BPA acquires new easements on private land, landowners are offered fair market value for the land as established through the appraisal process. The appraisal for each property accounts for all factors

affecting property value, including the impact the transmission line easement or access road would have on the remaining portion of the property. Where existing easements accommodate new structure locations or access roads, no additional compensation is paid.

Environmental Justice

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

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

The U.S. Department of Energy (DOE) issued an updated Environmental Justice Strategy in May 2008 (DOE 2008). The strategy integrates the requirements of Executive Order 12898 into the DOE's operations. The 2010 U.S. Census shows that the Oakridge, Westfir, and Lane County have a higher percentage of Caucasians than Oregon as a whole and a lower percentage of people that report being of Hispanic ethnicity (regardless of race) than the statewide averages, as shown in Table 3-15 (U.S. Census Bureau 2010). There are a higher proportion of families and individuals living in poverty in Oakridge and Lane County than in Westfir and Oregon, as shown earlier in Table 3-13.

There are two mobile home parks near the transmission line in Oakridge: Oakridge Mobile Home Park (adjacent to structures 5/1 and 5/2) and Monte Vista Mobile Home Park (near structures 5/3 and 5/4) (Google Maps 2015).

Table 3-15. Race and Ethnicity in Oakridge, Westfir, Lane County, and Oregon

Geographic Area	Race							Ethnicity
	Caucasian (White)	Black or African-American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Other race	Two or more races	Hispanic/Latino (of any race[1])
City of Oakridge	90.7%	1.0%	1.8%	0.6%	0.0%	1.5%	4.5%	5.4%
City of Westfir	92.1%	0.4%	1.6%	0.4%	0.0%	0.8%	4.7%	2.0%
Lane County	88.3%	1.0%	1.2%	2.4%	0.2%	2.8%	4.2%	7.4%
Oregon	83.6%	1.8%	1.4%	3.7%	0.3%	5.3%	3.8%	11.7%

Source: U.S. Census Bureau, 2010, Table P5 Hispanic or Latino Origin by Race
Note: Individuals who identify themselves as Hispanic or Latino may be of any race, including White.

3.9.2 Environmental Consequences—Proposed Action

Population and Community Character

While the work force required for construction would vary over the construction period (about 50 to 80 construction workers maximum at a given time), the population in the communities near the transmission line would be expected to return to pre-construction levels upon completion of the project. No changes to community gathering locations are anticipated during construction, other than the temporary closure of one of the Dairy Queen driveways during structure replacement.

Economy, Employment, and Income

Income earned by construction workers would not be expected to increase the annual per capita or median household income levels in Lane County. Construction of the Proposed Action would, however, create a short-term positive impact to the economic vitality of the communities near the transmission line, Oakridge, Westfir, and Lowell, by temporarily stimulating their economy over the short-term through the purchase of local supplies, materials, food, hotel or campground stays, and other direct or indirect spending by construction workers. Both material purchases and construction workers' salaries would add short-term income.

Public Services, Facilities, and Lodging

Access to all properties would be maintained during construction, and local agencies, residences, and businesses near the transmission line would be notified of upcoming construction activities and potential disruptions associated with the Proposed Action. The Proposed Action is not expected to affect emergency service providers (e.g., fire and law enforcement) routing or capacity.

Prior to construction, the underground telephone lines and natural gas lines would need to be located, and coordination with utility companies would occur to avoid impacts to these utility lines.

Based on existing housing vacancy rates, as well as the number of hotels and RV parks/campgrounds located throughout Lane County, existing local lodging would be expected to be sufficient to accommodate non-local workers during construction.

Property Taxes and Value

Replacement of structures would not require the acquisition of new easements or land from private property owners. All structures would be replaced within BPA's existing right-of-way except for the realignments in line miles two and three where new access rights would be acquired from the Forest Service (Sections 2.2.2 and 2.2.3).

Private property owners would be offered fair market value for the acquisition of easements needed for access road improvements and reconstruction. Easements typically do not affect property tax values; therefore, there would likely be no changes in property tax revenues resulting from construction of the Proposed Action.

Environmental Justice

All persons, regardless of race or income, would experience the same low impacts associated with construction of the Proposed Action. These impacts would be low because construction would be

short-term with temporary inconveniences to the residences and businesses located adjacent to the transmission line right-of-way. Furthermore, access to the mobile home parks near the transmission line would be maintained during construction. Residents would be notified of upcoming construction activities and potential disruptions associated with the Proposed Action. Therefore, construction of the Proposed Action would not result in long-term disproportionately high and adverse human health or environmental effects on environmental justice populations.

Overall, the proposed action would benefit local communities with improved reliability of the transmission line and short-term stimulation of the local economy, while disturbances (noise, air quality) to residents would be temporary, so there would be a low impact to the socioeconomic and public service resources.

3.9.3 Environmental Consequences—No Action Alternative

Under the No Action Alternative, the employment and income benefits of construction activities would not occur, and there would be no need for temporary housing for construction workers. Residents and businesses along the transmission line right-of-way could potentially experience disruptions from construction activities to repair structures as they deteriorate on a more frequent basis.

The No Action Alternative could also result in other potential socioeconomic impacts. The structures have already exceeded their expected life span, and as they continue to deteriorate, the transmission line's reliability could be reduced. This could potentially lead to negative impacts on the social and economic vitality of communities that rely on power supplied by the transmission line. Adverse impacts to all local residents, public facilities, community services, and businesses could include potential power outages and voltage fluctuations, potentially resulting in a moderate impact.

3.10 Noise, Public Health, and Safety

3.10.1 Affected Environment

Transmission lines provide electricity for heating, lighting, and other services essential for public health and safety. These same facilities can potentially harm humans. Contact with transmission lines or any electrical line can kill or seriously injure people and damage or destroy equipment. This section describes public health and safety concerns such as noise, hazardous materials, and ***electric and magnetic fields (EMF)*** (fields of force caused by voltage and current around electric wires) related to transmission lines or construction activities associated with the Proposed Action.

Noise

The main sources of noise associated with the transmission line include maintenance of the equipment, transmission line ***corona***, and the hum generated by electrical transformers. Transmission line corona, an electrical field around the surface of a conductor, insulator, or hardware caused by ionization of the surrounding air, generally occurs when water causes the partial breakdown of the insulating properties around transmission conductors; corona-generated noise is

normally only audible from transmission lines with voltages of 230-kV or greater. The Hills Creek-Lookout Point transmission line operates at 115-kV.

Existing noise levels in the transmission line right-of-way and access road areas are characteristic of rural lands with limited areas influenced by urban activities, as well as in localized areas where Highway 58 and local roads cross the transmission line. Noise-sensitive land uses located in the vicinity of the transmission line primarily include residences within the cities of Oakridge and Westfir, parks, and trails located in national forest land. The majority of the transmission line right-of-way and access road areas is located in rural and/or undeveloped areas characterized by low noise levels. Aircraft noise from Oakridge State Airport contributes to existing noise levels near Oakridge and Westfir.

Environmental noise is commonly measured in decibels on the A-weighted scale (dBA or ***A-weighted decibels***). The A-weighted scale corresponds to the sound that humans are able to hear. Typical A-weighted sound levels from various sources are presented in Table 3-16. BPA has established a 50 dBA design criterion for corona-generated audible noise at the edge of the transmission line right-of-way.

Table 3-16. Typical Sound Levels

Noise source	Sound level (dBA)
Jet takeoff (at 200 feet)	120
Shout (0.5 feet)	100
Truck (at 50 feet)	80
Gas lawnmower (at 100 feet)	70
Normal conversation (at 10 feet)	60
Traffic (at 50 feet)	50
Library	40
Soft whisper (at 15 feet)	30

Source: EPA 1971; EPA 1974.

Hazardous Materials

Government environmental databases that record the handling, storage, and release of hazardous materials to the environment were reviewed to document existing conditions in the transmission line right-of-way and access road areas. No areas of hazardous material contamination within the transmission line right-of-way and access road areas were identified during the database review. No areas of obvious hazardous material contamination were observed during a site visit (Parsons Brinckerhoff 2014) or reviews of recent, high-resolution aerial photos. Wood poles treated with chemical preservatives (e.g., PCP) are used throughout the transmission line right-of-way.

Electric and Magnetic Fields

Transmission lines, like all electric devices and equipment, produce ***electric and magnetic fields (EMF)***, fields of force caused by electric voltage and current around the electric wire or conductor when an electric transmission line or any electrical wiring is in operation. Voltage, the force that drives the current, is the source of the electric field. Current, the flow of electric charge in a wire,

produces the magnetic field. The strength of EMF depends on the design of the line and the distance from the line; field strength decreases rapidly with distance.

Electric fields are measured in units of volts per meter or thousands of volts per meter (kV/m). Magnetic fields are measured in units of ***gauss*** or milligauss (mG), which are thousandths of a gauss.

There are no national guidelines or standards for electric fields from transmission lines. For siting transmission lines under its jurisdiction, the Oregon Energy Facility Siting Council requires that a proposed transmission line be designed and operated so that its electric fields do not exceed 9 kV/m at roughly 3 feet above ground surface in areas accessible to the public (Oregon Administrative Rule 345-024-0090). BPA designs transmission lines to meet the electric-field guideline of 9 kV/m maximum within the transmission line right-of-way and a 5 kV/m maximum at the edge of the transmission line right-of-way.

Unlike electric fields, magnetic fields from outside power lines are not reduced in strength by trees and building material. Transmission lines and distribution lines (the lines feeding a neighborhood or home) can be a major source of magnetic field exposure throughout a home located close to the line.

There are no national standards for magnetic fields. The State of Oregon does not have a limit for magnetic fields from transmission lines. BPA does not have a guideline for magnetic field exposures. Guidelines created by national and international organizations range from 833 mG to 9,040 mG for public magnetic-field exposure and from 4,200 mG to 27,100 mG for occupational magnetic-field exposure.

Decades of scientific studies are inconclusive as to whether magnetic fields can potentially cause health effects. Scientific studies and reviews of research on the potential health effects of power line EMF have found there is insufficient evidence to conclude exposure to either field leads to long-term health effects, such as adult cancer, neurodegenerative diseases (such as Alzheimer's or Lou Gehrig's disease), or adverse effects on reproduction, pregnancy, or growth and development of an embryo. Uncertainties do remain about possible links between childhood leukemia and childhood magnetic field exposures at levels greater than 3 mG to 4 mG. There are also suggestions that short-term exposures to magnetic fields greater than 16 mG may be related to an increased risk of miscarriage. However, animal and cellular studies provide limited support for a causal relationship between magnetic field exposure and an increased risk of childhood cancer or miscarriage.

3.10.2 Environmental Consequences—Proposed Action

Noise

Construction activities would result in short-term and intermittent higher noise levels as construction progresses. Noise would result from construction equipment, vehicles, and helicopters that would be used for access road work, culvert replacement, vegetation and tree removal, and structure removal and replacement. A helicopter would be used to string a sock line through the structures and to deliver construction equipment and materials to segments of the transmission line inaccessible to construction vehicles. Table 3-17 contains examples of typical construction vehicles

and equipment used for the Proposed Action and the maximum noise levels, in dBA, that they might generate.

Construction noise may be bothersome to those in the immediate vicinity of the Proposed Action. Construction noise levels at 50 feet from a construction site would range from 80 dBA to 92 dBA with higher temporary-intermittent levels during helicopter use. Multiple sound sources can result in higher sound levels, although two sound sources with similar sound levels result in a change in sound levels that is barely perceptible to the human ear. In areas where helicopters are in close proximity to other noisy construction equipment, sound levels could be slightly higher than each individual noise source; however, this increase would likely not be perceptible to the human ear. Noise produced by construction equipment would decrease with distance at a rate of about 6 dBA per doubling of distance from the site. Based on that assumed attenuation rate, noise-sensitive properties within 400 feet of construction sites could be exposed to daytime noise levels of 71 dBA. Noise-sensitive properties within 800 feet of construction sites could be exposed to daytime noise levels of 65 dBA. Noise levels would be further attenuated due to the areas of open space within the transmission line right-of-way and access road areas.

Use of a helicopter would result in noise levels that may exceed 100 dBA for a brief time. Helicopter noise levels are about 106 dBA when operating at 50 feet above ground surface. Noise associated with helicopter use would be temporary and intermittent. It would generally take less than 10 minutes to deliver materials or to string the sock line through each structure and it is estimated that the helicopter would not be in any given line mile for more than 3 hours. Other construction activities at any given location would also be expected to be relatively short in duration (up to 2 days total per structure and 1 to 3 days per mile of access road work). In addition, implementation of the mitigation measures described below, such as having sound-control devices on construction equipment with gasoline or diesel engines and limiting construction noise to daylight hours (7:00 a.m. to 5:00 p.m.) would reduce noise impacts.

Noise from truck traffic and increased worker trips would temporarily contribute to existing traffic noise on local roads and highways, but is not expected to result in a substantial increase in average traffic noise levels, resulting in low impacts.

Table 3-17. Typical Construction Noise Levels

Type of equipment	Maximum noise level (dBA) at 50 feet
Road grader	80 to 92
Bulldozer	80 to 92
Heavy truck	78 to 90
Backhoe	72 to 92
Pneumatic tools	82 to 87
Concrete pump	81 to 83
Crane	85 to 88

Source: EPA 1971.

Noise impacts from construction of the Proposed Action would be low for the forested portions of the transmission line right-of-way and access road areas because these areas are located away from noise-sensitive uses and regularly include machinery noise from forestry practices, so it is unlikely that there would be a perceived change in overall noise levels. No noise impacts are predicted during the use of the temporary load banks outside of the Hill Creek Substation. Operation of the Hills Creek Substation and water flowing in the Middle Fork Willamette River contribute to ambient noise levels at the proposed load bank site, which range from 50 to 55 dBA. The temporary load banks would be located within the property of the existing substation, around 300 to 350 feet from the property line. Noise levels at the property line from the temporary load banks in operation are predicted to be between 50 to 53 dBA, which is within the range of ambient conditions.

The portion of the Proposed Action that would be constructed adjacent to the noise-sensitive land uses (described in Section 3.10.1) would have low to moderate impacts because residents and recreational users are present in these areas and noise levels during construction would range from 80 to 92 dBA, exceeding ambient noise levels, which generally range from 50 to 65 dBA. Construction disturbances near these noise-sensitive land uses, however, would be of short duration (averaging up to 2 days total per structure replacement and 1 to 3 days per mile of access road work).

Table 3-18 provides the calculated corona noise levels for the transmission lines under existing conditions and after implementation of the Proposed Action. Under the Proposed Action, corona noise from the transmission lines would be less than current levels due to the larger conductor, noise that could be generated during maintenance activities would not change, and the transmission line would remain compliant with applicable state noise regulations.

Table 3-18. Transmission Line Right-of-Way Audible Noise (dBA, wet conditions)[1]

	Eastern right-of-way edge[2]	Maximum on right-of-way	Western right-of-way edge
Right-of-Way Section A[3]: 100-foot wide ROW			
Existing Conditions	24.7	27.3	24.7
Proposed Action	17.0	19.6	17.6
Right-of-Way Section B[4]: 50-foot wide ROW			
Existing Conditions	25.2	25.9	24.9
Proposed Action	18.6	19.1	17.9

1. Values developed from BPA modeling programs and are based upon a 50-foot and 100-foot right-of-way with 115-kV line.
2. For Section B, these numbers reflect the side of the ROW with two conductors on one side of the pole.
3. Section A represents the 25-mile section of 100-foot wide right-of-way between line miles one to four and line miles 6 to 26.
4. Section B represents the 1-mile section of 50-foot wide right-of-way in line mile five that passes through Oakridge.

Hazardous Materials

BPA would dispose of treated wood poles in accordance with federal and state laws. Unknown hazardous materials could potentially be disturbed during construction of the Proposed Action, resulting in an unexpected release to the environment and likely a temporary impact to public health and safety of nearby residents. Construction activities associated with the Proposed Action including

construction of access roads could involve the use of small amounts of solvents, pesticides, paint products, motor and lubricating oils, and cleaners, which could be released into the environment. Similarly, it is possible that fuel for construction vehicles or helicopters, could be spilled during refueling. If any of these materials were spilled, BPA would immediately contain and clean up the spill and dispose of all regulated materials in accordance with federal and state laws. Impacts resulting from a hazardous materials release to soil or groundwater during construction would likely be low because of the implementation of mitigation measures discussed below.

Electric and Magnetic Fields

The primary parameters that affect the EMF levels produced by a power line are line voltage, current loading, line configuration, line routing, and structure type. The Proposed Action would not appreciably change any of these parameters, except in line mile five where new steel monopole structures would replace wood-pole structures and the conductor configurations would be altered.

Therefore, no changes to the electric field would occur within or at the edge of the transmission line right-of-way, except in line mile five where there would be a slight increase electric fields within the transmission line right-of-way as a result of the new conductor configuration (see Table 3-19). Despite this increase, the line would be well below the 5 kV/m edge of right-of-way State of Oregon's electric field regulation.

Magnetic fields levels would not change due to the line rebuild, except for in line mile five where the steel monopole structures would be used (see Table 3-20). In this 1-mile stretch, the average and peak magnetic field levels would increase over existing levels. It is important to note that magnetic fields change depending upon the patterns of power demand in the transmission system. The average magnetic field measurements in Table 3-19 represents the best estimate of the magnetic field on any randomly selected day of the year, while the peak measurement is likely to occur only for a few hours or a few days each year (Exponent Engineering and Scientific Consulting Electric 2014). As such, the average magnetic field at 25 feet from the edge of the transmission line right-of-way, which encompasses most residences adjacent to the transmission line in line mile five, would be no stronger than fields typically present in residential buildings in areas away from electrical appliances and home wiring.

Radio and television interference from high voltage power lines can be produced from two general sources: conductor corona activity and ***spark-discharge activity*** (electric sparks between electrical gaps in the metal parts of a transmission line) on connecting hardware. Conductor corona activity is primarily a function of the operating line voltage, while spark-discharge activity on connecting hardware is usually associated with the aging condition of hardware (e.g., over time, hardware connections can become loose and corroded causing small spark-gaps). However, BPA rarely receives public complaints of radio and television interference from BPA transmission lines operating at this voltage anywhere in BPA's service area.

Table 3-19. Transmission Line Right-of-Way Electric Field Values (kV/m)[1]

	Eastern right-of-way edge[2]	Maximum on right-of-way	Western right-of-way edge
Right-of-Way Section A[3]: 100-foot. wide ROW			
Existing Conditions	0.4	1.4	0.4
Proposed Action	0.4	1.5	0.4
Right-of-Way Section B[4]: 50-foot wide ROW			
Existing Conditions	0.6	1.0	0.7
Proposed Action	0.8	1.2	0.9

1. Values developed from BPA modeling programs and are based upon a 50-foot and 100-foot right-of-way with 115-kV line.
2. For Section B, these numbers reflect the side of the ROW with two conductors on one side of the pole.
3. Section A represents the 25-mile section of 100-foot wide right-of-way between line miles one to four and line miles 6 to 26.
4. Section B represents the 1-mile section of 50-foot wide right-of-way in line mile five that passes through Oakridge.

Table 3-20. Transmission Line Right-of-Way Magnetic Field Values[1, 2]

	Eastern right-of-way edge[3]		Maximum on right-of-way		Western right-of-way edge	
	Annual Average (mG)	Annual Peak (mG)	Annual Average (mG)	Annual Peak (mG)	Annual Average (mG)	Annual Peak (mG)
Right-of-Way Section A[4]: 100-foot wide ROW						
Existing Conditions	2.0	6.2	5.1	30.4	2.0	6.2
Proposed Action	2.0	6.2	5.1	30.4	2.0	6.2
Right-of-Way Section B[5]: 50-foot wide ROW						
Existing Conditions	1.9	8.3	2.7	17.0	2.0	8.7
Proposed Action	2.6	11.5	3.6	19.8	2.7	11.4
Right-of-Way Section B: 25 feet beyond ROW[6]						
Existing Conditions	1.1	3.2	2.7	17.0	1.1	3.5
Proposed Action	1.9	6.4	3.6	19.8	1.4	4.2

1. mG based on 2011 to 2012 line load statistics.
2. Values developed from BPA modeling programs. This is based upon a 50-foot and 100-foot right-of-way with 115-kV line.
3. For Section B, these numbers reflect the side of the ROW with two conductors on one side of the pole.
4. Section A represents the 25-mile section of 100-foot wide right-of-way between line miles one to four and line miles 6 to 26.
5. Section B represents the 1-mile section of 50-foot wide right-of-way in line mile five that passes through Oakridge.
6. Values represent changes in average and peak magnetic field 25 feet beyond right-of-way where residences are immediately adjacent to right-of-way.

The operating voltage of the Proposed Action would be the same as the existing operating line voltage. Additionally, the Proposed Action would add new, connecting hardware that would reduce any risk associated with aging hardware spark-discharge activity. Thus, the Proposed Action would not change or could possibly reduce the potential for radio and television interference along the transmission line. Nevertheless, any radio or television interference complaint received by BPA would be investigated. If BPA facilities were determined to be the cause of the interference, BPA would take corrective action to eliminate the interference.

3.10.3 Environmental Consequences—No Action Alternative

Under the No Action Alternative, there would be no construction impacts related to noise, hazardous materials, or EMF. The existing levels of audible noise, electric field, and magnetic fields would continue. If the Proposed Action were not implemented, the existing structures would continue to deteriorate and require repair or replacement as needed. Nearby noise-sensitive land uses would be impacted by increased repair activity, but work in any one location would be temporary and impacts would be low.

The potential impacts to public health and safety, however, could be moderate because the existing line has aging components and deteriorating wood-pole structures, which poses risk of failure of the line and power outages. Local and regional power could potentially put public safety agencies, health providers, and businesses that rely on a steady source of power at risk. Any downed lines resulting from structure failures could have the potential of causing a fire or electrocution as a result of accidental or inadvertent contact with an energized, downed line. Although contingencies are in place to back-up power when failures occur and for lines to be turned off when structures go down, potential impacts to public health and safety could be moderate-to-high if failures created loss of power, fire, or electrocution.

3.11 Air Quality

3.11.1 Affected Environment

EPA has identified several air pollutants as a concern nationwide. These pollutants, known as "criteria pollutants," are carbon monoxide, ***particulate matter (PM)*** (dust, soot, and other tiny bits of solid materials) with a diameter of 10 micrometers or less ***(PM-10)***, ozone, sulfur dioxide, lead, and nitrogen dioxide. Under the Clean Air Act (42 USC § 7401 *et seq*.), EPA has established ***National Ambient Air Quality Standards*** that specify maximum allowable concentrations for each of the six criteria pollutants. An area that fails to meet the standards established by EPA for any criteria pollutant is designated a ***nonattainment area***. If a nonattainment area meets the EPA promulgated standards for the criteria pollutant in question, then the area is designated a ***maintenance area*** after a maintenance plan has been established to keep the area within the standards approved by EPA.

A portion of the transmission line is located within the Oakridge UGB, which is designated as a nonattainment area for PM with a diameter of 2.5 micrometers or less (PM-2.5) and PM-10. PM-2.5 particles are fine particles often found in smoke or haze while particles between 2.5 micrometers and 10 micrometers are found near roadways or industries.

DEQ oversees the Oakridge PM-2.5 Nonattainment Area under the authority of the Lane Regional Air Protection Agency (LRAPA). The LRAPA oversees air quality conditions and enhancement programs in the cities of Eugene, Springfield, Cottage Grove, and Oakridge, and the Eugene-Springfield UGB (LRAPA 2012).

The LRAPA has proposed rules for PM-2.5 and ***greenhouse gases*** (chemical compounds found in the Earth's atmosphere that absorb and trap infrared radiation as heat), and national emission standards

for hazardous air pollutants into Oregon's State Implementation Plan. The LRAPA rules on open burning have been in effect in Lane County since their adoption by LRAPA Board of Directors. Oregon Environmental Quality Commission adoption of DEQ's rulemaking would allow DEQ to submit the LRAPA rules to the EPA for incorporation into the state's federally-approved implementation plan to protect air quality (LRAPA 2014).

Air quality issues related to the operation of the transmission line are generally only affected by low levels of ozone and nitrogen oxides, which are created during normal operations. Of the six criteria pollutants, PM generated by maintenance vehicles during routine maintenance is of primary concern, with carbon monoxide and ozone of lesser concern.

3.11.2 Environmental Consequences—Proposed Action

Construction of the Proposed Action would result in temporary higher levels of PM during structure replacement, access road work, conductor stringing, and other ground-disturbing activities. Dust could be created in localized areas for short durations. Construction equipment would disturb dirt on roads and emit pollutants, resulting in low-level impacts to local air quality and visibility for short durations. No open burning is planned as part of the Proposed Action; potential fuels would be lopped and scattered. The Proposed Action would result in short-term and localized emissions from internal combustion engines during construction. Low-growing vegetated areas that are disturbed during construction would be revegetated.

Overall, air quality impacts resulting from construction would be low because these impacts would be limited to the construction site, would be temporary in nature, and would not produce enough dust and contaminants to result in violations of air quality standards.

3.11.3 Environmental Consequences—No Action Alternative

Under the No Action Alternative, construction-related impacts to air quality would not occur at this time. However, needed repairs of the existing transmission line could potentially continue to have low-level impacts on air quality, primarily from dust and vehicle emissions as these impacts would be localized, temporary in nature, and would not result in violations of air quality standards.

3.12 Greenhouse Gases

3.12.1 Affected Environment

Greenhouse gases are chemical compounds found in the Earth's atmosphere that absorb and trap infrared radiation as heat. Global atmospheric greenhouse gas concentrations are a product of continuous emission (release) and removal (storage) of greenhouse gases over time. In the natural environment, this release and storage is largely cyclical. For instance, through the process of photosynthesis, plants capture atmospheric carbon as they grow and store it in the form of sugars. When plants decay or are burned, the stored carbon is released back into the atmosphere, available to be taken up again by new plants (Ecological Society of America 2008). Productive and long-lived forests play an important role in carbon capture and storage in that they act as temporary carbon reservoirs by storing carbon for extended periods of time. There is also a large amount of

greenhouse gases stored deep underground in the form of fossil fuels. Soils store carbon in the form of decomposing plant material and serve as the largest carbon reservoir on land.

