3.5 Vegetation

This Programmatic Environmental Impact Statement (EIS) considers the adverse environmental impacts on vegetation that would result from the types of facilities described in Chapter 2, Overview of Transmission Facilities, Development Considerations, and Regulations. This section addresses the following topics related to the new construction, operation and maintenance, upgrade, and modification of high-voltage electric transmission facilities (transmission facilities) in Washington:

- Section 3.5.1 identifies regulatory, siting, and design considerations.
- Section 3.5.2 describes the affected environment.
- Section 3.5.3 describes the adverse environmental impacts.
- Section 3.5.4 describes Mitigation Measures.
- Section 3.5.5 identifies probable significant adverse environmental impacts on vegetation.
- Section 3.5.6 provides an environmental sensitivity map and criteria weighting for the siting of transmission facilities as it relates to vegetation, based on the identified considerations, adverse environmental impacts, and Mitigation Strategies.

3.5.1 Regulatory, Siting, and Design Considerations

This Programmatic EIS establishes a broad framework for compliance, outlining general laws, regulations, best management practices (BMPs), and design considerations. It is assumed that project-specific applications would be developed within this pre-established regulatory context and comply with existing laws and regulations. Any projects not complying with applicable laws and regulations or failing to adhere to design considerations or BMPs would require additional project-specific environmental analyses and mitigation. The federal and state laws and regulations that apply to vegetation are summarized in **Table 3.5-1**.

Table 3.5-1: Laws and Regulations for Vegetation

Applicable Legislation	Agency	Summary Information
16 USC Chapter 35 – Endangered Species Act	U.S. Fish and Wildlife Service	This act establishes protection for fish, wildlife, and plants that are listed as threatened or endangered. Unless authorized by a permit from the USFWS, the act prohibits activities that would impact species and their habitats protected under the act (USFWS 2024a). Incidental take permits may be applied for by a non-federal entity whose activities may result in the take of endangered or threatened animal species. A habitat conservation plan must accompany an application for an incidental take permit (USFWS 2024a).
33 USC Chapter 26 – Clean Water Act	U.S. Environmental Protection Agency[(a)(b)(c)]	This act establishes regulations for discharging pollutants into waters of the United States and regulates water quality standards for surface water. Under the CWA, it is unlawful to release pollutants into navigable waters unless a permit is obtained. The following sections of the CWA may apply to projects covered under this Programmatic EIS: ▪ Section 404 of the CWA establishes regulations for discharging pollutants into WOTUS[1] and regulates water quality standards for surface water. Section 404 of the CWA requires authorization for the discharge of dredge or fill material into WOTUS, including some wetlands. The CWA also includes regulated state-specific water quality standards. ▪ Section 401 of the CWA is a series of laws passed by the U.S. Congress to regulate and improve the nation's waterways. It provides states, some Tribes, and the U.S. EPA the authority to issue water quality certifications, which are required for federal discharge permits[2] into WOTUS. ▪ Section 402 of the CWA regulates point sources of discharge for pollutants to waters of the United States. A NPDES permit is required for a facility to discharge a specified amount of pollutants into receiving waters under certain conditions.

[1] Defines the scope of waters that fall under federal jurisdiction for regulatory purposes. The definition of WOTUS has been subject to changes and legal interpretations. The most recent update, following the Supreme Court's decision in Sackett v. EPA, refined the criteria for what constitutes Waters of the United States, particularly focusing on wetlands directly connected to permanent waters (EPA 2025).

[2] A legal document issued by regulatory agencies that authorizes the release of pollutants into waterbodies under specific conditions. These permits are designed to ensure that the discharge meets environmental standards to protect water quality and public health.

Applicable Legislation	Agency	Summary Information
Washington State Environmental Policy Act	▪ Washington State Agencies ▪ Local governments	This act is a process that identifies and analyzes environmental impacts that can be related to issuing permits. SEPA helps applicants and decision-makers understand how a proposed project will impact the environment. Certain projects, as defined in the SEPA Rules (WAC 197-11-704) and that are not exempt, are required to go through the SEPA process.
State of Washington Priority Habitat and Species List (WDFW 2023)	Washington Department of Fish and Wildlife[(d)]	The WDFW maintains a catalog of habitats and species that are prioritized for conservation and management. Priority habitats[3] are unique habitats or features that support biodiversity. Priority species[4] require protection due to population trends, sensitivity to disturbance and habitat alteration, or importance to communities.
RCW 17.10, Noxious Weeds—Control Boards; WAC 16-750, State Noxious Weed List and Schedule of Monetary Penalties	Washington State Noxious Weed Control Board[(d)]	This law aims to limit economic loss and adverse effects on Washington's agricultural, natural, and human resources due to the presence and spread of noxious weeds on all terrestrial and aquatic areas in the state. WAC 16-750 implements RCW 17.10 by defining the official State Noxious Weed List and establishing procedures for weed classification, control, and enforcement. It describes when noxious weeds should be removed, and by whom. Some herbicides used to control noxious weeds must be applied by a licensed pesticide applicator (NWCB 2024a).
RCW 36.70A, Growth Management – Planning by Selected Counties and Cities	Washington State Department of Commerce[(d)]	The goals of the Growth Management Act are to maintain and enhance natural-resource-based industries, retain open space, enhance recreational opportunities, protect the environment, and enhance the state's high quality of life. The act covers the following: ▪ Provides guidance on classifying and designating forest resource lands and identifying the steps to preserve them

[3] Habitat that is given priority for conservation and management by the Washington Department of Fish and Wildlife; may refer to a unique vegetation association (e.g., shrubsteppe) or a particular habitat feature (e.g., cliffs).

[4] In Washington, species of concern for which special conservation actions may be required. These include, but are not, limited to, species that are either state-listed as endangered, threatened, sensitive, or candidate species, or considered vulnerable.

Applicable Legislation	Agency	Summary Information
		▪ Makes local governments responsible for creating their own regulations for development within and around wetlands ▪ Requires counties to adopt development regulations for conservation of agricultural, forest, and mineral resource lands Wetlands under development regulations must be delineated (RCW 36.70A.175).
RCW 76.04, Forest Protection	Washington Department of Natural Resources	Electric utilities are required to have a wildfire mitigation plan. The wildfire mitigation plan is recommended to include vegetation management along the transmission and distribution lines, infrastructure maintenance and repair, and preventative programs.
RCW 76.09, Forest Practices; WAC 222	Washington State Department of Natural Resources[(d)]	This code provides standards and regulations for managing the state's forests. As defined in WAC 222, forest land is all land that can produce merchantable timber,[5] excluding agricultural land and residential land. Several permits may be applicable, including the following: ▪ Notice of Conversion to non-forestry use if an area of forest land is not to be regenerated to forest ▪ Construction of forest roads ▪ Construction in wetlands for the purpose of forest roads or landings[6]
RCW 90.58, Washington State Shoreline Management Act	Washington State Department of Ecology[(d)]	This law establishes a state-local partnership for managing, accessing, and protecting Washington's shorelines. This law applies to shorelines of the state, including marine waters, streams and rivers with greater than 20 cubic feet per second mean annual flow, lakes 20 acres or larger, upland areas extending 200 feet landward from the edge of these waters, biological wetlands and river deltas connected to these waterbodies, and some or all of the 100-year floodplain, including all wetlands. The law requires local governments to prepare locally tailored policies and regulations for managing shoreline use in their jurisdictions, called SMPs. Local governments review shoreline development proposals for compliance with SMP standards.

[5] Trees that have a commercial value and can be harvested or sold.
[6] Designated areas where logs are collected, processed, and loaded onto trucks for transportation to mills or other destinations.

Applicable Legislation	Agency	Summary Information
		Projects within a coastal zone are required to comply with the State of Washington's Coastal Zone Management Program Enforceable Policies. The Washington Coastal Zone Management Program's enforceable policies are found in the following laws, regulations, and plans: ▪ Washington Shoreline Management Act and implementing WACs ▪ Washington State Water Pollution Control Act and implementing WACs ▪ Washington Clean Air Act ▪ Washington State Ocean Resources Management Act and Ocean Management Guidelines ▪ The Marine Spatial Plan for Washington's Pacific Coast
RCW 90.84, Wetlands Mitigation Banking; WAC 173-700	Washington State Department of Ecology[d]	Under this code, it is the policy of Washington State to support wetland mitigation banking.[7] WAC 173-700 provides a framework for certifying and operating a wetland banking system (ORIA 2019). A certification is required for participating in wetland banking. Wetland mitigation banks may include sites where wetlands are restored, created, enhanced, or preserved. Other permits may be required (ORIA 2019).
WAC 222-38, Forest Chemicals	Forest Practices Board	This code provides the policy for the storage, handling, and application of pesticides, fertilizers, and other forest chemicals in forest management.

Notes:

(a) Federal agencies set national standards and oversee the implementation of these acts, but states have the authority to issue permits and enforce regulations through their own programs. This system, known as cooperative federalism, allows states to tailor their programs to local conditions while maintaining consistency with federal standards.

(b) Section 404 permits are issued by the U.S. Army Corps of Engineers.

(c) Section 401 certifications are issued by the U.S. EPA, Ecology, and some Tribes.

(d) The agency responsible for administering most permits or authorizations for the identified regulation. However, if EFSEC is determined to be the agency responsible for approving a proposal, EFSEC can administer several types of permits at the state and local levels. EFSEC provides a streamlined process for siting and licensing major energy facilities, including transmission facilities in Washington State. EFSEC coordinates all evaluation and licensing steps, specifies the conditions for new construction and operation, and issues a Site Certification Agreement, which assumes the responsibility for issuing individual state or local permits. By consolidating these permits into a single Site Certification Agreement, EFSEC can simplify the regulatory process for energy facility developers. While EFSEC itself does not directly administer federal permits, it works closely with federal agencies to ensure that all necessary federal requirements are met during the evaluation and licensing of energy facilities.

[7] A system designed to compensate for unavoidable impacts on wetlands. A wetland mitigation bank is a site where wetlands are restored, created, enhanced, or, in exceptional cases, preserved.

Table 3.5-1 Notes (cont.):
CWA = Clean Water Act; **EFSEC** = State of Washington Energy Site Evaluation Council; **EPA** = U.S. Environmental Protection Agency; **NPDES** = National Pollutant Discharge Elimination System; **RCW** = Revised Code of Washington; **SEPA** = Washington State Environmental Policy Act; **SMP** = Shoreline Management Plan; **USC** = United States Code; **USFWS** = U.S. Fish and Wildlife Service; **WAC** = Washington Administrative Code; **WDFW** = Washington Department of Fish and Wildlife; **WOTUS** = Waters of the United States

The siting of transmission facilities is determined by engineering, technical, environmental, and socioeconomic factors. **Table 3.5-2** summarizes guidance documents and management plans that outline the design considerations and BMPs generally used to avoid or minimize adverse environmental impacts on vegetation.

Table 3.5-2: Siting and Design Considerations for Vegetation

Siting and Design Consideration	Description
Biodiversity Areas and Corridor Creation and Conservation (Azerrad et al. 2023)	This publication provides a priority habitat and species biodiversity areas and corridors map that allows for flagging regions of high-quality habitats that can be turned into corridors. Creating biodiversity areas and corridors is important for creating large, connected landscapes and creating movement for species.
BMPs for invasive plants	NCWB provides BMPs for controlling and disposing of noxious weeds. The board provides an integrated weed management approach to determine how best to control noxious weeds to reach land-use goals. It also provides information on the best control methods and timing of control (NWCB 2024a). The board has different BMPs for disposing of different types of noxious weeds, including flowering plants, woody materials, toxic plants, and more (NWCB 2024b).
Washington Utilities and Transportation Commission – Wildfire Mitigation Plan	The mission of the UTC is to ensure that investor-owned utility and transportation routes are safe, equitable, reliable, and fairly priced. The UTC requires that electric utilities submit annual wildfire plans, which would include all the tools a utility could use to prevent and respond to wildfires, including vegetation management, improving electrical line resilience against extreme weather, and methods for depowering lines (UTC 2025).
Management Recommendations for Washington's Priority Habitats and Species (Rodrick and Milner 1991; revised 2018)	This publication provides management recommendations for 60 species of fish and wildlife, some of which have been replaced by newer guidelines listed in this table.

Siting and Design Consideration	Description
Management Recommendations for Washington State's Shrubsteppe[8] Priority Habitat (WDFW 2020a)	This publication provides management recommendations for shrubsteppe ecosystems, including long-term planning and current planning activities. Long-range management practices include identifying and mapping ecosystems, creating habitat connectivity between shrubsteppe habitats, adopting policies and regulations to protect shrubsteppe, and including shrubsteppe in the Growth Management Act. Current activities include site-specific management, avoidance, and minimization.
BMPs for Washington State Oregon White Oak Woodlands (WDFW 2024a)	This document outlines the following BMPs for mitigating disturbance of Oregon white oak (*Quercus garryana*) woodlands: ▪ Avoidance - Avoid disturbance in and around Oregon white oak ecosystems. ▪ Minimization - When all alternatives for avoidance have been considered but are not possible, minimize disturbance by avoiding removal of high-functioning individual trees and retain as much habitat as possible. ▪ Compensation - When ecosystem function is lost due to habitat removal, implement compensatory mitigation on site or as close to the site as possible. A compensatory plan should address both the physical loss of habitat and temporal loss[9] of functions.
Conservation Strategy for Washington State Inland Sand Dune (DNR 2007)	This strategy provides information on inland sand dune systems in Washington and identifies management strategies for conserving these ecosystems. Inland sand dunes provide habitat for multiple plant and animal species at risk, as well as being a priority habitat. Eight sand dune ecosystems have been identified as having significant conservation value and should be avoided by transmission projects: Hanford Central Dunes, Juniper Dunes Wilderness, Delight Dunes, Wanapum and Wanapum North Dunes, Wahluke Dunes, Handford Black Sand Dunes, Sentinel Butte Dunes, and Wakefield Dunes.
Riparian Ecosystems, Volume 2: Management Recommendations (WDFW 2020b)	This publication provides updated riparian ecosystem management recommendations, including regulatory protections, delineation of riparian management zone, recommendations for restoring riparian ecosystems, and improving protection of riparian areas through adaptive management.

[8] An arid ecosystem that is dominated by grasses and shrubs in a landscape of rolling hills. In Washington, this is found in the southeast part of the state.

[9] The delay between the loss of a habitat or resource and the time it takes for mitigation efforts to fully compensate for that loss.

Siting and Design Consideration	Description
Landscape Planning for Washington's Wildlife: Managing for Biodiversity in Developing Areas (WDFW 2009a)	This publication provides guidelines and management strategies to reduce impacts on biodiversity in Washington.
Design Stormwater Management following the Washington State Department of Ecology's Stormwater Management Manuals	Ecology provides guidance on stormwater management with manuals specific to western and eastern Washington. Implementation of stormwater management can protect surrounding vegetation from impacts such as sedimentation and flash floods. The following BMPs are recommended for minimizing impacts on vegetation resources (Ecology 2024a, 2024b): ▪ BMP T5.40: Preserving Native Vegetation ▪ BMP T5.41: Better Site Design ▪ Biofiltration BMPs ▪ BMP F6.62: Tree Retention and Tree Planting
Institute for Electrical and Electronics Engineers Standards Association, IEEE Guide for Maintenance Methods on Energized Power Lines	This guide provides general recommendations for performing maintenance work along energized power lines, which includes ensuring proper care and maintenance of tools and equipment, and work methods for vegetation management.
Recommended Siting Practices for Electric Transmission Developers (Americans for a Clean Energy Grid 2023)	This document outlines best practices for siting electric transmission facilities. Recommended practices include: ▪ Early and transparent engagement ▪ Respect and fair dealing ▪ Environmental considerations ▪ Interagency coordination ▪ Use of existing infrastructure
Shoreline Master Programs Handbook, Chapter 11, Vegetation Conservation, Buffers, and Setbacks (Ecology 2017)	The Shoreline Master Program Handbook provides BMPs and guidelines for protecting shorelines and aquatic life. Buffers and setbacks help preserve native vegetation (mainly riparian) that occurs along shorelines, which has multiple benefits related to protecting both aquatic and terrestrial resources.
Update on Wetland Buffers: The State of Science Final Report (Ecology 2013)	This publication provides an update on the state of science regarding the use of buffers in protecting wetland functions.
Wetland Mitigation in Washington State Part 1: Agency Policies and Guidance and Part 2: Developing Mitigation Plans (Ecology et al. 2006, 2021)	These publications provide basic principles of wetland mitigation and technical guidance for developing compensatory mitigation.

Siting and Design Consideration	Description
Arid Lands Initiative – Shared Priorities for Conservation at a Landscape Scale (Arid Lands Initiative 2014)	The Arid Lands Initiative designates priority areas of shrubsteppe habitats for conservation in Washington.
Site-Specific Management: How to Avoid and Minimize Impacts of Development to Shrubsteppe (Azerrad et al. 2011)	This publication provides recommendations for shrubsteppe management in land development projects, including roads and utility corridors.
Shrub-Steppe and Grassland Restoration Manual for the Columbia River Basin (Benson et al. 2011)	This manual provides information on shrubsteppe and grassland restoration which can be important for proponents to consider when disturbing land in these habitats.
PHS Local Government User Guide: Shrubsteppe and Eastside Steppe Map (Folkerts et al. 2023)	This guide contains information on shrubsteppe classification and provides mapping tools that can help the development and siting of long-term projects such as transmission facilities in the Columbia Plateau.
Washington Shrubsteppe Restoration and Resiliency Initiative: Long-Term Strategy 2024 – 2054 (WDFW 2024b)	This initiative identifies priority areas for conservation in shrubsteppe habitat in the Columbia Basin. It contains a mapping tool that identifies core areas for conservation, species distributions, migration corridors, shrubsteppe cover, and other important information.
Federal Energy Regulatory Commission Reliability Standards	These standards ensure the reliable operation of the bulk power system, addressing aspects such as resource adequacy, system performance, and operational security.
North American Electric Reliability Corporation Transmission Vegetation Management standards (NERC 2016)	This document provides five requirements to follow for vegetation management within transmission ROW: ▪ Maintain vegetation to prevent spread into the minimum vegetation clearance distance. ▪ Document management strategies and processes to prevent spread of vegetation in the minimum vegetation clearance distance. ▪ Complete timely notification of the appropriate control center regarding vegetation conditions. ▪ Implement corrective actions to ensure that flashover spread[10] will not be violated (e.g., through vegetation management). ▪ Perform annual inspections of vegetation conditions.

[10] Occurs when high-voltage electricity jumps over an insulator or between conductors in an electrical discharge.

Siting and Design Consideration	Description
Interim Guidelines for Wetland Protection and Conservation in British Columbia; Chapter Nine: Road and Utility Corridors (Wetland Stewardship Partnership 2009)	This publication provides BMPs for road and construction in wetlands. Related recommended practices include the following: ▪ Design crossings for minimal impacts. ▪ Incorporate runoff treatment structures (detention ponds, grassed swales etc.) into road designs to serve as filters for contaminants entering the wetlands. ▪ Decommission unused roads and reestablish wetland functions.

BMP = best management practice; **DNR** = Washington Department of Natural Resources; **PHS** = Priority Habitat and Species; **IEEE** = Institute of Electrical and Electronics Engineers; **NERC** = Federal Energy Regulatory Commission; **NWCB** = Washington State Noxious Weed Control Board; **ROW** = right-of-way; **UTC** = Washington Utilities and Transportation Commission; **WDFW** = Washington Department of Fish and Wildlife

3.5.2 Affected Environment

This section describes vegetation within the Study Area defined in Chapter 1, Introduction, which includes several key components:

- Ecoregions of Washington
- Ecosystems
- Priority Habitats
- Wetlands
- Washington State Department of Natural Resources Protected Areas
- Washington Shrubsteppe Restoration and Resiliency Initiative
- Plant Priority Species

The analysis of the affected environment divides the Study Area into ecologically relevant sections based on Washington’s ecoregions, and groups vegetation in the Study Area using the following:

- Vegetation groups available from Landscape Fire and Resource Management Planning Tools (LANDFIRE 2016a) within the Study Area
- Sensitive ecosystems, which include vegetation associations of conservation concern (ranked as S1, S2, S3, SX, and SH by NatureServe) and terrestrial priority

habitats and features based on the Washington Department of Fish and Wildlife (WDFW 2005)

- Wetlands, utilizing the National Wetlands Inventory (NWI) wetlands mapper (USFWS 2024b)
- Plant priority species in Washington

While the Programmatic EIS was developed based on guidance documents available at the time of writing, including priority habitats, listed vegetation communities, and priority plant species, vegetation resources, and those considered most sensitive to transmission facility development may change over time. The most recent guidance and data layers available should be used and consulted by applicants on a project-by-project basis to determine and avoid potential interactions with vegetation resources.

3.5.2.1 Vegetation

Ecoregions of Washington

Washington is divided into nine level III ecoregions, which group similar ecosystems. These ecoregions group similar ecosystems within the state based on geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology (**Figure 3.5-1**) (DNR 2022a). This Programmatic EIS uses these ecoregions as a framework for its analysis of vegetation resources that may be impacted by transmission facilities in the Study Area. Ecoregions define ecologically similar areas; thus, the challenges and constraints associated with developing transmission facilities are similar within an ecoregion. Each ecoregion is described in the following sections. The descriptions focus on the portions of the ecoregions that are within Washington, as some ecoregions extend beyond the state boundaries into adjoining states and Canada. **Table 3.5-3** summarizes the total acres of each ecoregion within the Study Area.