Human activities such as deforestation, soil disturbance, and burning of fossil fuels (e.g., coal, natural gas, oil, and wood products) disrupt the natural cycle by increasing the greenhouse gas emission rate over the storage rate, which results in a net increase of greenhouse gases in the atmosphere. When forests are permanently converted to cropland, for instance, or when new buildings or roads displace vegetation, the greenhouse gas storage capacity of the disturbed area is diminished. Carbon dioxide, nitrous oxide, and methane emissions increase when soils are disturbed (Kessavalou et al. 1998), and burning fossil fuels releases greenhouse gases that have been stored underground for thousands of years and cannot be readily replaced. The resulting build-up of heat in the atmosphere due to increased greenhouse gas levels increases temperatures, which causes warming of the planet through a greenhouse-like effect (U.S. Energy Information Administration 2009).

The principal greenhouse gases emitted into the atmosphere through human activities are carbon dioxide, methane, nitrous oxide, and fluorinated gases, such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (EPA 2013b).

- Carbon dioxide is the major greenhouse gas emitted (EPA 2013b; Houghton 2010). Carbon dioxide enters the atmosphere as a result of such activities as land use changes, the burning of fossil fuels, and the manufacturing of cement. Carbon dioxide emissions resulting from the combustion of coal, oil, and gas constitute 84 percent of all greenhouse gas emissions in the United States (EPA 2013b). Before the industrial revolution, carbon dioxide concentrations in the atmosphere were roughly stable at 280 parts per million. By 2010, carbon dioxide levels had increased to 390 parts per million, a 40 percent increase, as a result of human activities (EPA 2013c).
- Methane is emitted during the processing and transport of fossil fuels, through intensive animal farming, and by the degradation of organic waste. Concentrations of methane in the atmosphere have increased to more than 2.5 times preindustrial levels (EPA 2013c).
- Nitrous oxide is emitted during agricultural and industrial activities and during the combustion of fossil fuels and solid waste. Atmospheric levels of nitrous oxide have increased 18 percent since the beginning of industrial activities (EPA 2013c).
- Fluorinated gases, including hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, are synthetic compounds emitted through industrial processes. They sometimes replace ozone-depleting compounds such as chlorofluorocarbons in insulating foams, refrigeration, and air conditioning. Fluorinated gases, particularly sulfur hexafluoride, are often used in substation equipment. Sulfur hexafluoride is used as an electrical insulator in high-voltage substation equipment such as circuit breakers, transformers, and ground switches. Although fluorinated gases are emitted in small quantities, fluorinated gases have the ability to trap more heat than carbon dioxide and are considered gases with a high ***global warming***

potential (the relative measure of how much heat a greenhouse gas traps in the atmosphere) (EPA 2013b).

Total human-caused greenhouse gas emissions were the highest in human history from 2000 to 2010 and reached 49 gigatons of ***carbon dioxide equivalent*** per year in 2010 (Intergovernmental Panel on Climate Change 2014). Carbon dioxide is a measurement used to compare the global warming potential of a typical greenhouse gas, based on concentrations of carbon dioxide. Annual greenhouse gas emissions grew on average by 1.0 gigaton of carbon dioxide equivalent (2.2 percent) per year from 2000 to 2010 compared to 0.4 gigaton (1.3 percent) increase per year from 1970 to 2000. Increasing levels of these greenhouse gases could increase the Earth's temperature by between 2.0°F and 11.5°F by 2100 (EPA 2013b). In the Pacific Northwest region, an increase in annual temperature between 3.3°F and 9.7°F may be realized between 2070 and 2099, depending on future total global emissions of greenhouse gases (Mote et al. 2014).

Increases in the Earth's temperature may result in accelerated melting of artic sea ice and glaciers, decreased periods of ice cover on lakes and rivers, changes in hydrology associated with early melting and decreased snow packs, changes in growing seasons and plant hardiness zones, changes in surface water characteristics, and increased extreme weather (Melillo et al. 2014). All of these changes could have a ripple effect on agricultural production, human health, public infrastructure, water supplies, hydropower generation, and terrestrial, aquatic, and marine ecosystems. While models predict that atmospheric concentrations of all greenhouse gases and temperatures will increase over the next century due to human activity, the extent and rate of change resulting from an individual project or action are difficult to predict, especially on a global scale.

To lessen the BPA system's contribution to greenhouse gas emissions, BPA developed a climate change roadmap (BPA 2008), which included the adoption of a new Strategic Business Objective and a Key Agency Target related to climate change. The climate change roadmap identified measuring BPA's overall greenhouse gas emissions as a key starting point for BPA to manage its overall greenhouse gas footprint. As a result, BPA started collecting greenhouse gas data in 2009 to complete an inventory of existing greenhouse gas emissions. The greenhouse gas reporting serves as a benchmark for quantifying reductions in greenhouse gas emissions from various activities and functions and helps BPA in quantifying the value of potential remedies for reducing emissions, estimating the costs of changing current practices and prioritizing future greenhouse gas emission reduction actions. In 2009, BPA became a founding member of The Climate Registry, a nonprofit collaboration that sets standards to calculate, verify, and report greenhouse gas emissions. BPA has completed and published a greenhouse gas inventory for the years of 2009, 2010, 2011, and 2012. The Climate Registry has been third-party verified and is publically available.

In 2012, BPA's system-wide direct emissions from stationary and mobile combustion and fugitive sources totaled 88,524 metric tons of carbon dioxide equivalent (The Climate Registry 2013). These direct emissions were calculated from the use of vehicles, air transportation, building operation, and transmission line operation. The greenhouse gas emissions reported to The Climate Registry also include a quantification of the sulfur hexafluoride emissions from BPA facilities. In addition to

reporting sulfur hexafluoride emissions associated with total greenhouse gas emissions to The Climate Registry, BPA joined the EPA's Sulfur Hexafluoride Emission Reduction Partnership in 1999, which includes voluntarily reporting of sulfur hexafluoride emissions.

3.12.2 Environmental Consequences—Proposed Action

Global atmospheric greenhouse gas concentrations are a product of emissions and removal over time. Greenhouse gas emissions, primarily in the form of carbon dioxide, nitrous oxide, and methane, would be generated under the Proposed Action through the use of vehicles, heavy equipment, and helicopters during construction. Tree removal does not immediately emit greenhouse gases and is not a direct emission, though tree removal could result in a permanent loss of a carbon storage reservoir. The subsections below estimate the project's direct emissions as well as the loss of carbon storage from tree removal. Detailed assumptions used to derive these estimates are provided in Appendix F.

Non-tree vegetation and soil disturbance could also result in an increase in greenhouse gas concentrations. Research has shown that emissions as a result of soil disturbance are short lived and return to background levels within several hours (Kessavalou et al. 1998; Intergovernmental Panel on Climate Change 2006). Carbon that would be stored in removed vegetation would be offset in time by the growth and accumulation of carbon in soils and new vegetation. For these reasons, the temporary increase in greenhouse gas concentrations as a result of temporary soil and non-tree vegetation disturbance are not quantified below.

Direct Emissions

Direct greenhouse gas emissions resulting from the Proposed Action were calculated using the assumptions described Appendix F. Calculations were done to estimate the greenhouse gas emissions from rebuilding the transmission line.

The Proposed Action could result in an estimated total of 2,700 metric tons of carbon dioxide emissions through the use of vehicles, equipment, and helicopters during construction activities. Greenhouse gas emissions associated with equipment operation and vehicle use were overestimated to account for all potential construction activities and associated material deliveries to and from the construction site.

To provide context for these levels of emissions, the EPA mandatory reporting threshold for large emission sources of greenhouse gases is 25,000 metric tons of carbon dioxide equivalent emitted annually (74 FR 56260). This threshold is about the amount of carbon dioxide equivalent generated by 5,263 passenger vehicles per year (EPA 2014). Comparatively, the emissions during project construction would be equivalent to the emissions generated by about 570 passenger vehicles per year. Given the low contributions, the impacts of the Proposed Action on greenhouse gas concentrations would be **low**.

Tree Sequestration Reduction

Based on the carbon cycle, trees act as temporary carbon reservoirs. Peak solid carbon storage occurs when a tree is fully mature. Alternatively, minimum solid carbon storage may occur when a forested area is permanently converted to a non-forested area, such as grasslands.

Rebuilding the transmission line would require the permanent removal of about 6 acres of forest habitat over the entire 26-mile alignment. For the realignments of line miles two and three, approximately 4 acres of forest land would be converted to new right of way, and approximately 4 acres of existing right of way would be reverted back to forestland. The nature of tree removal for realignment areas is to permanently convert land within the clearing area to a non-forested land use. Therefore, this action can be characterized as permanently maintaining the clearing area at the minimum level of carbon storage. In addition, individual tree removal along BPA's right of way is anticipated to total an additional 2 acres of trees that would be permanently removed, for a total of 6 acres of trees that would be permanently removed. The Proposed Action would also require the temporary removal of 6 acres of forest for structure replacement and access road and trail work (primarily through tree removal). The additional trees removed to facilitate pulling and tensioning would be temporarily cleared and allowed to regrow after project construction and are not included in the estimate of permanent sequestration loss.

The estimated 6 acres of trees to be permanently removed, if not permanently removed, would sequester about 8,300 metric tons of carbon dioxide equivalent at full maturity, the quantity of carbon dioxide equivalent generated by 1,750 vehicles. This estimate assumes that the removed trees are at full maturity and would remain in that state to provide full sequestration potential. This estimate is conservative as most of the removed trees are not currently at full maturity (i.e., at full sequestration potential) and many trees would not reach maximum maturity through natural attrition or other human-related disturbances (see Appendix F for details). Due to the small loss of greenhouse gas sequestration potential, tree removal for the proposed project would result in a low effect on greenhouse gas concentrations.

3.12.3 Environmental consequences—No Action Alternative

Under the No Action Alternative, the existing transmission line would not be rebuilt, so the impacts related to the construction of the Proposed Action would not occur. Maintenance activities could increase as more structure repair and replacement could be required, potentially resulting in increased greenhouse gas emissions from vehicles and equipment. Maintenance of access roads could be needed and road work could take place as an operations and maintenance activity. The maintenance activities could result in very minor increases in greenhouse gas emissions. There would be a loss of carbon sequestration as a result of tree removal during maintenance activities and emergency repairs. Because the increase would be small, the potential impacts on climate change and greenhouse gas emissions are expected to be low.

3.13 Cumulative Impacts

Cumulative impacts are the impacts on the environment which result 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. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). Sections 3.1 through 3.12 of this chapter present information about present environmental conditions and the environmental and socioeconomic consequences of implementing the Proposed Action or No Action Alternative. This section addresses the cumulative impacts of the Proposed Action when combined with other past, present, and reasonably foreseeable future actions.

3.13.1 Identification of Past, Present, and Reasonably Foreseeable Future Actions

The cumulative impacts analysis of this Proposed Action does not include an exhaustive list of individual past actions and instead, focuses on the impacts of existing projects, including the past impacts of those projects.

The nature and extent of existing development due to past and present actions in the vicinity of the Proposed Action is largely described earlier in this chapter in the affected environment sections for each environmental resource. In addition to BPA's access road and vegetation management work for the existing transmission line, past actions that have adversely affected natural and human resources in the transmission line right-of-way include forest management activities, highway and railroad construction, and commercial, industrial, ongoing operations of the dams, and residential development. Other reasonably foreseeable future actions within the Lookout Point watershed were identified. These actions include:

- Corps projects: rehabilitation of spillway gates at the Hills Creek and Lookout Point dams at the termini of the transmission line; installation/replacement of electronics in control house at the Dexter (beyond the western terminus of the transmission line)_and Lookout Point dams; and installation of oil-water separators at the Dexter, Hills Creek, and Lookout Point dams.
- Ongoing Forest Service activities throughout the Willamette National Forest, including the portion of the Forest crossed by the transmission line. These activities include timber harvests; road, trail, and campground maintenance; weed and invasive plant treatment; wildlife habitat rehabilitation; cultivating tree seedlings at seed orchards; railroad maintenance activities; fire management activities for wildfires and prescribed burns; and fisheries management activities.
- The Outlook Landscape Diversity Project, through which the transmission line crosses (approximately line miles 9 through 19), is a commercial thinning and fuels reduction activity that the Forest Service plans to conduct on 4,300 acres of plantation forest within the Willamette National Forest. This project would also include 110 miles of road maintenance; closure of 130 miles of roads; habitat restoration, maintenance, and creation; snag creation; and invasive plant abatement.

- Other planned Forest Service projects: North Shore Meadows Project, Buckhead Wildlife Area Management (approximately line mile 10), and Westfir Seed Orchard Management (line mile 9). These projects would include wildlife management, botany, silviculture/timber, fire/fuels treatments, engineering, fisheries, hydrologic and soils activities.
- Potential installation of seven to eight cell towers within the Willamette National Forest, including one tower near BPA's transmission line right-of-way on the north side of Lookout Point Lake. Glotel, a cell tower landlord, has contacted the Forest Service about installation of the towers and has engaged in preliminary discussions with the Forest Service.
- City of Oakridge projects where the line crosses through Oakridge (line mile five): Highway 58 Beautification Plan (2013-2018), Highway 58 Refinement Plan, expansion and improvement of the City's water system, re-establishment of an Amtrak terminal, and renovation and rehabilitation of Oakridge City Hall and the Willamette Activity Center.
- Lane County projects: roadway improvements on Fish Hatchery Road (across the Middle Fork Willamette River from line mile three) and Westfir-Oakridge Road (north of line miles four through six); rehabilitation of Office Covered Bridge in Westfir (north of line mile seven); and an update of the Lane County Transportation System Plan.
- Forestry activities on private lands, including timber harvests, planting, thinning, and other management activities. Private timber harvests provide notice to Oregon Department of Forestry.
- ODOT projects: congestion mitigation and air quality for Oakridge (line mile five) and pavement preservation work for a 5-mile stretch on Highway 58 from milepost 27.5 to milepost 33.18.
- Other state, county, and city road maintenance activities near the transmission line right-of-way, such as paving, slope stabilization, and culvert replacement.
- Continued operation and maintenance of Lane Electric's electric distribution lines and substations, including the Oakridge Substation (between 5/16 and 6/1), in and near BPA's transmission line right-of-way.
- Potential for additional urban development or redevelopment within the Oakridge (line miles five and six) and Westfir (line mile eight) UGBs near the transmission line corridor, as permitted by city zoning. Outside of the Oakridge and Westfir UGBs, limited rural development could occur near the transmission line corridor, as permitted by Lane County zoning.
- Ongoing operation and maintenance of the transmission line by BPA.

3.13.2 Cumulative Impacts

Land Use, Recreation, and Transportation

Land use, recreation, and transportation along the transmission line have incrementally changed due to past and present development, and this trend is expected to continue. Wood-pole structure

replacement would have a low cumulative impact on recreation because construction impacts such traffic delays, access closures, noise, and dust, would be temporary.

Original construction of the transmission line converted approximately 305 acres of forest land to BPA's right-of-way. Permanent conversion of about 4 acres of forested Forest Service land for the re-route of line miles two and three would be offset by the abandonment and rehabilitation of about 4 acres of BPA's existing right-of-way that would be reverted back to forestlands. The net impact would be a small increase in late successional reserve forest land and a small loss of matrix forest land, as described in Section 3.1.2. When considered in combination with the 305 acres converted back in 1952, the impacts of the Proposed Action (conversion of 4 acres and abandonment and rehabilitation of 4 acres) is very minimal compared with the entirety of the Willamette National Forest (1,675,407 acres). In combination with other past, present, and reasonably foreseeable development projects, the Proposed Action would have a minimal cumulative impact on land uses because the conversion of 4 acres and abandonment and rehabilitation of 4 acres would not prohibit the remainder of the Willamette National Forest from continuing to be used for forestry.

Past and present actions resulted in the development of numerous roads near the transmission line right-of-way, including state highways, rural roads, and other paved and graveled roads. The Proposed Action would result in temporary impacts to transportation and traffic, such as traffic delays, temporary lane closures, and of the construction of 0.1 mile of new access roads. Thus, the Proposed Action would have a minimal cumulative impact on transportation.

Geology and Soils

The principal past and ongoing activities that affect geology and soils in the vicinity of the transmission line are related to forest management, BPA's vegetation management program, and to a lesser extent, residential and commercial development. The area of geology and soils impacted by the Proposed Action is relatively small and much of it experienced compaction in the past when the line was constructed and/or accessed for maintenance. The Proposed Action would disturb a relatively small area of previously undisturbed soils for the construction of the realigned portions of line miles two and three and the short segment of new access roads, thereby having a very minimal contribution to cumulative impacts on geology and soils.

Vegetation

Past and present transmission line clearing and tree removal, access road construction and maintenance, forestry, and development have resulted in changes in the vegetation composition in the transmission line right-of-way and access road areas. Reasonably foreseeable future actions, such as BPA's vegetation management and tree removal, ongoing forest management, and development, would continue to impact vegetation.

The Proposed Action would have low impacts to vegetation, modifying existing vegetation cover, distribution, and dominance. Anticipated post-rebuild conditions within the transmission line right-of-way and access road areas would include altered succession profiles that would result from removal of selected trees. Following tree removal, remaining trees and shrubs may experience quicker growth into the newly available habitat.

Past and present activities within transmission line right-of-way and access road areas have led to a spread of invasive plants in the vicinity, which could continue with reasonably foreseeable future actions. Although mitigation measures have been identified that would minimize the spread of invasive plants by the Proposed Action, it is possible that impacts would still occur. Thus, the Proposed Action could contribute to a low cumulative impact on vegetation through the spread of invasive plant species, as well as through the modification of existing vegetation.

Streams and Fish

Activities other than the Proposed Action in the vicinity of the transmission line right-of-way and access road areas have the potential to impact water quality and fish through erosion and overland transport of suspended sediments to streams downstream of these operations. These activities include past, present, and future rural residential and commercial development; forestry activities and management; ongoing road and bridge maintenance; and vegetation management along BPA's rights-of-way.

Reasonably foreseeable future projects likely would result in additional impacts on water quality. The major cumulative impacts to streams in the vicinity of the transmission line right-of-way and access road areas would continue to be from forest management. However, improvements to streams would be made through habitat improvement projects in the watershed crossed by the transmission line right-of-way and access road areas, as stream enhancement projects are implemented and as stream barriers are removed as part of the Proposed Action and other projects.

The Middle Fork Willamette Watershed Council is currently involved with habitat restoration projects for streams within the Middle Fork Willamette Watershed, including aquatic, riparian, floodplain, and upland habitats. Because the anticipated post-construction conditions within the transmission line right-of-way and access road areas would be similar to existing conditions, the Proposed Action would have low impacts on streams, as discussed in Section 3.4. These impacts would be mitigated through the implementation of mitigation measures described in Section 2.6.

Fish

The principal past and ongoing activities that affect streams and fish in the vicinity of the corridor include operation and management of the Hills Creek and Lookout Point dams; forest management activities, including timber harvests by public and private entities; ongoing highway, road, and bridge maintenance; rural residential and commercial development; rail and utility maintenance; and BPA's tree removal program. These activities have altered flow regimes, changed habitat quality and availability, reduced fish passage, and reduced water quality. These activities and other reasonably foreseeable future actions would likely continue to affect fish.

The Proposed Action would have low impacts to fish through in-water work and the associated construction disturbance, temporary and permanent access road construction (including culverts), and short-term localized sediment inputs to streams. Impacts from the Proposed Action and ongoing past, present, and reasonably foreseeable future actions (including presence and operation of the existing dams) would continue to result in moderate to high cumulative impacts on fish.

However, improvements to stream condition and both habitat quality and access would also occur as projects are implemented and fish passage barriers are removed in the project watersheds. These include fish passage improvements and road and drainage improvements included with the Proposed Action. Long-term sediment reduction due to proposed access road and drainage improvements would benefit localized stream conditions and fish habitat. Additionally, improvements to the existing dams, as well as future road and bridge projects, would address fish passage. Finally, the Middle Fork Willamette Watershed Council and the Willamette National Forest are involved in ongoing habitat restoration projects that benefit streams and fish, including ESA-listed Chinook and bull trout. Incremental impacts on fish from the Proposed Action are minimal compared to the impacts from dam construction and operation.

Wetlands, Floodplains, and Groundwater

Wetlands

Wetlands throughout Oregon have experienced incremental losses and degradation over time. Within the transmission line right-of-way and access road areas, wetland impacts occurred in the past during construction of the existing transmission line and access roads. Road and railroad construction and development would have also resulted in wetland impacts. Floodplain wetlands were lost as a result of construction of the Hills Creek and Lookout Point dams. Any future projects in the vicinity would be required to avoid, minimize, and compensate for impacts to wetlands under federal and state laws, but could still contribute to a cumulative loss of function or value at the local level. The Proposed Action would result in both temporary and permanent impacts to wetlands. Temporary impacts would result in a short-term loss of function, which would be restored as described in Section 3.5.

Mitigation would be required for non-exempt permanent impacts to wetlands (0.8 acre) resulting from the Proposed Action. Most of this impact would be mitigated through the use of the Coyote Prairie North mitigation bank in Eugene, Oregon. However, the southeastern portion of the transmission line is outside the service area for this bank, so impacts in this area would contribute to a local cumulative loss at the local watershed level. Impacts outside the bank service area would be less than 0.05 acre. There would also be some minor impacts (less than 0.3 acre) that would not require mitigation at either the federal or the state level and would therefore contribute to a cumulative loss at a regional and local scale. With mitigation for most of the wetland impacts resulting from the Proposed Action, overall the contribution to wetland impacts would be minor.

Floodplains

Construction of the Hills Creek and Lookout Point dams has altered the floodplain of the Middle Fork Willamette River in the vicinity of the transmission line right-of-way and access roads. Past actions have had cumulative impacts on floodplains through development and other disturbances. Lane County has a Floodplain Combining Zone (Lane County 2014c) which regulates development in floodplains. Despite these regulations, impacts to floodplain functions could be expected to continue at a low level through continued development of those portions of the transmission line right-of-way and access road areas that are not part of the Willamette National Forest. Only a few wood-pole structures are located in the potential floodplain. Replacement of the wood poles would not change

floodplain function as existing structures would be replaced by new structures using roughly the same footing locations. Access road enhancements would contribute to a cumulative impact on floodplain function through the introduction of fill and potential sedimentation. The cumulative impact of the Proposed Action and other past, present, and reasonably foreseeable projects on floodplains would be low.

Groundwater Resources

The cumulative impacts related to the reduction or contamination of groundwater would be highly variable depending on the type and location of other projects and their relation to groundwater resources. In general, mining projects have the highest potential to heavily affect groundwater resources. Land development, railroads, and agriculture may also greatly impact groundwater resources. In contrast, highways, transmission lines, and roads are likely to have little impact on groundwater resources. Reasonably foreseeable future actions near the transmission line do not include mining or major agriculture or land development projects. In combination with mitigation measures, cumulative impacts from the Proposed Action on groundwater resources would be low.

Wildlife

Past and present development and other activities have had a cumulative impact on wildlife and their habitat near the transmission line. The clearing and conversion of land for forest management, utility infrastructure (such as the existing transmission line), and other uses have resulted in loss of wildlife habitat. The Proposed Action would have low impacts to wildlife and wildlife habitat through temporary construction disturbance, vegetation removal, access road and trail work.

The Proposed Action is located almost entirely within an existing transmission line right-of-way and using existing roads. Minimal new road construction and transmission line re-routing would occur. The Proposed Action would slightly reduce available perching, foraging, and nesting habitat available for wildlife species; therefore, the Proposed Action would contribute a low cumulative impact on wildlife.

Cultural Resources

Cultural resources near the transmission line have likely been cumulatively affected by past, present, and current development activities. Most impacts have likely occurred as a result of inadvertent disturbance or destruction from ground-disturbing activities such as dam and lake (reservoir) construction, road work, urban development, and agriculture. Like the Proposed Action, other reasonably foreseeable future projects in the vicinity of the transmission line—including forestry, residential, commercial, and utility line maintenance activities—have the potential to disturb previously undiscovered cultural resources. The Proposed Action would likely have low cumulative effects on cultural resources because access road work activities could affect a number of archaeological resources. Implementation of the mitigation measures described in Section 2.6 would reduce the potential for construction activities to contribute incrementally to the cumulative impacts on unknown cultural resources near the transmission line. In the event that previously undiscovered cultural resources are encountered, potential impacts could occur, depending on the level and amount of disturbance, and the eligibility of the resource for listing in the NRHP.

Visual Quality

The visual quality along the transmission line has changed due to past and present development in urban areas and forestry activities in forested areas, and this trend is expected to continue. The impact to visual quality and views resulting from the Proposed Action would be expected to be a low long-term impact on the forested and urban visual environments because the rebuilt transmission line would be similar in character to the existing line. Thus, the Proposed Action would have a low cumulative impact on visual quality.

Socioeconomics and Public Services

The Proposed Action would likely not result in any changes in population. Thus, there would be no cumulative impact on population levels, public facilities, or social services. In addition, because the Proposed Action would not be expected to disproportionately affect any low-income or minority populations, there would be no cumulative impact on environmental justice populations. Any employment and income associated with rebuilding the transmission line would be temporary and limited in duration; therefore, the Proposed Action would not contribute to noticeable long-term economic benefits (employment, income, tax revenue) or demand for housing in communities along the right-of-way. If other large construction projects occurred simultaneously with the Proposed Action, such as the installation of cell towers within the Willamette National Forest and City of Oakridge highway projects, the Proposed Action would likely contribute to a low cumulative impact on employment, income, tax revenue, and housing demand.

Noise, Public Health, and Safety

Noise, public health, and safety near the transmission line have incrementally changed as a result of past and present development; this trend would be expected to continue in the future. The noise effects from reasonably foreseeable actions combined with the Proposed Action would have a low cumulative impact on noise because noise from the Proposed Action would temporary, localized, and substantially decrease after construction.

Past and ongoing activities along the transmission line include timber harvest, other forestry activities, and some residential and industrial development, all of which have the potential for risks to public health and safety from operating heavy machinery and exposure to hazardous materials. Since the effects of the Proposed Action would be mitigated through safety and mitigation measures (Section 2.6) aimed at reducing the risks from operating heavy equipment and vehicles and exposure to hazardous materials, the cumulative impacts on public health and safety would be expected to be low.