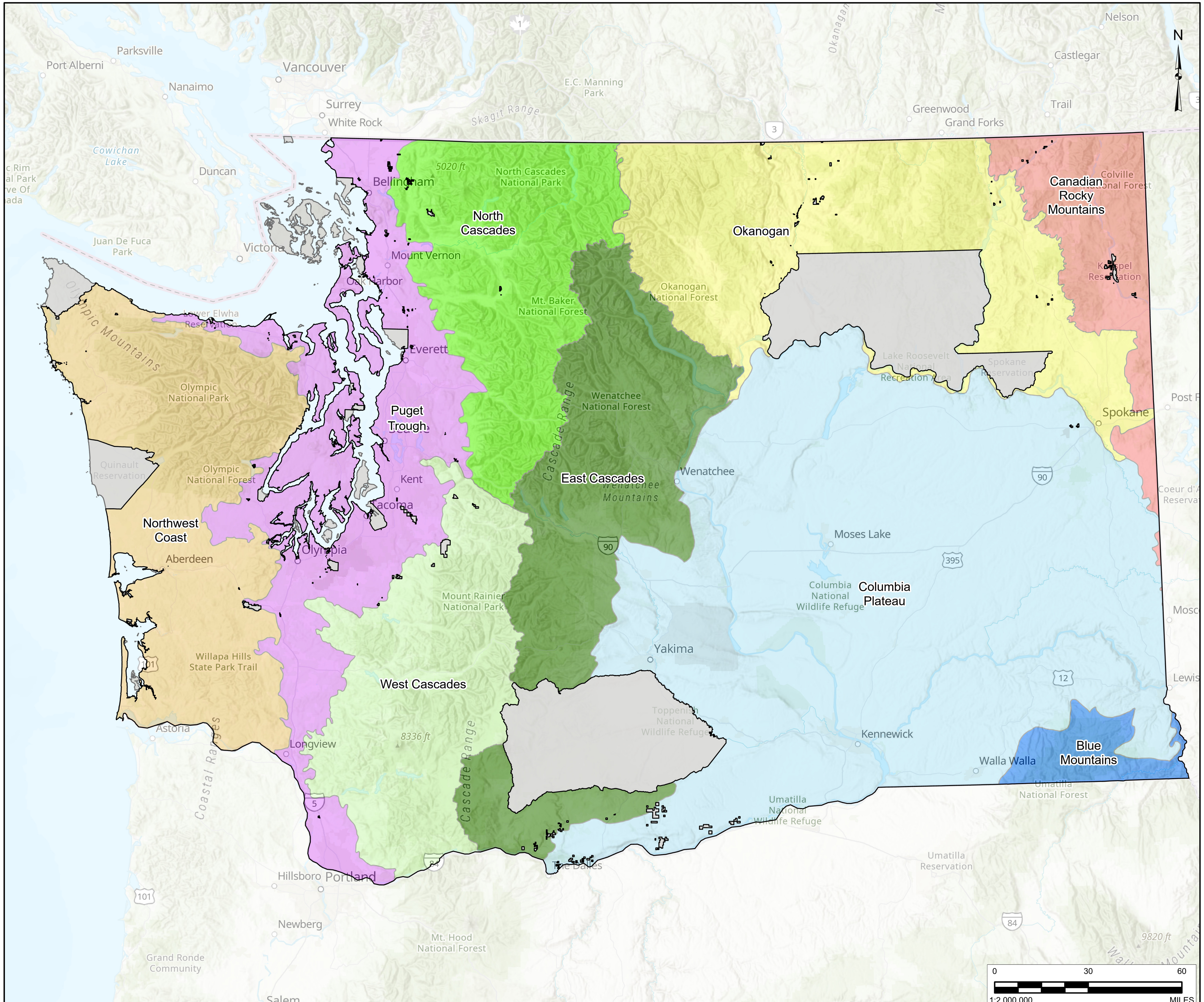
Table 3.5-3: Total Area of Washington's Ecoregions (Level III) within the Study Area

Ecoregion of Washington	Total Area (Acres)	Percentage of the Study Area[a]
Blue Mountains	566,513	1.4%
Canadian Rocky Mountains	1,663,598	4.2%
Columbia Plateau	13,143,500	33.1%
East Cascades	4,169,496	10.5%
North Cascades	3,328,979	8.4%
Northwest Coast	4,411,035	11.1%
Okanogan	4,832,328	12.2%
Puget Trough	4,121,571	10.4%
West Cascades	3,470,182	8.7%
Total	**39,707,201**	**100%**

Source: Summary calculated using data from DNR (2022a)

Notes:

(a) Total may not sum due to rounding.



LEGEND

- Study Area
- Exclusion Areas

Ecoregions (DNR, 2022a)

- Blue Mountains
- Canadian Rocky Mountains
- Columbia Plateau
- East Cascades
- North Cascades
- Northwest Coast
- Okanogan
- Puget Trough
- West Cascades

REFERENCES AND NOTES

1. SERVICE LAYER CREDITS: SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY, ESRI, USGS
2. DNR. 2022A. ECOREGIONS OF THE PACIFIC NORTHWEST. ACCESSED OCTOBER 3, 2024. HTTPS://DATA-WADNR.OPENDATA.ARCGIS.COM/DATASETS/3B9362E8F29E465A985AA8DDC8DE2D86_0/EXPLORE?LOCATION=46.246758%2C-118.050200%2C5.82

Washington State Energy Facility Site Evaluation Council

PROJECT

PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE

ECOREGIONS OF WASHINGTON

YYYY-MM-DD 2025-08-28

CONSULTANT wsp

FIGURE 3.5-1

This Page Intentionally Left Blank

Northwest Coast

The Northwest Coast ecoregion occupies 4,411,035 acres (approximately 11.1 percent) of the Study Area and covers the Olympic Peninsula and the Coast Mountain Range, including the Willapa Hills (WDFW 2005). The climate of the region is characterized by high precipitation, ranging from 60 to 240 inches annually, which mostly falls between November and April (WDFW 2005). The northeastern Olympic Mountains receive the least amount of rain due to the rain shadow effect. Summers are typically cool (WDFW 2005).

The Olympic Mountains are characterized by jagged peaks that extend up to 8,000 feet above sea level and were formed as an individual uplift event separate from the coastal mountain chain. Areas of alpine and subalpine[11] terrain occur on this range, including alpine meadows, exposed rock, and glacial ice. The Willapa Hills have a more rounded topography due to erosion (WDFW 2005).

Forests in this ecoregion are highly productive and consist predominantly of coniferous trees (WDFW 2005). The climate produces large trees with an abundant understory of mosses, lichens, ferns, and herbs. Dominant tree species of the ecoregion include Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and western redcedar (*Thuja plicata*) (WDFW 2005). Forests extend from sea level to 2,200–3,200 feet above sea level in the Coast Range and Olympic Mountains. A narrow area of forests dominated by Sitka spruce (*Picea sitchensis*) occurs along the coast, where cool, wet conditions and salt spray favor this species, in this ecoregion (WDFW 2005).

Open subalpine parkland occurs at higher elevations, above the timberline (WDFW 2005). Parkland is characterized by well-spaced trees intermixed with shrub or herbaceous vegetation. Alpine environments persist at the highest elevations where climatic extremes limit tree growth. Other prominent ecosystems in this ecoregion include broadleaf riparian forests, native grasslands, sand dunes and coastal strand communities, western redcedar and red alder (*Alnus rubra*) swamps, and rush meadows and marshes (WDFW 2005). Glaciers occur on the peaks of the Olympic Mountains, including one prominent glacier approximately 10 square miles on Mount Olympus (WDFW 2005). Numerous rare plants occur in the Olympic Mountains due to their relative isolation and diversity of ecosystems (WDFW 2005).

[11] A region on a mountain just below the tree line. This is typically the transition zone between montane forest and treeline.

Fifty-five percent of this ecoregion is privately owned land and is predominantly used for commercial forestry. Thirty-one percent is managed by six federal agencies (U.S. Forest Service [USFS], National Park Service, U.S. Fish and Wildlife Service [USFWS], U.S. Department of Defense, and U.S. Army Corps of Engineers), and 12 percent is in public trust land managed by the Washington Department of Natural Resources (DNR) (WDFW 2005). The Olympic National Forest, managed by the USFS, is a protected area that occurs in this ecoregion and is surrounded by Olympic National Park (WDFW 2005). Other dominant land uses include sport fishing, recreational activities, and hunting (WDFW 2005). Most communities in this ecoregion are small and located along the coast, with one major metropolitan area, Aberdeen-Hoquiam (WDFW 2005).

Puget Trough

The Puget Trough is located east of the Northwest Coast ecoregion and is the most populous of the ecoregions in Washington. The Puget Trough covers 4,121,571 acres (approximately 10.4 percent) of the Study Area. The climate in this ecoregion is characterized as maritime with warm, relatively dry summers and mild, wet winters (WDFW 2005). Annual precipitation ranges from 25 to 60 inches. The Olympic Mountains produce a rain shadow effect that reduces the amount of rainfall this region receives (WDFW 2005). Meltwater from glaciers in the adjacent Olympic Mountains and North Cascades provides fresh, cold water to the streams and rivers located in the Puget Trough (WDFW 2005).

The Puget Trough comprises broad lowland valleys and inland seas. It is bordered in the west by the Olympic Mountains and in the east by the Cascade Range, creating a unique climate, soils, and geology (WDFW 2005). The lowlands have an average height of 445 feet. The Puget Trough includes three natural basins that formed 150 million years ago from colliding tectonic plates. The area was covered by thick glaciers approximately 15,000 years ago, followed by erosion during the melting of the last major glaciation, which formed the lowlands that exist today (WDFW 2005).

Ecosystems in the Puget Trough are diverse, ranging from coniferous forest to prairie grasslands, oak savannahs, and estuarine[12] environments. Dominant tree species of coniferous forests include Douglas-fir, western hemlock, and western redcedar (WDFW 2005). Characteristic deciduous[13] trees include Oregon white oak (*Quercus garryana*), Pacific madrone (*Arbutus menziesii*), bigleaf maple (*Acer macrophyllum*),

[12] Unique and dynamic ecosystems where rivers meet the sea, creating a mix of fresh and saltwater known as brackish water.
[13] A type of tree that sheds its leaves annually.

and red alder. Grasslands intermix with open oak woodlands, creating Oregon white oak (*Quercus garryana*) ecosystems, which were historically maintained by fires set by Native Americans of the region (WDFW 2005).

West Cascades

The West Cascades ecoregion is located west of the Cascade crest and south of Snoqualmie Pass and is the least developed ecoregion in Washington. The West Cascades ecoregion covers 3,470,182 acres (approximately 8.7 percent) of the Study Area. The climate in this ecoregion is characterized as wet and mild (WDFW 2005). Annual precipitation ranges from 55 to 140 inches, mostly falling from October through April. Higher elevations have fluctuating snowpack, with lower elevations accumulating little snow (WDFW 2005).

The West Cascades ecoregion is composed of highlands shaped by montane[14] glaciers and riverine valleys. Elevation ranges from 1,000 to 7,000 feet above sea level, with peaks exceeding 14,000 feet on Mount Rainier (WDFW 2005). Isolated volcanic peaks and high plateaus also occur in this region, including Mount St. Helens. Natural lakes frequently occur, created by glacial processes and resulting landslides (WDFW 2005).

Ecosystems in the West Cascades are dominated by conifer forests, including Douglas-fir and western hemlock forests at low to middle elevations (WDFW 2005). At higher elevations on volcanic peaks, alpine meadows, and cushion plant communities are supported (WDFW 2005). Historically, this region was extensively used for timber harvest, but it remains biologically diverse and somewhat intact botanically (WDFW 2005).

North Cascades

The North Cascades ecoregion occupies 3,328,979 acres (approximately 8.4 percent) of the Study Area, includes the Cascade Range north of Snoqualmie Pass and west of the crest, and extends northward to British Columbia, Canada (WDFW 2005). The climate of the ecoregion is characterized by high precipitation, ranging from 60 to 160 inches annually, which mostly falls between October and April (WDFW 2005). High elevations maintain snowpack through much of the year, while middle to low elevations have fluctuating or transient snowpacks (WDFW 2005).

The North Cascades ecoregion is composed of glaciated mountain terrain ranging from 1,000 to 7,000 feet above sea level, with the highest peaks (volcanoes) reaching more

[14] An area with lots of mountains, or on a mountain.

than 10,000 feet. Glacially carved valleys and cirques[15] are prominent, in addition to natural lakes created by glacial processes (WDFW 2005).

Forests in this ecoregion consist of western hemlock, Douglas-fir, and redcedar at low elevations. At middle elevations, forests consist predominantly of either Pacific silver fir (*Abies amabilis*) or western hemlock, and forests at higher elevations are a mosaic of both species. Above timberline, alpine heaths, meadows, and fell-fields (cushion plant communities) occur (WDFW 2005). Other habitats include riparian areas dominated by broadleaf trees, avalanche chutes with Sitka alder (*Alnus alnobetula*) and vine maple (*Acer circinatum*), and wetlands.

The majority of land in this region is owned by the National Park Service, USFS (through the Mount Baker-Snoqualmie National Forest), or DNR. Private land is under legacy ownership, and other state, city, and county land makes up the remainder of the region (WDFW 2005).

East Cascades

The East Cascades ecoregion is located east of the Cascade crest and extends from the Sawtooth Ridge south to the Columbia Gorge. The East Cascades covers 4,169,496 acres (approximately 10.5 percent) of the Study Area. The climate in this ecoregion varies from west to east, with western areas having colder temperatures and high precipitation and eastern areas being hot and dry (WDFW 2005). Annual precipitation ranges from 20 to 120 inches, mostly falling from November through April (WDFW 2005).

The East Cascades were formed by alpine glaciers and landslides, creating rugged topography. Broad valleys extend in the lowlands between mountain ridges (WDFW 2005). Isolated volcanic cones appear in this region, though only Mount Adams (12,276 feet) is as high as those in the Western Cascades. Most of the region ranges in elevation from 2,000 to 7,000 feet (WDFW 2005).

Ecosystems in the East Cascades are dominated by coniferous forests. Dominant species include grand fir (*Abies grandis*), Douglas-fir, and ponderosa pine (*Pinus ponderosa*) (WDFW 2005). Oregon white oak woodlands occur at lower elevations in the southern half of the ecoregion, and shrublands occur along the foothills and south-facing slopes (WDFW 2005). Fire has historically been an important factor in this ecoregion, with fire intervals ranging from 10 to 150 years. The historic fire regime

[15] A bowl-shaped, amphitheater-like valley formed by glacial erosion.

impacted the forest stand patterns, resulting in a mosaic of forest stand ages and densities; however, fire suppression has resulted in large areas of dense forests (WDFW 2005).

Okanogan

The Okanogan ecoregion is located east of the Cascade crest and west of the Selkirk Mountains. This ecoregion covers 4,832,328 acres (12.2 percent) of the Study Area. The climate in this ecoregion is the coldest in the state (WDFW 2005). Annual precipitation in this area ranges from 14 to 24 inches, with up to 90 inches in the Cascades. The Cascade Mountains produce a rain shadow effect over this ecoregion, resulting in less rainfall (WDFW 2005).

The Okanogan ecoregion is a transitional region that includes the Methow and Okanogan Valleys, the Okanogan Highlands, and the Colville and Spokane Valleys (WDFW 2005). The highest elevation is in the northern part of this region, with peaks surpassing 8,900 feet above sea level. Low valleys are located around 750 feet above sea level (WDFW 2005).

Ecosystems in the Okanogan ecoregion are diverse, ranging from coniferous forests in the mountain ridges and hills and shrubsteppe and native grasslands in the low valleys (WDFW 2005). High elevations are dominated by subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*), while Douglas-fir, western larch (*Larix occidentalis*), western white pine (*Pinus monticola*), and quaking aspen (*Populus tremuloides*) are more common at middle elevations (WDFW 2005). This area has remained somewhat intact and contains many rare plant species that are important for wildlife (WDFW 2005).

Columbia Plateau

The Columbia Plateau is in the eastern part of Washington; it is bounded by the Cascade, Okanogan, Blue, and Rocky Mountains ecoregions and covers approximately one-third of the state. The Columbia Plateau covers 13,143,500 acres (approximately 33.1 percent) of the Study Area. The climate in this ecoregion is the hottest and driest of any region in the state (WDFW 2005). Annual precipitation ranges from 8 to 14 inches due to a rain shadow effect produced by the Cascade Mountains (WDFW 2005). Drought and natural fires are common in this region (WDFW 2005).

The Columbia Plateau is composed of basalt canyons and coulees carved by ice age floods. Elevations are lowest near the Columbia River (160 feet above sea level) and rise to nearly 4,000 feet above sea level in the Badger and Tekoa Mountains (WDFW 2005).

The dominant ecosystem in the Columbia Plateau is generally characterized as drought-tolerant shrubsteppe. Most of the region is dominated by sagebrush; other steppe communities, such as salt desert scrub, desert playa, and grasslands, are also present (WDFW 2005). The remaining native vegetation of the region occurs on canyon sides and in shallow basalt soils in the scablands (WDFW 2005). Douglas-fir and ponderosa pine forests occur in the foothills of the surrounding mountains (WDFW 2005). Other special habitats include sand dunes, gravelly areas, basalt cliffs, steep canyons, alkali lakes, and vernal pools[16] (WDFW 2005).

Canadian Rocky Mountains

The Canadian Rocky Mountains ecoregion is located east of the Okanogan Ecoregion. The Canadian Rocky Mountains ecoregion covers 1,663,598 acres (approximately 4.2 percent) of the Study Area. The climate in this ecoregion varies, but the majority of the region is characterized as a maritime climate with warm, relatively dry summers and mild, wet winters (WDFW 2005). Annual precipitation ranges from 24 to 34 inches.

The Canadian Rocky Mountains ecoregion was historically nearly completely glaciated. This has resulted in U-shaped moraine valleys[17] and isolated mountain peaks (WDFW 2005). Elevations range from 1,300 feet above sea level along the Columbia River up to 7,000 feet in the Salmo-Priest Wilderness area (WDFW 2005).

Ecosystems in the Canadian Rocky Mountains are dominated by coniferous forest, though forest composition varies with climate and elevation (WDFW 2005). At lower elevations, Douglas-fir and ponderosa pine are dominant, while grand fir, western hemlock, and western redcedar forests are more common in mid-montane elevations in the region (WDFW 2005). Subalpine fir and Engelmann spruce forests can be found at higher elevations, along with whitebark pine (*Pinus albicaulis*), lodgepole pine (*Pinus contorta*), and subalpine larch (*Larix lyallii*) (WDFW 2005). Along riparian areas, willows (*Salix* spp.) and cottonwoods (*Populus* sp.) can be found in addition to native grasslands on south-facing slopes and along the foothills (WDFW 2005).

Blue Mountains

The Blue Mountains ecoregion extends from Idaho and Oregon into the southeast corner of Washington. The Blue Mountains cover 566,513 acres (approximately 1.4 percent) of the Study Area. The climate in this ecoregion is characterized by wet

[16] Seasonal pool of water that provides habitat for plants and animals.
[17] A type of valley formed by the accumulation of glacial debris, known as moraines.

winters, with floods in the spring and autumn being common (WDFW 2005). Annual precipitation ranges from 14 to 24 inches (WDFW 2005).

The Blue Mountains were formed by the uplifting of the Columbia River basalt flows. The Grande Ronde and Snake Rivers cut deep canyons, creating the topography that typifies this region (WDFW 2005). Elevation ranges from 2,000 to 4,000 feet above sea level, with the highest point being Mount Misery (6,387 feet) and the lowest point occurring along the Snake River (750 feet) (WDFW 2005). Windblown silt and volcanic ash cover the majority of the plateau, creating a rich soil base.

Ecosystems in the Blue Mountains have remained relatively intact and consist largely of natural or semi-natural vegetation. Most of the region is dominated by coniferous forest consisting of Douglas-fir and ponderosa pine at lower elevations, which are replaced by subalpine fir and Engelmann spruce at higher elevations (WDFW 2005). Canyon grasslands and dense shrublands also occur, due to the varying topography of the region (WDFW 2005).

The majority of this ecoregion is public land managed by federal and state departments such as the USFS, USFWS, and DNR. There is some private land in the valley bottoms of the region and a few mining claims in the mountains.

Ecosystems

While ecoregions are geographically and climatically similar sections of Washington, ecosystems are more discrete units used to describe vegetation communities that arise from combinations of soil, climate, topography, and physiography. Multiple ecosystems occur within each ecoregion of Washington, and similar ecosystems may be found across ecoregions.

Ecosystem classification often follows a hierarchical approach, with plant associations as the fundamental unit by which ecosystem status and rank are assessed. The classification system identifies a group of plant community types, termed an "association," that tend to co-occur across the landscape due to the combination of ecological processes, substrates,[18] and environmental gradients (LANDFIRE 2016b). Plant associations are typically named after the climax species that characterize the ecosystem, meaning the species expected to occur in an ecosystem that is in an unmodified state (i.e., not impacted by fire, flooding, or human intervention). The Washington Natural Heritage Program (WNHP) identifies plant associations that occur

[18] A layer of material or surface where an organism could live.

in Washington and assesses each plant association's status to determine which are priorities for conservation. The WNHP assesses the rarity or extirpation[19] risk of plant associations using NatureServe's Conservation Status Ranking Methodology, which ranks ecosystems on a five-point scale from critically imperiled (1) to secure (5) (NatureServe 2024a). **Table 3.5-4** summarizes the definitions of these ranks, using the subnational (S) status category for Washington. Species conservation rankings follow the same convention. Plant associations of conservation concern for the purpose of assessing the affected environment include those that are ranked as S1, S2, or S3, as well as those that are considered extirpated (SX and SH).

Table 3.5-4: Conservation Status Ranking and Definition for Ecosystems and Vegetation Based on NatureServe

Rank	Definition
SX	Presumed Extirpated – species or plant association that is believed to be extirpated from the jurisdiction.
SH	Possibly Extirpated – species or plant association known only from historical records without sufficient evidence to definitively determine whether the occurrence is extirpated from the jurisdiction.
S1	Critically Imperiled – species or plant association at a very high risk of extirpation in the jurisdiction due to very restricted range,[20] few populations or occurrences, very steep population decline, severe threats, or other factors.
S2	Imperiled – species or plant association at a high risk of extirpation due to restricted range, few populations or occurrences, steep population decline, severe threats, or other factors.
S3	Vulnerable – species or plant association at medium risk of extirpation due to fairly restricted range, relatively few populations or occurrences, recent or widespread declines in population, threats, or other factors.
S4	Apparently Secure – species or plant association at a fairly low risk of extirpation due to extensive range or many populations or occurrences, but with possible cause for some concern due to local recent declines, threats, or other factors.
S5	Secure – species or plant association at very low risk of extirpation in the jurisdiction due to very extensive range or abundant populations or occurrences, with little to no concern from declines or threats.
SU	Unrankable – unable to assign rank due to insufficient data or conflicting information.

[19] The state of a species or population becoming locally extinct in a specific geographic area while still existing elsewhere.
[20] Species with ranges that are restricted by some factor which could be biological, physical, or behavioral.

Rank	Definition
SNR	Unranked – status is not yet assessed for the jurisdiction.
SNA	Not Applicable – the species or plant association is not a suitable target for conservation for the jurisdiction (e.g., non-native species).

Source: NatureServe 2024b

Plant associations are often too detailed for broad-scale ecosystem mapping, so they are typically grouped together into broader groups for ecosystem mapping purposes. This is achieved by grouping plant associations that have similar dominant species and provide similar structure and function. Habitat mapping for Washington was obtained from LANDFIRE (2016a). The LANDFIRE database is a multi-agency program managed by the USFS and the U.S. Department of the Interior. The tool provides landscape geospatial tools to assist with planning, management, and operations (LANDFIRE 2016c). The most detailed scale of habitat mapping from LANDFIRE, which covers the entire State of Washington, is at the level of vegetation group. The ecosystem classification for vegetation type in LANDFIRE follows the ecosystem classification developed by NatureServe for the western hemisphere. **Table 3.5-5** summarizes vegetation groups by ecoregion in the Study Area**.**

Developed land within the Study Area is estimated to be 2,323,596 acres, with 47.4 percent of the developed land mapped in the Puget Trough (**Table 3.5-5**). Developed land includes areas of all intensities of development, including developed (high, medium, low); developed roads; and industry development (i.e., quarries, strip mines, gravel pits, wells, and wind pads). Urban green spaces total 893,026 acres in the Study Area, which includes urban forests, urban herbaceous areas, and urban shrubland, the majority of which occurs in the Puget Trough (**Table 3.5-5**). Agricultural areas, including crops, fallow fields, orchards, berries, pasture, vineyards, and wheat, total 7,354,164 acres in the Study Area, of which 84.3 percent occurs in the Columbia Plateau. The remaining areas all fall into natural vegetation groups or vegetated areas dominated by introduced species (e.g., Great Basin & Intermountain Introduced Annual and Biennial Forbland). Ecosystems in the Study Area are shown in **Figure 3.5-2.**

This Page Intentionally Left Blank

Table 3.5-5: Area of Vegetation Groups by Ecoregion in the Study Area

Vegetation Group	Blue Mountains Ecoregion (Acres)	Canadian Rocky Mountains Ecoregion (Acres)	Columbia Plateau Ecoregion (Acres)	East Cascades Ecoregion (Acres)	North Cascades Ecoregion (Acres)	Northwest Coast Ecoregion (Acres)	Okanogan Ecoregion (Acres)	Puget Trough Ecoregion (Acres)	West Cascades Ecoregion (Acres)	Total Area in the Study Area (Acres)
Agriculture-Cultivated Crops and Irrigated Agriculture	0	<1	0	0	<1	0	96	76	0	173
Columbia Basin Foothill and Canyon Dry Grassland	78,195	79	602,191	23,859	16	0	51,090	0	0	755,430
Columbia Basin Foothill Riparian Herbaceous	49	2	25,176	126	0	0	1,562	0	0	26,915
Columbia Basin Foothill Riparian Shrubland	168	42	13,287	354	0	0	1,231	0	0	15,081
Columbia Basin Foothill Riparian Woodland	2,120	711	63,714	1,392	0	0	6,549	0	0	74,486
Columbia Basin Palouse Prairie	216	5	22,090	0	0	0	0	0	0	22,310
Columbia Plateau Low Sagebrush Steppe	194	0	68	0	0	0	0	0	0	262
Columbia Plateau Scabland Shrubland	2,324	3	383,928	30,550	0	0	5,510	0	0	422,315
Columbia Plateau Steppe and Grassland	4,368	36	1,359,727	53,999	0	0	113,781	0	0	1,531,911
Developed-High Intensity	2	199	18,005	1,872	542	2,493	6,955	78,011	866	108,945
Developed-Low Intensity	440	5,148	82,363	26,255	12,275	25,318	42,534	306,458	26,893	527,683
Developed-Medium Intensity	32	1,275	58,257	6,408	2,123	6,763	21,792	161,147	3,210	261,008
Developed-Roads	10,696	25,216	422,842	127,708	29,254	103,260	148,495	487,896	66,469	1,421,836
East Cascades Mesic Montane Mixed-Conifer Forest and Woodland	0	0	882	914,814	71	0	28,847	0	398	945,012
East Cascades Oak Forest and Woodland	0	0	1,114	1,812	0	0	0	0	0	2,927

Vegetation Group	Blue Mountains Ecoregion (Acres)	Canadian Rocky Mountains Ecoregion (Acres)	Columbia Plateau Ecoregion (Acres)	East Cascades Ecoregion (Acres)	North Cascades Ecoregion (Acres)	Northwest Coast Ecoregion (Acres)	Okanogan Ecoregion (Acres)	Puget Trough Ecoregion (Acres)	West Cascades Ecoregion (Acres)	Total Area in the Study Area (Acres)
East Cascades Oak-Ponderosa Pine Forest and Woodland	0	0	106	2,193	0	0	0	0	0	2,299
East Cascades Ponderosa Pine Forest and Woodland	0	0	10,192	96,801	0	0	0	0	0	106,992
Great Basin & Intermountain Introduced Annual Grassland	3,551	41	330,059	20,551	0	0	18,112	0	0	372,314
Great Basin & Intermountain Introduced Perennial Grassland and Forbland	5,781	121	168,824	6,286	0	0	23,051	0	0	204,063
Great Basin & Intermountain Ruderal Shrubland	13,165	2	123,952	6,594	0	0	19,161	0	0	162,874
Interior West Ruderal Riparian Forest	0	0	6,980	35	0	0	0	0	0	7,014
Interior Western North American Temperate Ruderal Grassland	5,014	11,315	287,764	27,367	0	0	56,697	0	0	388,156
Interior Western North American Temperate Ruderal Shrubland	1,668	2,544	268,177	6,768	0	0	3,998	0	0	283,156
Inter-Mountain Basins Active and Stabilized Dune	0	0	11,949	19	0	0	22	0	0	11,989
Inter-Mountain Basins Alkaline Closed Depression	2	<1	51,940	137	0	0	1,602	0	0	53,681
Inter-Mountain Basins Big Sagebrush Shrubland	4,771	186	1,107,599	49,947	0	0	105,216	0	0	1,267,719
Inter-Mountain Basins Big Sagebrush Steppe	7,283	104	589,409	83,271	0	0	104,748	0	0	784,815

Vegetation Group	Blue Mountains Ecoregion (Acres)	Canadian Rocky Mountains Ecoregion (Acres)	Columbia Plateau Ecoregion (Acres)	East Cascades Ecoregion (Acres)	North Cascades Ecoregion (Acres)	Northwest Coast Ecoregion (Acres)	Okanogan Ecoregion (Acres)	Puget Trough Ecoregion (Acres)	West Cascades Ecoregion (Acres)	Total Area in the Study Area (Acres)
Inter-Mountain Basins Cliff and Canyon	6,605	13	104,441	15,275	0	0	20,505	0	0	146,841
Inter-Mountain Basins Curl-leaf Mountain Mahogany Shrubland	1,523	0	17	0	0	0	0	0	0	1,540
Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	245	0	2	0	0	0	0	0	0	247
Inter-Mountain Basins Greasewood Flat	<1	0	0	0	0	0	0	0	0	<1
Inter-Mountain Basins Montane Sagebrush Steppe	3,689	3	131	36,373	0	0	52,880	0	0	93,076
Inter-Mountain Basins Semi-Desert Shrubsteppe	14	0	30,880	31	0	0	262	0	0	31,187
North American Arid West Emergent Marsh	83	2,903	11,698	6,143	0	0	7,538	0	0	28,365
North American Glacier and Ice Field	0	0	0	11,839	50,873	35,159	54	0	31,065	128,990
North Pacific Active Volcanic Rock and Cinder Land	0	0	0	0	0	0	0	0	12,493	12,493
North Pacific Alpine and Subalpine Bedrock and Scree[21]	0	0	0	106,839	178,509	39,679	53,062	0	26,060	404,149
North Pacific Alpine and Subalpine Dry Grassland	0	0	<1	116,159	48,722	10,816	82,419	5	12,673	270,794
North Pacific Avalanche Chute Shrubland	0	0	0	7,390	9,410	1,408	4,550	0	3,427	26,185

[21] Loose, rocky debris on a hill or cliff.

Vegetation Group	Blue Mountains Ecoregion (Acres)	Canadian Rocky Mountains Ecoregion (Acres)	Columbia Plateau Ecoregion (Acres)	East Cascades Ecoregion (Acres)	North Cascades Ecoregion (Acres)	Northwest Coast Ecoregion (Acres)	Okanogan Ecoregion (Acres)	Puget Trough Ecoregion (Acres)	West Cascades Ecoregion (Acres)	Total Area in the Study Area (Acres)
North Pacific Broadleaf Landslide Forest	0	0	0	23	63,194	593,131	0	581,465	348,933	1,586,747
North Pacific Dry and Mesic Alpine Dwarf-Shrubland	0	0	0	19,969	27,210	2,778	27,948	0	2,426	80,331
North Pacific Dry and Mesic Alpine Fell-field or Meadow	0	0	0	977	3,807	1,714	2,371	0	55	8,924
North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland	0	0	0	410	2	4,769	0	29,329	8,834	43,344
North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest	0	0	0	199,329	276,857	28,260	4,128	604	486,485	995,664
North Pacific Hardwood-Conifer Swamp	0	0	0	357	2,063	12,746	0	3,400	1,735	20,301
North Pacific Herbaceous Bald and Bluff	0	0	0	64	54	284	0	212	98	712
North Pacific Hypermaritime Herbaceous Headland	0	0	0	0	0	711	0	83	0	794
North Pacific Hypermaritime Shrub Headland	0	0	0	0	0	48	0	24	0	71
North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest	0	0	0	0	134,059	61,354	0	43,394	15,718	254,525
North Pacific Lowland Mixed Hardwood-Conifer Forest	0	0	0	135	127,640	14,130	0	70,520	12,751	225,176
North Pacific Lowland Riparian Forest	0	0	393	44,369	70,619	239,811	7,056	320,483	85,382	768,113

Vegetation Group	Blue Mountains Ecoregion (Acres)	Canadian Rocky Mountains Ecoregion (Acres)	Columbia Plateau Ecoregion (Acres)	East Cascades Ecoregion (Acres)	North Cascades Ecoregion (Acres)	Northwest Coast Ecoregion (Acres)	Okanogan Ecoregion (Acres)	Puget Trough Ecoregion (Acres)	West Cascades Ecoregion (Acres)	Total Area in the Study Area (Acres)
North Pacific Lowland Riparian Shrubland	0	0	129	1,139	750	3,611	330	6,275	675	12,909
North Pacific Maritime Coastal Sand Dune and Strand	0	0	0	0	0	3,133	0	2,518	0	5,651
North Pacific Maritime Coastal Sand Dune Ruderal Herb Vegetation	0	0	0	0	0	101	0	126	0	227
North Pacific Maritime Coastal Sand Dune Ruderal Scrub	0	0	0	0	0	91	0	57	0	148
North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest	0	0	0	12,284	44,977	708,180	0	433,647	767,105	1,966,192
North Pacific Maritime Mesic Subalpine Parkland	0	0	0	31,115	85,963	24,351	0	0	2,917	144,347
North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest	0	0	0	3,759	25,362	345,558	0	289,144	324,579	988,403
North Pacific Mesic Western Hemlock-Silver Fir Forest	0	0	0	240,596	1,330,802	647,622	7,442	2,822	677,807	2,907,091
North Pacific Montane Massive Bedrock-Cliff and Talus[22]	0	0	0	118,427	81,277	22,142	39,133	7,466	23,992	292,437
North Pacific Montane Riparian Shrubland	0	0	4	1,475	1,027	91	2,339	169	1,030	6,134
North Pacific Montane Riparian Woodland	0	0	0	33,612	13,144	10,966	9,727	855	19,601	87,905

[22] A deposition of rocks fallen from a slope or cliff and collected near the base.

Vegetation Group	Blue Mountains Ecoregion (Acres)	Canadian Rocky Mountains Ecoregion (Acres)	Columbia Plateau Ecoregion (Acres)	East Cascades Ecoregion (Acres)	North Cascades Ecoregion (Acres)	Northwest Coast Ecoregion (Acres)	Okanogan Ecoregion (Acres)	Puget Trough Ecoregion (Acres)	West Cascades Ecoregion (Acres)	Total Area in the Study Area (Acres)
North Pacific Montane Shrubland	0	0	84	210,570	62,081	73,504	132,694	3,666	38,201	520,802
North Pacific Mountain Hemlock Forest	0	0	0	154,507	297,551	70,618	9,561	<1	52,265	584,502
North Pacific Oak Woodland	0	0	0	37	0	382	0	5,350	20,052	25,821
North Pacific Seasonal Sitka Spruce Forest	0	0	0	0	72,411	799,806	0	33,371	2,730	908,318
North Pacific Shrub Swamp	0	0	0	86	24	113	0	414	801	1,438
North Pacific Wooded Volcanic Flowage	0	0	0	11,324	0	0	0	0	4,265	15,589
Northern Rocky Mountain Avalanche Chute Shrubland	0	798	0	0	0	0	23	0	0	821
Northern Rocky Mountain Conifer Swamp	0	99	0	0	0	0	2	0	0	101
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	182,509	362,427	72,604	437,962	64	0	1,408,308	0	0	2,463,874
Northern Rocky Mountain Foothill Conifer Wooded Steppe	2,838	828	8,294	3,211	0	0	14,949	0	0	30,120
Northern Rocky Mountain Lower Montane Riparian Shrubland	32	602	7	0	0	0	1,030	0	0	1,671
Northern Rocky Mountain Lower Montane Riparian Woodland	1,532	34,694	609	0	0	0	38,809	0	0	75,644
Northern Rocky Mountain Lower Montane-Foothill-Valley Grassland	16,123	15,559	9,754	92,665	115	0	287,924	0	0	422,141

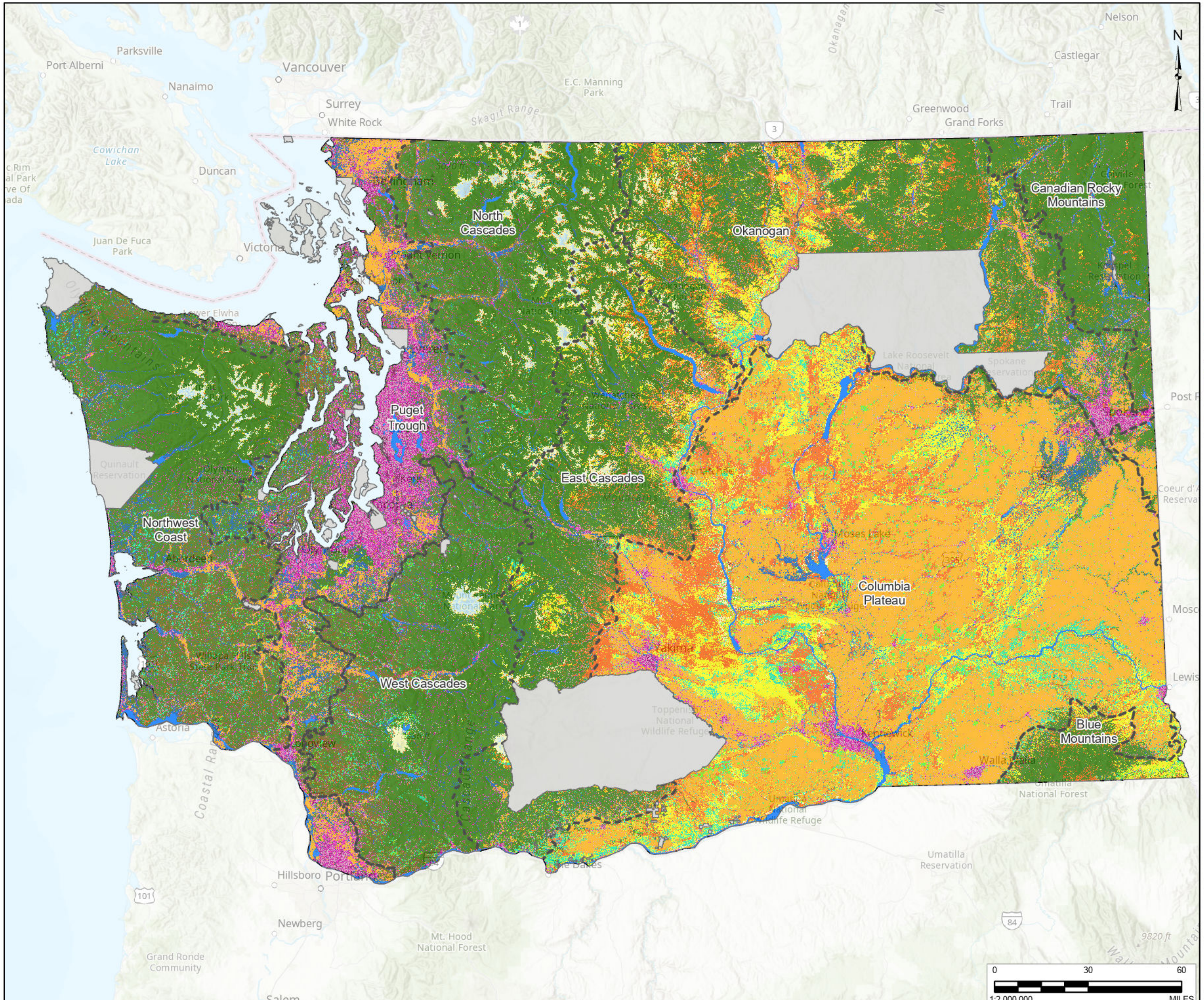
Vegetation Group	Blue Mountains Ecoregion (Acres)	Canadian Rocky Mountains Ecoregion (Acres)	Columbia Plateau Ecoregion (Acres)	East Cascades Ecoregion (Acres)	North Cascades Ecoregion (Acres)	Northwest Coast Ecoregion (Acres)	Okanogan Ecoregion (Acres)	Puget Trough Ecoregion (Acres)	West Cascades Ecoregion (Acres)	Total Area in the Study Area (Acres)
Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	67,715	767,272	3,532	0	0	0	114,635	0	0	953,154
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland	55,389	69,592	39,494	39,738	155	0	337,303	0	0	541,670
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna	47,076	102,115	175,509	185,281	1	0	428,634	0	<1	938,616
Northern Rocky Mountain Subalpine Deciduous Shrubland	829	17,607	288	0	0	0	14,141	0	0	32,864
Northern Rocky Mountain Subalpine Woodland and Parkland	0	4,509	0	43,141	6,251	0	117,919	0	0	171,821
Northern Rocky Mountain Subalpine-Upper Montane Grassland	1,538	2,170	244	0	0	0	4,980	0	0	8,931
Northern Rocky Mountain Western Larch Savanna	75	4,965	33	785	0	0	31,318	0	0	37,176
Open Water	2,918	23,386	249,209	78,904	45,093	78,182	82,835	116,163	57,057	733,746
Quarries-Strip Mines-Gravel Pits-Well and Wind Pads		661	959	190	167	37	358	1,695	151	4,218
Rocky Mountain Alpine-Montane Wet Meadow	23	579	9	0	0	0	4,400	0	0	5,010
Rocky Mountain Aspen Forest and Woodland	4,572	375	517	390	0	0	2,412	0	0	8,266
Rocky Mountain Cliff Canyon and Massive Bedrock	812	2,285	24	0	0	0	21,901	0	0	25,022

Vegetation Group	Blue Mountains Ecoregion (Acres)	Canadian Rocky Mountains Ecoregion (Acres)	Columbia Plateau Ecoregion (Acres)	East Cascades Ecoregion (Acres)	North Cascades Ecoregion (Acres)	Northwest Coast Ecoregion (Acres)	Okanogan Ecoregion (Acres)	Puget Trough Ecoregion (Acres)	West Cascades Ecoregion (Acres)	Total Area in the Study Area (Acres)
Rocky Mountain Lodgepole Pine Forest	2,167	14,436	86	20,832	22	0	160,794	0	0	198,337
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	2,367	17,566	1	70,631	16,377	0	69,105	0	3,813	179,859
Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	7,396	49,234	8	174,746	74,865	46,283	118,876	0	27,038	498,446
Rocky Mountain Subalpine-Montane Mesic Meadow	713	1,983	57	0	0	0	9,879	0	0	12,633
Rocky Mountain Subalpine-Montane Riparian Shrubland	54	17	14	0	0	0	30	0	0	115
Rocky Mountain Subalpine-Montane Riparian Woodland	207	522	21	3,093	910	0	16,150	0	0	20,903
Southern Vancouverian Lowland Ruderal Grassland	0	0	0	6,290	49,200	120,891	164	64,152	85,116	325,813
Southern Vancouverian Lowland Ruderal Shrubland	0	0	0	2,626	882	23,731	<1	39,139	54,119	120,496
Temperate Pacific Freshwater Emergent Marsh	0	0	<1	734	6,636	14,125	88	47,545	9,736	78,863
Temperate Pacific Subalpine-Montane Wet Meadow	0	0	0	3,360	1,469	479	3,211	0	2,337	10,856
Temperate Pacific Tidal Salt and Brackish Marsh	0	0	0	0	0	18,692	0	14,320	0	33,012
Western Cool Temperate Bush Fruit and Berries	<1	9	8,073	7	1,004	2,939	65	20,550	336	32,983