Air Quality

Air quality near the transmission line has incrementally changed as a result of past and present development, vehicles traveling on local roads, and periodic residential and agricultural burning. This trend would be expected to continue. The Proposed Action would result in temporary impacts to air quality, such as temporary increases in PM, dust, and vehicle emissions, so the contribution of the Proposed Action to cumulative impacts on air quality would be expected to be low.

Greenhouse Gases

As described above in Section 3.12.2, the impacts of the Proposed Action on greenhouse gas concentrations would be low. Impacts would be further reduced through implementation of the mitigation measures identified in Section 2.6. All levels of greenhouse gas emissions are significant in that they contribute to global greenhouse gas concentrations and climate change. However, given the small amount of contribution, the project's incremental impact on greenhouse gas concentrations would be low. This would also be the case when combined with the other independent reasonably foreseeable future projects and activities near the transmission line.

3.14 Intentional Destructive Acts

In its December 1, 2006, memorandum, the Department of Energy (DOE) issued interim guidance titled "Need to Consider Intentional Destructive Acts in NEPA Documents." This interim guidance was developed by the Office of NEPA Policy and Compliance and requires that all environmental impact statements and environmental assessments prepared for proposed DOE actions, address the potential environmental consequences of intentional destructive acts such as sabotage, terrorism, vandalism, and theft. Where applicable, partial guidance is also offered in "Recommendations for Analyzing Accidents under NEPA," that was also prepared by the Office of NEPA Policy and Compliance in July 2002.

Intentional destructive acts, such as sabotage, terrorism, vandalism, and theft, sometimes occur at power utility facilities. Vandalism and thefts are most common, and recent increases in the prices of metal and other materials have accelerated thefts and destruction of federal, state, and local utility property. The impacts from vandalism and theft, though expensive, do not generally cause a disruption of service to the area.

Federal and other utilities use physical deterrents, such as fencing, cameras, and warning signs, to help prevent theft, vandalism, and unauthorized access to facilities. In addition, through its Crime Witness Program, BPA offers up to $25,000 for information that leads to the arrest and conviction of individuals committing crimes against BPA facilities. Anyone having such information can call BPA's Crime Witness Hotline at (800) 437-2744. The line is confidential, and rewards are issued in such a way that the caller's identity remains confidential.

Acts of sabotage or terrorism on electrical facilities in the Pacific Northwest are rare, although some have occurred. These acts generally focused on attempts to destroy large transmission line lattice-steel towers. Depending on the size and voltage of the line, destroying towers or other equipment could cause electrical service to be disrupted to utility customers and end users. The effects of these acts would be as varied as those from the occasional sudden storm, accident, or blackout (disconnection of the source of electricity from all electrical loads in a geographic area) and would depend on the particular configuration of the transmission system in the area. While in some situations these acts would have no noticeable effect on electrical service, in other situations, service could be disrupted in the local area, or if the damaged equipment was part of the main transmission system, a much larger area could be left without power.

When a loss of electricity occurs, all services provided by electrical energy cease. Illumination is lost. Lighting used by residential, commercial, industrial, and municipal customers for safe movement and security is affected. Residential consumers lose heat. Electricity for cooking and refrigeration is also lost, so residential, commercial, and industrial customers cannot prepare or preserve food and perishables. Residential, commercial, and industrial customers experience comfort/safety and temperature impacts, increases in smoke and pollen, and changes in humidity due to loss of ventilation. Mechanical drives stop, causing impacts as elevators, food preparation machines, and appliances for cleaning, hygiene, and grooming are unavailable to residential customers. Commercial and industrial customers also lose service for elevators, food preparation, cleaning, office equipment, heavy equipment, and fuel pumps.

In addition, roadways experience gridlock where traffic signals fail to operate. Mass transit that depends on electricity, such as light rail systems, can be impacted. Sewage transportation and treatment can also be disrupted. Electricity loss also affects alarm systems, communication systems, cash registers, and equipment for fire and police departments. Loss of power to hospitals and people on life-support systems can be life threatening.

Overhead transmission conductors and the structures that carry them are mostly on unfenced utility rights-of-way. The conductors use the air as insulation. The structures and tension between conductors make sure they are high enough above ground to meet safety standards. Structures are constructed on footings in the ground and are difficult to dislodge.

While the likelihood for sabotage or terrorist acts on the Proposed Action is difficult to predict, it is unlikely that such acts would occur. If such an act did occur, it could impact the transmission system or electrical service to the local area. However, any impacts from sabotage or terrorist acts likely could be quickly isolated. The DOE, public and private utilities, and energy resource developers include the security measures discussed above, as well as other measures, to help prevent such acts and to respond quickly if human-caused damage occurs.

Chapter 4. Persons, Tribes, and Agencies Receiving the EA

The project mailing list contains over 150 stakeholders, including potentially interested or affected landowners; tribes; local, state, and federal agencies; public officials; interest groups; businesses; and libraries. They have directly received or have been given instructions on how to receive all project information made available so far, and they will have an opportunity to review and comment on the Draft EA. Specific entities (other than private persons) receiving this EA are listed below by category.

4.1 Federal Agencies and Officials

U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
U.S. Forest Service
U.S. Representative Peter DeFazio
U.S. Senator Jeff Merkley
U.S. Senator Ron Wyden

4.2 Tribes

Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians
The Confederated Tribes of Grand Ronde
The Klamath Tribe
Confederated Tribes of the Warm Springs Reservation
Confederated Tribes of Siletz Indians of Oregon
Coquille Indian Tribe
Cow Creek Band of Umpqua Tribe of Indians

4.3 State Agencies and Officials

Oregon Department of Agriculture
Oregon Department of Environmental Quality
Oregon Department of Transportation
Oregon State Historic Preservation Office
Oregon State Representative Bruce Hanna
Oregon State Senator Floyd Prozanski

4.4 Local Governments and Utilities

City of Westfir
Emerald Public Utility District
Eugene Water and Electric Board
Lane County Board of Commissioners
Lane County Commissioner, Faye Stewart
Lane County Commissioner, Jay Bozievich
Lane County Commissioner, Pat Farr
Lane County Commissioner, Pete Sorenson
Lane County Commissioner, Sid Leiken
Lane Electric Cooperative
Oakridge City Councilor, Christine Slaven
Oakridge City Councilor, Glenn Fortune
Oakridge City Councilor, Ernie Baszler
Oakridge City Councilor, Jerry Shorey
Oakridge City Councilor, Jim Coey
Oakridge City Councilor, Lester Biggerstaff
Oakridge City Councilor, Rayetta Clark
Oakridge Chamber of Commerce

4.5 Libraries

Oakridge Public Library
Oregon State University Valley Library
Springfield Public Library
University of Oregon Knight Library

Chapter 5. Glossary

Term	Definition
303(d), water quality limited waters	Under Section 303(d) of the Clean Water Act, states, territories, and authorized tribes are required to develop a list of water quality limited segments. Waters on the 303(d) list do not meet water quality standards, even after the minimum required levels of pollution control technology have been installed at the point sources of pollution.
A-weighted decibel (dBA)	A logarithmic measurement of sound based on the decibel but weighted to approximate the human perception of sound. Commonly used for measuring environmental and industrial noise levels.
Anadromous	Fish species that breed in fresh water but live their adult life in the sea.
Anchor	A device that stabilizes a transmission structure with respect to the ground.
Background	More than 5 miles from the viewer.
Bird diverter	Device placed on the transmission line to help birds see power lines and avoid potentially fatal collisions.
Candidate species	Plants and animals native to the United States for which the USFWS or the NMFS has derived from sufficient information on biological vulnerability and threats to justify proposing to add them to the threatened and endangered species list, but the species has not yet been listed.
Carbon dioxide equivalent	A measurement used to compare the global warming potential of a typical greenhouse gas, based on concentrations of carbon dioxide.
Conductor	The wire cable strung between transmission structures through which electric current flows.
Corona	An electrical field around the surface of a conductor, insulator, or hardware caused by ionization of the surrounding air.
Corridor trees	Trees that are within BPA's transmission line right-of-way that are not considered part of a low-growing plant community. Tall-growing vegetation is removed by BPA as part of ongoing vegetation maintenance before it grows tall enough to interfere with transmission facilities.
Counterpoise	A type of electrical ground that is not connected to earth. It is used when a normal earth ground cannot be used because of high soil resistance. It consists of a network of wires or cables (or a metal screen) parallel to the ground, suspended from a few centimeters to several meters above the ground. The counterpoise functions as one plate of a large capacitor, with the conductive layers of the earth acting as the other.
Critical habitat	Habitat essential to the conservation of an endangered or threatened species listed under the ESA that has been designated by the USFWS or the NMFS.

Term	Definition
Cross arm	A high quality piece of wood mounted on a utility pole used to hold up power lines or other equipment.
Cross brace	A structural member that forms an "X" between two wood poles to strengthen the transmission line structure and provides stability.
Dampers	Devices attached to insulators in order to minimize vibration of the conductors in windy conditions.
Danger tree	Trees (or high-growing brush) growing alongside the transmission line right-of-way that are hazardous to the transmission line. These trees are identified by special crews and must be removed to prevent tree-fall into the line or other interference with the conductors. BPA's Construction Clearing Policy requires that trees be removed that meet either one of two technical categories. Category A is any tree that within 15 years would grow to within about 18 feet of conductors when the conductor is at maximum sag (212ºF) and swung by 6 pounds per square feet of wind (58 miles per hour). Category B is any tree or high-growing brush that after a year of growth would fall within about 8 feet of the conductor at maximum sag (176ºF) and in a static position.
Direction of Travel Road	An existing road that provides a path of access for the transmission line and can be used in its current condition without any improvements or upgrades. Direction of travel maybe include public roads, publicly available state and federal roads, and access roads where BPA owns rights of way or has easements where no improvements will be made to existing roads or fields. No new easements or rights-of-way have to be acquired for direction of travel roads. Direction of travel roads connect all separated road construction activities and creates a continuous transportation plan from every structure to a county road or state highway.
Disconnect switch	A power system switch, manually or motor operated, used for changing connections in a circuit (open or close) or for isolating a circuit or piece of equipment from the source of power.
Easement	The property interest obtained by BPA to use land owned by another, for example, to construct, maintain, and operate a transmission line.
Ecoregion	An area defined by its geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology.
Electric and magnetic fields (EMF)	Fields of force caused by electric voltage and current around the electric wire or conductor when an electric transmission line or any electrical wiring is in operation. Magnetic fields exist only when current is flowing. Electric fields are present in electrical appliances and cords whenever they are plugged in.
Endangered species	Plants or animals that are in danger of extinction through all or a significant portion of their ranges and that have been listed as endangered by the USFWS or the NMFS.

Term	Definition
Environmental assessment (EA)	A document that evaluates the possible environmental effects of a federal agency's proposed action and provides sufficient evidence to determine whether an EIS or a Finding of No Significant Impact is warranted. An EA is one means of compliance with NEPA.
Environmental Justice Populations	Environmental justice populations are low-income and minority populations protected under Executive Order 12898 from disproportionate adverse effects of federal projects.
Erosion	The wearing of soil or rock due to weather or the action of wind and water.
Essential fish habitat (EFH)	EFH is defined in the Magnuson-Stevens Act as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The rules promulgated by the NMFS in 1997 and 2002 further clarify EFH with the following definitions: waters—aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate—sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary—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—stages representing a species' full life cycle.
Evolutionarily significant unit (ESU)	A Pacific salmon population or group of populations that is substantially reproductively isolated from other salmon populations and that represents an important component of the evolutionary legacy of the species.
Forb	Non-grass-like herbaceous plant.
Foreground	Within 0.5 mile of the viewer.
Gauss	A unit of measurement of a magnetic field B, which is also known as the "magnetic flux density" or the "magnetic induction."
Global warming potential	The relative measure of how much heat a greenhouse gas traps in the atmosphere by comparing the amount of heat trapped by a certain mass of the gas in question to the amount of heat trapped by a similar mass of carbon dioxide.
Greenhouse gas	Greenhouse gases are chemical compounds found in the Earth's atmosphere that absorb and trap infrared radiation as heat.
Ground wire	A protective wire strung above the conductors on a transmission line to shield the conductors from lightning; also called shield wire or overhead ground wire.
Guy wire	Steel wire used to support or strengthen a structure.
Habitat	Habitat is an ecological or environmental area that is inhabited by a particular species of animal, plant, or other type of organism. It is the natural environment in which an organism lives, or the physical environment that surrounds a species population.

Term	Definition
Insulators	A bell-shaped device, made of ceramic or other non-conducting material, used to prevent electricity from arcing from the conductors to the structures and traveling to the ground.
Jurisdictional wetlands	Jurisdictional wetlands are those wetlands that are protected either under the federal Clean Water Act Section 404 or under state or local regulations.
Line mile	The number of miles of transmission line.
Lithic scatter	A surface scatter of cultural artifacts and debris that consists entirely of lithic (i.e., stone) tools and chipped stone debris.
Load bank	A device that creates additional electrical demand and dissipates the excess power
Low-income populations	Low-income populations are populations that are at or below the poverty line, as established by the U.S. Department of Health and Human Services
Maintenance area	A former nonattainment area that meets EPA's promulgated standards for the same air quality criteria pollutant.
Merchantable Tree	A tree that is large enough to be of commercial value.
Middle ground	Within 0.5 to 5 miles from the viewer.
Minority populations	Minority populations include all people of the following origins: African-American, American Indian and Alaskan Native, Native Hawaiian or Other Pacific Islander, and Hispanic (of any race).
Mitigation measures	Steps or measures taken to lessen the potential impacts predicted for a resource. They may include reducing the impact, avoiding it completely, or compensating for the impact. Some mitigation, such as adjusting the location of a structure to avoid a special resource, is taken during the design and location process. Other mitigation may be done during construction, such as measures to reduce noise, or after construction, such as reseeding access roads with desirable grasses to help prevent the proliferation of weeds.
Mitigation bank	A mitigation bank is an area formally established for the restoration, creation, enhancement, or preservation of a wetland, stream, or habitat conservation area, and which is designed to offset expected adverse impacts to similar nearby ecosystems. The goal is to replace the exact function and value of the specific wetland habitats that would be adversely affected by a proposed project.
Mitigation credit	Mitigation credits are the units of exchange and are defined as the ecological value associated with 1-acre of a wetland or ecosystem and the linear distance of a stream functioning at the highest possible capacity within the service area of the bank. Credits are evaluated by a Mitigation Bank Review Team.

Term	Definition
National Ambient Air Quality Standards	Under the Clean Air Act, EPA specifies maximum allowable concentrations for each of the six criteria pollutants (carbon monoxide, PM, ozone, sulfur dioxide, lead, and nitrogen dioxide). For each of the six criteria pollutants, the National Ambient Air Quality Standards represent a maximum concentration above which adverse effects on human health may occur.
Nonattainment area	An area that fails to meet the standards established by EPA for an air quality criteria pollutant.
Outages	Events caused by a disturbance on the electrical system that requires BPA to remove a piece of equipment or a portion or all of a transmission line from service. The disturbances can be either natural or human-caused.
Palustrine	Palustrine systems include any inland wetland that lacks flowing water, contains ocean-derived salts in concentrations of less than 0.05 percent, and is non-tidal. Palustrine wetlands are further divided into palustrine emergent (dominated by herbaceous plants), palustrine scrub-shrub (dominated by shrubs and saplings), palustrine forested (dominated by trees) or palustrine open water (little if any vegetation).
Particulate matter (PM)	A criteria air pollutant regulated under the Clean Air Act. Particulate matter includes dust, soot, and other tiny bits of solid materials that are released into, and move around, in the air.
Payment-In-Lieu program	This state run program is similar to a mitigation bank but may involve several projects and can accept funds prior to the work being completed. If a project results in impacts to wetlands and waters, the project can pay into the in-lieu program to mitigate for their impacts. The state then undertakes projects that replace lost wetlands and waters functions through restoration, creation, or enhancement.
PM-10	A measure of particles in the atmosphere with a diameter of less than or equal to 10 micrometers. PM-10 is one of the six criteria pollutants regulated under the Clean Air Act.
Propagule	A plant part that becomes detached from the rest of the plant and grows into a new plant.
Riparian	Riparian areas have distinctive soil and vegetation between a stream or other body of water and the adjacent upland, including wetlands.
Spark-discharge activity	Electric sparks between electrical separations (gaps) in the metal parts of a transmission line. Spark discharges can create noise and possible electromagnetic interference. Spark-discharge activity with transmission lines is often associated aging connecting hardware.
Special-status	Plant or animal species in any of the following categories: threatened or endangered species, proposed threatened or endangered species, candidate species, state listed species, Forest Service sensitive species
Substation	The fenced site that contains the terminal switching and transformation equipment needed at the end of a transmission line so that energy can be supplied to customers.

Term	Definition
Take	Under the ESA, take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.
Temporary equipment mat	Large mats designed to provide ground stabilization under the weight of large construction equipment.
Tensioning sites	Tensioning sites are used for pulling and tightening the conductor and fiber optic cable to the correct tension once they are mounted on the transmission structures. Tensioning sites are located within the right-of-way where possible or just outside of the right-of-way where the line makes a turn or angle.
Threatened species	Any plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which have been listed as threatened by the USFWS or the NMFS.
Transmission line	The structures, insulators, conductors, and other equipment used to transmit electrical power from one point to another.
Type 2 helicopter	Type 2 helicopters are medium helicopters that have seats for 9-14 passengers and have a maximum gross takeoff/landing weight of 6,000-12,500 pounds. By comparison, Type 1 helicopters are larger and they carry 15 or more passengers and have a maximum gross weight of more than 12,501 pounds, while Type 3 helicopters are smaller, carrying 4-8 passengers with a maximum weight of 6,000 pounds (National Wildfire Coordinating Group 2013).
View	A scene observed from a given vantage point.
Viewers	Viewers include those people who have views of the transmission line. For this project, they include residents, park visitors, employees, motorists (drivers and passengers), rail passengers, bicyclists, and pedestrians.
Visually sensitive locations	Visually sensitive locations have been identified based on their visual quality, uniqueness, cultural significance, or viewer characteristics (Sevi 1986). For this project, visually sensitive locations include residences and parks.

Term	Definition
Wetlands	Wetlands, for the purposes of the Clean Water Act, must meet a three-parameter approach that includes the presence of hydrophytic (water-loving) vegetation, wetland hydrology, and hydric soils (soils subject to saturation/inundation). All three parameters must be present, under normal circumstances, and the wetland must be connected to or have a significant nexus with "waters of the United States" for an area to be designated as a jurisdictional wetland under the Clean Water Act.
Zoning	Dividing mapped areas into zones or sections reserved for different purposes, such as residences, businesses, manufacturing, etc.

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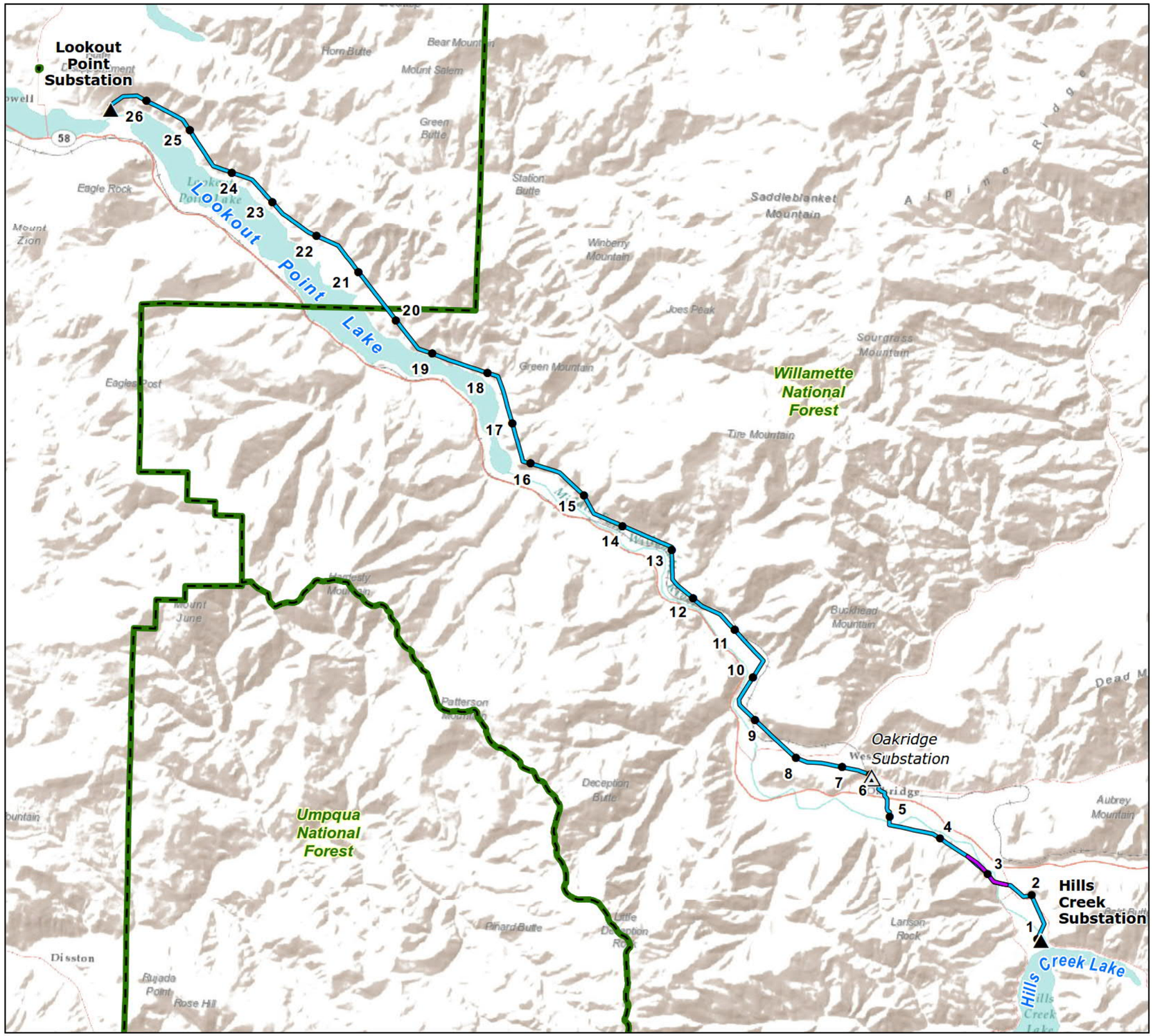
Appendix A. Project Maps

The maps in Appendix A illustrate the alignment and project elements included in the Proposed Action, as well as land ownership, U.S. Forest Service land use allocations, and riparian reserve classifications.

Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR



- Hills Creek - Lookout Point Transmission Line
- BPA Transmission Tower (First of Mile)
- Transmission Line Reroute
- Reroute Tower
- BPA Substation
- Non-BPA Substation
- Bureau of Land Management
- Corps of Engineers
- State Land

BPA Planned Access Roads

- New Construction
- New Construction (trail)
- Reconstruction
- Reconstruction (trail)
- Improvement
- Existing (no road work)
- Acquire Road Easement

- B — Temporary Bridge
- C — Culvert
- FO — Ford
- G — Gate

Trees to be Removed
Species, DBH, Count

- AS (Quaking Aspen), 10-14in
- BM (Bigleaf Maple), 10-14in
- CH (Cherry spp), 10-14in
- CW (Cottonwood), 10-14in
- DF (Douglas Fir), 10-14in
- GF (Grand Fir), 10-14in
- IC (Incense Cedar), 10-14in
- OA (Oregon Ash), 10-14in
- OT (Other Species), 10-14in
- PM (Pacific Madrone), 10-14in
- RA (Red Alder), 10-14in
- RC (Western Red Cedar), 10-14in
- WH (Western Hemlock), 10-14in

USFS Management Designation

- 11A, Matrix land
- 11C, Matrix land
- 11D, Matrix land
- 11E, Matrix land
- 11F, Matrix land
- 12A, Administratively withdraw
- 13A, Administratively withdraw
- 13B, Administratively withdraw
- 14A, Matrix land
- 16A, Late Successional Reserve
- 16B, Late Successional Reserve
- 6E, Congressionally withdrawn
- 9C, Administratively withdraw
- 9D, Administratively withdraw
- WA, Administratively withdraw

USFS Riparian Classification

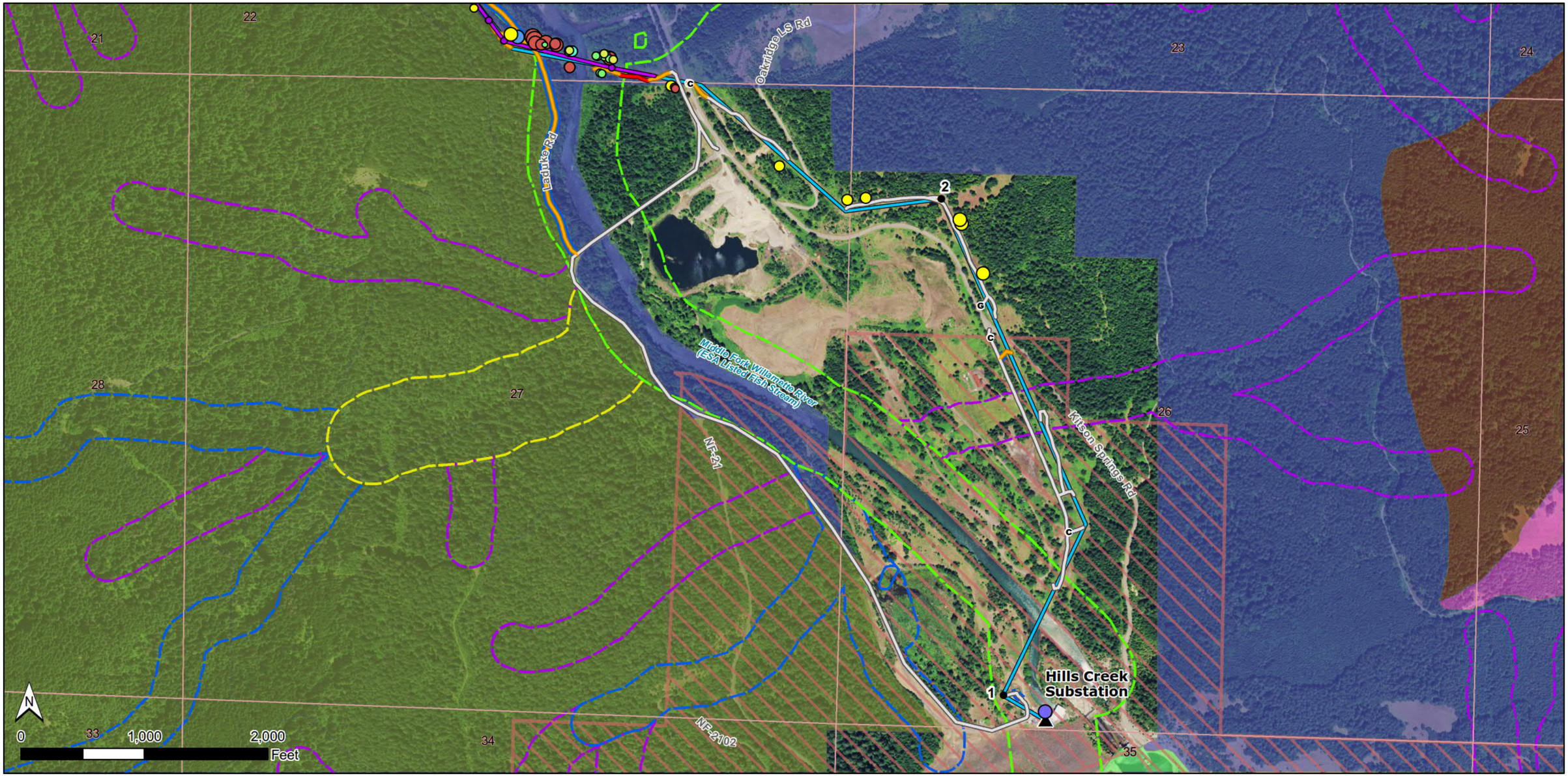
- Riparian Class 1
- Riparian Class 2
- Riparian Class 3
- Riparian Class 4

November 2015

N

0 2 4 Miles

Bonneville POWER ADMINISTRATION



Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR

October 2015

Bonneville Power Administration

- Hills Creek - Lookout Point Transmission Line
- BPA Transmission Tower (First of Mile)
- Transmission Line Reroute
- Reroute Tower
- BPA Substation
- Corps of Engineers

BPA Planned Access Roads

- New Construction
- Improvement
- Existing (no road work)
- Acquire Road Easement

- c Culvert
- g Gate

Trees to be Removed

- BM, 10-14in (10)
- CW, 10-14in (2)
- CW, 15-20in (4)
- CW, 21-28in (4)
- CW, 29-48in (2)
- DF, 10-14in (2)
- DF, 15-20in (4)
- DF, 21-28in (4)
- IC, 15-20in (1)
- RA, 2-9in (1)
- RA, 10-14in (16)
- RA, 15-20in (2)
- RC, 21-28in (2)
- WH, 21-28in (1)

USFS Management Designation

- 11D, Matrix land
- 11E, Matrix land
- 11F, Matrix land
- 16A, Late Successional Reserve
- WA, Administratively withdraw

USFS Riparian Classification

- Riparian Class 1
- Riparian Class 2
- Riparian Class 3
- Riparian Class 4

Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014

Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR

October 2015

Bonneville Power Administration

Hills Creek - Lookout Point Transmission Line

BPA Transmission Tower (First of Mile)

Transmission Line Reroute

Reroute Tower

BPA Planned Access Roads

- New Construction
- Reconstruction
- Improvement
- Existing (no road work)
- Acquire Road Easement

C Culvert

G Gate

Trees to be Removed

- BM, 2-9in (12)
- BM, 10-14in (14)
- CW, 2-9in (20)
- CW, 10-14in (18)
- CW, 15-20in (23)
- CW, 21-28in (15)
- DF, 2-9in (5)
- DF, 10-14in (8)
- DF, 15-20in (14)
- DF, 21-28in (1)
- GF, 21-28in (2)
- IC, 10-14in (5)
- IC, 15-20in (2)
- RA, 2-9in (1)
- RA, 10-14in (9)
- RA, 15-20in (6)

USFS Management Designation

- 11F, Matrix land
- 13B, Administratively withdraw
- 16A, Late Successional Reserve

USFS Riparian Classification

- Riparian Class 1
- Riparian Class 2
- Riparian Class 3
- Riparian Class 4

Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014

N

0 1,000 2,000 Feet

Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR

October 2015

Bonneville Power Administration

Hills Creek - Lookout Point Transmission Line

BPA Transmission Tower (First of Mile)

Non-BPA Substation

BPA Planned Access Roads

- Reconstruction
- Improvement
- Existing (no road work)
- Acquire Road Easement

c Culvert

G Gate

Trees to be Removed

- BM, 2-9in (9)
- BM, 10-14in (2)
- CW, 2-9in (1)
- CW, 10-14in (5)
- CW, 15-20in (1)
- DF, 15-20in (1)
- DF, 21-28in (2)
- GF, 21-28in (1)
- OT, 10-14in (7)

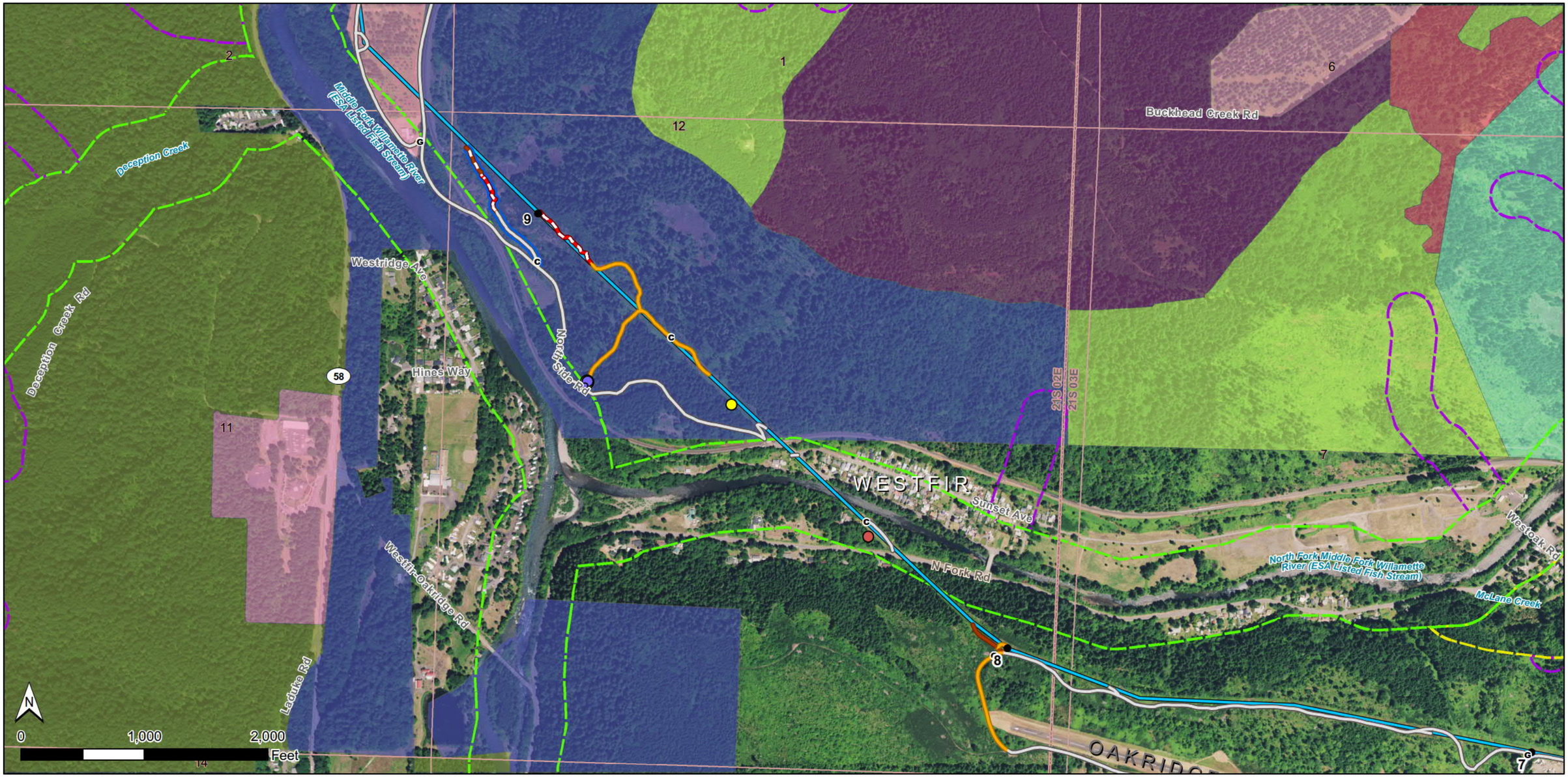
USFS Management Designation

- 11F, Matrix land
- 12A, Administratively withdraw
- 13A, Administratively withdraw
- 16A, Late Successional Reserve

USFS Riparian Classification

- Riparian Class 1
- Riparian Class 2
- Riparian Class 3
- Riparian Class 4

Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014



Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR

October 2015

Bonneville Power Administration

- Hills Creek - Lookout Point Transmission Line
- BPA Transmission Tower (First of Mile)

BPA Planned Access Roads

- New Construction (trail)
- Reconstruction
- Reconstruction (trail)
- Improvement
- Existing (no road work)
- Acquire Road Easement

- c Culvert
- g Gate

Trees to be Removed

- CW, 15-20in (1)
- DF, 15-20in (1)
- DF, 21-28in (1)
- RC, 2-9in (1)
- RC, 15-20in (1)

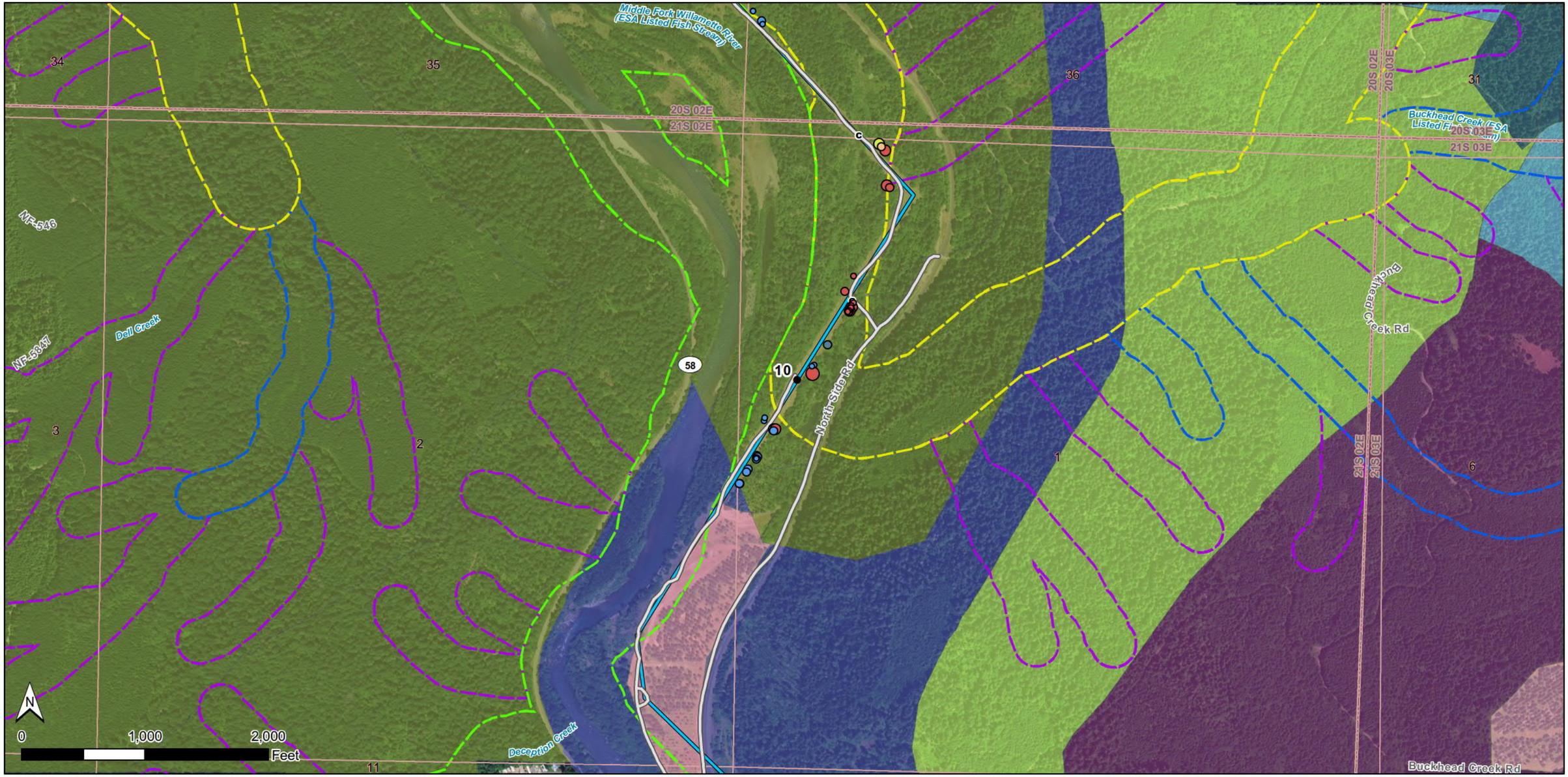
USFS Management Designation

- 11C, Matrix land
- 11F, Matrix land
- 13B, Administratively withdraw
- 14A, Matrix land
- 16A, Late Successional Reserve
- 6E, Congressionally withdrawn
- 9C, Administratively withdraw

USFS Riparian Classification

- Riparian Class 1
- Riparian Class 2
- Riparian Class 4

Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014



Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR

October 2015

Bonneville Power Administration

Hills Creek - Lookout Point Transmission Line

BPA Transmission Tower (First of Mile)

BPA Planned Access Roads

- Existing (no road work)
- Acquire Road Easement

c Culvert

g Gate

Trees to be Removed

- AS, 10-14in (1)
- BM, 15-20in (1)
- CW, 2-9in (11)
- CW, 10-14in (6)
- CW, 15-20in (5)
- CW, 21-28in (1)
- OA, 10-14in (1)
- RA, 15-20in (1)
- WH, 2-9in (42)
- WH, 10-14in (11)

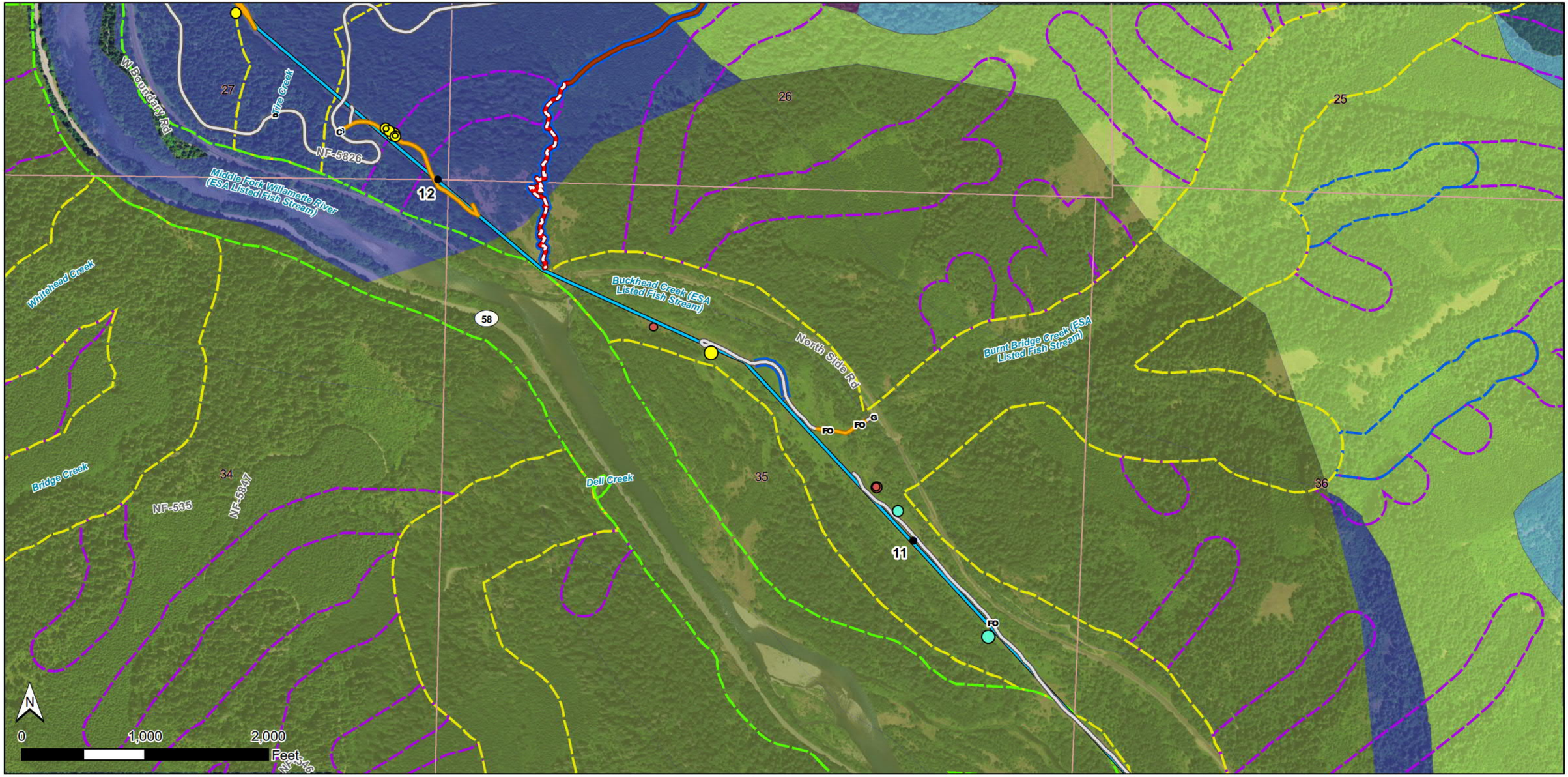
USFS Management Designation

- 11A, Matrix land
- 11C, Matrix land
- 11F, Matrix land
- 13B, Administratively withdraw
- 14A, Matrix land
- 16A, Late Successional Reserve
- 16B, Late Successional Reserve

USFS Riparian Classification

- Riparian Class 1
- Riparian Class 2
- Riparian Class 3
- Riparian Class 4

Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014



Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR

October 2015

Bonneville Power Administration

Hills Creek - Lookout Point Transmission Line

BPA Transmission Tower (First of Mile)

Corps of Engineers

BPA Planned Access Roads

- New Construction (trail)
- Reconstruction
- Improvement
- Existing (no road work)
- Acquire Road Easement

- B Temporary Bridge
- C Culvert
- FO Ford
- G Gate

Trees to be Removed

- CW, 10-14in (2)
- CW, 15-20in (2)
- DF, 2-9in (2)
- DF, 15-20in (4)
- DF, 21-28in (3)
- IC, 15-20in (1)
- IC, 21-28in (1)

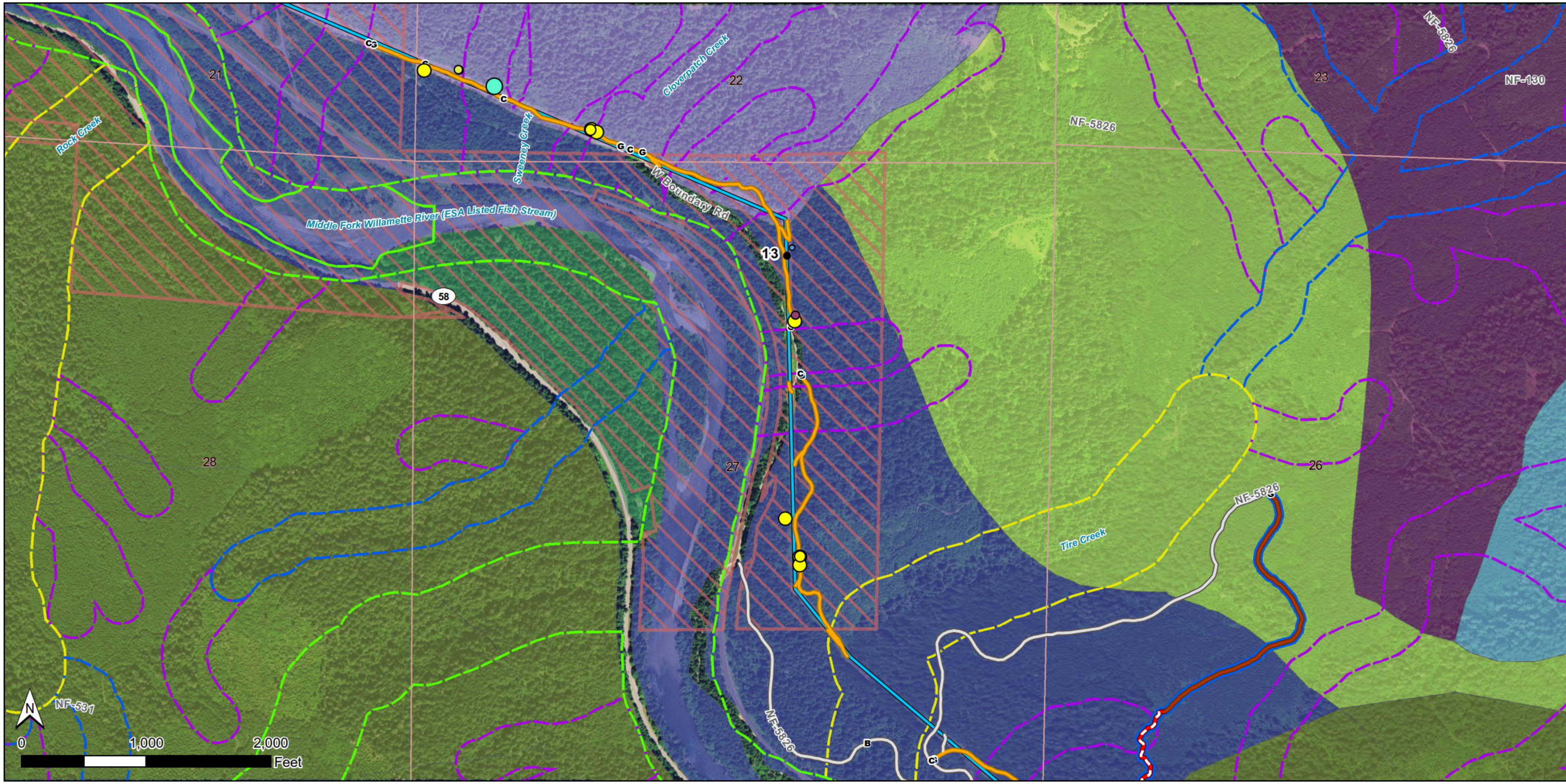
USFS Management Designation

- 11A, Matrix land
- 11C, Matrix land
- 11F, Matrix land
- 14A, Matrix land
- 16A, Late Successional Reserve
- 16B, Late Successional Reserve

USFS Riparian Classification

- Riparian Class 1
- Riparian Class 2
- Riparian Class 3
- Riparian Class 4

Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014



Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR

October 2015

Bonneville Power Administration

- Hills Creek - Lookout Point Transmission Line
- BPA Transmission Tower (First of Mile)
- Corps of Engineers

BPA Planned Access Roads

- New Construction
- New Construction (trail)
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- Improvement
- Existing (no road work)
- Acquire Road Easement

- B Temporary Bridge
- C Culvert
- G Gate

Trees to be Removed

- BM, 10-14in (2)
- DF, 15-20in (2)
- DF, 21-28in (7)
- IC, 29-48in (1)
- PM, 10-14in (1)
- WH, 2-9in (5)

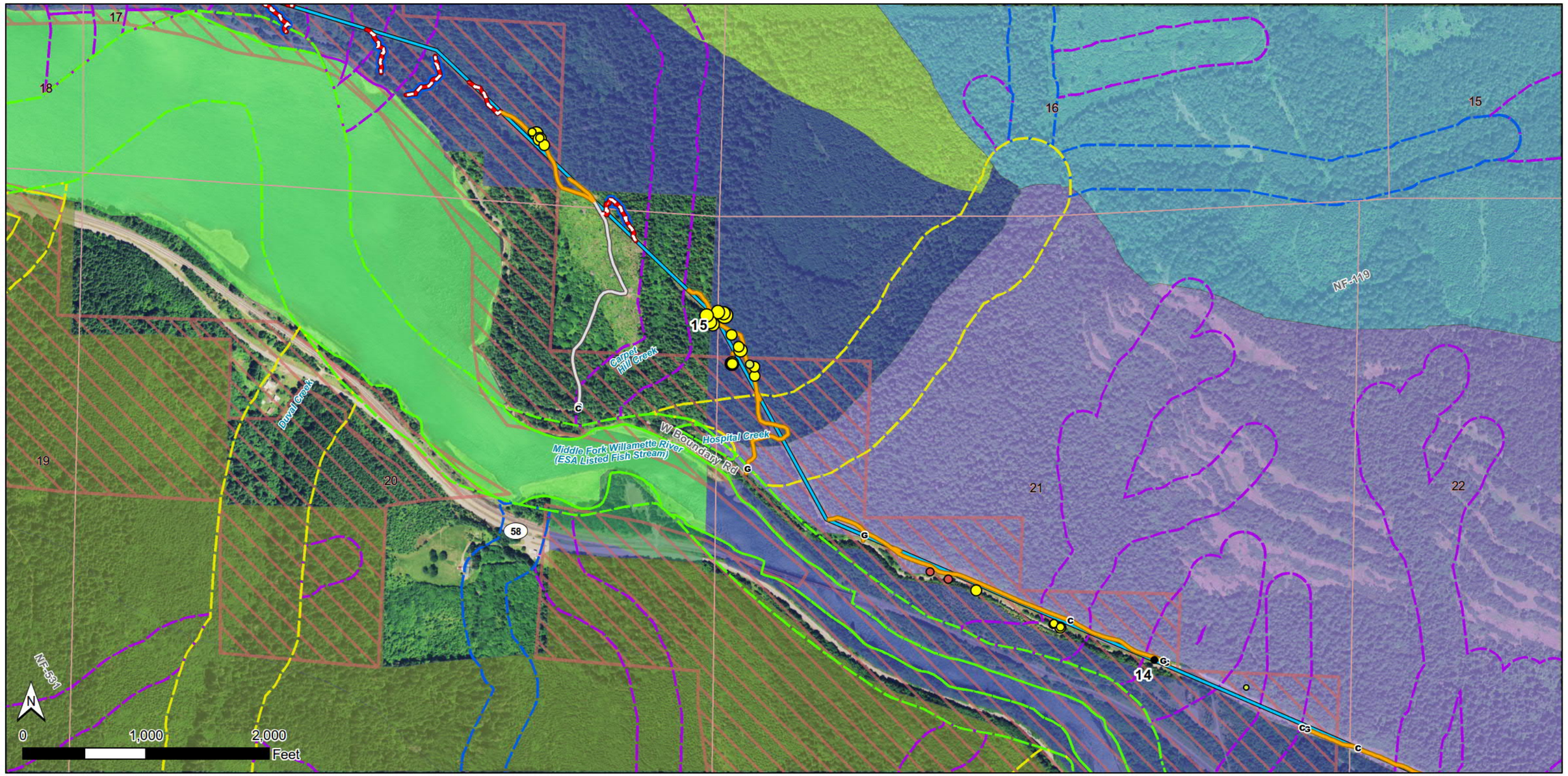
USFS Management Designation

- 11A, Matrix land
- 11C, Matrix land
- 11F, Matrix land
- 12A, Administratively withdraw
- 14A, Matrix land
- 16A, Late Successional Reserve
- 9D, Administratively withdraw