Vegetation Group	Blue Mountains Ecoregion (Acres)	Canadian Rocky Mountains Ecoregion (Acres)	Columbia Plateau Ecoregion (Acres)	East Cascades Ecoregion (Acres)	North Cascades Ecoregion (Acres)	Northwest Coast Ecoregion (Acres)	Okanogan Ecoregion (Acres)	Puget Trough Ecoregion (Acres)	West Cascades Ecoregion (Acres)	Total Area in the Study Area (Acres)
Western Cool Temperate Close Grown Crop	1,193	17,339	508,239	9,343	55	94	87,271	7,751	117	631,403
Western Cool Temperate Developed Deciduous Forest	1	1	2	24	1,003	2,624	18	61,287	1,943	66,902
Western Cool Temperate Developed Evergreen Forest	109	2,119	6,769	2,627	916	2,579	7,839	30,280	2,154	55,392
Western Cool Temperate Developed Herbaceous	87	988	35,561	3,055	1,033	3,998	8,173	42,647	1,477	97,018
Western Cool Temperate Developed Mixed Forest	32	340	2,512	612	752	2,791	846	29,960	708	38,553
Western Cool Temperate Developed Shrubland	57	1,244	10,528	1,223	144	468	5,716	4,464	209	24,052
Western Cool Temperate Fallow/Idle Cropland	1,409	2,701	1,555,390	7,480	45	101	16,862	3,977	2	1,587,968
Western Cool Temperate Orchard	18	186	281,128	30,227	435	3,272	33,414	16,991	3,167	368,838
Western Cool Temperate Pasture and Hayland	4,326	24,019	321,839	28,455	21,950	76,726	50,102	456,913	32,492	1,016,822
Western Cool Temperate Row Crop	744	8,293	772,865	256	1,150	2,365	5,635	71,532	94	862,933
Western Cool Temperate Row Crop - Close Grown Crop	1,052	9,009	203,979	1,327	10	236	11,150	6,286	36	233,085
Western Cool Temperate Urban Deciduous Forest	124	601	13,311	2,069	8,122	29,390	3,820	86,437	17,828	161,702
Western Cool Temperate Urban Evergreen Forest	959	3,735	12,868	25,689	30,098	67,546	9,464	55,941	75,433	281,732
Western Cool Temperate Urban Herbaceous	76	442	13,544	1,438	1,224	6,335	5,103	30,022	3,373	61,557

Vegetation Group	Blue Mountains Ecoregion (Acres)	Canadian Rocky Mountains Ecoregion (Acres)	Columbia Plateau Ecoregion (Acres)	East Cascades Ecoregion (Acres)	North Cascades Ecoregion (Acres)	Northwest Coast Ecoregion (Acres)	Okanogan Ecoregion (Acres)	Puget Trough Ecoregion (Acres)	West Cascades Ecoregion (Acres)	Total Area in the Study Area (Acres)
Western Cool Temperate Urban Mixed Forest	233	364	2,381	1,857	5,722	9,391	1,074	28,819	7,785	57,625
Western Cool Temperate Urban Shrubland	72	1,008	25,209	1,848	406	2,828	7,795	7,648	1,604	48,418
Western Cool Temperate Vineyard	8	15	106,251	1,203	11	1	398	295	66	108,249
Western Cool Temperate Wheat	6,720	33,086	2,436,858	4,185	24	25	27,955	2,518	2	2,511,372
Western North American Ruderal Wet Meadow & Marsh	46	10,609	16,338	82	0	0	21,123	0	0	48,198
Western North American Ruderal Wet Shrubland	111	3,262	72,844	161	0	0	6,341	0	0	82,719
Willamette Valley Upland Prairie	0	0	0	0	0	0	0	5,254	0	5,254
Total	**566,513**	**1,663,598**	**13,143,500**	**4,169,496**	**3,328,979**	**4,411,035**	**4,832,328**	**4,121,571**	**3,470,182**	**39,707,201**

Source: LANDFIRE 2016a



LEGEND

- Study Area
- Exclusion Areas
- Ecoregions (DNR, 2022a)

Vegetation Cover (BLM and USDA Forest Service, 2023)

- Agricultural
- Conifer
- Conifer-Hardwood
- Developed
- Developed-High Intensity
- Developed-Low Intensity
- Developed-Medium Intensity
- Developed-Roads
- Exotic Herbaceous
- Exotic Tree-Shrub
- Grassland
- Hardwood
- NA
- Open Water
- Quarries-Strip Mines-Gravel Pits-Well and Wind Pads
- Riparian
- Shrubland
- Snow-Ice
- Sparsely Vegetated

REFERENCES AND NOTES

1. SERVICE LAYER CREDITS: ESRI, CGIAR, USGS, SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
2. DNR. 2022A. ECOREGIONS OF THE PACIFIC NORTHWEST. ACCESSED OCTOBER 3, 2024. HTTPS://DATA-WADNR.OPENDATA.ARCGIS.COM/DATASETS/3B9362E8F29E465A985AA8DDC8DE2D86_0/EXPLORE?LOCATION=46.246758%2C-118.050200%2C5.82
3. BLM AND USDA FOREST SERVICE. 2023. LANDFIRE - EXISTING VEGETATION COVER AND TYPE. ACCESSED JULY 10, 2024. HTTPS://WWW.LANDFIRE.GOV/VIEWER/

Washington State Energy Facility Site Evaluation Council

PROJECT

PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE

ECOSYSTEMS IN THE STUDY AREA
BASED ON LANDFIRE VEGETATION GROUPS MAPPING

YYYY-MM-DD 2025-09-05 | CONSULTANT wsp | FIGURE 3.5-2

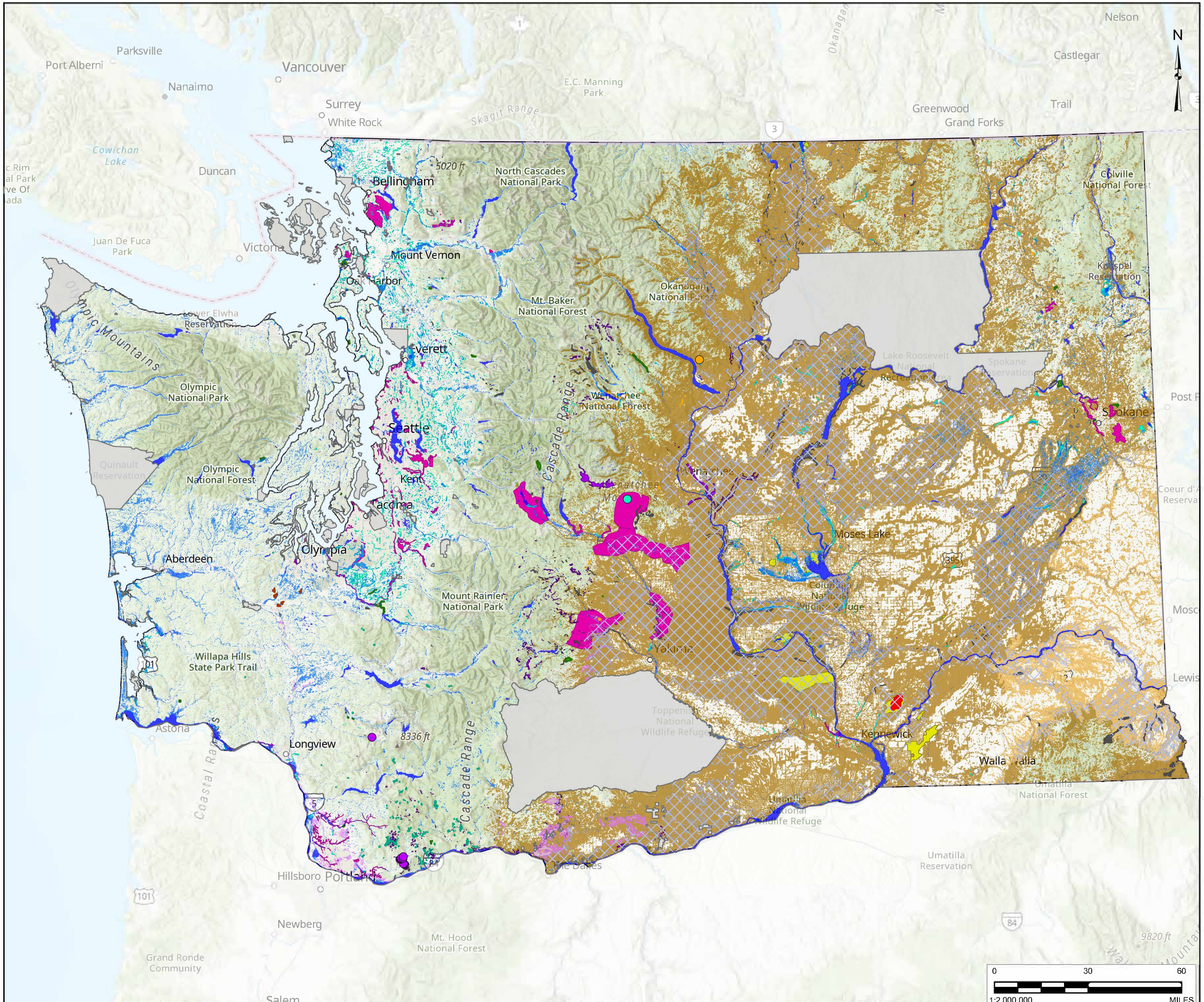
This Page Intentionally Left Blank

Priority Habitats

The WDFW also maintains information on at-risk ecosystems in Washington. The WDFW has identified 16 priority habitats and four priority habitat features in Washington for which conservation measures should be taken. Priority habitats and features are a habitat type or unique feature on the landscape that provides significant value to multiple wildlife species (WDFW 2023). Due to the importance of priority habitats to multiple species, the need to conserve these spaces, and the threat imposed by development on these vegetation resources, priority habitats were identified as a constraint in this Programmatic EIS.

Of the 20 identified priority habitats, 11 are terrestrial systems; these are summarized below. Five of the priority habitats are aquatic habitats. Aquatic habitats are discussed in Section 3.6, Habitat, Wildlife, and Fish. Wetlands are described below under their own subsection. In addition to terrestrial and aquatic systems, the WDFW has identified four priority habitat features included under priority habitats. Three have been identified as ecosystem-related components (cliffs, caves, and talus slopes) and are described below. The fourth habitat feature, logs and snags, is widespread and was not available for summary. Priority habitat mapped in the Study Area is provided in **Figure 3.5-3. Table 3.5-6** summarizes the area of terrestrial priority habitats in the Study Area for each ecoregion**.** Due to variations in climate, topography, soils, physiography, and ecosystem-forming processes, some priority habitats are tied to specific ecoregions, while others are more evenly distributed across the state.

This Page Intentionally Left Blank



LEGEND

- Study Area
- Exclusion Areas
- Riparian Area (BLM and USDA Forest Service 2023)
- Open Water (BLM and USDA Forest Service 2023)

Priority Habitat (WDFW, 2024)

- Eastside Steppe
- Shrub Steppe
- Oregon White Oak
- Columbia Plateau Regional BAC
- Wetlands
- Old-growth/mature Forest
- Biodiversity Areas and Corridor
- Inland Sand Dunes
- Aspen Stands
- Cliffs/bluffs
- Prairie
- Talus Slopes
- Juniper Savannah
- Herbaceous Bald
- Aspen Stands
- Talus Slopes
- Wetlands

REFERENCES AND NOTES

1. SERVICE LAYER CREDITS: SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY, ESRI, USGS
2. WDFW. 2024a. PRIORITY HABITATS AND SPECIES. ACCESSED JULY 10, 2024. HTTPS://WDFW.WA.GOV/SPECIES-HABITATS/ATRISK/PHS/MAPS/DATA-REQUEST-SENSITIVE
3. BLM AND USDA FOREST SERVICE. 2023. LANDFIRE - EXISTING VEGETATION COVER AND TYPE. ACCESSED JULY 10, 2024. HTTPS://WWW.LANDFIRE.GOV/VIEWER/

Washington State Energy Facility Site Evaluation Council

PROJECT
PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE
PRIORITY HABITAT MAPPED BY WDFW IN THE STUDY AREA

YYYY-MM-DD 2025-08-04
CONSULTANT wsp
FIGURE
3.5-3

This Page Intentionally Left Blank

Table 3.5-6: Area of Priority Habitat by Ecoregion in the Study Area[a]

Terrestrial Priority Habitat or Feature[b]	Blue Mountains Ecoregion (Acres)	Canadian Rocky Mountains Ecoregion (Acres)	Columbia Plateau Ecoregion (Acres)	East Cascades Ecoregion (Acres)	North Cascades Ecoregion (Acres)	Northwest Coast Ecoregion (Acres)	Okanogan Ecoregion (Acres)	Puget Trough Ecoregion (Acres)	West Cascades Ecoregion (Acres)	Total Area (Acres)
Aspen Stands	0	22	48	1,186	0	0	69	0	0	1,324
Biodiversity Areas and Corridors	77,911	10,721	4,982,241	455,754	5,037	3,656	516,706	93,442	10,040	6,155,508
Caves	0	0	0	325	0	9	0	121	259	715
Cliffs	14,855	42	66,074	22,263	2,031	1,676	9,934	1,706	2,268	120,848
Eastside Steppe	25,298	2,271	297,981	0	0	0	31	0	0	325,581
Herbaceous Balds	0	0	0	95	0	13	0	19	2,664	2,790
Inland Dunes	0	0	104,740	435	0	0	1,378	0	0	106,553
Juniper Savannah	0	0	7,606	0	0	0	0	0	0	7,606
Old Growth – Mature Forests	0	16	61	3,617	420	160	1,565	2,020	1,153	9,012
Oregon White Oak Woodlands	0	0	16,357	33,657	0	51	0	3,249	99	53,414
Riparian[c]	4,161	36,590	254,480	106,687	86,450	85,560	327,782	84,812	103,354	1,089,876
Shrubsteppe	108,970	29,558	5,162,268	419,998	0	0	797,167	0	0	6,517,961
Talus Slopes	0	0	12,628	26,495	165	0	260	66	6,782	46,396
Westside Prairie	0	0	0	0	0	0	0	1,957	0	1,957
Wetlands[d]	0	7,526	50,895	40,40	11,685	9,383	5,732	91,595	3,544	184,401
Total	**231,195**	**86,747**	**10,955,379**	**1,074,552**	**105,787**	**100,508**	**1,660,624**	**278,987**	**130,162**	**14,623,941**

Notes:

(a) Priority habitat summaries are based on the Priority Habitat and Species database received from WDFW (2024b) received August 21, 2024. For priority habitats that are recorded using point features in the database, a 300-foot radius was applied to the data point to provide an approximate area. All areas are rounded to the nearest acre.

(b) Four habitat features are recognized by WDFW (2023): caves, cliffs, logs and snags, and talus slopes. All were included in the analysis except logs and snags. Data for logs and snags were not available from WDFW (2024b), and these features are too widespread to estimate.

(c) One data point was available in the WDFW (2024b) database for riparian areas, which was located in the North Cascades ecoregion, though more occur within the State of Washington. For this reason, riparian areas were summarized using LANDFIRE (2016a) and included all groups that contained the word "riparian."

(d) The wetland summary provided is from the Priority Habitat and Species database (WDFW 2024d). The Priority Habitat and Species database does not differentiate between freshwater wetlands and freshwater deepwater; however, based on review of the identified areas, these areas mainly represent freshwater wetlands. An additional summary is provided under the Wetlands section for wetlands from the National Wetlands Inventory.

This Page Intentionally Left Blank

Aspen Stands

Aspen stands are defined as areas dominated by quaking aspen trees either as a homogeneous stand or mixed with other species. Areas of aspen stands must be greater than 1 acre to qualify as a priority habitat (WDFW 2023). Aspen stands are distributed throughout eastern Washington, in the Cascade Mountains, and in the southern part of the Coastal and Olympic Mountains.

Caves

Caves are underground cavities that can be located in soil, rock, ice, or other geological formations. A cave is defined as a cavity that is large enough to contain a human. Human-made cavities, including mine shafts, can mimic natural caves and are considered in this feature group if they contain actual or suspected occurrences of priority species (WDFW 2023). Caves serve important functions for wildlife, such as providing maternal roosting areas for species of bats.

Cliffs

Cliffs include areas of steep topography, with vertical or nearly vertical angles. To be considered a priority habitat, a cliff must be greater than 25 feet high and occur below 5,000 feet elevation (WDFW 2023).

Eastside Steppe

The eastside steppe is located primarily east of the Cascade Mountains and is characterized by perennial bunchgrasses and forbs.[23] The vegetation community is dominated by bluebunch wheatgrass (*Pseudoroegneria spicata*) with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrass (*Achnatherum* sp.). The cover of grass and forbs is typically low in drier sites and increases in areas that receive greater precipitation or are located on soils with greater moisture-holding capacity. The shrub layer is typically sparse and includes sagebrush (*Artemisia* sp.), rabbitbrush (*Chrysothamnus* sp.), bitterbrush (*Purshia tridentata*), common snowberry (*Symphoricarpos albus*), and rose (*Rosa* sp.) (WDFW 2023).

Herbaceous Balds

Herbaceous balds occur in mountainous terrain in the western part of the state. Herbaceous balds are characterized as patches of low-growing grasses and forbs

[23] A broad-leaved, non-woody flowering plant that is not a grass.

located on shallow soils over bedrock. The plant species that persist are capable of surviving at climatic extremes, including seasonally dry conditions and steep slopes with shallow soils. Some scattered trees may survive in these conditions. Herbaceous balds range in size from small patches of 12 acres to larger areas of 250 acres (WDFW 2023).

Inland Dunes

Inland dunes were formed through the initial deposition of sand from flood events, followed by wind reworking of the deposits to form sand fields. The formation of dunes requires transport by wind; therefore, the material of inland dunes is characterized by well-sorted fine- to medium-grained sand. In general, dunes accumulate sand during strong winds and lose sand during gentle winds until a critical size is reached. At a critical size, sand is maintained and deposited on the leeward side (WDFW 2023).

Three functional stages of dunes are recognized: 1) open/migrating, 2) anchored, and 3) stabilized. An open/migrating dune has active surface sand that migrates with the effective wind direction. Unstable slip faces (lee slopes) form, on which vegetation cover is minimal. Anchored dunes have active surface sands, but the movement of sand is inhibited by vegetation. This stage of a dune is often located on the trailing arms of migrating parabolic dunes and on vegetated sand sheets. Stabilized dunes lack active sands due to the presence of vegetation, cryptobiotic crusts, or volcanic ash that has sealed off the sand (WDFW 2023).

Plant communities on inland dunes vary but often resemble communities found in shrubsteppe ecosystems such as bitterbrush, rabbitbrush, and snow buckwheat (*Eriogonum niveum*). Some species of plants are restricted to sand dune ecosystems, including Indian ricegrass (*Achnatherum hymenoides*), lemon scurfpea (*Psoralidium lanceolatum*), veiny dock (*Rumex venosus*), and gray cryptantha (*Cryptantha leucophaea*). Vegetation cover varies with precipitation and evapotranspiration[24] (WDFW 2023). Several listed plant associations, priority plant species, and animal species at risk occur in inland sand dunes (DNR 2007).

Inland dunes exist in a state of flux. The mobility of sand is influenced by wind strength, while vegetation stabilizes sand and is influenced by precipitation. In periods of extended precipitation, vegetation persists, resulting in litter accumulation and soil

[24] Combined process of water movement from the Earth's surface to the atmosphere through evaporation and transpiration.

development processes. Periods of drought lead to unfavorable conditions for vegetation persistence that can result in the mobility of sand again (WDFW 2023).

An estimated 76 percent of inland sand dunes in Washington have been lost since the 1970s (DNR 2007). Major threats identified include invasive species (in particular, cheatgrass [*Bromus tectorum*]); conversion to agricultural land; off-road vehicles; intentional stabilization; residential development; livestock grazing; and mining (DNR 2007).

Juniper Savannah

Juniper savannah priority habitat includes juniper woodlands (WDFW 2023). Juniper savannahs occur on the drier edges of juniper woodlands where western juniper (*Juniperus occidentalis*) mixes with grasslands and consists of a shrub/tree mix with 0 to 20 percent tree cover (NatureServe 2024c). Junipers are widely spaced and commonly have dead portions in their upper branches, making the canopies open and irregular (NatureServe 2024b). Juniper woodlands occur in areas with 20 to 40 percent canopy cover (NatureServe 2024c). Juniper savannahs are often found along the northern and western edges of the Great Basin and within the Columbia Plateau (NatureServe 2024c). The dominant species are western juniper and big sagebrush (*Artemisia tridentata*). Common shrubs include bitterbrush, rubber rabbitbrush (*Ericameria nauseosa*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), wax current (*Ribes cereum*), and horsebrush species (*Tetradymia* ssp.) (NatureServe 2024c). Common grasses include thread-leaf sedge (*Carex filifolia*), Idaho fescue, Sandberg bluegrass, and bluebunch wheatgrass (NatureServe 2024c). Juniper is usually the only tree species, but ponderosa pine and Jeffrey's pine (*Pinus jeffreyi*) occur occasionally (NatureServe 2024c).

Old Growth – Mature Forests

The definition of old-growth forest differs based on location due to changes in growing conditions such as climate and soils, and disturbance regimes (e.g., fire). The main characteristics of old-growth forests west of the Cascade crest are large-diameter or old trees, multi-structured canopy, tree gaps, standing dead trees, and downed wood. To be considered an old-growth forest west of the Cascade crest, a forest stand must meet all of the following criteria (WDFW 2023):

- The stand is greater than 7.5 acres.
- The stand contains at least two tree species.

- The stand forms a multi-layered canopy with occasional small openings.
- The density is at a minimum of eight trees per acre that have a diameter at breast height (dbh) greater than 32 inches or are more than 200 years old.
- The density is at a minimum of four snags per acre with a dbh of greater than 20 inches and a minimum of 15 feet in height.
- The density of downed wood is at a minimum of four logs per acre that measure greater than 24 inches in diameter and are greater than 50 feet in length.

Elevation impacts tree growth and size. For forest stands above 2,500 feet, the above criteria apply with all of the following amendments (WDFW 2023):

- The trees in the stand have a dbh greater than 30 inches.
- The density of snags is 1.5 per acre.
- The density of large downed logs is at a minimum of two logs per acre, which are greater than 24 inches in diameter and greater than 50 feet in length.

Forest stands east of the Cascade crest vary greatly in tree species composition and structural complexity due to the influence of fire, climate, and soils. The density of downed logs is expected to vary or be absent, and tree canopies may be multi-storied or single-storied. East of the Cascade crest, all of the following criteria must be met to identify old-growth forest (WDFW 2023):

- The forest stand is older than 150 years.
- The density of trees is at a minimum of 10 trees per acre with a dbh greater than 21 inches.
- The density of snags is at a minimum of one to three snags per acre with a dbh greater than 12 to 14 inches.

Mature forest stands are important not only as habitat for multiple species, but also as an important component in regenerating old-growth forests. Snags and large downed wood are also important components in mature forests, but there is typically a lower density in mature forests than in old-growth forests (WDFW 2023). Both of the following criteria must be present for a habitat to meet the definition of mature forest (WDFW 2023):

- The average dbh of the stand is greater than 21 inches.