USFS Riparian Classification

- Riparian Class 1
- Riparian Class 2
- Riparian Class 3
- Riparian Class 4

Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014



Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR

October 2015

Bonneville Power Administration

Hills Creek - Lookout Point Transmission Line

BPA Transmission Tower (First of Mile)

Corps of Engineers

BPA Planned Access Roads

- New Construction (trail)
- Improvement
- Existing (no road work)
- Acquire Road Easement

c Culvert

g Gate

Trees to be Removed

- BM, 2-9in (7)
- BM, 10-14in (1)
- CW, 10-14in (2)
- DF, 10-14in (5)
- DF, 15-20in (11)
- DF, 21-28in (9)
- DF, 29-48in (1)

USFS Management Designation

- 11A, Matrix land
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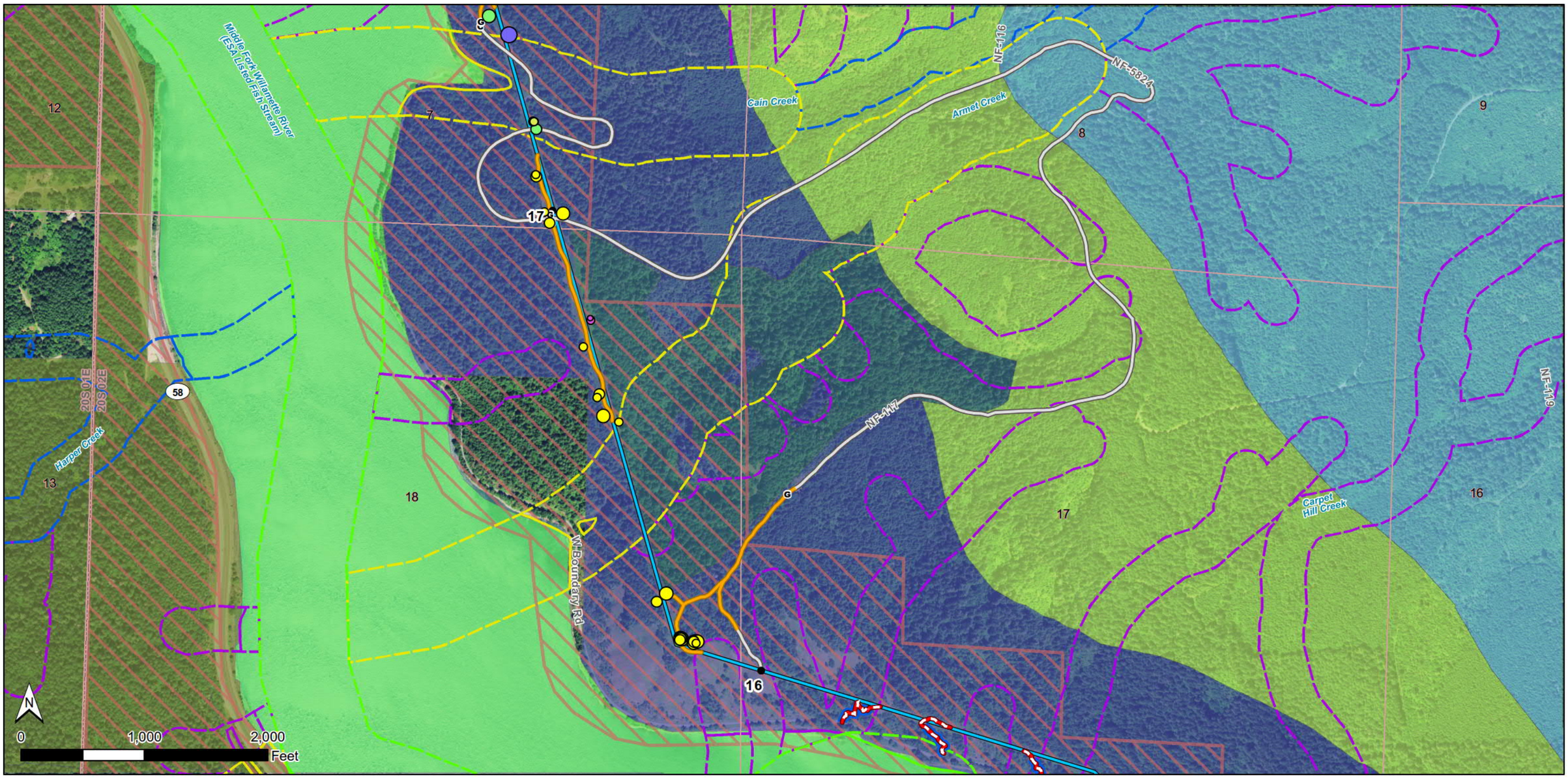
- Riparian Class 3
- Riparian Class 4

Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014



Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR

October 2015

Bonneville Power Administration

Hills Creek - Lookout Point Transmission Line

BPA Transmission Tower (First of Mile)

Corps of Engineers

BPA Planned Access Roads

- New Construction (trail)
- Improvement
- Existing (no road work)
- Acquire Road Easement

c Culvert

G Gate

Trees to be Removed

- BM, 10-14in (1)
- CH, 2-9in (2)
- CH, 10-14in (1)
- DF, 10-14in (6)
- DF, 15-20in (10)
- DF, 21-28in (10)
- RA, 10-14in (3)
- RA, 15-20in (1)
- RA, 21-28in (1)
- RC, 29-48in (1)

USFS Management Designation

- 11A, Matrix land
- 11C, Matrix land
- 11F, Matrix land
- 16A, Late Successional Reserve
- 16B, Late Successional Reserve
- WA, Administratively withdraw

USFS Riparian Classification

- Riparian Class 1
- Riparian Class 2
- Riparian Class 3
- Riparian Class 4

Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014

Hills Creek - Lookout Point Transmission Line Rebuild Project

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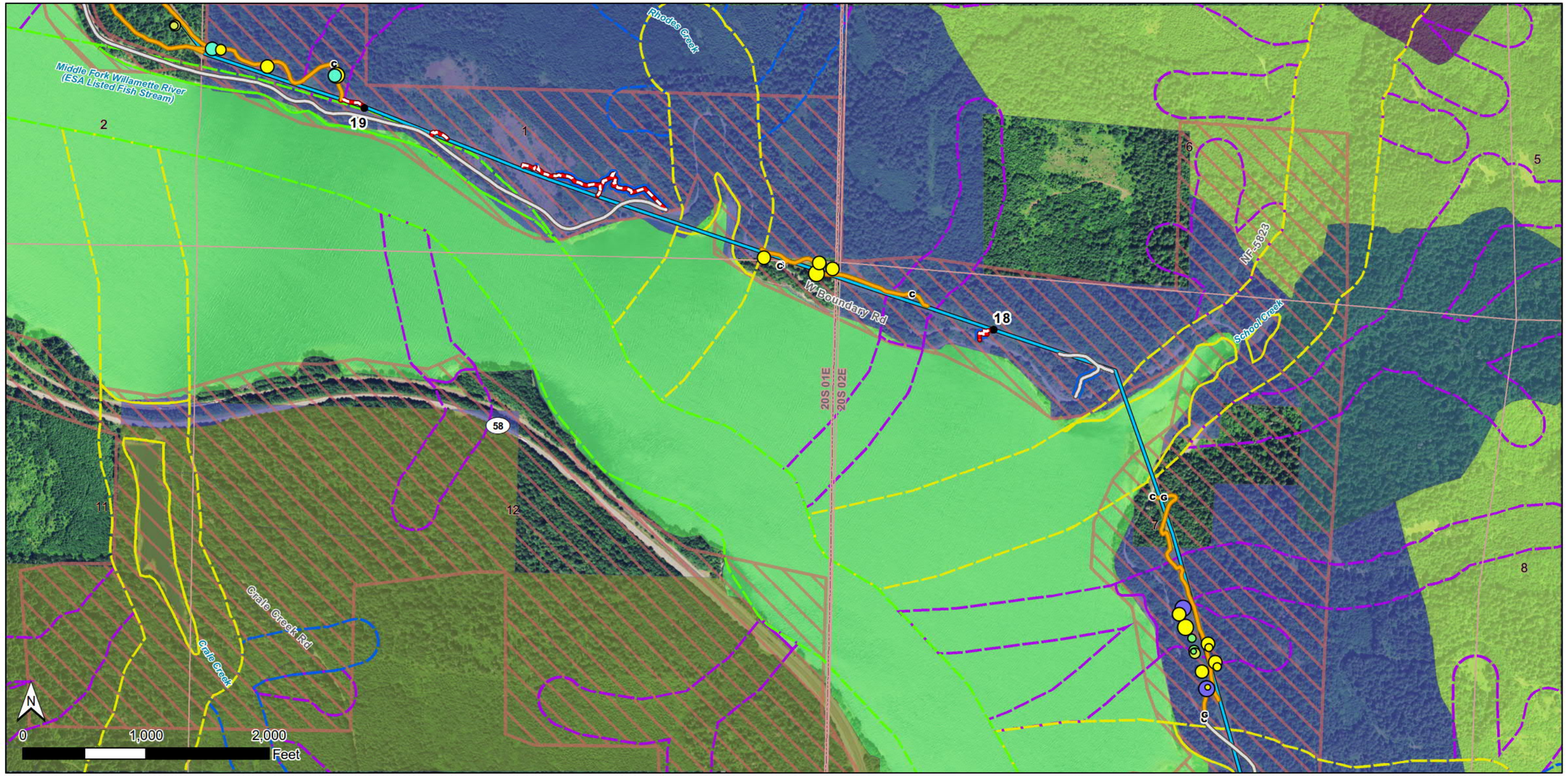


Hills Creek - Lookout Point Transmission Line

BPA Transmission Tower (First of Mile)

Corps of Engineers

BPA Planned Access Roads

- New Construction (trail)
- Improvement
- Existing (no road work)
- Acquire Road Easement

c Culvert

G Gate

Trees to be Removed

- BM, 10-14in (4)
- BM, 15-20in (3)
- DF, 2-9in (1)
- DF, 10-14in (2)
- DF, 15-20in (1)
- DF, 21-28in (8)
- DF, 29-48in (3)
- IC, 21-28in (2)
- RA, 2-9in (1)
- RA, 10-14in (1)
- RA, 15-20in (1)
- RC, 29-48in (2)

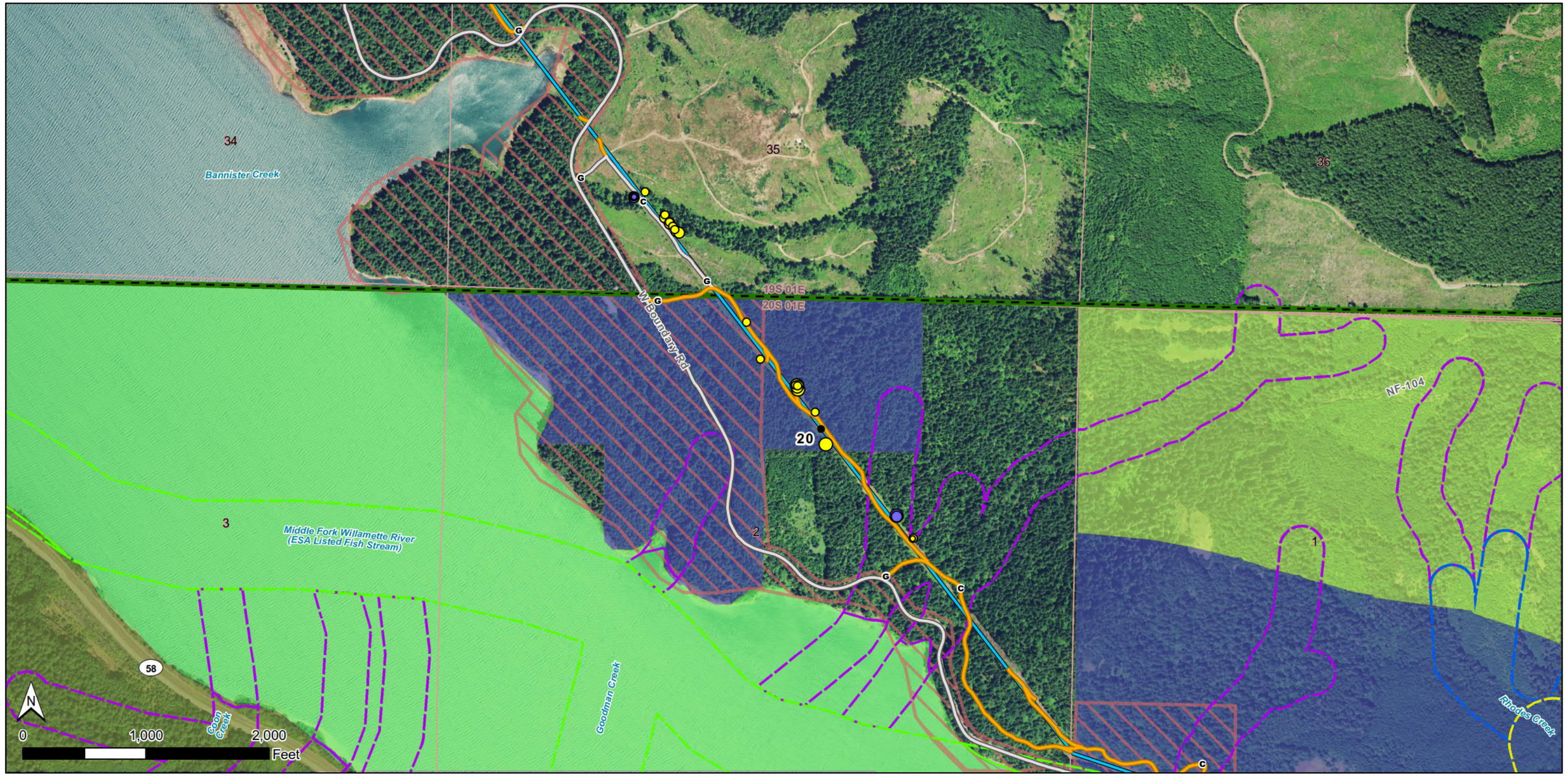
USFS Management Designation

- 11C, Matrix land
- 11F, Matrix land
- 14A, Matrix land
- 16A, Late Successional Reserve
- 16B, Late Successional Reserve
- WA, Administratively withdraw

USFS Riparian Classification

- Riparian Class 1
- Riparian Class 2
- Riparian Class 3
- Riparian Class 4

Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014



Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR

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Bonneville Power Administration

- Hills Creek - Lookout Point Transmission Line
- BPA Transmission Tower (First of Mile)
- Corps of Engineers

BPA Planned Access Roads

- Improvement
- Existing (no road work)
- Acquire Road Easement

- c Culvert
- G Gate

Trees to be Removed

- DF, 2-9in (2)
- DF, 10-14in (11)
- DF, 15-20in (7)
- DF, 21-28in (3)
- RC, 2-9in (1)
- RC, 10-14in (4)
- RC, 15-20in (2)
- RC, 21-28in (1)

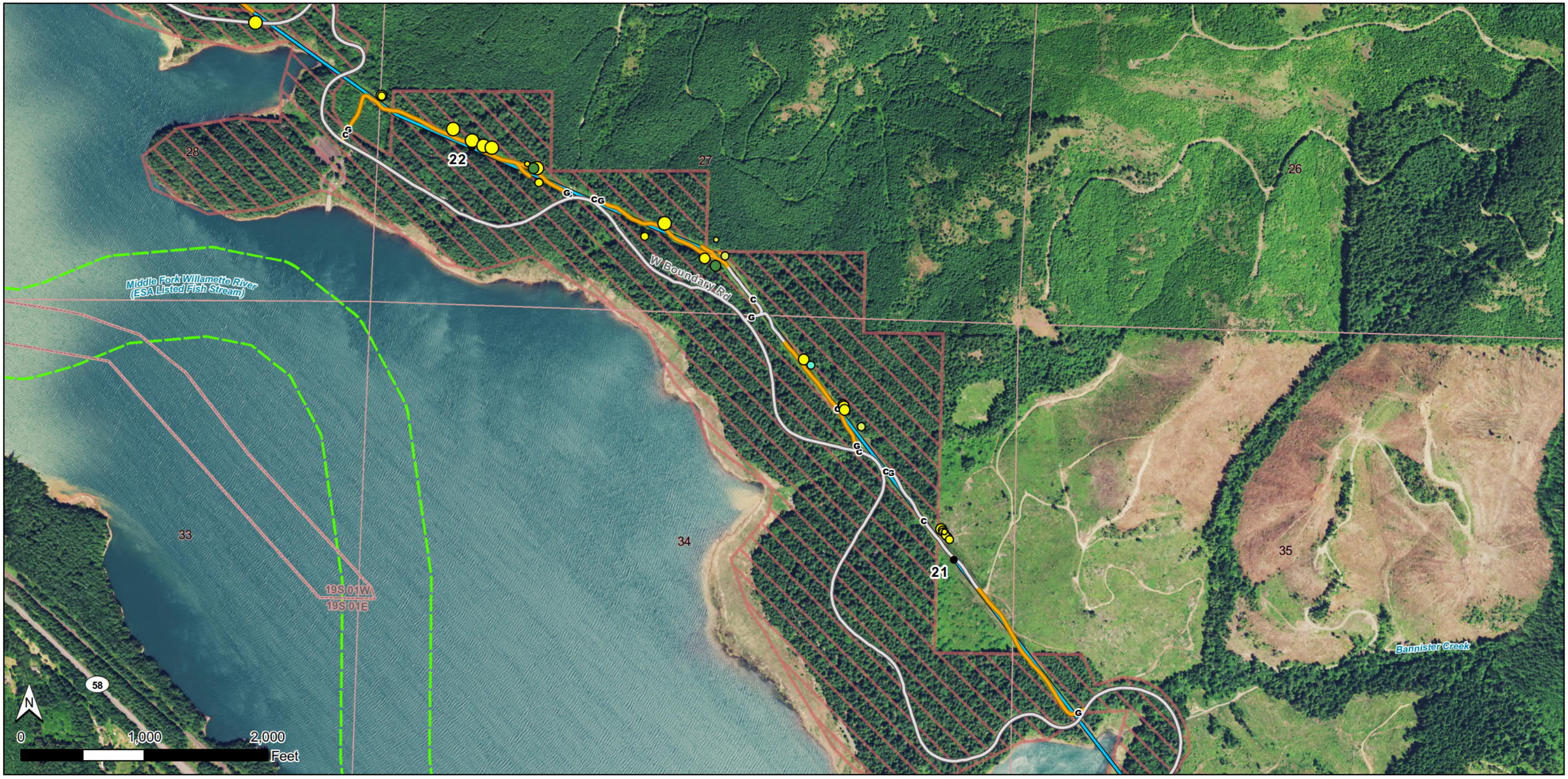
USFS Management Designation

- 11C, Matrix land
- 11F, Matrix land
- 14A, Matrix land
- 16A, Late Successional Reserve
- WA, Administratively withdraw

USFS Riparian Classification

- Riparian Class 1
- Riparian Class 2
- Riparian Class 3
- Riparian Class 4

Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014



Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR

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Bonneville Power Administration

Hills Creek - Lookout Point Transmission Line

BPA Transmission Tower (First of Mile)

Corps of Engineers

BPA Planned Access Roads

- Improvement
- Existing (no road work)
- Acquire Road Easement

c Culvert

g Gate

Trees to be Removed

- BM, 2-9in (1)
- BM, 10-14in (5)
- DF, 2-9in (2)
- DF, 10-14in (12)
- DF, 15-20in (7)
- DF, 21-28in (7)
- GF, 15-20in (2)
- IC, 10-14in (2)

USFS Riparian Classification

Riparian Class 1

Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014

Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR

October 2015

Bonneville Power Administration

Hills Creek - Lookout Point Transmission Line

BPA Transmission Tower (First of Mile)

Corps of Engineers

State Land

BPA Planned Access Roads

Improvement

Existing (no road work)

Acquire Road Easement

c Culvert

G Gate

Trees to be Removed

BM, 10-14in (4)

BM, 15-20in (5)

CW, 2-9in (4)

CW, 10-14in (1)

DF, 2-9in (2)

DF, 10-14in (20)

DF, 15-20in (13)

DF, 21-28in (2)

USFS Riparian Classification

Riparian Class 1

Riparian Class 2

Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014

Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR

October 2015

Bonneville Power Administration

Hills Creek - Lookout Point Transmission Line

BPA Transmission Tower (First of Mile)

Corps of Engineers

State Land

BPA Planned Access Roads

- Improvement
- Existing (no road work)
- Acquire Road Easement

c Culvert

G Gate

Trees to be Removed

- BM, 2-9in (204)
- BM, 10-14in (2)
- DF, 2-9in (2)
- DF, 10-14in (5)
- DF, 15-20in (5)
- DF, 21-28in (8)
- DF, 29-48in (2)
- GF, 10-14in (3)
- GF, 15-20in (1)
- IC, 15-20in (2)
- IC, 21-28in (2)
- IC, 29-48in (1)
- PM, 2-9in (6)
- PM, 10-14in (3)
- RC, 10-14in (3)
- RC, 15-20in (3)
- WH, 15-20in (1)

USFS Riparian Classification

Riparian Class 1

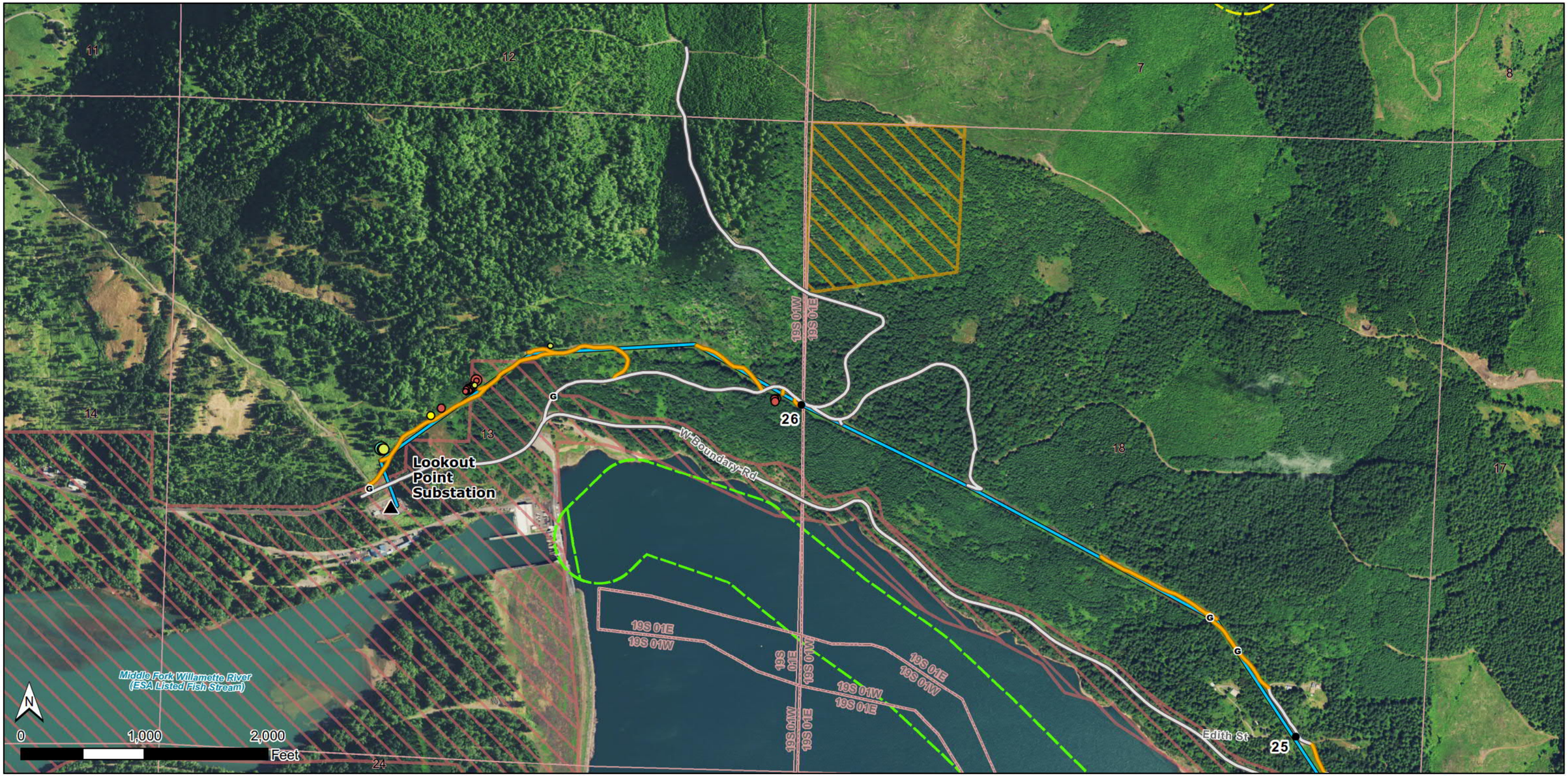
Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014