- The age of trees in the stand is 80 to 200 years for forests west of the Cascade crest and 80 to 160 years for areas east of the Cascade crest. Due to the overlap in these definitions, stands greater than 150 years east of the Cascade crest were assumed to be old growth for purposes of this Programmatic EIS.

Oregon White Oak Woodlands

Oregon white oak woodlands are restricted to the western half of Washington. These areas are characterized by stands with 25 percent oak-dominated canopy coverage or with canopy coverage less than 25 percent but where oak accounts for at least 50 percent, which is often referred to as an oak savannah (WDFW 2023). The understory of oak woodlands typically contains plants indicative of prairie grasslands (see Westside Prairie, below). To be considered priority habitat, oak woodlands west of the Cascade Mountains in non-urbanized areas must be greater than 1.0 acre; east of the Cascade Mountains, they must be greater than 5 acres; and in urban or urbanizing areas, single oaks or stands less than 1.0 acre may be considered priority habitat (WDFW 2023).

Riparian

Riparian areas are located adjacent to freshwater aquatic systems and include the area from the ordinary high-water mark to the extent of land that is influenced by the aquatic system (WDFW 2023). Riparian habitat also includes the entire floodplain and other riparian areas that are connected to streams and freshwater (WDFW 2023). Perennial[25] and intermittent[26] water influences the soil, vegetation, water tables, microclimate,[27] and wildlife in riparian systems, and riparian vegetation influences the aquatic systems and the soil as well (WDFW 2023).

Shrubsteppe

Shrubsteppe is a non-forested ecosystem that consists of one or more layers of perennial bunchgrass and an overstory of conspicuous shrub species patterned on the landscape(WDFW 2023). The most dominant shrub species is big sagebrush, but other co-dominant shrubs include bitterbrush, threetip sagebrush (*Artemisia tripartita*), scabland sagebrush (*Artemisia rigida*), and dwarf sagebrush (*Artemisia arbuscula*) (WDFW 2023). Commonly found grasses include Idaho fescue, bluebunch wheatgrass, Sandberg bluegrass, Thurber's needlegrass (*Achnatherum thurberianum*), and needle-

---

[25]Bodies of water that maintain continuous flow or presence throughout the year under normal conditions.
[26]Bodies of water that flow only during certain times of the year, typically after rainfall or snowmelt.
[27] A local climate at a small scale.

and-thread (*Hesperostipa comata*), and some sites have layers of lichens, mosses, and algae (WDFW 2023). Areas with higher precipitation or greater capacity for soils to hold moisture can support a dense layer of forbs (WDFW 2023). Shrubsteppe has diverse habitat features, including various levels of topography, and can occur in canyons or riparian ecosystems (WDFW 2023). Shrubsteppe ecosystems vary in quality and are influenced by soil properties and erosion or disturbance (WDFW 2023). More disturbed sites have more non-native species that co-dominate (WDFW 2023).

Snags and Logs

Snags are defined as dead or dying trees that exhibit decay characteristics, which enable cavity excavation or use by wildlife. Snags and logs are associated with habitat types that are dominated by trees (WDFW 2023). Priority snags and logs are determined based on dbh and height or length. Priority snags include snags with a dbh greater than 20 inches in western Washington or greater than 12 inches in eastern Washington, and greater than 6.5 feet in height. Priority logs include logs that are greater than 12 inches in dbh and greater than 20 feet long (WDFW 2023).

Snags and logs were not identified in the Priority Habitat and Species (PHS) database provided by WDFW and analyzed in **Table 3.5-6**. These habitat features are associated with tree-dominated ecosystems and are assumed to be available primarily in forested habitat. However, snags and logs may also include solitary snags near waterbodies, remnant snags in developed or urban areas, and areas with relatively high densities of snags (WDFW 2023). Therefore, they may occur in any ecosystem type.

Talus Slopes

Talus slopes are dominated by rock and form naturally from rockslides. The WDFW defines these as areas of rock rubble ranging in average size from 0.5 to 6.5 feet composed of basalt, andesite, and/or sedimentary rock (WDFW 2023). Anthropogenic talus slopes, such as mine tailings, can also be included in this category. Talus slopes form unique features that are important for wildlife habitat.

Westside Prairie

Westside prairie is a non-forested, herbaceous habitat with less than 60 percent cover (WDFW 2023). There are two types of westside prairie: dry prairie and wet prairie (WDFW 2023). If a soil surface is impervious, it is not considered to be either dry or wet prairie. Dry prairie occurs on many soils that are commonly associated with prairies and in places where soils are well-drained (WDFW 2023). Diagnostic grasses, sedges, and forbs dominate, with mosses, lichen, and bare ground found in between the forbs and grasses (WDFW 2023). To be considered dry prairie, an area must have at least three of 24 identified diagnostic grasses, sedges, or forbs species (WDFW 2023). Wet prairie can be found in the lower Columbia-Willamette region of southwest Washington and occurs on rich clay soils that are saturated in the early part of the growing season and then dry out throughout the summer (WDFW 2023). Wet prairies are also found in the Puget Trough ecoregion on glacial outwash soils that are limited to swales and low-gradient riparian areas (WDFW 2023). Similar to the dry prairie, three diagnostic grasses, sedges, or forbs species are needed to establish an area as wet prairie (WDFW 2023).

Biodiversity Areas and Corridors

Biodiversity areas and corridors occur across Washington. Biodiversity areas and corridors are grouped together as one priority habitat, but include two distinct features. Biodiversity areas are defined using one of two criteria (WDFW 2023):

a) An area that has been identified as biologically diverse through scientific-based assessments conducted at a landscape scale (e.g., an ecoregion, county-level); or

b) An area within a city or urban growth area that contains valuable habitat for fish or wildlife and features predominantly native vegetation. The area has relatively high vertical or horizontal diversity (due to canopy layers, snags, downed wood, and diverse native vegetation) compared to the surrounding urban environment, or it should support a diverse community of species as identified by a qualified biologist.

Corridors are areas of relatively undisturbed vegetation that connect habitat conservation areas, priority habitats, biodiverse areas, or other habitat valuable to fish and wildlife within a city or urban growth area (WDFW 2023).

Wetlands

Wetlands are areas that are inundated with water at a frequency and duration sufficient to support vegetation typically adapted for survival in saturated soil conditions (USACE and EPA 2024). Wetlands also have hydric soils that produce anaerobic conditions and hydrophytic plants that can tolerate the anaerobic conditions of the soils (Ecology 2024c). Wetlands provide various critical ecosystem functions; they help stabilize shorelines, maintain water quality, recharge aquifers, and provide habitat for fish, wildlife, and plants (Michaud 2001). Wetlands have economic benefits too, including flood and erosion protection that would otherwise damage infrastructure (Michaud 2001). Washington wetlands cover approximately

938,000 acres, or about 2 percent of the state (Ecology 2024c). The types of wetlands in Washington are bogs, aquatic beds, coastal salt marshes, freshwater flats, fens, freshwater tidal wetlands, interdunal wetlands, interior alkaline wetlands, marshes and wet meadows, riparian areas, seeps and springs, swamps, vernal pools, and wet rock. Wetlands occur across the entirety of the state but are more abundant in western Washington than eastern Washington. Estuarine and marine wetlands are concentrated on the west coast of Washington. Wetlands are important for healthy watersheds and are becoming scarce in Washington.

In addition to the Priority Habitat and Species database information provided in **Table 3.5-6**, the NWI database was summarized to determine the area of wetlands in the Study Area by ecoregion. The NWI includes areas of freshwater ecosystems (i.e., lakes and freshwater ponds) and marine environments (i.e., estuarine and marine), which were excluded from the summary. Lakes and freshwater are discussed in Section 3.4, Water Resources. Marine environments are not included in the Study Area. With the excluded marine habitats, the NWI has 1,324,7511 acres of wetlands mapped in Washington, with the greatest area of wetlands mapped in the Columbia Plateau ecoregion. Wetlands in Washington are summarized in **Table 3.5-7** and shown in **Figure 3.5-4.**

Table 3.5-7: Area Wetlands in the Study Area by Ecoregion

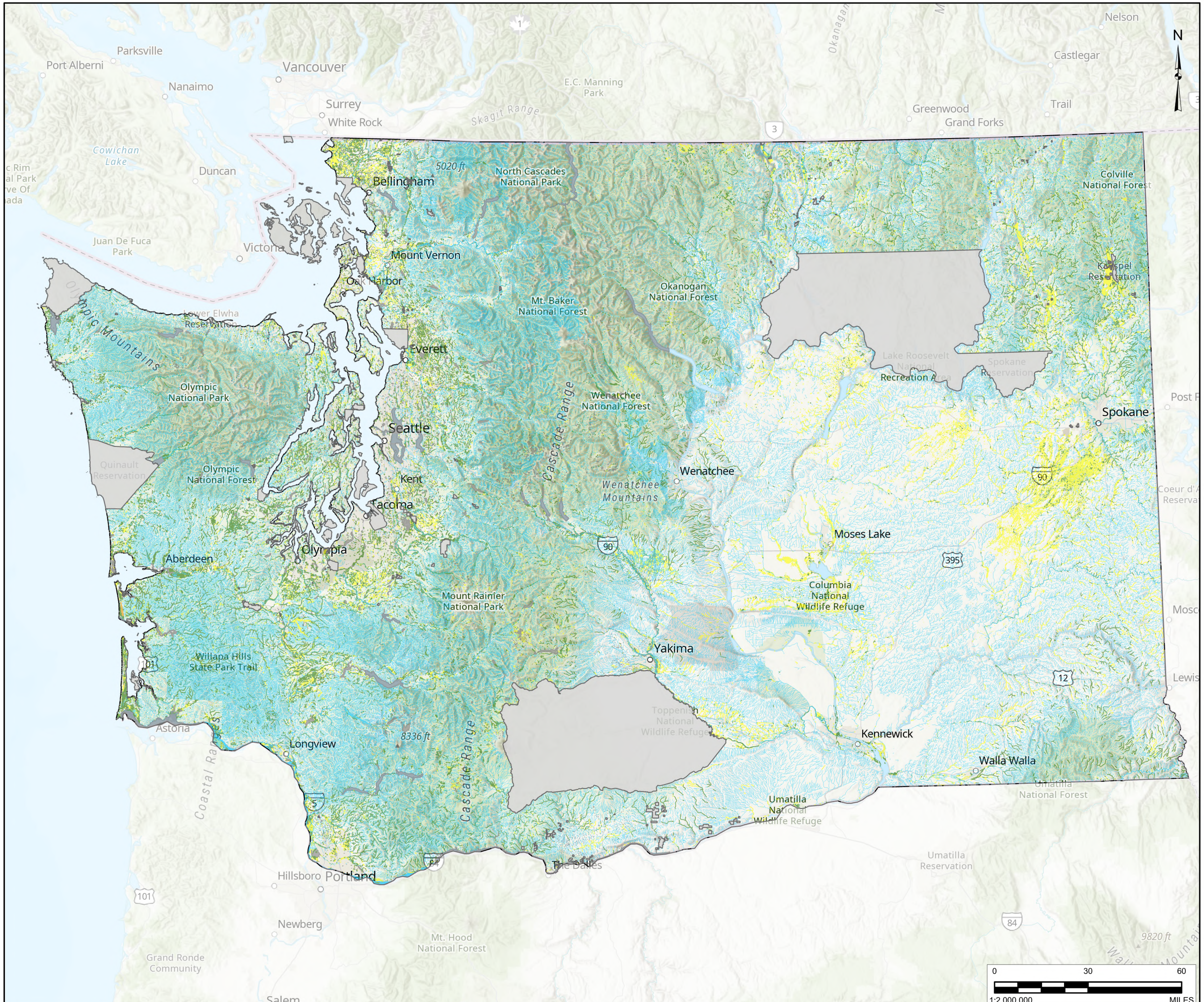
Wetland Type	Blue Mountains Ecoregion (Acres)	Canadian Rocky Mountains Ecoregion (Acres)	Columbia Plateau Ecoregion (Acres)	East Cascades Ecoregion (Acres)	North Cascades Ecoregion (Acres)	Northwest Coast Ecoregion (Acres)	Okanogan Ecoregion (Acres)	Puget Trough Ecoregion (Acres)	West Cascades Ecoregion (Acres)	Total Area (Acres)
Estuarine and Marine Wetland	0	0	0	0	0	20,129	0	17,260	0	37,389
Freshwater Emergent Wetland	108	26,542	108,486	7,662	3,305	28,936	53,175	87,287	10,675	326,176
Freshwater Forested/Shrub Wetland	704	11,550	19,508	25,398	16,896	68,440	29,380	113,763	32,713	318,352
Other	0	0	53	0	0	754	0	31	9	847
Riverine	8,414	20,714	107,369	54,299	77,449	128,592	59,069	70,411	93,905	620,222
Total Acres	**9,227**	**58,807**	**235,416**	**87,359**	**97,650**	**246,850**	**141,624**	**288,752**	**137,303**	**1,302,988**

Source: USFWS 2024b

Notes:

(a) Freshwater ponds, lakes and estuarine and marine deepwater are included in the National Wetland Inventory database but were not included in the data summary as these are generally considered surface waters, not wetlands.

This Page Intentionally Left Blank



LEGEND

- Study Area
- Exclusion Areas

Mapped Wetland (USFWS, 2025)

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Riverine
- Other

REFERENCES AND NOTES

1. SERVICE LAYER CREDITS: SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY, ESRI, USGS
2. USFWS (U.S. FISH AND WILDLIFE SERVICE). 2025. NATIONAL WETLAND INVENTORY - SEAMLESS WETLANDS DATA BY STATE. ACCESSED AUGUST 20, 2025. HTTPS://WWW.FWS.GOV/PROGRAM/NATIONAL-WETLANDS-INVENTORY/DOWNLOAD-STATE-WETLANDS-DATA

Washington State Energy Facility Site Evaluation Council

PROJECT

PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE

WETLANDS MAPPED IN THE STUDY AREA

YYYY-MM-DD 2025-09-19 CONSULTANT wsp

FIGURE 3.5-4

This Page Intentionally Left Blank

Washington State Department of Natural Resources Protected Areas

The DNR manages 5.6 million acres of state-owned lands within the Study Area. DNR-administered lands include the following:

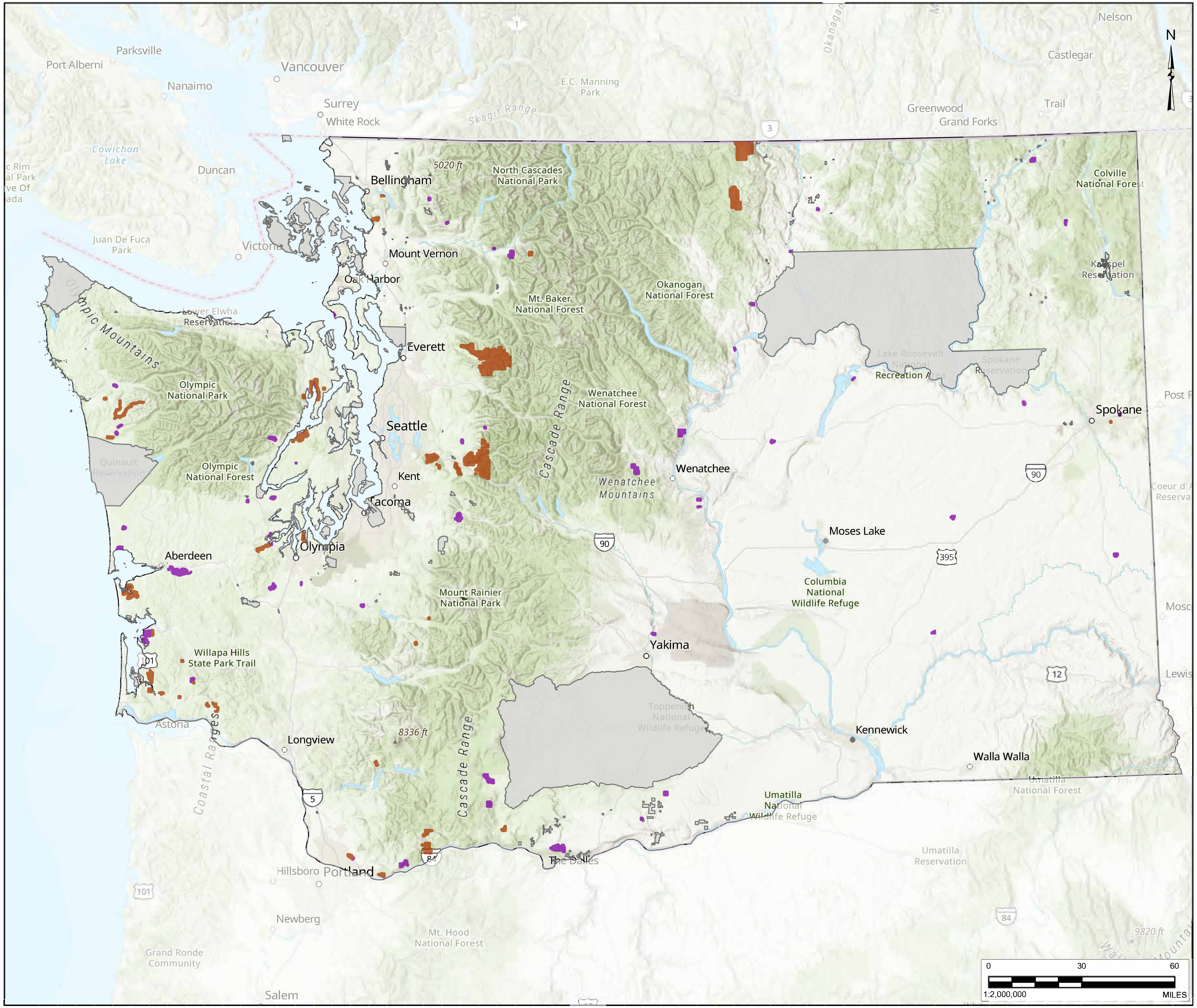
- Forest and trust lands
- Natural areas
- Aquatic reserves
- Community Forest Trust Program
- Land Transactions

The DNR manages the lands listed above for various purposes, including forestry, range, commercial, and natural resources. The DNR primarily protects native plants and ecosystems; these protected areas have been included in the analysis of the affected environment. DNR Protected Areas are shown in **Figure 3.5-5**.

There are two types of natural areas: Natural Area Preserves (NAPs) and Natural Resource Conservation Areas (NRCAs). NAPs were established to protect representative ecological communities and habitats for priority plant species and wildlife. These areas were identified as high-quality and ecologically important for protection. In total, there are 41,483 acres of NAPs across 58 protected sites. NRCAs protect high-value native ecosystems, habitat for priority species, and scenic landscapes. Many NRCAs include critical habitat for at-risk plant and animal species. There are 127,981 acres of NRCAs in Washington across 39 sites.

Certain DNR-administered lands are included in the State Trust Lands Habitat Conservation Plan (HCP). This multi-species, long-term land management plan intends to conserve threatened and endangered species under the Endangered Species Act (ESA). The HCP details how the DNR will ensure habitat preservation for various species, including the northern spotted owl, marbled murrelet, and bull trout, as well as protecting riparian areas, wetlands, and other uncommon habitats, while carrying out forest management and other activities on state trust lands. DNR is required to comply with the HCP and the associated Incidental Take Permits (ITP) from the USFWS and National Marine Fisheries Service.

This Page Intentionally Left Blank



LEGEND

- Study Area
- Exclusion Areas

Department of Natural Resources Protected Areas (DNR 2025a)

- Natural Area Preserves (NAPs)
- Natural Resources Conservation Areas (NRCAs)

REFERENCES AND NOTES

1. SERVICE LAYER CREDITS: SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY, ESRI, USGS
2. DNR. 2025A. DEPARTMENT OF NATURAL RESOURCES PROTECTED AREAS. RECEIVED FROM DNR JUNE 24, 2025.

Washington State Energy Facility Site Evaluation Council

PROJECT

PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE

DEPARTMENT OF NATURAL RESOURCES PROTECTED AREAS

YYYY-MM-DD 2025-08-28

CONSULTANT wsp

FIGURE 3.5-5

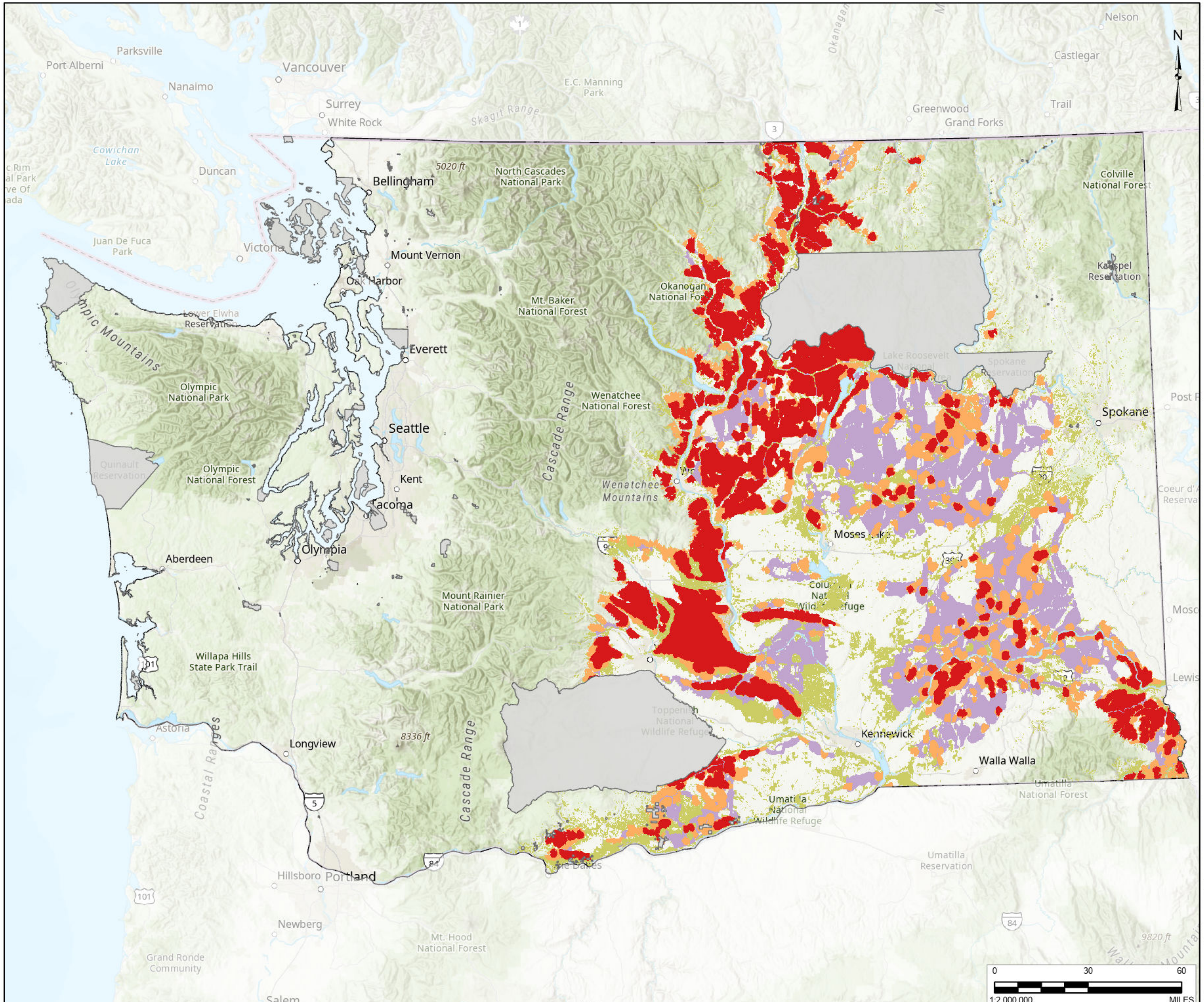
This Page Intentionally Left Blank

Washington Shrubsteppe Restoration and Resiliency Initiative

Shrubsteppe ecosystems in Washington have experienced an estimated 80% loss from historic extent due to conversion to agricultural land, industrial and urban development, and degradation (WDFW 2025a). The Washington Shrubsteppe Restoration and Resiliency Initiative (WSRRI) primarily focuses on creating benefits to Washington's shrubsteppe ecosystems and the wildlife dependent on those ecosystems. As part of their work, the WSRRI provides policy recommendations, identifies spatial priorities, and restores habitat after fire. Mapping available from the WSRRI provides the following information:

- Core Areas, which include the highest-quality habitat that should be protected and restored in places where disturbance occurs
- Growth Opportunity Areas, which include areas that are more degraded than core areas, but with strategic restoration in places where disturbance occurs despite protection measures
- Corridors, which include areas that are relatively free of barriers to movement for wildlife and connect core areas and growth opportunity areas across the landscape
- Other Habitats, which include areas that are more degraded than those included in the other three categories, but are still important to retain and, if resources allow, restore
- Because these areas have been identified as high-quality shrubsteppe or areas important for restoration and connection of existing shrubsteppe, they were identified as important vegetation areas. Two groups of ecosystems were mapped as priority by the WSRRI. Xeric ecosystems are drier environments and include primarily sagebrush and perennial grasslands. The priority areas for xeric ecosystems are shown in **Figure 3.5-6**. Mesic ecosystems are wetter environments which include wetlands, wet meadows, and riparian habitats. The priority areas for mesic ecosystems are shown in **Figure 3.5-7**.

This Page Intentionally Left Blank



LEGEND

- Study Area
- Exclusion Areas

WSRRI Spatial Priorities Xeric Habitat (WDFW, 2021)

Spatial Priorities Class

- Core Area
- Corridor
- Growth Opportunity Area
- Other Xeric Habitat
- Non habitat

REFERENCES AND NOTES

1. SERVICE LAYER CREDITS: SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY, ESRI, USGS
2. WDFW. 2021. WASHINGTON SHRUBSTEPPE RESTORATION AND RESILIENCY INITIATIVE SPATIAL DATA. ACCESSED SEPTEMBER 4TH, 2024. HTTPS://WDFW.WA.GOV/SPECIES-HABITATS/HABITAT-RECOVERY/SHRUBSTEPPE#MAPPING

Washington State Energy Facility Site Evaluation Council

PROJECT

PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE

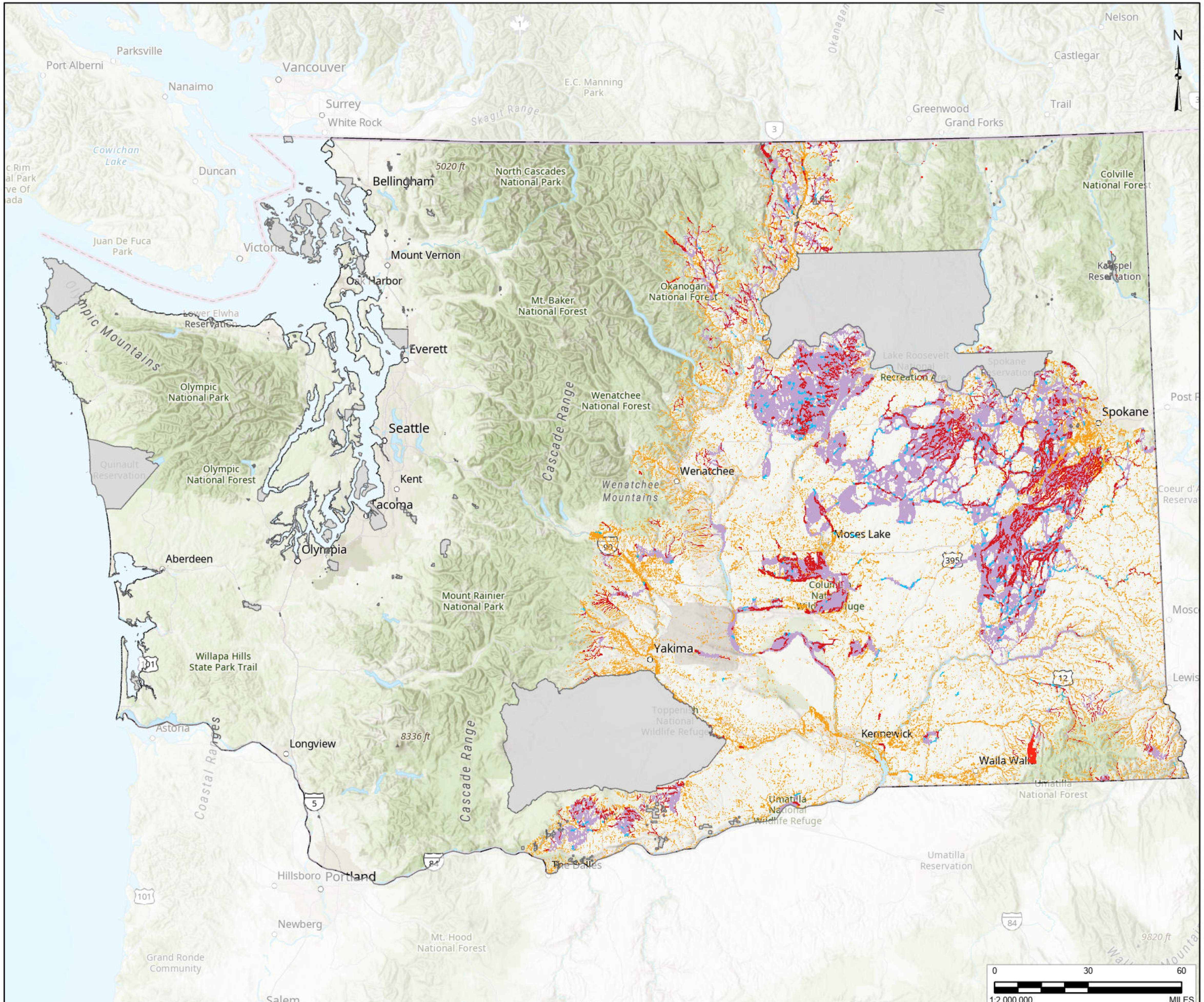
WSRRI XERIC HABITAT

YYYY-MM-DD 2025-09-04

CONSULTANT wsp

FIGURE 3.5-6

This Page Intentionally Left Blank



LEGEND

Study Area

Exclusion Areas

WSRRI Spatial Priorities Mesic Habitat (WDFW, 2021)

Spatial Priorities Class

- Core Area
- Corridor
- Other Mesic Habitat
- Growth Opportunity Area
- Non habitat

REFERENCES AND NOTES

1. SERVICE LAYER CREDITS: SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY, ESRI, USGS
2. WDFW. 2021. WASHINGTON SHRUBSTEPPE RESTORATION AND RESILIENCY INITIATIVE SPATIAL DATA. ACCESSED SEPTEMBER 4TH, 2024. HTTPS://WDFW.WA.GOV/SPECIES-HABITATS/HABITAT-RECOVERY/SHRUBSTEPPE#MAPPING

Washington State Energy Facility Site Evaluation Council

PROJECT

PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE

WSRRI MESIC HABITAT

YYYY-MM-DD 2025-09-04 CONSULTANT wsp

FIGURE 3.5-7

This Page Intentionally Left Blank

Plant Priority Species

The WNHP maintains a list of plant priority species, which includes all plant species in Washington that are species of concern (Miller et al. 2024). Within this list, the WHNP uses a ranking system to assess the global, federal, and state levels of concern for each species. There are three levels of priority:

- Priority 1, the highest priority, includes species that are at high risk of extinction across their entire range, including their range in Washington. The species will have a small population, and their habitats are generally degraded or reduced (DNR 2018).
- Priority 2 includes species that are predicted to become endangered across their entire range or within Washington within the foreseeable future (DNR 2018).
- Priority 3 species are vulnerable, and their population is declining in Washington. Species in this level are likely to become threatened without active management practices (DNR 2018).

In addition to the priority rankings, the WNHP includes the state status of each species and the ecoregions where it may be found (Miller et al. 2024), as follows:

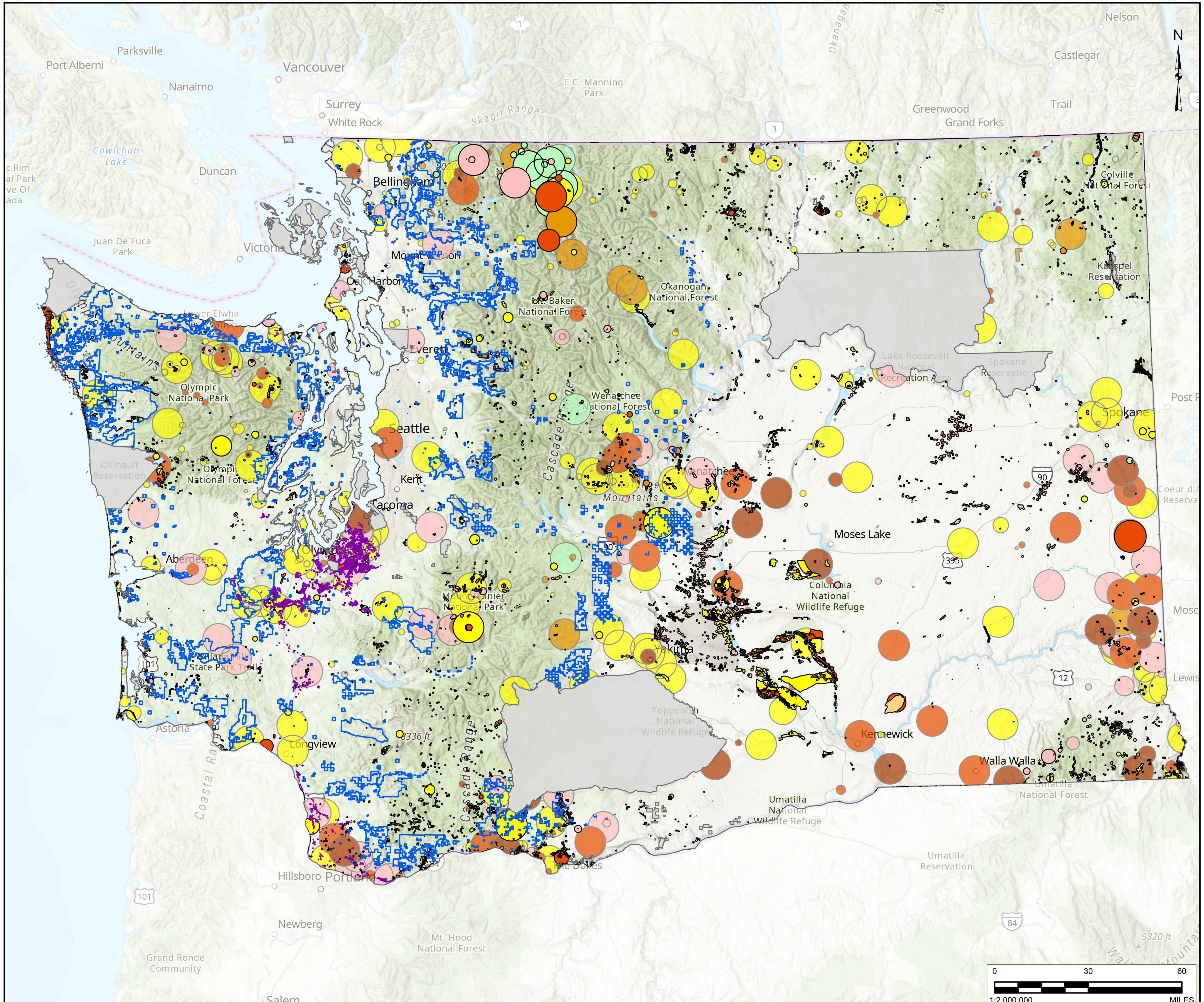
- Endang: Endangered, at risk of becoming extirpated in Washington, or extinct
- Threat: Threatened, likely to become endangered in Washington
- Sens: Sensitive or population in decline in Washington, could become threatened or endangered without management
- Extirp: Extirpated in Washington, or possibly extinct

The WNHP also includes the federal status of the species as listed (Miller et al. 2024):

- Endang: Endangered, a species is at risk of extinction in a major portion or all of its range.
- Threat: Threatened, a species is likely to become endangered in the near future.
- Prop: Proposed, a species has been proposed to be listed as endangered or threatened.
- Cand: Candidate, a species is being evaluated by the USFWS to be listed as endangered or threatened, but no proposal has been made.

- B-Sens: Bureau of Land Management (BLM) sensitive, the species has been found in at least one BLM-managed area in Washington.
- F-Sens: USFS sensitive, the species has been found on at least one USFS-managed area in Washington.

A summary of priority vascular plant species in Washington State is provided in **Appendix 3.5-1**, along with a description of habitat requirements and a summary of ecoregion species that are known to occur. Known occurrences of plant priority species are shown in **Figure 3.5-8**.



LEGEND

- Study Area
- Exclusion Areas
- Oaks and Grasslands of the Puget Trough Ecoregion (DNR, 2022b)
- Habitat Conservation Plan Lands (DNR, 2021)

Washington Natural Heritage Program Element Occurrences

Current State Status (DNR, 2023)

- ENDANGERED
- REVIEW 1 LIST
- REVIEW 2 LIST
- WATCH LIST
- SENSITIVE
- THREATENED
- NO CONCERN
- NOT LISTED

Historical State Status (DNR, 2022c)

- ENDANGERED
- POSSIBLY EXTIRPATED
- REVIEW 1 LIST
- REVIEW 2 LIST
- SENSITIVE
- THREATENED
- NO CONCERN

REFERENCES AND NOTES

1. SERVICE LAYER CREDITS: SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY, ESRI, USGS
2. DNR (WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES). 2022B. OAKS AND GRASSLANDS OF THE PUGET TROUGH ECOREGION. ACCESSED FEBRUARY 1, 2025. HTTPS://DATA-WADNR.OPENDATA.ARCGIS.COM/DATASETS/WADNR::OAKS-AND-GRASSLANDS-OF-THE-PUGET-TROUGH-ECOREGION/ABOUT
3. DNR (WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES). 2021. HABITAT CONSERVATION PLAN LANDS. ACCESSED FEBRUARY 1, 2025. HTTPS://GEO.WA.GOV/DATASETS/WADNR::HABITAT-CONSERVATION-PLAN-LANDS/ABOUT
4. DNR (WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES). 2023. WASHINGTON NATURAL HERITAGE PROGRAM ELEMENT OCCURRENCES – CURRENT. ACCESSED FEBRUARY 1, 2025. HTTPS://DATA-WADNR.OPENDATA.ARCGIS.COM/DATASETS/WADNR::WASHINGTON-NATURAL-HERITAGE-PROGRAM-ELEMENT-OCCURRENCES-CURRENT/ABOUT
5. DNR (WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES). 2022C. WASHINGTON NATURAL HERITAGE PROGRAM ELEMENT OCCURRENCES – HISTORICAL. ACCESSED FEBRUARY 1, 2025. HTTPS://DATA-WADNR.OPENDATA.ARCGIS.COM/DATASETS/WADNR::WASHINGTON-NATURAL-HERITAGE-PROGRAM-ELEMENT-OCCURRENCES-HISTORICAL/ABOUT

Washington State Energy Facility Site Evaluation Council

PROJECT

PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE

PRIORITY PLANT SPECIES ELEMENT OCCURRENCES FROM WASHINGTON NATURAL HERITAGE PROGRAM

YYYY-MM-DD 2025-09-19

CONSULTANT wsp

FIGURE 3.5-8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

This Page Intentionally Left Blank

3.5.3 Impacts

Transmission facilities are known to have adverse environmental impacts on vegetation resources. This section summarizes the adverse environmental impacts of transmission facilities on vegetation, biological factors that contribute to impacts, and transmission facility features that contribute to impacts. For this Programmatic EIS, adverse environmental impacts were assessed for the new construction, operation and maintenance, upgrade, and modification of transmission facilities within the Study Area.

3.5.3.1 Method of Analysis

The study area for a project-specific application would typically encompass several key regions and features, such as the following:

- **Project Site and Immediate Vicinity:** Specific location of the project and the surrounding area that might be directly affected by new construction, operation and maintenance, upgrade, and modification activities.
- **Protected Areas:** Nearby protected areas that could be affected by the project, such as preserves and conservation areas.
- **Critical Habitat:** Areas designated as critical habitat under the ESA for endangered or threatened species.
- **Priority Plant Species:** Location of known priority plant species populations or important or protected habitat for priority plant species.
- **Sensitive Ecosystems or Habitat:** Location of sensitive ecosystems or important habitat.
- **Biodiversity Corridors:** Areas important due to high biodiversity that occurs within the ecosystem or is supported by the ecosystem.
- **Local Study Area Surrounding the Project Site:** Areas beyond the project site and immediate vicinity to help understand the landscape-level context of the project and its potential adverse environmental impacts on vegetation.

This Programmatic EIS analyzes the affected environment and adverse environmental impacts on vegetation within the Study Area defined in Chapter 1, Introduction. Four project stages for each transmission facility type (overhead or underground) were considered: new construction, operation and maintenance, upgrade, and modification.

This evaluation considers both overhead and underground transmission facilities for each stage. Overhead transmission facilities consist of transmission lines, substations, and ancillary infrastructure. Overhead and underground transmission facilities may involve similar aboveground infrastructure. Underground transmission facilities consist of underground transmission lines, underground access vaults, and other infrastructure located below the ground surface. The new construction of underground transmission facilities could include both open-trench and trenchless construction methods.

Impact Determination

The discussion of adverse environmental impacts is qualitative given the high-level nature of a Programmatic EIS; quantification would require project-specific details to analyze. **Table 3.5-8** describes the criteria used to evaluate adverse environmental impacts from the Action Alternative and No Action Alternative. Information reviewed to identify adverse environmental impacts on vegetation in the Study Area was obtained from federal agencies, state agencies, local planning documents, and public scoping.

Table 3.5-8: Criteria for Assessing the Impact Determination on Vegetation

Impact Determination	Description
Nil	No foreseeable adverse environmental impacts are expected. A project would not adversely affect vegetation, as it would be sited entirely within existing anthropogenic disturbance (e.g., on developed, agricultural, or crop land). A project would not result in the direct loss of native plants or ecosystems. Buffers would be maintained around areas with native vegetation.
Negligible	A project would have minimal adverse environmental impacts on vegetation, including native plant species and ecosystems. Changes would either be non-detectable or, if detected, would have only slight effects. A project would be sited outside buffers around known occurrences of plant priority species, priority habitats, plant associations of conservation concern, and wetlands. There would be no measurable change to the vegetation community composition of adjacent native ecosystems or plant populations. Negligible impacts would be short-term in duration. BMPs and design considerations are expected to be effective.

Impact Determination	Description
Low	A project would result in noticeable adverse environmental impacts on vegetation, even with the implementation of BMPs and design considerations. These adverse environmental impacts may include the direct and indirect loss of natural ecosystems and plants, but such changes would fall within the natural variability and resiliency of affected species or populations. These adverse environmental impacts are not expected to affect the long-term viability of the species or populations. A project would also result in changes to natural vegetation, including losses or changes in composition; however, the structure and function of the naturally vegetated areas would remain the same as pre-disturbance conditions. Adverse environmental impacts on vegetation would be localized. Adverse environmental impacts may be short or long-term in duration.
Medium	A project would result in adverse environmental impacts on vegetation, even with the implementation of BMPs and design considerations. A project would result in incremental direct and indirect losses of natural ecosystems and plants, which would change plant populations or the native ecosystem. These adverse environmental impacts would exceed the resiliency and adaptability[28] of affected species or populations. Consequently, the affected population levels would stabilize at a lower rate or abundance compared to pre-disturbance conditions. The overall function, structure, or ecosystem services that the ecosystem provides would be altered, leading to reduced functionality, though this functionality would not be entirely lost. Naturally vegetated areas would become more fragmented, isolated, or have measurable changes in the ratio of edge to core habitat. Medium impacts may be short or long-term in duration.
High	A project would result in adverse and potentially severe environmental impacts on vegetation, even after implementation of BMPs and design considerations. A project would cause incremental direct and indirect losses of natural ecosystems and plants, which would substantially change plant populations or the native ecosystem. These changes to plant populations or native ecosystems would exceed the resiliency and adaptability of the affected species or populations. The changes would impact the viability of the species or populations such that they would be at risk of extirpation. These adverse environmental impacts on natural ecosystems would impact the functionality and ecosystem services that they provide, rendering the ecosystem non-functional. High impacts may be short or long-term.