Hills Creek - Lookout Point Transmission Line Rebuild Project

Lane County, OR

October 2015

Bonneville Power Administration



- Hills Creek - Lookout Point Transmission Line
- BPA Transmission Tower (First of Mile)
- BPA Substation
- Bureau of Land Management
- Corps of Engineers

BPA Planned Access Roads

- Improvement
- Existing (no road work)
- Acquire Road Easement

G Gate

Trees to be Removed

- BM, 2-9in (4)
- BM, 15-20in (1)
- CW, 2-9in (44)
- CW, 10-14in (5)
- CW, 15-20in (1)
- DF, 10-14in (1)
- IC, 15-20in (1)
- IC, 21-28in (1)

USFS Riparian Classification

- Riparian Class 1
- Riparian Class 2

Aerial Imagery Source: National Agriculture Imagery Program (NAIP) 2014

Appendix B. Vegetation Data Tables

Table B-1. Special-Status Plant Species Potentially Occurring Within and Adjacent to the Transmission Line Right-of-Way and Access Road Areas

Common name	Scientific name	Federal status	State status	Ecoregion		Willamette National Forest	Habitat
				WC	WV		
Tall agoseris	*Agoseris elata*	--	--	X	--	S	mesic meadows, dry meadows
Hells Canyon rockcress	*Arabis hastatula*	SOC	--	X	--	D	rocky outcrops
Shasta arnica	*Arnica viscosa*	--	--	X	--	S	rocky outcrops
Grass-fern	*Asplenium septentrionale*	--	--	X	--	S	rocky outcrops
Mountian grape-fern	*Botrychium montanum*	SOC	--	X	--	D	riparian zones, coniferous forest
Pumice grape-fern	*Botrychium pumicola*	--	T	X	--	S	alpine
Brewer's reedgrass	*Calamagrostis breweri*	--	--	X	--	D	mesic meadows, riparian zones
Capitate sedge	*Carex capitata*	--	--	X	--	S	wet meadows
Lesser panicled sedge	*Carex diandra*	--	--	X	--	D	bog
Slender sedge	*Carex lasiocarpa var. americana*	--	--	X	--	S	fen, bog, wet meadows
Pale sedge	*Carex livida*	--	--	X	--	S	wet meadows
Alaskan single-spiked sedge	*Carex scirpoidea var. stenochlaena*	--	--	X	--	D	rocky outcrops
Native sedge	*Carex vernacula*	--	--	X	--	S	wet meadows, riparian zones alpine
Cliff paintbrush	*Castilleja rupicola*	SOC	--	X	--	--	alpine and subalpine
Tall bugbane	*Cimicifuga elata*	--	C	X	X	--	moist woods and forest
Three-leaf goldthread	*Coptis trifolia*	--	--	X	--	S	coniferous forest
Cold-water corydalis	*Corydalis aquae-gelidae*	SOC	C	X	--	D	riparian zones, coniferous forest
Willamette Valley larkspur	*Delphinium oreganum*	SOC	C	X	X	--	native wet prairie
Peacock larkspur	*Delphinium pavonaceum*	SOC	LE	X	X	--	flat areas in moist, silty soils
Short-seeded waterwort	*Elatine brachysperma*	--	--	X	--	S	shallow waters, shores, and mudflats
Willamette daisy	*Erigeron decumbens var. decumbens*	LE	LE		X	--	native prairie
Gorman's aster	*Eucephalus gormanii*	--	--	X	--	D	rocky outcrops
Wayside aster	*Eucephalus vialis*	SOC	LT	X	X	S	coniferous forest
Umpqua swertia	*Frasera umpquaensis*	--	C	X	--	D	mesic meadows
Newberry's gentian	*Gentiana newberryi*	--	--	X	--	D	mesic meadows
Shaggy hawkweed	*Hieracium horridum*	--	--	X	--	D	rocky outcrops subalpine
Shaggy horkelia	*Horkelia congesta ssp. Congesta*	SOC	C	X	X	--	wet prairie

Table B-1. Special-Status Plant Species Potentially Occurring Within and Adjacent to the Transmission Line Right-of-Way and Access Road Areas (continued)

Common name	Scientific name	Federal status	State status	Ecoregion		Willamette National Forest	Habitat
				WC	WV		
alifornia globe-mallow	*Iliamna latibracteata*	--	--	X	--	S	coniferous forest, riparian zones
Thin-leaved peavine	*Lathyrus holochlorus*	SOC	--	X	X	D	dry meadows
Columbia lewisia	*Lewisia columbiana var. columbiana*	--	--	X	--	D	rocky slopes, scree
Bradshaw's desert-parsley	*Lomatium bradshawii*	LE	LE	--	X	--	native
Kincaid's lupine	*Lupinus sulphureus ssp. Kincaidii*	LT	LT	--	X	--	native prairie and forests
Bog club-moss	*Lycopodiella inundata*	--	--	X	--	D	wet meadows
Ground cedar	*Lycopodium complanatum*	--	--	X	--	D	coniferous forest
Howell's montia	*Montia howellii*	--	C	X	X	--	wet meadows
Adder's-tongue	*Ophioglossum pusillum*	--	--	X	--	D	wet meadows
Coffee fern	*Pellaea andromedaefolia*	--	--	X	--	S	rocky outcrops
Whitebark pine	*Pinus albicaulis*	C	--	X	--	D	alpine
Timber bluegrass	*Poa rhizomata*	--	--	X	--	D	coniferous forest
California sword-fern	*Polystichum californicum*	--	--	X	--	D	rocky outcrops
Villous Cinqefoil	*Potentilla villosa*	--	--	X	--	D	rocky outcrops
White beakrush	*Rhynchospora alba*	--	--	X	--	D	wet meadows
Thompson's mistmaiden	*Romanzoffia thompsonii*	--	--	X	--	D	rocky slopes
Lowland Tootcup	*Rotala ramosior*	--	--	X	--	S	riparian zones, wet meadows
Scheuchzeria	*Scheuchzeria palustris var. americana*	--	--	X	--	D	wet meadows
Water clubrush	*Schoenoplectus subterminalis*	--	--	X	--	D	ponds
Meadow checkermallow	*Sidalcea campestris*	SOC	C	--	X	--	meadows
Hitchcock's blue-eyed grass	*Sisyrinchium hitchcockii*	SOC	C	--	X	--	native prairie
Pale blue-eyed grass	*Sisyrinchium sarmentosum*	--	--	X	--	S	mesic meadows, dry meadows
Lesser bladderwort	*Utricularia minor*	--	--	X	--	D	standing water
Northern bladderwort	*Utricularia ochroleuca*	--	--	X	--	D	standing water
Dotted water-meal	*Wolffia borealis*	--	--	X	--	S	standing water
Columbia Water-meal	*Wolffia columbiana*	--	--	X	--	S	standing water
Fungus	*Alvopa alexsmithii*	--	--	X	--	D	coniferous forest
Fungus	*Boletus pulcherrimus*	--	--	X	--	D	coniferous forest
Fungus	*Bridgeoporus nobilissimus*	--	--	X	--	D	coniferous forest
Fungus	*Choiromyces venosus*	--	--	X	--	S	coniferous forest

Table B-1. Special-Status Plant Species Potentially Occurring Within and Adjacent to the Transmission Line Right-of-Way and Access Road Areas (continued)

Common name	Scientific name	Federal status	State status	Ecoregion		Willamette National Forest	Habitat
				WC	WV		
Fungus	*Cortinarium barlowensis*	--	--	X	--	D	coniferous forest
Fungus	*Cystangium idahoensis*	--	--	X	--	D	coniferous forest
Fungus	*Gastroboletus vividus*	--	--	X	--	D	coniferous forest
Fungus	*Gymnomyces fragrans*	--	--	X	--	D	coniferous forest
Fungus	*Helvella crassitunicata*	--	--	X	--	D	coniferous forest
Fungus	*Pseudorhizina californica*	--	--	X	--	D	coniferous forest
Fungus	*Ramaria amyloidea*	--	--	X	--	D	coniferous forest
Fungus	*Ramaria spinulosa var. diminutiva*	--	--	X	--	S	coniferous forest
Fungus	*Rhizopogon exiguous*	--	--	X	--	S	coniferous forest
Fungus	*Rhizopogon inquinatus*	--	--	X	--	D	coniferous forest
Fungus	*Stagnicola perplexa*	--	--	X	--	S	coniferous forest
Lichen	*Bryoria subcana*	--	--	X	--	D	coniferous forest
Lichen	*Lobaria linita*	--	--	X	--	D	rocky outcrops
Lichen	*Microcalcium arenarium*	--	--	X	--	D	coniferous forest
Lichen	*Pseudocyphellaria mallota*	--	--	X	--	D	coniferous forest
Lichen	*Ramalina pollinaria*	--	--	X	--	D	coniferous forest, riparian zones
Lichen	*Stereocaulon spathuliferum*	--	--	X	--	D	coniferous forest
Lichen	*Tholurna dissimilis*	--	--	X	--	D	coniferous forest
Bryophyte	*Anastrophyllum minutum*	--	--	X	--	D	rocky outcrops, wet
Bryophyte	*Andreaea schofieldiana*	--	--	X	--	S	rocky outcrops
Bryophyte	*Anthelia julacea*	--	--	X	--	S	rocky outcrops, wet meadows, riparian zones
Bryophyte	*Barbilophozia lycopodioides*	--	--	X	--	D	rocky outcrops, wet
Bryophyte	*Blepharostoma arachnoideum*	--	--	X	--	S	coniferous forest
Bryophyte	*Calypogeia sphagnicola*	--	--	X	--	D	wet meadows
Bryophyte	*Cephaloziella spinigera*	--	--	X	--	S	wet meadows
Bryophyte	*Encalypta brevicollis*	--	--	X	--	S	montane soil
Bryophyte	*Encalypta brevipes*	--	--	X	--	S	rocky outcrops
Bryophyte	*Gymnomitrion concinnatum*	--	--	X	--	S	rocky outcrops
Bryophyte	*Haplomitrium hookeri*	--	--	X	--	D	soil
Bryophyte	*Harpanthus flotovianus*	--	--	X	--	D	wet meadows
Bryophyte	*Jungermannia polaris*	--	--	X	--	D	rocky outcrops, riparian zones, aquatic

Table B-1. Special-Status Plant Species Potentially Occurring Within and Adjacent to the Transmission Line Right-of-Way and Access Road Areas (continued)

Common name	Scientific name	Federal status	State status	Ecoregion		Willamette National Forest	Habitat
				WC	WV		
Bryophyte	*Lophozia laxa*	--	--	X	--	D	bog
Bryophyte	*Marsupella condensa*	--	--	X	--	S	alpine peat
Bryophyte	*Marsupella emarginata var. aquatica*	--	--	X	--	D	riparian zones, aquatic
Bryophyte	*Marsupella sparsifolia*	--	--	X	--	S	riparian zones, rocky outcrops alpine
Bryophyte	*Mythicomyces corneipes*	--	--	X	--	D	coniferous forest
Bryophyte	*Nardia japonica*	--	--	X	--	S	rocky outcrops, alpine
Bryophyte	*Polytrichum sphaerothecium*	--	--	X	--	S	rocky outcrops, meadows alpine
Bryophyte	*Schistostega pennata*	--	--	X	--	D	coniferous forest
Bryophyte	*Schofieldiana monticola*	--	--	X	--	S	riparian zones, meadows, alpine
Bryophyte	*Splachnum ampullaceum*	--	--	X	--	S	wet meadows, on dung
Bryophyte	*Tetraphis geniculata*	--	--	X	--	S	coniferous forest
Bryophyte	*Tomentypnum nitens*	--	--	X	--	D	fen
Bryophyte	*Trematodon asanoi*	--	--	X	--	D	Soil, riparian zones, alpine
Bryophyte	*Tritomaria exsectiformis*	--	--	X	--	S	bog

Sources: USFWS, ODFW, Oregon Natural Heritage Information Center, Oregon Biodiversity Information Center, U.S. Forest Service.
WC = West Cascades; WV = Willamette Valley; C = Candidate; LE = Listed endangered; LT = Listed threatened; SOC = Species of concern; D = Documented; S = Suspected.

Table B-2. Invasive Plants within the Transmission Line Right-of-Way and Access Road Areas

Common Name	Scientific Name	WNF Weed Designation	ODA Category	Location relative to Transmission Line and Access Roads
False brome	*Brachypodium sylvaticum*	New Invader	B	Localized patches within ROW and along access roads; structures 11/1 to 26/3.
Butterfly bush	*Buddleja davidii*	New Invader	B	Two individuals within ROW; structures 9/2 to 9/3.
Meadow knapweed	*Centaurea nigrescens (C. pratensis)*	New Invader	B	Localized scattered within row; structures 2/2 to 2/2, 12/1 to 13/3, and 19/3 to 23/1.
Spotted knapweed	*Centaurea stoebe (C. maculosa)*	New Invader	B, T	Single population within ROW; structures 1/2 to 1/3.
Canada thistle	*Cirsium arvense*	Established Infestation	B	Localized patches within ROW and along access roads, up to 60% cover in places; structures 1/2 to 4/1, 8/2 to 8/3, 10/5 to 18/5, and 19/8 to 26/5.
Bull thistle	*Cirsium vulgare*	Established Infestation	B	Localized scattered within ROW and along access roads; structures 1/1 to 1/2, 8/3 to 10/5, 14/7 to 15/2, 16/1 to 20/4, and 22/6 to 26/3.
Field bindweed	*Convolvulus arvensis*	New Invader	B, T	Trace distribution within ROW; structures 10/8 to 11/3.
English hawthorn	*Crataegus monogyna*	--	--	Two individuals within ROW; structures 3/5 to 3/6 and 9/5 to 9/5.
Scotch broom	*Cytisus scoparius*	Established Infestation	B	Ubiquitous within ROW and along access roads; structures 1/1 to 26/8.
Foxglove	*Digitalis purpurea*	Established Infestation	--	Localized scattered within ROW and along access roads; structures 3/1 to 3/2, 13/5 to 13/9, 14/7 to 17/2, 21/5 to 21/6, 24/7 to 24/8.
Geranium, Herb Robert	*Geranium robertianum*	New Invader	B	Localized scattered within ROW, mostly along access roads; structures 2/8 to 4/9, 10/8 to 11/7, and 24/7 to 24/8.
English ivy	*Hedera helix*	New Invader	B	Two small patches along access roads; structures 3/9 to 4/8.
St. Johnswort	*Hypericum perforatum*	Established Infestation	B	Ubiquitous scattered within ROW and along access roads; structures 1/1 to 1/2, 2/2 to 3/2, 4/1 to 4/9, 8/2 to 9/1, 10/5 to 24/6, and 26/3 to 26/5.
English holly	*Ilex aquifolium*	--	--	Three individuals within ROW and along access roads; structures 3/8 to 3/12 and 6/1 to 6/1.
Yellow flag iris	*Iris pseudocorus*	New Invader	B	Single patch within ROW; structures 11/3 to 11/3.
Perennial peavine	*Lathyrus latifolius*	New Invader	B	Localized patchy within ROW and along access roads; structures 1/1 to 2/4, 8/3 to 8/3, and 9/2 to 9/3.
Oxeye daisy	*Leucanthemum vulgare*	Established Infestation	--	Ubiquitous within ROW and along access roads; structures 1/6 to 26/8.
Sweetclover	*Melilotus officinalis (M. alba)*	New Invader	--	Several occurrences within ROW and along access roads; structures 1/2 to 1/3 and 11/2 to 11/3.

Table B-2. Invasive Plants within the Transmission Line Right-of-Way and Access Road Areas (continued)

Common Name	Scientific Name	WNF Weed Designation	ODA Category	Location relative to Transmission Line and Access Roads
Reed canarygrass	*Phalaris arundinacea*	New Invader*	--	Localized dense patches near streams within ROW; structures 2/4 to 2/6, 4/4 to 4/4, 10/5 to 11/4, 20/4 to 20/10, and 24/8 to 24/9.
Japanese knotweed	*Polygonum cuspidatum*	New Invader	B	Single patch within ROW; structures 10/7 to 10/8.
Sulfur cinquefoil	*Potentilla recta*	New Invader	B	Scattered individuals within ROW, highest concentration near structure 1/2; structures 1/1 to 1/3, 2/3 to 2/4, and 9/2 to 11/3.
Armenian (Himalayan) blackberry	*Rubus armeniacus (R. procerus, R. discolor)*	New Invader*	B	Ubiquitous within ROW and along access roads; structures 1/1 to 26/8.
Evergreen blackberry	*Rubus lacinatus*	New Invader*	--	Scattered within ROW and along access roads; structures 9/3 to 10/5 and 14/1 to 24/9.
Tansy ragwort	*Senecio jacobaea*	Established Infestation	B, T	Scattered individuals within ROW and along access roads; structures 3/4 to 3/6, 7/1 to 7/1, 16/2 to 17/2, 19/8 to 20/8, and 24/5 to 24/5.
Climbing nightshade	*Solanum dulcamara*	New Invader	--	Scattered patches within ROW and along access roads; structures 3/11 to 3/12, 7/1 to 7/1, 9/2 to 9/2, and 11/2 to 11/2.
Spiny cocklebur	*Xanthium spinosum*	--	B	Single patch within ROW; structures 5/12 to 5/14.

Source: PBS Engineering & Environmental 2014a

Note: Species is considered an established weed infestation, unless the population is isolated with fewer than ten plants

Appendix C. Streams in Project Area

Table C-1. Named and Unnamed Streams in Project Area

Stream Name	Nearest Structures	Stream Type	Max OHW width (ft)
Unnamed	1/5-1/6	Intermittent	3
Unnamed	1/7-2/1	Intermittent	10
Unnamed	3/4-3/5	Intermittent	1
Unnamed	3/5-3/6	Upper Perennial	6
Unnamed	3/6-3/7	Upper Perennial	4
Unnamed	3/6-3/7	Upper Perennial	8
Middle Fork Willamette River	4/9-5/1	Upper Perennial	275
Unnamed	4/4-4/8	Intermittent	8
Unnamed	7/1-7/2	Intermittent	3
North Fork of the Middle Fork Willamette River	8/3-8/4	Upper Perennial	125
Buckhead Creek	10/1-10/2	Lower Perennial	12
Buckhead Creek	10/8-10/9	Lower Perennial	18
Buckhead Creek	11/2-11/3	Lower Perennial	12
Unnamed	11/1-11/3	Lower Perennial	8
Unnamed	12/1-12/2	Intermittent	2
Unnamed	12/7-12/8	Intermittent	3
Unnamed	12/5-12/6	Intermittent	1.5
Unnamed	12/8-12/9	Intermittent	2
Unnamed	13/2-13/3	Intermittent	2
Unnamed	13/3-13/4	Upper Perennial	3
Unnamed	13/4-13/5	Upper Perennial	14
Unnamed	13/7-13/8	Upper Perennial	4
Unnamed	13/8-13/9	Intermittent	3
Unnamed	13/9-14/1	Intermittent	3
Unnamed	14/2-14/3	Intermittent	3
Unnamed	13/2-13/3	Intermittent	1.5
Unnamed	15/4-15/5	Intermittent	2
Unnamed	17/4-17/5	Upper Perennial	8
Unnamed	18/2-18/3	Intermittent	1.5
Unnamed	18/9-19/1	Intermittent	1
Unnamed	19/2-19/3	Upper Perennial	5
Unnamed	19/6-19/7	Intermittent	12
Unnamed	15/10-16/1	Intermittent	4
Unnamed	18/5-18/6	Intermittent	*

Table C-1. Named and Unnamed Streams in Project Area (continued)

Stream Name	Nearest Structures	Stream Type	Max OHW width (ft)
Unnamed	20/5-20/6	Lower Perennial	10
Unnamed	21/2-21/3	Intermittent	6
Unnamed	21/3-21/4	Intermittent	2
Unnamed	21/5-21/6	Lower Perennial	5
Unnamed	21/8-21/9	Intermittent	10
Unnamed	22/8-23/1	Intermittent	1
Unnamed	23/7-23/8	Upper Perennial	6
Unnamed	24/3-24/4	Intermittent	5
Unnamed	24/4-24/5	Intermittent	1.5
Unnamed	24/7-24/8	Intermittent	2
Unnamed	24/8-24/9	Upper Perennial	3
Unnamed	24/2-24/3	Intermittent	5
Unnamed	24/5-25/5	Intermittent	2
Unnamed	26/2-26/3	Intermittent	3
Unnamed	26/3-26/4	Intermittent	3
Unnamed	26/4-26/5	Intermittent	1
Unnamed	26/6-26/7	Intermittent	2
Unnamed	25/5-25/6	Intermittent	2
Unnamed	26/3-26/4	Intermittent	4

1. Stream and wetland identification numbers referenced in this additional information column correspond to identification numbers used in the Joint Permit Application.

Appendix D. Aquatic Conservation Strategy

The Aquatic Conservation Strategy (ACS) was developed as part of the Northwest Forest Plan and associated amendments within the Record of Decision to help restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public land (U.S. Forest Service 1994a, U.S. Forest Service 1994b). The purpose of this appendix is to support the project Environmental Assessment (EA) in describing the proposed Hills Creek - Lookout Point Transmission Line Rebuild Project, describe BPA's efforts to address these ACS objectives and components during project design, and explain how the project will help improve the ecological condition of the watersheds crossed by the existing transmission line. This memorandum supplements descriptions of the proposed project and existing conditions provided in the EA and other project submittals.

As a transmission line rebuild project, primary actions relevant to the ACS are improvements to the existing roads used by BPA maintenance and construction staff to access each wood and steel transmission pole structure within BPA's right-of-way. Some tree felling is also required to maintain line safety clearances and minimize the risk of arcing and fire danger in proximity to the transmission lines. Specific improvements to existing access road surfaces, drainage improvements, and culvert replacements (improving hydraulics and fish passage) are also proposed as part of the project.

The ACS is composed of nine objectives and four components. Each of these is described below, with the following paragraphs summarizing project elements and efforts to comply with the ACS. Based on this review, the transmission line rebuild project action meets or does not prevent attainment of each ACS objective. Specifically, the project addresses a number of general concerns outlined in the Forest Service's watershed analyses for the Hills Creek Reservoir Watershed (U.S. Forest Service 1995a), North Fork Middle Fork Willamette River Watershed (U.S. Forest Service 1995b) and the Lookout Point Reservoir Watershed (U.S. Forest Service 1997 and 2012).

The Nine Objectives of the Aquatic Conservation Strategy

Objective #1: Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

As a transmission line rebuild project, the proposed action includes replacing existing wood and steel pole structures along the existing 26-mile transmission line corridor. The project also includes improvements to existing access roads, road surfaces, culverts, and drainage as described in detail in the EA, with a net reduction in access roads (0.1-mile new and 0.5-mile decommissioning). To address recent rockfall and documented landslide risks in line miles two and three, minor relocation of approximately 0.3-mile of the transmission line has been proposed. No timber harvest is proposed, however minor tree felling as described in the EA will address danger trees, maintain safe line clearances and address the two re-routes. BPA foresters and project engineers evaluated all danger trees and their condition, prescribing the minimum amount of felling to maintain North

American Electric Reliability Corporation[2] vegetation management standards for safety clearances, address line mile two rockfall concerns, and resolve the active landslide concerns in line mile three (BPA 2010). This action would reduce the potential for large-scale fires from line/tree contact, flashovers, and arcing. Danger tree felling areas also occur in a largely random pattern over the entire 26-mile corridor, and each is within the realm of natural variability associated with a small landslide, windthrow event, and/or insect or disease tree mortality that could result in similar localized impacts. To further reduce environmental impacts, many trees felled on Forest Service property will be left in-situ (as downed wood) or made available for Forest Service upcoming stream restoration projects. This is consistent with riparian area management in the Standards and Guidelines (U.S. Forest Service 1994b) that allows trees to be felled within riparian reserves when they pose a safety risk and keeping felled trees onsite to meet coarse woody debris objectives.

Existing pole replacement, improving existing access road conditions, and reducing the risk of fires by addressing accidental tree-line contact, landslides, and rockfall each demonstrate compliance with Objective 1. As such, the project meets or does not prevent attainment of Objective 1.

Objective #2: Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

The proposed action, as described in the EA, would not create new barriers to aquatic and riparian-dependent species, and no new roads would be constructed that would create a barrier to aquatic organisms. Alternatively, and consistent with ACS goals, undersized culverts on fish streams would be replaced to meet current Forest Service, NMFS, and ODFW standards. Culverts identified during BPA's initial engineering review as requiring greater than a 36-inch culvert were modeled using HY-8 to ensure the new culvert was sufficiently sized to pass the 100-year event while professional judgment and field experience were used for sizing culverts up to 36 inches (Gilliam 2015). Project improvements to existing access roads and drainage conditions (e.g., culverts/cross-drains/waterbars) would further serve to maintain and/or improve connectivity within and between watersheds, while addressing road maintenance concerns outlined in the Hills Creek Reservoir Watershed Analysis, the North Fork Middle Fork Willamette River Watershed Analysis, and the Lookout Point Watershed Analysis and Update. Improvements at road-stream crossings would lessen the chance of erosion or culvert failure and would reduce the risk of sedimentation. As such, connectivity within and between watersheds will be maintained or improved, and the transmission line rebuild project meets or does not prevent attainment of Objective 2.

[2] A national regulatory body that oversees reliability of the U.S. power grids. BPA and other utilities must comply or face the possibility of fines of up to $1 million a day given risk to the powergrid, as described in BPA's Keeping the way clear for safe, reliable service brochure. (https://www.bpa.gov/news/pubs/GeneralPublications/lusi-Keeping-the-way-clear-for-safe-reliable-service.pdf)

Objective #3: Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

The physical integrity of the aquatic system will be maintained or improved over the long-term based on project actions described below. These measures specifically address the poor condition of existing roads required to access the transmission line. In many cases, access roads have received limited maintenance and would benefit from aggregate surfacing, more consistent installation of drainage features (cross-drains, drain dips/waterbars), or larger sized and more appropriately placed culverts.