BMP = best management practice

To clearly understand the potential severity of adverse environmental impacts without any interventions, the following impact determinations exclude the use of Avoidance Criteria and Mitigation Measures. The ratings assume compliance with all federal, state, and local laws and regulations, as well as standardized BMPs and design

[28] In biology, a species' ability to continue functioning after a disturbance.

considerations. Assessing adverse environmental impacts without Avoidance Criteria or Mitigation Measures offers a baseline understanding of potential environmental effects, helping to identify the true extent of these impacts. Environmental laws often require that initial impact assessments be conducted without considering mitigation to maintain the integrity of the environmental review process.

When impact determinations are identified as medium or high, then either the applicant would adopt applicable Mitigation Measures from this Programmatic EIS, or the State Environmental Policy Act (SEPA) Lead Agency may require applicable mitigation measures to be implemented to reduce project-specific adverse environmental impacts. When impact determinations are low, applicable Mitigation Measures should still be considered by the applicant and the SEPA Lead Agency, as these measures would help to further reduce adverse environmental impacts, including the project's contribution to cumulative impacts. These Mitigation Measures would be implemented in addition to compliance with laws, regulations, environmental permits, plans, and design considerations required for transmission facilities.

Potential interactions between a transmission facility (both overhead and underground) and vegetation during new construction, operation and maintenance, upgrade, and modification were identified based on information obtained from a review of literature and published information. The analysis of adverse environmental impacts and characterization of significant adverse environmental impacts are organized under new construction, operation and maintenance, upgrade, and modification by impact category as follows:

- **Loss of Native Ecosystems and Plants:** This includes direct disturbance or loss of ecosystems and populations of plant species within the project footprint, in particular at-risk species and ecosystems.
- **Fragmentation:** This occurs when a linear feature results in the division of an otherwise continuous tract of an ecosystem or plant priority species population into smaller, more isolated patches.
- **Degradation of Soil:** Heavy machinery and soil disturbance required during the new construction of transmission facilities may impact soil quality and structure, which may affect plant establishment.

- **Edge Effects:** The boundary between the transmission facility and adjacent native ecosystems may have changes to structure and physical characteristics (e.g., change in light and temperature) that can affect community composition.
- **Introduction or Spread of Invasive Plants or Noxious Weeds:** This includes the introduction of new invasive species to an area or the spread of existing invasive species within the project footprint or to adjacent areas around the footprint. The introduction and spread of invasive species can impact ecosystem structure and function.
- **Surface Runoff:** Erosion or sediment-laden water from the project area can mobilize and impact retained vegetation or adjacent areas. Sediment release can affect the growth and vigor of plants.
- **Impacts from Increased Dust:** Construction activities and use of new roads to access areas of the transmission facility during operation and maintenance may increase the adverse environmental impacts of dust on vegetation. Dust can affect plant growth and vigor.
- **Introduction of Hazardous Materials:** Hazardous materials are required for new construction and operation and maintenance of transmission facilities. The accidental release may have impacts on vegetation, including mortality.
- **Increased Fire Risk:** Vegetation maintained within the right-of-way (ROW) may present a fuel source for fires. In addition, some maintenance activities, such as brush clearing, have the potential to initiate wildfires.

The analysis of adverse environmental impacts is based on best available science at the time of writing. It is limited by the availability of data from public sources. Understanding the adverse environmental impacts of anthropogenic disturbances on biodiversity, including vegetation resources, is an evolving science, and few studies have collected long-term data or addressed confounding effects. Scientific understanding may change over time, and applicants and the SEPA Lead Agency should rely on the best available science at the time of application, which may differ from the adverse environmental impacts identified here.

3.5.3.2 Action Alternative

New Construction

Overhead Transmission Facilities

Activities for new construction of overhead transmission facilities would vary and depend on the scale of the facility and site characteristics. New construction could include a relatively short site preparation period (e.g., a few months), followed by a longer construction and start-up period. It is assumed that the new construction of overhead transmission facilities, per mile, would have a shorter duration than underground construction. Overhead transmission facilities could have the following adverse environmental impacts on vegetation resources during new construction:

- Loss of Native Ecosystems and Plants
- Fragmentation
- Degradation of Soil
- Edge Effects
- Introduction or Spread of Invasive Plants or Noxious Weeds
- Surface Runoff
- Impacts from Increased Dust
- Introduction of Hazardous Materials
- Increased Fire Risk

Loss of Native Ecosystems and Plants

Vegetation clearing and grubbing are one of the main adverse environmental impacts on vegetation resources. New construction of overhead transmission facilities would require clearing vegetation for structure placement, access roads, and substations, which would have adverse environmental impacts on ecosystems and priority plant species. In some cases, the entire ROW may require vegetation clearing. Impacts from vegetation clearing typically occur near the onset of new construction and often persist through operation and maintenance until the project is decommissioned and ecological communities can be restored.

A typical ROW width is 130 to 260 feet, but widths may vary depending on transmission facility voltage and the adjacent landscape. For transmission facility

ROWs that run hundreds of miles, this can equate to thousands of acres of direct disturbance to vegetation. Tall vegetation, such as tall shrubs and trees, is typically cleared from the width of the ROW or within strike distance of the transmission line. However, complete clearing may not be required for all ecosystem types, such as those dominated by low-growing vegetation.

Permanent loss of native ecosystems and plants from transmission facilities would include loss that persists from new construction through the operation and maintenance stage and that is not restored within the life of the project (WDFW 2009b). This would include the individual footprint of structure foundations for overhead transmission facility poles and permanent access roads to allow workers to maintain the transmission facility. These areas are assumed to remain non-vegetated throughout the life of the transmission facility and would constitute permanent losses of vegetation resources.

Temporary loss of native ecosystems and plants from transmission facilities would include loss that is required for new construction activities but is restored and revegetated following construction (WDFW 2009b). This would include construction laydown areas and temporary access roads. Following new construction, these areas would be restored to native vegetation similar to pre-disturbance conditions. However, vegetation under overhead transmission facilities must be maintained to avoid electrification. For this reason, restoration of the area underneath overhead transmission facilities may have differential impacts on different ecosystems.

Ecosystems dominated by low-growing vegetation, such as grasslands, shrubsteppe, some wetlands, or sparsely vegetated ecosystems, such as talus slopes or rock outcrops, are more compatible with overhead transmission facilities than ecosystems dominated by tall vegetation. The vegetation naturally does not reach the height of overhead wires, and, while some clearing and loss would be associated with the areas of permanent direct impacts, the entire ROW would not require clearing. On the other hand, forested ecosystems, which are dominated by trees, experience greater adverse environmental impacts than other ecosystems because all trees within the ROW or within strike distance are required to be cleared. Following new construction, many of these areas cannot be restored to pre-construction conditions due to safety concerns of trees interacting with overhead transmission lines. Therefore, forested areas in the ROW are permanently lost for the life of the project. These areas may become “modified habitat” within the ROW, where some native vegetation is restored, but the same structure and functions as the previous forested habitat are not available. Forested ecosystems are more dominant in the western portion of Washington in the

Northwest Coast, Puget Trough, North Cascades, West Cascades, and East Cascades ecoregions.

The adverse environmental impacts of transmission facilities are exacerbated in old and mature forests. Old and mature forests are defined based on the age of trees and the presence of multi-storied structures within the forest, which require time to develop. Further, in addition to the time lag between vegetation clearing and restoration, mature and old forests require time to achieve the climactic or near-climactic state. In other words, it takes mature and old forests decades or even centuries to develop the age and characteristics that define these systems. Old and mature forests predominantly occur in the East Cascades, Okanogan, Puget Trough, and West Cascades based on the PHS database (**Table 3.5-5**) (WDFW 2024d). Old and mature forest is also known to occur in the Canadian Rocky Mountains, Columbia Plateau, North Cascades, and Northwest Coast ecoregions, but less than 500 acres are currently mapped (**Table 3.5-5**) (WDFW 2024d). These areas may be of particular importance given the limited amount of old and mature forest remaining in these ecoregions.

Clear spanning is a method of transmission facility construction that could be used to avoid disturbing some ecosystem patches that support low-growing vegetation communities, such as wetlands, shrubsteppe, or some riparian areas. In this method, all access is maintained outside the avoidance areas, and the poles are erected on either side, which limits direct disturbance to what is required to run the cables over the vegetation. The following sections discuss the direct impacts of constructing overhead transmission facilities in relation to broad ecosystem groups.

Alpine Ecosystems

Alpine ecosystems occur above the tree line. These areas are typically characterized by harsh climatic extremes. Alpine ecosystems are typically characterized by low-growing plant communities such as heathlands, alpine meadows, or alpine grasslands, or sparsely vegetated communities such as late-snowbeds, glaciers, and alpine fell-fields. Due to the harsh environments, including strong winds and difficult access, it is unlikely that many of these ecosystems would be suitable for overhead transmission; however, given the predominantly low-growing vegetation, it is not anticipated that the entire ROW would need to be cleared in these areas.

Forests and Woodlands

As described above, adverse environmental impacts from overhead transmission facilities would be greatest for forests and woodlands where the ecosystem is defined by tall woody species. It is expected that the width of the ROW (130 to 260 feet) would need to be cleared for all portions of the overhead transmission facility that are routed through forests and woodlands, and that trees would continue to be excluded during operation and maintenance.

Riparian Areas

Riparian areas include areas near waterbodies such as streams, lakes, ponds, and rivers. These areas may range from deciduous and mixed forests to shrub-dominated areas or herbaceous communities. The use of clear spanning to cross waterbodies is common practice within riparian areas for overhead transmission facilities. This method would minimize the disturbance to riparian areas from the transmission facility footprint and any required ROW or access road for each direction. The impact would vary depending on the dominant vegetation in the riparian area.

Steppe and Prairie

Steppe and prairie ecosystems include areas dominated by low-growing shrubs (e.g., big sagebrush), graminoids (i.e., grasses, rushes, and sedges), and forbs. While direct impacts would be associated with the access roads and transmission tower footprints, it is not anticipated that the entire ROW would need to be cleared in these ecosystems because the low-growing vegetation does not pose a threat to overhead transmission facility safety.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Sparsely vegetated ecosystems include a broad range of ecosystems, such as talus slopes, cliffs/bluffs, and inland dunes, that are characterized by a low percentage of the area being covered by vascular plants. When considering overhead transmission facilities, direct impacts on these ecosystems are anticipated to be limited to areas needed for temporary construction and permanent features. Because there is limited vegetation cover, clearing the entire ROW width is not anticipated in these areas.

Wetlands

Wetland ecosystems can range from low-growing graminoid-dominated ecosystems (e.g., marshes and fens) to tall woody shrubs and coniferous trees (e.g., treed swamps). For wetlands that are dominated by tall shrubs and trees, it would be necessary to clear the entire ROW width. In addition, wetlands may range from small, isolated depressions to large wetland complexes. In some cases, overhead transmission facilities may clear span wetlands, with limited disturbance to the wetland or wetland buffer. In other instances, where wetlands are large complexes, the fill required to create roads and platforms for transmission facility towers can have not just footprint-related impacts, but also alterations to the function of the ecosystem by changing hydrological regimes. Transmission pole structures and roads in wetlands would likely require infilling and could alter water flow through wetlands. Heavy machinery can degrade soil quality, causing compaction (PSCW n.d.), which may limit the ability to restore temporary and permanent areas needed for new construction.

Plant Priority Species

Plant priority species are federally and state-listed species that have been assessed and are at some risk of extinction. Loss of habitat from anthropogenic development is one of the leading threats to species at risk (Government of Canada 2014). Direct disturbance could result in loss of habitat for priority plant species, direct loss of a population, or even localized extirpation. At-risk plant species may undergo varying degrees of population loss, depending on the vulnerability of the species, the ability of surrounding populations to “rescue” the population, and the resilience of the species to mitigation measures such as transplanting and propagation. The rescue effect hypothesizes that less isolated populations are less likely to go extinct due to the ability of nearby populations to recolonize[29] suitable habitat and due to increased genetic diversity through occasional migration among nearby populations (Lehtinen 2023).

Impact Determination: Adverse environmental impacts on vegetation resulting from the loss of native ecosystems and plants during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Fragmentation

Fragmentation occurs when multiple disturbances, usually anthropogenic, reduce the patch size[30] of ecosystems, creating a mosaic of residual patches interspersed within a matrix of disturbance (Haddad et al. 2015). This can alter ecosystem function in various ways, such as by reducing gene flow between communities.

Linear features such as roads and transmission facility ROWs traverse long distances across landscapes. They bisect multiple ecosystems and can lead to fragmentation. The shape of linear features means that they have a high edge-to-interior ratio and increase the edges along natural ecosystems. It is estimated that 70 percent of the world’s remaining forests are located within 0.6 miles of an edge (Haddad et al. 2015).

[29] The reestablishment of a species into an area after it was extirpated.
[30] The size of a continuous or connected ecosystem type.

Edges can lead to ecosystem degradation over time by altering microclimates, changing community composition, altering nutrient cycling, and impacting biodiversity (Haddad et al. 2015).

Fragmentation can lead to ecosystem loss—in particular, as patch sizes become increasingly small and/or isolated from other patches. Fragmentation reduces species richness for both plants and animals and changes community composition, resulting in localized extirpation (Haddad et al. 2015). Plant community composition is used to classify plant associations. Ecosystems are lost when a change to plant communities results in indicator and dominant species no longer being present. This is particularly a concern for priority habitats and plant associations listed at the state level, which have already been identified as under some degree of threat and typically occur as patches of residual intact ecosystems on the landscape. The adverse environmental impacts from fragmentation may increase over time if fragmentation persists (Haddad et al. 2015).

The concept of fragmentation can be applied to populations of plant priority species. Studies of habitat fragmentation show that plant biodiversity declines over time with decreased patch size and increased patch isolation,[31] indicating local extirpations (Haddad et al. 2015). Small populations of plant priority species are vulnerable to extirpation as unanticipated events may wipe out the population. Fragmentation can have multiple adverse environmental impacts on plant priority species. First, it may reduce the population size by directly impacting a portion of the population. Populations can recover if there are other populations nearby that can migrate to the area. However, fragmentation can slow or prevent migration from adjacent populations, in a phenomenon known as immigration lag (Haddad et al. 2015).

The new construction of overhead transmission facilities is anticipated to have fragmentation-related adverse environmental impacts on vegetation. The severity of the impact is a function of the degree of existing isolation of the ecosystem patches, the distance between ecosystem patches (i.e., the width of the direct disturbance area), the ability of species to disperse, and the length of time before decommissioning (i.e., the impact is removed). The following sections discuss the fragmentation-related adverse environmental impacts of constructing new overhead transmission facilities in relation to broad ecosystem groups.

[31] The extent to which a habitat patch is disconnected from other similar habitats.

Alpine Ecosystems

Most alpine ecosystems are remote and have undergone less anthropogenic disturbance than other ecosystems. Alpine ecosystems naturally occur as a mosaic responding to variations in soil availability, solar radiation, and extreme climatic conditions. At the landscape scale, alpine ecosystems are isolated from one another as they occur above the tree line at high elevations. Because of the isolation, alpine ecosystems may be quite distinct from one another, with unique sets of species and plant priority species restricted to small ranges. Fragmentation-related adverse environmental impacts from new construction of overhead transmission facilities are relatively uncommon in alpine ecosystems, but could result in further isolation of populations.

Forests and Woodlands

Adverse environmental impacts related to the fragmentation of forests and woodlands, from the new construction of overhead transmission facilities, could vary. In portions of western Washington, forests dominate the landscape up to the tree line. New construction of overhead transmission facilities could lead to distinct boundaries along the forest edge, but is not anticipated to result in ecosystem loss. However, other tree-dominated ecosystems, such as Oregon Oak woodlands, which already occur as fragmented patches, would be highly susceptible to loss from further fragmentation.

Riparian Areas

Adverse environmental impacts on riparian ecosystems related to fragmentation from new construction of transmission facilities are expected to vary. In urban areas, riparian habitat has been highly modified, fragmented, and lost. Further fragmentation is likely to exacerbate the impact and could result in ecosystem loss. Where riparian areas are relatively intact, the impact of fragmentation may be less. Low-growing riparian vegetation can persist under overhead transmission facilities, so the distance between intact patches is estimated to be the width of a road. Where riparian ecosystems are dominated by tall shrubs or trees, the distance between patches is expected to be greater due to the need to clear the full ROW width. Clear-span construction of overhead transmission facilities is expected to minimize fragmentation of riparian areas.

Steppe and Prairie

Steppe and prairie ecosystems have been highly modified due to agricultural development in Washington. Patches of intact steppe and prairie remain, but these could be impacted by further fragmentation from new construction of overhead transmission facilities. Fragmentation may increase indirect impacts (such as invasive plants), resulting in degradation of the ecosystem. For larger patches, ecosystems may undergo increased indirect impacts, but large patches of steppe and prairie are anticipated to persist. Steppe and prairie ecosystems are expected to be maintained in overhead transmission facility ROWs, and only areas needed for new construction are expected to be cleared. This means that most species would still be able to migrate between patches.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Sparsely vegetated ecosystems occur as isolated patches on the landscape. Similar to alpine ecosystems, species that occur in these ecosystems may already experience some isolation. The resilience of species in these ecosystems is a product of the species' dispersal ability and the ability to survive conditions with limited nutrients. Clearing of the entire ROW is not expected to be necessary in sparsely vegetated areas, so the distance between patches would be reduced to the width of access roads and pole footings.

Wetlands

New construction of overhead transmission facilities could cause fragmentation that impacts the ecological function of wetlands. This could alter water flow within a wetland and result in isolated patches of wetland that were once continuous, which can alter ecosystem function. In addition, linear features such as roads that bisect a wetland may result in loss of hydrological connections among connected wetlands, which can change wetland hydrology from impoundment. Small, isolated patches may be at increased risk of ecosystem loss. Clear-span methods are anticipated to minimize adverse environmental impacts of new construction on wetlands, particularly small wetlands that can be entirely avoided; however, for larger wetland complexes, this method may not be feasible.

Plant Priority Species

As described above, fragmentation can cause losses of populations of plant priority species as patch size decreases and patch isolation increases. Ultimately, this may lead to local extirpation if there is reduced migration among populations (Haddad et al. 2015). Small populations of plant priority species are vulnerable to extirpation as unanticipated events may wipe out the population.

Impact Determination: Adverse environmental impacts on vegetation resulting from fragmentation during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Degradation of Soil

Soil is a fundamental component of a healthy ecosystem. Heavy equipment used during new construction can cause soil compaction, which reduces pores in the soil matrix. Pores between soil particles are important for the movement of water and air through the matrix, provide habitat for soil microorganisms, and allow plant roots to move through the soil (USDA 2008). Over time, compacted layers can develop in the subsoil. Ultimately, changes to soil porosity can affect plant development and growth by limiting access to important resources, including water, nutrients, and microorganisms, and affecting root development (USDA 2008; Shaheb et al. 2021). As soil compacts, the pores are reduced or lost, leading to reduced oxygen in the rooting zone. The risk of soil compaction is increased when soil is near field capacity (i.e., soil is saturated with water). In addition, compacted soils have a reduced ability for water absorption due to the lack of pores, leading to increased risk of surface runoff and loss of soil to erosion. While the degradation of soil can impact plant growth, plant roots can improve soil conditions. As plants grow, their root systems also grow and move through the soil, creating spaces between soil particles and improving soil porosity.

Stockpiling soil may be required during the new construction of overhead transmission. Topsoil layers may be stockpiled in areas of temporary disturbance and then later replaced across the site prior to revegetating. Soil stockpiling can lead to soil degradation, including changes in soil microbial communities and loss of soil nutrients. Soil that is stockpiled may not be equally impacted, as some adverse environmental impacts, like soil nutrient loss, increase for soil that is deeper in the stockpile (Fischer et al. 2022). The alteration of soil quality following stockpiling can impact the success of revegetation.

Some ecosystems develop biological soil crusts on the surface of the soil. The ecological role of biological crust varies depending on the composition of the crusts, ecosystem type, and the amount of biomass. Some key ecological roles include carbon fixation, nitrogen fixation, albedo (i.e., the measure of energy reflected from a surface), and soil stabilization (USDI 2001). Activities associated with new construction that result in soil disturbance could lead to loss of biological soil crusts, which could destabilize soils, alter nutrient cycling, and impact soil temperature. These adverse environmental impacts could lead to increased erosion by wind or water; reduced soil nutrient availability, which could impact plant growth; and reduced soil temperatures, which could affect plant germination timing.

Alpine Ecosystems

Alpine plants are often low-growing species, and some are adapted to variable soil conditions, including shallow soils. As soil can be limited in alpine areas, the compaction of soil and reduced water absorption, leading to increased soil runoff, could result in soil loss, limiting the ability for revegetation.

Forests and Woodlands

Forests and woodlands are characterized by large, woody vegetation, including trees and shrubs. These species tend to be more deeply rooted. Degradation of soil, such as the development of compaction layers, can affect the growth and development of trees. Trees may adapt but may develop shallow-rooted systems, making them more susceptible to windthrow.

Riparian Areas

Forested riparian areas would be subject to adverse environmental impacts similar to those of forests and woodlands. Riparian areas are located adjacent to waterbodies, and vegetation is important for maintaining water quality and stabilizing banks. Soil degradation can impact revegetation success, and if unsuccessful, could lead to changes in water quality and bank stability issues.

Steppe and Prairie

Biological soil crusts are an important component of shrubsteppe ecosystems and provide ecological functions that contribute to the health of shrubsteppe ecosystems; however, they are fragile to disturbance. Impacts from new construction resulting in the loss of biological soil crust can result in soil destabilization and increased erosion (McIntosh et al. 2007).

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Some sparsely vegetated ecosystems, such as talus slopes, cliffs, and bluffs, have naturally limited soil. Soil degradation is anticipated to result in less impact on these ecosystems. These ecosystems have naturally sparse vegetation, and while revegetation is challenging because of the lack of soil, the ability to return the site to similar pre-construction conditions is likely achievable.

Wetlands

Wetlands are characterized by waterlogged soils, and some wetlands have deep organic soils. These soil types are highly susceptible to compaction. Use of heavy machinery during new construction could result in degradation of wetland soils.