Based on the project engineer's review, new and replacement culverts, fords, cross-drains, and drain dips are proposed to improve road conditions, minimize collection of runoff on access roads and ditches, maintain natural drainage patterns, and provide opportunities for natural filtration through existing vegetation. Headwaters culverts (non-fish drainages) would be designed for the 100-year storm event, while replacements on fish streams have been engineered and sized to address Forest Service, NMFS, and ODFW sizing and aquatic passage requirements. Gates will also be installed to minimize unauthorized access and off-road use. These measures will help to maintain and restore the integrity of the aquatic system (including shorelines, bed, and banks) by reducing existing road-related sediment transport into streams and helping to normalize peak/base flows.

Project design standards also reflect Objective 3 goals. Specifically, culvert replacements on fish streams will be embedded and will utilize salvaged native substrate within the new culverts, while ford improvements on fish streams (at-grade fords) will also salvage and replace the existing streambed material to maintain natural streambed/bottom substrates and configurations, which will maintain or improve fish passage. Use of temporary bridges at existing fords over Buckhead and Burnt Bridge Creeks is proposed to minimize in-stream vehicle disturbance during construction. Work area isolation, implementation of project mitigation measures specific to work in and around streams, and fish salvage/rescue will minimize potential direct and indirect effects to aquatic species and stream banks and bottoms during these project activities. Work will also occur during the (summer) construction season and approved ODFW in-water work windows. All temporarily disturbed areas will be restored (seeded and/or planted with native species per plans and specifications). Temporary ground disturbance during construction has the potential for minor short-term erosion; however, implementation of stabilization measures (planting, seeding, mulching), and the long-term improvements described above minimize the potential for short-term construction impacts and reflect consistency with Objective 3 goals.

Proposed tree felling minimizes the risk of avoidable fires. Specifically, the current risk of tree contact with the transmission line carries with it significant consequences: loss of habitat, shade and large wood inputs and associated increases in post-fire scour and stream sedimentation impacts. Although specifically designated (danger) trees will be felled to address line safety and clearance constraints, they would be left in place as downed wood (e.g., similar to what would occur naturally with individual trees or small pockets of wind-throw), or made available for stream restoration projects if the U.S. Forest Service prefers felled trees be removed. Tree roots would typically be left in place, continuing to provide soil stabilization functions.

Based on the above measures, the proposed action meets or does not prevent attainment of Objective 3. Access road, culvert, and drainage improvements meet the intent of the ACS and address existing and stated access road maintenance concerns documented in Forest Service watershed analyses for the subject watersheds, providing long-term benefits to the physical integrity of the aquatic environment.

Objective #4: Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals comprising aquatic and riparian communities.

Common water quality indicators typically include temperature, sediment, and chemical/nutrient contamination. Project engineers reviewed all existing access roads in the field, evaluating their condition and recommending various levels of maintenance (improve, reconstruct, new, decommission) based on BPA access requirements, opportunities for decommissioning, and addressing the relative risks/impacts to aquatic ecosystems. Based this engineering review, aggregate surfacing, new and replacement culverts, ford improvements, cross-drains, and drain dips have also been proposed along the project corridor to help improve road conditions, minimize collection of runoff on access roads, maintain natural drainage patterns, and provide opportunities for natural filtration through existing vegetation. Proposed actions help address many miles of existing roads in the project watersheds that have not been maintained or repaired to desired standards as well as reduce the potential for failure of drainage features that would have a detrimental effect on water quality and in-stream habitat for aquatic organisms.

Minor long-term improvements to water quality parameters would occur throughout the project corridor. These include: reduction in recurring sediment impacts during vehicular crossings; decreased potential sedimentation; and a reduced risk of chemical contamination (spills) after construction. These should result from safer access roads, improved access road surfaces (gravel versus mud and fines) and improved access road drainage measures that help maintain natural drainage patterns and distribute runoff into nearby vegetation for infiltration (instead of allowing it to flow in roadside ditches and directly into drainages). Installation of gates will further minimize water quality impacts resulting from illegal off-road vehicle use and erosion. Finally, pole wraps would be installed on wood poles located within 50 feet of wetlands or streams or within the 100-year floodplain to prevent potential leaching of pentachlorophenol (a wood preservative) into wetlands and streams. Together, these measures help address access road improvement recommendations outlined in Forest Service watershed analyses for the Hills Creek Reservoir Watershed, Lookout Point Reservoir Watershed, and the North Fork Middle Fork Willamette River Watershed and associated water quality concerns.

Any temporary reductions in water quality during project construction are not expected to be biologically significant as a result of utilizing the proposed summer construction window (when road conditions are dry), work area isolation measures (for in-water work), BPA construction monitoring and construction specifications, and mitigation measures that have been incorporated into project documents to reduce potential impacts to water quality. As described in detail in the project EA,

these measures include, but are not limited to, spill prevention and spill response plans, specifications on fueling, equipment and vehicle storage, and having emergency spill control materials on site during construction.

Finally, the proposed transmission line rebuild project is not proposing timber harvest, creation of impervious surfaces, or a net increase in the road network. There will be a net reduction of 0.4-mile of access road. Tree felling is limited to that required to maintain North American Electric Reliability Corporation (BPA 2010) vegetation management standards for safety clearances, address line mile two rockfall concerns, and resolve the active landslide in line mile three (e.g., greater risk of fire, etc.). Felling of these trees sporadically along the existing 26-mile corridor is not expected to cause a measureable change in water quality parameters, and should reduce potential water quality impacts that could reasonably be expected due to fires from tree/line contact (as discussed in Objective 3). Finally, existing access road and drainage improvements will serve to protect perennial streams as well as smaller seasonally flowing streams that will, in turn, help protect water quality downstream where there is perennial stream flow. As such, the proposed project meets or does not prevent attainment of Objective 4.

Objective #5: Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate and character of sediment input, storage, and transport.

Given their current condition, the effects of inadequately maintained roads on hydrology, geomorphology, riparian vegetation, and sedimentation support the proposed access road improvements. BPA project engineers reviewed all existing access roads, evaluating their condition and recommending various levels of maintenance (improve, reconstruct, new, decommission) in order to maintain BPA access to the existing transmission line and work to address unstable areas. Part of this planning and review included a risk assessment for crossing improvements based on a risk screening matrix recommended by the USFWS. This assessment was used by the project team to help evaluate existing crossings and proposed improvements in light of geomorphic condition and other relevant watershed conditions. Culverts identified during initial engineering review as requiring greater than a 36-inch culvert were modeled using HY-8 to ensure the new culvert was sufficiently sized to pass the 100-yr event while professional judgment and field experience were used for sizing culverts up to 36 inches (Gilliam 2015).

Improved access road conditions and drainage features reduce direct runoff from access roads into streams, while appropriately sized culverts will facilitate more normative fluvial processes, including more natural bedload transfer to downstream reaches. Similarly, the project will address ditches, drainage structures, and undersized culverts with a risk of failure during high runoff events, which could result in mass wasting events that deliver large quantities of sediment to streams. The project would also result in improvements to existing dirt and gravel road conditions and road-related drainage. Placing additional aggregate surfacing on the existing road system would reduce road related sediment delivery. Runoff from access roads and ditches would be routed into adjacent vegetation, primarily via out-sloped roads, cross-drains, or drain dips/waterbars. These improvements provide increased opportunities for dispersal, shading, and infiltration away from

waterways, while reducing the potential for fine sediments to reach nearby streams. Additional gates are also proposed on BPA access roads, thereby reducing the potential for unauthorized access and associated off-road vehicle impacts. Finally, no impervious surfaces are proposed as part of this project.

During construction, access road improvements will be closely monitored by BPA, and mitigation measures (as detailed in the EA) will be utilized to reduce potential sediment impacts to stream, wetlands, and waterbodies. Any temporary increase in sediment input to the streams are not expected to be biologically significant over the short term, and long term improvements over existing conditions are anticipated. As such, the proposed project meets or does not prevent attainment of Objective 5.

Objective # 6: Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Based on proposed project actions, BPA anticipates no project-related increases in peak flows. Improved road surface conditions, appropriately sized culverts, and additional culverts, cross-drains, drain dips/waterbars reflect the intent of ACS Objective 6 by helping to normalize the timing, magnitude, duration of runoff to and through streams and wetlands. Areas temporarily disturbed for construction will be replanted and/or reseeded per project plans and specifications. This should address Forest Service site restoration concerns, and mitigate potential temporary impacts to peak/base flows. As such, the proposed project meets or does not prevent attainment of Objective 6.

Objective # 7: Maintain and restore the timing, variability and duration of flood inundation and water table elevations in meadow and wetlands.

The proposed transmission line rebuild project's improvements to existing access roads, replacement and improvements to culverts and fords, installation of additional road/drainage features, and road decommissioning will each help maintain and restore the timing, variability, and duration of floodplain inundation and water tables in nearby wetlands. As such, the proposed project meets or does not prevent attainment of Objective 7.

Objective #8: Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distribution of coarse woody debris sufficient to sustain physical complexity and stability.

As a transmission line rebuild project, BPA anticipates limited vegetation disturbance, which will primarily take place within the established BPA transmission line corridor and along existing access roads that have been present since the 1950s. BPA's project specifications and mitigation measures will minimize disturbance in riparian and wetland areas along the entire 26-mile long existing transmission line corridor as described in the EA. Proposed access road and drainage improvements

would improve water quality parameters, restore more natural drainage patterns, and help distribute runoff into nearby vegetation for infiltration, with corresponding benefits to temperature regulation, erosion, and sedimentation.

No timber harvest is proposed; however, some tree felling is required to maintain compliance with the North American Electric Reliability Corporation (BPA 2010) vegetation management standards for safety clearances, address line mile two rockfall concerns, and resolve the active landslide concerns in line mile three. Proposed tree felling has been limited to the minimum required to maintain this compliance. Additionally, danger tree felling areas occur in a largely random pattern over the 26-mile corridor, and each is within the realm of natural variability associated with a small landslide, windthrow event, and/or insect, or disease tree mortality that would result in similar localized impacts. Felled trees would be left in-situ as downed wood for habitat purposes, or made available for Forest Service stream restoration projects. Invasive plant surveys, as well as pre- and post-construction removal and treatment of invasive plant, would occur to help restore native species diversity. Site restoration consisting of seeding and/or planting of all temporarily disturbed areas would also occur, helping maintain riparian reserve functions and allowing them to continue to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration. As such, the proposed project meets or does not prevent attainment of Objective 8.

Objective #9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

As a transmission line rebuild project, BPA anticipates limited vegetation disturbance, which will primarily take place within the established BPA transmission line corridor and along existing access roads that have been present since the 1950s. BPA's project specifications and mitigation measures as described in the EA will minimize disturbance in riparian and wetland areas along the entire 26-mile long existing transmission line corridor. Proposed access road surface and drainage improvements including culvert replacements and additional culvert/cross-drain installations would improve fish passage, facilitate more normal bedload transfer, and yield associated benefits to invertebrate and vertebrate riparian dependent species. These actions help address road maintenance concerns outlined in the Forest Service's watershed analyses for the Hills Creek Reservoir Watershed, Lookout Point Reservoir Watershed, and the North Fork Middle Fork Willamette River Watershed.

BPA has conducted invasive plant surveys along the project corridor, and as described in the EA, will conduct pre- and post-construction removals and treatments of invasive plants to help maintain and restore native plant species diversity, thus addressing watershed analyses recommendations for invasive weed treatments. Similarly, site restoration measures consisting of seeding and/or planting of all temporarily disturbed areas would also occur, helping restore native plants and associated riparian-dependent species.

Work area isolation, implementation of project mitigation measures specific to work in and around streams, and fish salvage/rescue will minimize the potential direct and indirect effects to riparian habitat and riparian-dependent species. Site-specific measures have also been proposed to protect

the western pond turtle (based on confirmed nest sites in the Buckhead Wildlife Area and Bannister Pond), including pre-construction surveys for pond turtles, avoidance measures, and monitoring from April to July of the year of construction.

The Four Components of the Aquatic Conservation Strategy

Riparian Reserves

The BPA Hills Creek - Lookout Point Transmission Line Rebuild Project crosses several land management designations and riparian classifications. Riparian reserves are lands along streams, reservoirs, and unstable and potentially unstable areas where special standards and guidelines direct land use. Standards and guidelines prohibit programmed timber harvest, and direct the Forest Service to manage roads, grazing, mining and recreation to achieve objectives of the ACS. The proposed project is consistent with intent of riparian reserve guidance for existing and new access roads contained in the Northwest Forest Plan standards and guidelines. BPA has designed the project to minimize potential impacts and improve baseline conditions based on roads management conditions and general riparian area management conditions:

- BPA has minimized roads and disturbance within Riparian Reserves.
- BPA's project engineers and biologists have evaluated watershed and site specific conditions prior to proposing access road maintenance and improvements.
- BPA's proposed road improvements include installation of new and replacement culverts that reflect Forest Service, NMFS, and ODFW sizing and fish passage requirements.
- BPA's proposed road improvements will help improve hydrologic connectivity while reducing access road interception of surface and subsurface flows.
- BPA has prepared road design criteria, elements, and standards that prescribe specific mitigation measures for all construction actions within riparian reserves.
- BPA has conducted a wetland delineation along the project corridor to facilitate avoidance and minimization of impacts associated the transmission line rebuild project.
- BPA evaluated access road and road improvement impacts and met ACS objectives by:
  - Reconstructing roads and associated drainage features that pose a substantial risk.
  - Prioritizing reconstruction based on current and potential impact to riparian resources and the ecological value of the riparian resources affected.
  - Closing and stabilizing, or obliterating and stabilizing roads based on the ongoing and potential effects to BPA and ACS objectives in light of short-term and long-term access and transportation needs.
- BPA has designed new culverts and other permanent stream crossings to accommodate at least the 100-year flood, including associated bedload, with crossings constructed and maintained to

prevent diversion of streamflow out of the channel and down the road in the event of crossing failure.

- BPA's proposed access road and drainage improvements would minimize sediment delivery to streams from roads.
- BPA's proposed actions on fish streams would provide and maintain fish passage.
- BPA has a Road Management Plan/Transportation Management Plan that addresses the intent of the ACS.

Key Watersheds

Key Watersheds are a system of large refugia comprising watersheds that are crucial to at-risk fish species and stocks and provide high quality water. The Hills Creek - Lookout Point Transmission Line Rebuild Project crosses the following 5th field HUC watersheds: Hills Creek Reservoir Watershed, North Fork Middle Fork Watershed and Lookout Point Reservoir Watershed. Of these, only the North Fork Middle Fork is considered a Key Watershed (Tier 2 - Water Quality) (Hogervorst 2015). Additionally, the Lookout Point Reservoir Watershed Analysis also describes two smaller key watershed areas that the existing transmission line crosses through: the Buckhead KWA and Hospital KWA (U.S. Forest Service 1997 and 2002). The proposed action is consistent with applicable standards and guidelines for key watersheds based on the following:

- No new roads will be built in these areas.
- There will be no net increase in the amount of roads in these areas.
- A net reduction of roads is proposed given access road decommissioning proposed as part of the project.
- No timber harvest is proposed.
- As allowed, the project would include road maintenance and felling specified hazard (danger) trees along rights-of-way, with trees remaining on-site as woody debris to provide habitat.

Watershed Analysis

Watershed analysis is a procedure for conducting analysis that evaluates geomorphic and ecological processes operating in specific watersheds. The Forest Service completed a watershed analysis for each of the following watersheds crossed by the existing BPA Hills Creek - Lookout Point Transmission Line Rebuild Project: Hills Creek Reservoir (U.S. Forest Service 1995b); North Fork Middle Fork Willamette River (U.S. Forest Service 1995b); and Lookout Point Reservoir (U.S. Forest Service 1995). The Forest Service also completed an update for the Lookout Point Reservoir in 2012. Site visits with both Forest Service and BPA biologists and engineers were conducted as part of the design phase for the BPA Hills Creek - Lookout Point Transmission Line Rebuild Project and these analyses stimulated and focused the discussions. BPA project engineers and biologists also evaluated stream-road crossings, with BPA subsequently completing an independent risk assessment for waterbody crossings used to address site-specific risks and design parameters.

Watershed Restoration

Watershed restoration is a comprehensive, long-term program to restore watershed health and aquatic ecosystems, including the habitats supporting fish and other aquatic and riparian-dependent organisms. This objective focuses on comprehensive restoration efforts within specific watersheds. The BPA Hills Creek - Lookout Point Transmission Line Rebuild Project proposes several actions that facilitate long-term improvements in watershed conditions as described in this memorandum and the project EA. Specific watershed restoration actions to be completed as part of this project include decommissioning of 0.4-mile of existing access road (a net reduction in access roads). Indirect contributions to watershed restoration goals would be accomplished through BPA's proposed culvert replacements.

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Appendix E. Wildlife Data Tables

Table E-1. Common Wildlife Species Found Within 5 Miles of the Transmission Line and Access Roads

Scientific Name	Common Name
Amphibians	
Ambystoma gracile	Northwestern Salamander
Ambystoma macrodactylum	Long-toed Salamander
Dicamptodon tenebrosus	Pacific Giant Salamander
Ensatina eschscholtzii	Ensatina
Plethodon dunni	Dunn's Salamander
Plethodon vehiculum	Western Red-backed Salamander
Pseudacris regilla	Pacific Chorus Frog
Rana aurora	Northern Red-legged Frog
Rana catesbeiana	Bullfrog
Taricha granulosa	Rough-skinned Newt
Birds	
Accipiter cooperii	Cooper's Hawk
Accipiter striatus	Sharp-shinned Hawk
Actitis macularia	Spotted Sandpiper
Aegolius acadicus	Northern Saw-whet Owl
Aegolius funereus	Boreal Owl
Agelaius phoeniceus	Red-winged Blackbird
Aix sponsa	Wood Duck
Anas cyanoptera	Cinnamon Teal
Anas discors	Blue-winged Teal
Anas platyrhynchos	Mallard
Aphelocoma californica	Western Scrub-Jay
Ardea herodias	Great Blue Heron
Asio flammeus	Short-eared Owl
Aythya collaris	Ring-necked Duck
Bombycilla cedrorum	Cedar Waxwing
Bonasa umbellus	Ruffed Grouse
Branta canadensis	Canada Goose
Branta canadensis moffitti	Western Canada Goose
Bubo virginianus	Great Horned Owl
Buteo jamaicensis	Red-tailed Hawk
Butorides virescens	Green Heron

Scientific Name	Common Name
Birds (continued)	
Callipepla californica	California Quail
Calypte anna	Anna's Hummingbird
Carduelis pinus	Pine Siskin
Carduelis psaltria	Lesser Goldfinch
Carduelis tristis	American Goldfinch
Carpodacus cassinii	Cassin's Finch
Carpodacus mexicanus	House Finch
Carpodacus purpureus	Purple Finch
Cathartes aura	Turkey Vulture
Catharus guttatus	Hermit Thrush
Catharus ustulatus	Swainson's Thrush
Certhia americana	Brown Creeper
Chaetura vauxi	Vaux's Swift
Chamaea fasciata	Wrentit
Charadrius vociferus	Killdeer
Cinclus mexicanus	American Dipper
Circus cyaneus	Northern Harrier
Cistothorus palustris	Marsh Wren
Coccothraustes vespertinus	Evening Grosbeak
Colaptes auratus	Northern Flicker
Columba livia	Rock Dove
Contopus sordidulus	Western Wood-pewee
Corvus brachyrhynchos	American Crow
Cyanocitta cristata	Blue Jay
Dendragapus obscurus	Blue Grouse
Dendroica coronata	Yellow-rumped Warbler
Dendroica nigrescens	Black-throated Gray Warbler
Dendroica occidentalis	Hermit Warbler
Dendroica petechia	Yellow Warbler
Dendroica townsendi	Townsend's Warbler
Dryocopus pileatus	Pileated Woodpecker
Empidonax difficilis	Pacific-slope Flycatcher

Table E-1. Common Wildlife Species Found Within 5 Miles of the Transmission Line and Access Roads (continued)

Scientific Name	Common Name
Birds (continued)	
Empidonax hammondii	Hammond's Flycatcher
Empidonax oberholseri	Dusky Flycatcher
Euphagus cyanocephalus	Brewer's Blackbird
Falco columbarius	Merlin
Falco mexicanus	Prairie Falcon
Falco sparverius	American Kestrel
Fulica americana	American Coot
Geothlypis trichas	Common Yellowthroat
Glaucidium gnoma	Northern Pygmy-owl
Haliaeetus leucocephalus	Bald Eagle
Histrionicus histrionicus	Harlequin Duck
Icterus bullockii	Bullock's Oriole
Junco hyemalis	Dark-eyed Junco
Lophodytes cucullatus	Hooded Merganser
Loxia curvirostra	Red Crossbill
Loxia leucoptera	White-winged Crossbill
Melanerpes formicivorus	Acorn Woodpecker
Meleagris gallopavo	Wild Turkey
Melospiza melodia	Song Sparrow
Mergus merganser	Common Merganser
Molothrus ater	Brown-headed Cowbird
Myadestes townsendi	Townsend's Solitaire
Nucifraga columbiana	Clark's Nutcracker
Oporornis tolmiei	Macgillivray's Warbler
Otus kennicottii	Western Screech-owl
Pandion haliaetus	Osprey
Passer domesticus	House Sparrow
Passerculus sandwichensis	Savannah Sparrow
Passerella iliaca	Fox Sparrow
Passerina amoena	Lazuli Bunting
Phalaenoptilus nuttallii	Common Poorwill
Pheucticus melanocephalus	Black-headed Grosbeak
Picoides pubescens	Downy Woodpecker

Scientific Name	Common Name
Birds (continued)	
Picoides villosus	Hairy Woodpecker
Pipilo chlorurus	Green-tailed Towhee
Piranga ludoviciana	Western Tanager
Poecile atricapillus	Black-capped Chickadee
Poecile gambeli	Mountain Chickadee
Poecile rufescens	Chestnut-backed Chickadee
Psaltriparus minimus	Bushtit
Rallus limicola	Virginia Rail
Porzana carolina	Sora
Regulus calendula	Ruby-crowned Kinglet
Regulus satrapa	Golden-crowned Kinglet
Seiurus noveboracensis	Northern Waterthrush
Selasphorus rufus	Rufous Hummingbird
Sialia mexicana	Western Bluebird
Sitta canadensis	Red-breasted Nuthatch
Sitta carolinensis	White-breasted Nuthatch
Sphyrapicus ruber	Red-breasted Sapsucker
Spizella passerina	Chipping Sparrow
Stelgidopteryx serripennis	Northern Rough-winged Swallow
Stellula calliope	Calliope Hummingbird
Strix nebulosa	Great Gray Owl
Strix varia	Barred Owl
Sturnus vulgaris	European Starling
Troglodytes aedon	House Wren
Troglodytes pacificus	Pacific Wren
Tyrannus verticalis	Western Kingbird
Tyto alba	Barn Owl
Vermivora celata	Orange-crowned Warbler
Vermivora ruficapilla	Nashville Warbler
Vireo cassinii	Cassin's Vireo
Vireo gilvus	Warbling Vireo
Vireo huttoni	Hutton's Vireo
Wilsonia pusilla	Wilson's Warbler

Table E-1. Common Wildlife Species Found Within 5 Miles of the Transmission Line and Access Roads (continued)

Scientific Name	Common Name
Birds (continued)	
Zenaida macroura	Mourning Dove
Zonotrichia leucophrys	White-crowned Sparrow
Mammals	
Aplodontia rufa	Mountain Beaver
Bassariscus astutus	Ringtail
Canis latrans	Coyote
Castor canadensis	American Beaver
Cervus elaphus roosevelti	Roosevelt Elk
Clethrionomys californicus	Western Red-backed Vole
Eptesicus fuscus	Big Brown Bat
Erethizon dorsatum	Common Porcupine
Glaucomys sabrinus	Northern Flying Squirrel
Lasiurus cinereus	Hoary Bat
Lepus americanus	Snowshoe Hare
Lutra canadensis	Northern River Otter
Lynx rufus	Bobcat
Marmota flaviventris	Yellow-bellied Marmot
Microtus californicus	California Vole
Microtus longicaudus	Long-tailed Vole
Microtus oregoni	Creeping Vole
Microtus richardsoni	Water Vole
Microtus townsendii	Townsend's Vole
Mus musculus	House Mouse
Mustela erminea	Ermine
Mustela vison	Mink
Myotis lucifugus	Little Brown Myotis
Myotis septentrionallis	Northern Long-eared Myotis
Neotoma cinerea	Bushy-tailed Woodrat
Neotoma fuscipes	Dusky-footed Woodrat
Neurotrichus gibbsii	Shrew-mole
Ochotona princeps	American Pika
Odocoileus hemionus columbianus	Black-tailed Deer
Ondatra zibethicus	Muskrat

Scientific Name	Common Name
Mammals (continued)	
Peromyscus maniculatus	Deer Mouse
Phenacomys intermedius	Heather Vole
Phenacomys longicaudus	Red Tree Vole
Phenacomys albipes	White-footed Vole
Procyon lotor	Raccoon
Puma concolor	Mountain Lion
Rattus norvegicus	Norway Rat
Scapanus orarius	Coast Mole
Scapanus townsendii	Townsend's Mole
Sorex bairdi	Baird's Shrew
Spermophilus beecheyi	California Ground Squirrel
Spermophilus lateralis	Golden-mantled Ground Squirrel
Spermophilus saturatus	Cascade Golden-mantled Ground Squirrel
Spilogale gracilis	Western Spotted Skunk
Sylvilagus bachmani	Brush Rabbit
Sylvilagus floridanus	Eastern Cottontail
Tadarida brasiliensis	Brazilian Free-tailed Bat
Tamias amoenus	Yellow-pine Chipmunk
Tamias senex	Allen's Chipmunk
Tamias siskiyou	Siskiyou Chipmunk
Tamias townsendii	Townsend's Chipmunk
Thomomys mazama	Western Pocket Gopher
Urocyon cinereoargenteus	Common Gray Fox
Ursus americanus	Black Bear
Zapus trinotatus	Pacific Jumping Mouse
Reptiles	
Charina bottae	Rubber Boa
Clemmys marmorata	Western Pond Turtle
Coluber constrictor	Racer
Contia tenuis	Sharptail Snake
Crotaphytus bicinctores	Mojave Black-collared Lizard
Diadophis punctatus	Ringneck Snake
Elgaria coerulea	Northern Alligator Lizard

Table E-1. Common Wildlife Species Found Within 5 Miles of the Transmission Line and Access Roads (continued)

Scientific Name	Common Name
Reptiles (continued)	
Elgaria multicarinata	Southern Alligator Lizard
Eumeces skiltonianus	Western Skink
Pituophis catenifer	Gopher Snake
Thamnophis sirtalis	Common Garter Snake
Trachemys scripta	Red-eared Slider Turtle
Sceloporus occidentalis	Western Fence Lizard

Scientific Name	Common Name
Reptiles (continued)	
Thamnophis ordinoides	Northwestern Garter Snake
Mollusks	
Megomphix hemphilli	Oregon megomphix
Pristiloma articum crateris	Crater Lake tightcoil
Prophysaon coeruleum	Blue-grey tail-dropped

Sources: Geographic Biotic Observations Database (BLM 2014a), Integrated Biodiversity Information System (NHI 2014).

Table E-2. Threatened, Endangered, Candidate, and Special-Status Wildlife Species Potentially Occurring Within and Adjacent to the Transmission Line Right-of-Way and Access Road Areas

Species	Status	Habitat	Conclusion
Mammals			
Pallid bat *(Antrozous pallidus pacificus)*	Federal SOC, State vulnerable, Forest Service sensitive	Cliffs and structures provide roosting habitat in project area.	Species was not observed during field investigation and there are no documented occurrences within 5 miles of the project area; therefore, the species is not likely to use the project area.
Red tree vole *(Arborimus longicaudus)*	Federal candidate (West Coast DPS), State vulnerable, Forest Service Survey and Manage	Mature conifer forests provide potential habitat in project area; uncommon, lives only in conifers.	Species was not observed during field investigation and there are no documented occurrences within 5 miles of the project area; potential habitat exists and the species is likely to use the project area.
Townsend's western big-eared bat *(Corynorhinus townsendii townsendii)*	Federal SOC, State critical, Forest Service sensitive	Nest and roost in caves and cave-like structures, including abandoned mines, buildings, bridges, rock crevices, hollow trees, under bridges and in old buildings.	Species has been documented within 2 miles of the project area. Species is likely to use the project area for foraging.
North American wolverine (*Gulo gulo luscus)*	Federal candidate, Forest Service sensitive	Restricted to high elevations.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area; however, habitat is present and species is not likely to use the project area.
Fisher (*Martes pennanti;* West Coast Distinct Population Segment)	Federal candidate, State critical, Forest Service sensitive	Associated with areas of high cover and structural complexity in large tracts of mature and old-growth forests.	Species was not observed during field investigation and there are no documented occurrences within 5 miles of the project area. Habitat is present; however, species is not likely to use the project area.
Fringed myotis bat *(Myotis thysanodes)*	Federal SOC, State vulnerable, Forest Service sensitive	Roost in crevices in buildings, rocks, cliff faces, bridges, and in decadent trees and snags; forage within forest interior and along forest edges.	Species has been documented within 5 miles of the project area. Habitat is present, and species is likely to use the project area.
Long-legged myotis bat *(Myotis volans)*	Federal SOC, State vulnerable	Roost in trees, rock crevices, under bark, stream banks, and buildings; forage near trees and cliffs, over water, and in wooded openings.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area; however, potential habitat exists within the project area and the species likely to use the project area.

Table E-2. Threatened, Endangered, Candidate, and Special-Status Wildlife Species Potentially Occurring Within and Adjacent to the Transmission Line Right-of-Way and Access Road Areas (continued)

Species	Status	Habitat	Conclusion
Birds			
Northern goshawk *(Accipiter gentilis)*	Federal SOC, State vulnerable	Nest in various forest types; preys on large birds, squirrels, rabbits, and hares.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area; however, the species is likely to use mature conifer or mixed conifer stands as nesting and foraging habitat, and migration through project area may occur in spring and fall.
Short-eared Owl *(Asio flammeus)*	BCC	Nest on ground in prairies, hayfields, or stubble fields.	Species is likely to use project area year-round.
Western burrowing owl (*Athene cunicularia hypugaea)*	Federal SOC, State candidate	Breed and forage in open, well-drained areas, such as native prairie, pastures, hayfields, and fallow fields; preys on arthropods, small mammals, birds, amphibians and reptiles.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area. Suitable breeding and foraging habitat is not present within the project area; therefore, species is not likely to use the project area. Suitable breeding and foraging habitat is present within the project area.
Bufflehead (*Bucephala albeola*)	Forest Service sensitive	Winter in protected coastal or open inland waters. Nest in tree cavities close to water.	Species has been documented as occurring within Willamette National Forest within 5 miles of the project area. Nesting habitat does not occur within the project area. Species is likely to use the project area as foraging habitat.
Aleutian cackling goose *(Branta canadensis leucopareia)*	Federal DL	Forage in floodplains and other open areas.	Species was not observed during field investigation. Flocks may use the floodplains area in project area; floodplains and wetland areas provide potential habitat during spring and fall migrations. Species is likely to use the project area.
Cassin's Finch *(Carpodacus cassinii)*	BCC	Breed in coniferous forests. Nest in large conifers. Forage in trees; mainly eat seeds, buds, and berries.	Species is likely to use project area year-round.
Purple Finch *(Carpodacus purpureus)*	BCC	Breed in coniferous and mixed forests. Forage in trees and bushes; mainly eat seeds, berries, and insects.	Species is likely to use project area year-round.
Olive-sided flycatcher *(Contopus cooperi)*	Federal SOC, State vulnerable, BCC	Open woodland and riparian areas provide potential habitat in project area.	Species was not observed during field investigation, and there are no documented occurrences in project area; however, species is likely to use the project area.

Table E-2. Threatened, Endangered, Candidate, and Special-Status Wildlife Species Potentially Occurring Within and Adjacent to the Transmission Line Right-of-Way and Access Road Areas (continued)

Species	Status	Habitat	Conclusion
Birds (continued)			
Yellow rail (Coturnicops noveboracensis)	Forest Service sensitive	Feed in shallow water; mainly eat snails, insects, some seeds and grasses. Summer in wet meadows and marshes. Winter on grasslands, fields, coastal marshes.	Species was not observed during field investigation, and there are no documented occurrences in the project area. Species is not likely to use the project area.
Black swift *(Cypseloides niger)*	Forest Service sensitive	Nest on ledges or crevices associated with waterfalls. Found near wet cliffs in mountainous regions.	Species was not observed during field investigation, and there are no documented occurrences in the project area. Species is not likely to use the project area.
Willow Flycatcher *(Empidonax traillii)*	BCC	Breed in deciduous thickets, especially willows.	Species is likely to use project area during breeding.
Streaked horned lark (*Eremophila alpestris strigata)*	Federal threatened, State critical	Nest and forage in sparsely vegetated and bare ground habitats, such as grass fields, open pastures, mudflats, and on gravel roads.	Species was not observed during field investigation, and there are no documented occurrences in project area. Suitable habitat is not present within the project area; therefore, the species is not likely to use the project area.
American peregrine falcon *(Falco peregrinus anatum)*	State vulnerable, Forest Service sensitive, BCC	Nest on cliff scrapes or less commonly in large tree hollows; hunt on the wing in all habitat types.	Three known nesting sites within 5 miles of the project area; one nesting site within 2 miles of project area. Protocol surveys of the project area reveal that the species is not currently using the project area for nesting; however, the species is likely to use the project area for foraging.
Bald eagle (*Haliaeetus leucocephalus)*	Federal DL, Forest Service sensitive, BCC	Associated with many habitats, including Westside grasslands, agriculture, pastures, Westside oak and Douglas-fir forests, urban and mixed environs, open water, herbaceous wetlands, Westside riparian wetlands, etc.	Regularly observed near lakes within project area. Known to nest between Hills Creek and Lookout Point lakes. Species is likely to use the project area year-round.
Harlequin duck *(Histrionicus histrionicus)*	Federal SOC, Forest Service sensitive	Breed along fast-moving mountain streams within closed forest canopy; forage in stream.	Species has been documented within 5 miles of project area in recent years along the Willamette River near Oakridge. Species is likely to use the project area.
Yellow-breasted chat *(Icteria virens)*	Federal SOC, State critical	Associated with riparian wetland habitats, agriculture, pastures, oak, and Douglas-fir forests.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area; however, the species is likely to use dense riparian areas in project area.
Acorn woodpecker *(Melanerpes formicivorus)*	Federal SOC, State vulnerable	Nest and forage in oak habitat.	Species was not observed during field investigations; however, oak savanna and woodlands may provide potential habitat in project area. Species likely to use the project area as year-round residents.

Table E-2. Threatened, Endangered, Candidate, and Special-Status Wildlife Species Potentially Occurring Within and Adjacent to the Transmission Line Right-of-Way and Access Road Areas (continued)

Species	Status	Habitat	Conclusion
Birds (continued)			
Lewis' woodpecker *(Melanerpes lewis)*	Federal SOC, State critical, Forest Service sensitive, BCC	Nest in decayed tree or snag cavities; forage in open forests with brushy understories.	Species is not suspected, and there are no documented occurrences within fiv5e miles of the project area; however, breeding habitat includes riparian woodlands and would most likely be found nesting in cavities in cottonwoods. Species is not likely to use project area.
Long-Billed curlew *(Numenius americanus)*	BCC	Breeds in prairies and grassy meadows, generally near water.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area; however, species is likely to use project area during breeding.
Sage Thrasher *(Oreoscoptes montanus)*	BCC	Breeds in tall brush/grasses and scrub/shrub habitat.	Species is likely to use the project area during breeding.
Flammulated owl *(Otus flammeolus)*	BCC	Breeds in mountainous forests, generally coniferous. Preference for ponderosa forests.	Species is likely to use the project area during breeding.
Fox Sparrow *(Passerella iliaca)*	BCC	Associated with dense thickets in coniferous or mixed forest. Requires dense brushy cover for nesting.	Species is likely to use the project area during breeding.
Green-tailed Towhee *No(Pipilo chlorurus)*	BCC	Breed in thickets and scrub/shrub and riparian scrub primarily in the mountains.	Species is likely to use the project area during breeding.
White-headed woodpecker (*Picoides albolarvatus)*	Federal SOC, State critical, Forest Service sensitive	Forage and excavate cavity nests in Ponderosa pine forests.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area. Suitable habitat is not present within the project area; therefore, the species is not likely to use the project area.
Oregon vesper sparrow *(Pooecetes gramineus affinis)*	Federal SOC, State critical, BCC	Nest and forage in upland prairie, grasslands, and savannah habitat types with vegetation less than 18 inches tall.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area. Suitable habitat does not exist within the project area; therefore, species is not likely to use project area.
Purple martin *(Progne truei)*	Federal SOC, State critical, Forest Service sensitive	Nest in tree cavities or nesting boxes; forage in open areas near water.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area. Potential nesting and foraging habitat exist within project area; however, species is not likely to use project area.

Table E-2. Threatened, Endangered, Candidate, and Special-Status Wildlife Species Potentially Occurring Within and Adjacent to the Transmission Line Right-of-Way and Access Road Areas (continued)

Species	Status	Habitat	Conclusion
Birds (continued)			
Northern waterthrush *(Seiurus noveboracensis)*	Forest Service sensitive	Nest and forage in riparian thickens in forests near rapidly flowing water.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area. Species not likely to use in project area.
Rufous hummingbird *(Selasphorus rufus)*	BCC	Breeding habitat includes coniferous forest, second growth, thickets, and brushy hillsides.	Species is likely to use project area during breeding.
Williamson's Sapsucker *(Sphyrapicus thyroideus)*	BCC	Breeding habitat includes mountainous coniferous and mixed forest.	Species is likely to use project area during breeding.
Brewer's Sparrow *(Spizella breweri)*	BCC	Breeds mainly in sagebrush, to lesser extent in other scrub/scrub habitat.	Species is not documented to occur within 5 miles of the project area; however, suitable habitat exists and species is likely to use project area during breeding season.
Calliope Hummingbird *(Stellula calliope)*	BCC	Nests in tree (often conifer) at edge of meadow or thicket along stream.	Species is likely to use project area during breeding.
Great gray owl *(Strix nebulosa)*	Forest Service sensitive	Nest in mature coniferous forest near meadows, which are used for foraging habitat.	Species was not observed during one year of protocol surveys of suitable nesting habitat within the project area; however, species has been documented within 2 miles of the project area. Habitat occurs within the project area; however, species is not likely to use project area for nesting and foraging.
Northern spotted owl *(Strix occidentalis caurina)*	Federal threatened	Nest and forage in large expanses of contiguous mature conifer forests with dense canopy.	There are 17 spotted owl home ranges located within one home range (1.2 miles) of the project area. Species is likely to use forested stands adjacent to the project area. Designated critical habitat occurs within the project area.
Reptiles and Amphibians			
Pacific (Western) pond turtle *(Actinemys marmorata marmorata)*	Federal SOC, State critical, Forest Service sensitive	Nest in dry, well-drained soils in open areas with grass and herbaceous vegetation with trees and shrubs in close proximity	Species has been documented within the project area. Ponds and low to moderate energy streams and rivers provide potential habitat in project area. Species likely to use project area.

Table E-2. Threatened, Endangered, Candidate, and Special-Status Wildlife Species Potentially Occurring Within and Adjacent to the Transmission Line Right-of-Way and Access Road Areas (continued)

Species	Status	Habitat	Conclusion
Reptiles and Amphibians (continued)			
Coastal tailed frog *(Ascaphus truei)*	Federal SOC, State vulnerable	Inhabits cold, clear, rocky streams in wet forests, and not inhabit ponds or lakes.	Species was not observed during field investigation, and no documented occurrences within 5 miles of the project area; however, cold, high gradient streams in forested areas in project area provide potential habitat. Species likely to use project area.
Oregon slender salamander (*Batrachoseps wrighti)*	Federal SOC, State vulnerable	Inhabit moist Douglas-fir and mixed maple, hemlock and redcedar woodlands on the western slopes of the Cascade Mountains; dependent on mature and old-growth stands, commonly in large downed logs.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area. Suitable habitat is present and species is likely to use project area.
Painted turtle *(Chrysemys picta)*	State critical	Nest in sandy or grassy areas near water. Associated with agriculture, pastures, oak and dry Douglas-fir forest and woodlands, open water, rivers, and streams, and herbaceous wetlands.	No documented occurrences in project area, but one population documented within 2 miles. Species likely to use project area.
Northern red-legged frog *(Rana aurora aurora)*	Federal SOC, State vulnerable	Breed in cool-water ponds, lake edges, or slow-moving streams; associated with grasslands, agriculture, and pastures.	Species was not observed during field investigation, and there are no documented occurrences in project area but is found in West Cascades and Willamette Valley regions of Lane County; therefore, lakes, ponds, and low energy streams provide potential habitat in project area. Species likely to use project area.
Foothill yellow-legged frog *(Rana boylii)*	Federal SOC, State critical, Forest Service sensitive	Inhabit small, ephemeral streams to large rivers and within many types of plant communities, including valley-foothill hardwood, coastal scrub, chaparral, valley-foothill riparian, hardwood-conifer, ponderosa pine, and wet meadow.	Species was not observed during field investigation, and there are no documented occurrences in project area. One historical population within 0.25 miles of project area. Small to large streams in project area provide potential habitat. Forest Service Biologists consider species not likely to use project area.
Cascades frog (*Rana cascadae)*	Federal SOC, State vulnerable	Inhabit wet mountain areas in open coniferous forests to near timberline, including small streams, small pools in meadows, lakes, bogs, ponds, and marshy areas near streams with no predatory fishes.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area. Suitable habitat may be present within the project are; however, the species is not likely to use the project area because it is outside the current species range.

Table E-2. Threatened, Endangered, Candidate, and Special-Status Wildlife Species Potentially Occurring Within and Adjacent to the Transmission Line Right-of-Way and Access Road Areas (continued)

Species	Status	Habitat	Conclusion
Reptiles and Amphibians (continued)			
Oregon spotted frog (*Rana pretiosa)*	Federal candidate, State critical	Inhabit shallow water in wet meadows or stream/pond edges with abundant aquatic vegetation for breeding; associated with grasslands, agriculture, and pastures.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area. Suitable habitat may be present within the project area; however, the species is not likely to use the project area because it is outside the current species range.
Invertebrates			
Western Bumblebee *(Bombus occidentalis)*	Forest Service sensitive	Generalist forager, not dependent on particular flower types.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area; however, range and occurrence records are sparse. Suitable habitat exists within the project area; therefore, species is likely to use the project area.
Johnson's Hairstreak *(Callophrys johnsoni)*	Forest Service sensitive	Inhabit coniferous forests that contain mistletoes of genus *Arceuthobium*.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area; however, suitable habitat exists within the project area; therefore, this species is likely to use the project area.
Cascades Axetail Slug *(Carinacauda stormi)*	Forest Service sensitive	Inhabit forested stands dominated by Douglas-fir, with vine maple, sword fern, and Oregon grape understory.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area. Species is not likely to use the project area because occurrences are limited to elevations above 2,500 feet.
Taylor's checkerspot *(Euphydrays editha taylori)*	Federal candidate	Inhabit open grasslands and oak balds where food plants for larvae and nectar sources for adults are available.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area. Suitable habitat may be present within the project area; however, the species is not likely to use the project area.
Fender's blue butterfly (*Icaricia icarioides fender)*	Federal endangered	Inhabit upland prairies of the Willamette Valley; breeding areas associated with Kincaid's lupine.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area. Suitable foraging habitat may be present within the project area; however, the species is not likely to use the project area as breeding habitat.

Table E-2. Threatened, Endangered, Candidate, and Special-Status Wildlife Species Potentially Occurring Within and Adjacent to the Transmission Line Right-of-Way and Access Road Areas (continued)

Species	Status	Habitat	Conclusion
Invertebrates (continued)			
Mardon skipper *(Polites mardon)*	Federal candidate, Forest Service sensitive	Inhabit native, fescue-dominated grasslands.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area. Species not likely to use project area because it is outside the species range.
Oregon megomphix *(Megomphox hemphillia)*	Forest Service Survey and Manage	Inhabit leaf litter and decaying vegetation under sword ferns and big-leaf maple and near downed woody debris.	Habitat present within the project area; also, several known sites exist within 5 miles of the project area; therefore, species is likely to use the project area.
Crater Lake Tightcoil *(Pristiloma arcticum crateris)*	Forest Service sensitive, Forest Service Survey and Manage	Inhabit perennially wet areas in mature conifer forests and meadows.	Species was not observed during field investigation. One documented occurrence within 5 miles of project area. Species is not likely to use project area as it appears limited to areas above 2,000 feet elevation that are under snow for extended periods during winter.
California Shield-backed Bug *(Vanduzeeina borealis californica)*	Forest Service sensitive	Believed to inhabit medium to high elevation natural balds and meadows.	Species was not observed during field investigation, and there are no documented occurrences within 5 miles of the project area. Suitable habitat may be present within the project area; however, the species is not likely to use the project area.

Note: BCC = migratory bird of conservation concern; DL= delisted – taxon recovered; DPS = distinct population segment; SOC = species of concern; Project Area = Land adjacent to and within the transmission line right-of-way and access road areas

Appendix F. Greenhouse Gas Emission Calculations

Implementation of the Proposed Action could contribute to an increase in greenhouse gas concentrations through the below-listed activities. Described below are the assumptions and methods used to determine the project's contribution to greenhouse gas levels.

Assumptions

Construction Emissions

Project construction would take about 7 months during one construction season, with peak construction activity, including road and structure installation, occurring during the entire period. Non-peak construction activities would include installing and removing mitigation measures, establishing staging areas, moving equipment and material into and out of the construction area, and site preparation and restoration work.

The transportation components of greenhouse gas emissions were estimated based on the approximate number of vehicles that would be used during project construction and the approximate distance those vehicles would travel. Greenhouse gas emissions were calculated for both the 5-month-long peak construction period and the 2-month-long non-peak period based on estimates of vehicle round trips per day.

Overestimating the number of round trips ensures that greenhouse gas emission estimates are conservatively high. The number of round trips was deliberately overestimated using the following assumptions:

- All workers would travel in separate vehicles to and within the construction area each day.
- A maximum number of workers would be required to construct the project.
- The round-trip distance to the transmission line is the distance from Portland, Oregon to the Hills Creek Substation and back (about 310 miles round trip).[1]
- All workers would travel the full length of the transmission line each day. Although this is true for some workers, such as inspectors, other workers could be localized.
- Fuel consumption is based on the average fuel economy for standard pickup trucks of 17 miles per gallon (EPA 2013e). Again, this is likely an overestimation as more efficient vehicles may be occasionally used.
- Average helicopter fuel consumption is estimated by BPA pilots at 1 mile per gallon.

Up to 30 construction workers would be at work on the transmission line during the peak construction period (5 months), and an estimated 15 workers could be present during the non-peak construction period (2 months).

[1] The distance to the Hills Creek Substation was chosen as part of developing a conservative estimate as the substation is the farthest point of the project from Portland, Oregon. Workers would likely travel fewer miles to reach most project work areas.

BPA staff would travel to the transmission line for various purposes, such as road inspection, work inspection, staff meetings, environmental compliance monitoring, and meetings with landowners. An estimated one round trip every 2 weeks from the Alvey Maintenance Headquarters during the 7-month-long construction period would result in a total of 14 round trips at an estimated 80 miles per trip.

A helicopter may be used to replace the conductor and deliver construction materials to structures lacking road access. It was assumed that the helicopter would be used for about 4 hours per day for 3 months (26 workdays) to conduct this work. An estimated two round trips from the Oakridge Airport each day would result in a total of an estimated 50 miles per day.

Fuel consumption and greenhouse gas emissions would also result from operation of on-site heavy construction equipment. Heavy construction equipment may include augers, bulldozers, excavators, graders, heavy-duty trucks, and front-end-loaders. Similar to the transportation activities identified above, the increased use of heavy construction equipment would occur during peak construction.

Greenhouse gas emissions associated with equipment operation were overestimated to account for all potential construction activities and associated material deliveries to and from the construction site. Although it is difficult to develop an accurate estimate of total fuel consumption associated with heavy construction equipment operation, the following assumptions were used:

- A maximum of 20 pieces of equipment would be in operation during peak construction, and 5 pieces of equipment would be in operation during off-peak construction.
- The average size of the equipment would not exceed 250 horsepower. All equipment would operate at maximum power for 8 hours per day and 5 days per week throughout the construction phase. This is a significant overestimate because equipment commonly operates in idle or at reduced power.
- Equipment would operate at about 35 percent efficiency, representing the percentage of productive energy extracted from the diesel fuel relative to the maximum potential energy within the fuel (i.e., 128,450 British thermal units per gallon of diesel) (AFDC 2013).

Tree Sequestration Reduction

Tree growth and future carbon sequestration rates are highly variable and depend on several factors including the species of tree, age of tree, climate, forest density, and soil conditions. In the Pacific Northwest, a report published by the Forest Service in 2006 estimates that the maximum carbon density associated with a fully mature forest ranges from 41 to 233 metric tons of carbon per acre (Smith et al. 2006). Although tree removal does not immediately emit any greenhouse gas, this analysis is intended to account for the permanent loss of a carbon storage reservoir resulting from land use changes.

The analysis assumes that about 6 acres of land would be permanently cleared of trees and converted to an area where trees would not be allowed to regrow. This is an overestimation because some of these areas currently lack mature trees. Further, trees in some of these areas would never reach full maturity due to natural attrition or other human-related disturbances. Because a majority

of the tree clearing would occur in a westside Douglas-fir forest type, a carbon storage estimate of 160 metric tons of carbon per acre was used (Smith et al. 2006). It is assumed that 100 percent of the stored carbon would be converted to carbon dioxide upon conversion. The use of tree removal equipment to clear access road areas and the right-of-way was included within the construction assumptions, described above.

Detailed Results

The greenhouse gas emissions or storage loss are quantified below for each type of activity described above.

Construction Emissions

Table F-1 displays the results of calculations for the construction activities that would contribute to greenhouse gas emissions. Construction of the Proposed Action would result in an estimated 2,656.2 metric tons of carbon dioxide equivalent emissions.

Table F-1. Estimated Greenhouse Gas Emissions from Project Construction

Construction Activities	Estimated Greenhouse Gas Emissions (metric tons)			
	Carbon Dioxide[1]	Methane (carbon dioxide equivalent)[2]	Nitrous Oxide (carbon dioxide equivalent)[2]	Total CO_2e[3]
Peak construction transportation	67.9	44.5	266.0	378.4
Off-peak construction transportation	67.9	44.5	266.0	378.4
BPA employee transportation	1.2	0.8	4.5	6.5
Helicopter operation	0.0	0.0	0.0	0.0
Peak construction: equipment operation	1,252.3	1.3	8.4	1,262.0
Off-peak construction: equipment operation	626.1	0.7	4.2	631.0
TOTAL[3]	2,015.4	91.7	549.0	2,656.2[4]

[1] Carbon dioxide emission factors calculated from The Climate Registry (2014).
[2] Methane and nitrous oxide emissions have been converted into units of carbon dioxide equivalent using the Intergovernmental Panel on Climate Change global warming potential factors of 25 for methane and 298 for nitrous oxide (The Climate Registry 2014).
[3] The sum of the individual entries may not sum to the total depicted due to rounding.
[4] This value was rounded to 2,700 metric tons in Chapter 3 of the EA.

Tree Sequestration Reduction

BPA estimates that about 6 acres of trees need to be removed for the Proposed Action. If those trees were to be allowed to reach full maturity, the area would provide about 8,300 metric tons of carbon dioxide equivalent.[2]

[2] Based on a maximum carbon storage rate of 160 tons of carbon per acre. Assumes that 100 percent of the carbon stored would be converted to carbon dioxide.