Plant Priority Species

As previously described, changes in the physical, chemical, and/or biological properties of soil can result in soil degradation. If changes are severe enough, this can impact the growth and propagation of plants. Plant priority species are typically already under threat, and further loss could impact populations, resulting in further loss of plant priority species.

Impact Determination: Adverse environmental impacts on vegetation resulting from the degradation of soil during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to medium.

Edge Effects

Edge effects[32] can result from fragmentation and may vary depending on the ecosystem type. New construction of overhead transmission facilities would result in new distinct boundaries between natural ecosystems and the adjacent infrastructure or ROW. The biophysical conditions at these boundaries could be altered by the adjacent construction. It is estimated that adverse environmental impacts on microclimates and from invasive plants along edges may extend 25 to 775 feet into adjacent areas (Bentrup 2008). Edge effects can change community composition and should be considered for linear infrastructure. In addition, some species may benefit from increased edge effects, including habitat generalist species and invasive plant species. While individual plant priority species were not specifically investigated for this Programmatic EIS, this concept can be applied in ecosystem-level impact assessments. If the habitat on which a plant priority species depends is substantially altered, localized extirpation may occur. In addition, changes to community composition, in particular the spread of invasive plants, can extirpate a population.

[32] A phenomenon where species composition changes towards the boundary of a habitat. Typically used in the context of habitat degradation, where intact habitat contains less diversity near where it contacts disturbed areas, such as clearcuts or agricultural land.

The closer the populations of priority plant species are to the edge, the larger and more likely an impact will occur.

Alpine Ecosystems

New construction of overhead transmission facilities could result in edge effects in alpine environments. Edge effects may be less pronounced as species living in alpine environments are typically adapted to large variations in temperature and moisture. Furthermore, the low-growing vegetation of alpine ecosystems may enable limited clearing for overhead transmission, reducing edge effects.

Forests and Woodlands

Edge effects from the new construction of overhead transmission facilities could result in edge–effect–related adverse environmental impacts on forest and woodlands. Loss of overstory vegetation and tall shrub vegetation would affect light and temperature along edges, which could also affect soil moisture. These changes to microhabitat could alter plant communities that persist in the understory and could benefit species adapted to higher light and temperature conditions. An increase in invasive plants due to edge effects is also expected to result in areas adjacent to overhead transmission facilities.

Riparian Areas

The new construction of overhead transmission facilities could result in edge–effect–related adverse environmental impacts on riparian areas. Similar to forests, loss of trees or tall shrubs in riparian areas would affect microhabitat along edges and could lead to changes in community composition or opportunity for invasive plant spread.

Steppe and Prairie

New construction of overhead transmission facilities could result in edge effects in steppe and prairie ecosystems. Edge effects increase the potential for the introduction and spread of invasive plants, which are a threat to steppe and prairie ecosystems. In addition, changes to light and temperature along edges could impact plant growth. However, low-growing vegetation in steppe and prairie may enable limited clearing for overhead transmission, reducing edge effects.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Edge effects in sparsely vegetated ecosystems may be less pronounced than in other ecosystems. These ecosystems are, in part, characterized by low coverage of vascular plants. Changes to physical characteristics along edges, such as light and temperature, are anticipated to be minimal. Edge effects could still impact the movement of invasive plants into adjacent areas.

Wetlands

New construction of overhead transmission facilities within wetlands could result in edge effects. Alteration of physical characteristics like light and temperature along edges may impact soil moisture. Saturated soils are often a key characteristic of wetlands, and changes in the microhabitat could have profound changes on vegetation communities, shifting to species tolerant of drier conditions. Shifts in community composition in wetlands can further impact soil conditions by changing soil nutrient regimes due to changes in litter type. This could lead to the loss of certain wetland ecosystems.

Plant Priority Species

Edge effects could alter the physical characteristics of the habitat for plant-priority species and the community composition located near the new construction of an overhead transmission facility. Habitat loss is a leading threat to many species at risk, and edge effects can ultimately result in the loss of individuals or populations. Edge effects are expected to be more pronounced for populations closer to the boundary of an overhead transmission facility.

Impact Determination: Adverse environmental impacts on vegetation resulting from edge effects during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Introduction or Spread of Invasive Plants or Noxious Weeds

Linear infrastructure can facilitate the spread of invasive species to adjacent ecosystems (Dubé et al. 2011). New construction could introduce or spread invasive plants or noxious weeds. New construction resulting in vegetation removal and soil disturbance creates opportunities for invasive plant establishment, and linear construction along a transmission facility creates a corridor for invasive plants to travel. Invasive plants typically have characteristics that facilitate their spread, such as being pioneering species that are quick to establish in available sites and are competitive with native vegetation. The competitive nature of successful invasive plants can aid in competitively excluding other, desirable native plants from establishing. The primary vectors that could introduce or spread invasive plants and noxious weeds are vehicles, equipment, and material (in particular, soil and seed) brought to a site. Invasive species have the potential to alter the chemical and physical properties of soil, as well as change nutrient cycling regimes, which can alter the structure and composition of native vegetation (Weidenhamer and Callaway 2010).

All ecosystem types are susceptible to the spread of invasive plants; however, some factors may increase the risk of invasive plant establishment and spread. In general, invasive plants along transmission facility corridors are correlated with biophysical attributes, including soil productivity and abundant light, and are correlated with distance to human development and recent disturbance (Lampinen et al. 2015). New construction of transmission facilities could result in new disturbances that create available space and opportunity for invasive plant establishment. Furthermore, transmission facilities developed near existing human development are more likely to have invasive plants already established. Transmission facilities in areas of relatively low human disturbance then provide an opportunity to spread invasive plants to areas with current low establishment. The adverse environmental impacts of the spread of invasive plants on ecosystems that have limited human development and invasive plant establishment would likely be greater than the impacts on ecosystems that have already undergone large-scale human disturbance.

Alpine Ecosystems

Most alpine ecosystems occur in remote areas and have undergone limited existing human disturbance. Plant species that persist in alpine areas are highly adapted to harsh conditions. As human development is typically low, and biophysical conditions are marginal, alpine ecosystems typically have a low abundance of invasive plant species. New disturbance from transmission facility development could have adverse environmental impacts on these areas by facilitating invasive plant spread; however, the harsh environmental conditions may preclude the establishment of some invasive plants.

Forests and Woodlands

Forests are a commercial resource in Washington, and many of the state’s forests have been impacted by logging. This has resulted in invasive plant establishment in many areas. Forests may restrict some invasive plant spread where canopies are dense, thereby restricting light availability. Areas of relatively undisturbed forest, including existing old and mature forests, likely have limited invasive plant establishment in comparison to second-generation or commercial forests.

Riparian Areas

Riparian ecosystems provide many services, including flood and erosion protection, stormwater management, and water filtration (Ecology 2024d). Impacts of invasive plants on riparian ecosystems can result in changes to the structure and function of the ecosystem. Streams and other flowing waterbodies can act as dispersal corridors, similar to roads and transmission facilities. Introduction or spread of invasive plants to riparian ecosystems may result in a much broader area of spread due to the connection of land and water. In addition, invasive plants that create monocultures along streambanks can change the aquatic ecosystem by altering nutrient cycling, destabilizing banks, affecting water quality, and altering stream temperature (Urgenson et al. 2009; Greenwood and Kuhn 2014).

Steppe and Prairie

Steppe and prairie ecosystems are most commonly found in eastern Washington, where agriculture and livestock grazing are abundant. Grasslands and shrublands (synonymous with prairie and steppe) typically have productive soil and highlight availability, creating conditions suitable for invasive plants (Dhakal et al. 2023; Lampinen et al. 2015). Biodiversity of invasive plants in grasslands is higher than in forested environments and may be attributed in part to disturbance agents like fire and grazing, as well as proximity to human disturbance (Dhakal et al. 2023). Fire is an important disturbance agent in these ecosystems, but it can also provide opportunities to create available space and release nutrients for use in invasive plant establishment and spread.

Cheatgrass is an invasive plant that has not only established over much of eastern Washington but has also resulted in ecosystem-level changes. Cheatgrass is a common invader of shrubsteppe, grasslands, and agricultural fields. The characteristics of cheatgrass result in increases in fire frequency, whereby lands with a high cover of cheatgrass (15 percent or more) are twice as likely to burn and result in fire seasons starting earlier in the year (Bradley et al. 2017). Invasive plants that interact and alter ecological conditions that maintain ecosystems are particularly detrimental to the persistence of natural ecosystems.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Sparsely vegetated ecosystems are characterized by a low cover of plant species. This may be in part due to marginal conditions in the substrate. For example, talus slopes and cliffs typically have limited soil development, and plants are restricted to pockets of soil developed on and between rocks. Similarly, inland dunes are characterized by sandy substrate, which has limited moisture-holding capacity. While space is available for colonization by invasive plants, conditions may be unsuitable for many invasive plants. However, stabilization of inland dune ecosystems by invasive plants is one of the leading threats to this ecosystem, particularly cheatgrass, which can establish and achieve densities that prevent sand movement (DNR 2007).

Wetlands

Wetlands are particularly susceptible to invasive plants. Wetland invasive plants are prolific and often result in monocultures, which can alter wetland structure, biodiversity, and, ultimately, food webs (Zedler and Kercher 2004). Wetlands with nutrient-rich, productive soils may be particularly at risk of invasion as many invasive plants can out-compete native plants (Zedler and Kercher 2004). Indirect impacts on wetlands related to invasive plants, from the new construction of overhead transmission facilities, could result in loss of wetland functions (PSCW n.d.).

Plant Priority Species

Introduction and spread of invasive plants or noxious weeds may further degrade habitat for plant priority species or cause further mortality. Invasive plant spread may alter the physical and chemical properties of soil, which can reduce the quality of habitat for other native species, including plant priority species (Weidenhamer and Callaway 2010). Plant priority species are species that are already considered to be at risk of extinction to some degree, and adverse environmental impacts from invasive plants and noxious weeds could result in additional population loss.

Impact Determination: Adverse environmental impacts on vegetation resulting from the introduction or spread of invasive plants or noxious weeds during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Surface Runoff

New construction of overhead transmission facilities is expected to result in exposed soils once vegetation clearing is complete. Surface runoff from a construction site could mobilize sediments from exposed surfaces during clearing and infrastructure installation and redistribute these soils outside of the project footprint or in sensitive ecosystems. Movement and deposition of sediment could impact soil quality and vegetation in the surrounding area. The adverse environmental impact from sedimentation may vary depending on the ecosystem type. Floodplain ecosystems and wetlands may be adapted to some sedimentation and require sediment to accumulate to maintain equilibrium; however, a large release of sediment could still have adverse environmental impacts on vegetation. Sediments can inundate vegetation, causing mortality or reduced growth (BC Ministry of Transportation and Infrastructure 2022). Sedimentation could alter hydrology by blocking flow channels, which could impact ecosystems that depend on hydrological connections, such as wetlands.

Alpine Ecosystems

Soil in alpine areas is typically early in development due to recent deglaciation; however, soil depth may vary depending on the steepness of slopes, deposition patterns, and weatherability of parent material (Poulenard and Podwojewski 2004). Alpine soils may be susceptible to erosion, particularly where there are steep slopes with limited vegetation cover. Alpine environments also have potential for wind erosion due to high winds and exposure of soils (Poulenard and Podwojewski 2004). Most vegetation in this ecosystem is low to the ground, and sedimentation may cover vegetation, impacting growth and survival.

Forests and Woodlands

Surface runoff from transmission facilities could impact adjacent areas and would mostly affect understory vegetation. Overall, ecosystem structure is expected to be maintained (i.e., trees would have limited adverse environmental impacts from sedimentation and dust).

Riparian Areas

Riparian ecosystems occur along streams and other waterbodies and are typically adapted to various flooding regimes. Flood events result in the natural deposition and removal of sediments over time. Sedimentation from anthropogenic sources could impact riparian areas, but these ecosystems are expected to be resilient to sedimentation that could result from the new construction of an overhead transmission facility. However, riparian ecosystems play a role in protecting aquatic ecosystems. If riparian areas are lost, there is limited vegetation to protect aquatic ecosystems from surface runoff.

Steppe and Prairie

Steppe and prairie ecosystems occur predominantly in arid eastern Washington. Dry conditions can result in reduced infiltration of rain into the soil, resulting in risk for overland flow or flash floods, which can increase sedimentation. Vegetation in these ecosystems is low to the ground, and sedimentation can impact growth.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Sparsely vegetated ecosystems occur across the state. Adverse environmental impacts on rock-dominated ecosystems related to surface runoff are likely to be limited due to the limited soil resources in rock-dominated ecosystems. Conversely, mobile substrate is a fundamental characteristic of inland dunes, and sedimentation may be an issue during extreme rain events.

Wetlands

Wetlands function as natural filtration systems for water; however, major releases of sediment can impact wetlands. Wetlands typically occur in lower slope positions and depressional areas, which naturally receive water from the surrounding landscape. Accidental release of sediment to wetlands can impact vegetation by burying plants and potentially impacting water quality. Large sedimentation events could result in infilling of portions of wetlands, resulting in cumulative loss of wetland area. In addition, linear infrastructure can change water flow and flow rates into wetlands, which may also impact the wetland quality.

Plant Priority Species

Sedimentation may further degrade habitat for plant priority species or cause further mortality. Plant priority species are species that are already considered to be at risk of extinction to some degree, and indirect impacts may result in additional population loss.

Impact Determination: Adverse environmental impacts on vegetation resulting from surface runoff during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Impacts from Increased Dust

New construction could increase ambient dust from site preparation and clearing activities, excavation, and concrete works. In addition, vehicles and equipment moving along temporary and permanent access roads could increase dust as these roads are typically unpaved. Vehicle movements on unpaved roads generally produce more dust than paved roads, with dust deposition occurring up to 0.6 miles from the road (Kameswaran et al. 2019). As dust can move a long distance from a construction site, deposition can impact the surrounding vegetation, which would not otherwise have been disturbed. Dust deposition can impact the quality and quantity of vegetation adjacent to new construction areas by adversely affecting plant growth. This occurs when dust settles on plants and blocks stomata, reducing photosynthesis and chlorophyll content, and ultimately impacting plant vigor and leaf growth (Farmer 1993; Kameswaran et al. 2019).

Alpine Ecosystems

New construction of overhead transmission facilities may result in increased dust. High winds may occur more frequently in alpine environments, which could increase ambient dust during dry conditions. Deposition of dust on the surrounding vegetation may impact growth and survival.

Forests and Woodlands

Increase in dust could impact forest and woodlands by affecting overall plant vigor in forests and woodlands. However, overall ecosystem structure is expected to be maintained.

Riparian Areas

An increase in dust could impact riparian areas by affecting overall plant vigor. However, overall ecosystem structure is expected to be maintained.

Steppe and Prairie

Steppe and prairie ecosystems occur predominantly in arid eastern Washington. Dust is more typical in these environments, and therefore, the adverse environmental impacts from dust may be greater than in other ecosystems that are more common in western Washington.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Sparsely vegetated ecosystems occur across the state. Talus slopes and cliffs have limited soil material, and dust adverse environmental impacts are anticipated to be low. Conversely, a fundamental characteristic of inland dunes is mobile substrates. Stabilizers used in dust suppression may have adverse environmental impacts on inland dunes, similar to stabilization from invasive plants.

Wetlands

Dust generated from the new construction of transmission facilities could impact wetlands. Dust may impact the overall health of wetlands, and dust could accumulate in pockets of water, affecting water quality in wetlands.

Plant Priority Species

Dust generated from the new construction of transmission facilities may further degrade habitat for plant priority species or cause further mortality of individuals. Dust-related adverse environmental impacts on plant priority species would be more severe the closer the transmission facility infrastructure is to known populations. For example, dust from access roads may coat the leaves of some plants, which can result in smothering effects on vegetation and, ultimately, plant mortality (Farmer 1993; Kameswaran et al. 2019). Plant priority species are species that are already considered to be at risk of extinction to some degree, and indirect impacts may result in additional population loss.

Impact Determination: Adverse environmental impacts on vegetation resulting from increased dust during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to low.

Introduction of Hazardous Materials

Accidental spills can result in the introduction of hazardous substances to the environment. Hazardous substances that may be stored or used during the new construction of a project include synthetic lubricating oils, glycol-water mix, hydraulic fluid, and diesel fuel. Activities that could result in accidental spills include refueling vehicles and equipment (e.g., oil, diesel fuel), vehicle and equipment maintenance (e.g., oil leak), concrete-mixing for foundations or pads, and installation of project features that are filled with liquid, such as transistors. Hazardous substances could cause direct mortality of vegetation or plant priority species, loss of vigor, and increased susceptibility to pathogens. Similar to dust, when substances like oil come into contact with leaves and other surfaces, stomata may be blocked, resulting in adverse environmental impacts on photosynthesis, thermal stress, and oxidative stress (da Silva Correa et al. 2022). Some hazardous substances persist in soil for prolonged periods and may impact soil chemistry. Oil-contaminated soil results in reduced availability of oxygen, water, and nutrients (da Silva Correa et al. 2022). In addition, oil-contaminated soil impacts plant growth, including changes to root and leaf growth and development, and a change in plant biomass (da Silva Correa et al. 2022). Accidental spills may occur regardless of the ecosystem, and the adverse environmental impacts would be similar across all ecosystem types.

Impact Determination: Adverse environmental impacts on vegetation resulting from the introduction of hazardous materials during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to medium.

Increased Risk of Fire

New construction of overhead transmission facilities requires the use of equipment, flammable material, and activities that may generate sparks. During the wildfire season, new construction has the potential to start wildfires. Wildfire has the potential to spread over large areas and may range in severity from light ground fires to higher-severity stand-replacing fires. The severity and size of a fire are dependent on the type of fuel (i.e., vegetation), weather conditions (primarily wind, temperature, and moisture), and topography. The scale of adverse environmental impacts is also dependent on the remoteness of the work area, as this may affect response time by firefighters. Impacts from wildfire include loss of vegetation and ecosystems, change to ecosystem structure and succession, large release of carbon and nutrients to the soil, and potential for the spread of invasive species. Past fire suppression activities have led to a buildup of fuel in some areas, which can increase the risk of large wildfires if one starts.

Alpine Ecosystems

Wildfire can impact alpine ecosystems by causing the death of plants. Due to the isolated nature of alpine environments, dispersal of seeds to the area following fire may take a greater amount of time than in other ecosystems, causing a time lag for revegetation.

Forests and Woodlands

Wildfire is a natural component of many forested ecosystems in Washington. Some trees are adapted to wildfire and can resist lower-severity fires. For example, Douglas fir (*Pseudotsuga menziesii)* trees develop thick bark that protects the tree from lower-severity fires. However, forests and woodlands have a lot of available vegetation, in particular when downed trees and litter have built up, which provides fuel for wildfires. When there is a lot of fuel, forests can have high-severity fires, which can result in the loss of entire forest stands.

Riparian Areas

Wildfire in riparian areas can result in the death of vegetation. Vegetation in riparian areas plays an important role in maintaining water quality and bank stability. When large areas of riparian vegetation are lost to wildfire, adjacent aquatic ecosystems may be impacted by sedimentation, and stream banks may become destabilized.

Steppe and Prairie

Similar to forests, wildfire is a natural component of many steppe and prairie ecosystems. Grass is typically adapted to wildfire events, as growth can be re-initiated if underground structures remain intact. Wildfires may kill shrubs in shrubsteppe ecosystems, temporarily altering the structure of the ecosystem. Wildfires in steppe and prairie have also provided opportunities for invasive annual grasses to proliferate, which may limit the ability of shrubsteppe ecosystems to return post-fire.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Sparsely vegetated ecosystems have limited vegetation, which means there is limited fuel available for wildfires. Impacts from wildfires on these ecosystem types are typically less than those on other ecosystems.

Wetlands

Wildfire can result in the death of vegetation in wetlands. The release of nutrients following wildfire may impact wetland species and composition. Some wetlands are nutrient-poor, and plants that persist are adapted to these conditions. Changes in nutrient levels could provide opportunities for other species or invasive plants to establish or spread.

Plant Priority Species

The impact of wildfire on plant priority species is variable, depending on the species and severity of the fire. Wildfire can cause the mortality of plants, so it could result in the loss of individuals or a population. Wildfire can also alter community composition and structure, leading to alterations of habitat that species may rely on. If individuals survive a wildfire, the changes to light and nutrients that can occur post-fire may make conditions unsuitable for species, leading to further loss of individuals or populations. This may further fragment or isolate remaining populations.

Impact Determination: Adverse environmental impacts on vegetation resulting from increased risk of fire during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions.

In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Underground Transmission Facilities

Activities for new construction of underground transmission facilities, including open-trench and trenchless (including horizontal directional drilling), would vary depending on the scale of the facility and site characteristics. Similar to overhead transmission facilities, new construction of underground facilities could include a relatively short site preparation period, followed by a longer construction and start-up period. It is assumed that the new construction stage for underground transmission facilities, per mile, would have a longer duration than overhead projects. Underground transmission facilities could have the following adverse environmental impacts on vegetation resources during new construction:

- Loss of Native Ecosystems and Plants
- Fragmentation
- Degradation of Soil
- Edge Effects
- Introduction or Spread of Invasive Plants or Noxious Weeds
- Surface Runoff
- Impacts from Increased Dust
- Introduction of Hazardous Materials
- Increased Fire Risk

Loss of Native Ecosystems and Plants

In general, the adverse environmental impacts of vegetation clearing and grubbing for new construction of underground transmission facilities would be similar to those of overhead transmission facilities. Similar to an overhead transmission facility, a typical ROW is 130 to 260 feet; however, larger excavations would be required every 900 to 3,500 feet to accommodate underground vaults. In addition to the clearing activities described for overhead transmission (i.e., structure placement, access roads, and substations), excavation of trenches for placing underground transmission facilities could result in adverse environmental impacts on complex plant root systems, particularly tree species, where root systems can be as extensive as the above-ground branching. Damage to root systems can lead to the death of a tree and may extend outside the boundaries of the trench for species that are rooted along the boundary. The adverse environmental impacts from vegetation clearing typically occur near the onset of new construction and persist through operation and maintenance until the project is decommissioned and ecological communities can be restored.

Permanent loss of native ecosystems and plants from new construction of underground transmission facilities includes loss that persists through the operation and maintenance stage and is not restored within the life of the project (WDFW 2009b). These include permanent access roads to allow workers to maintain the transmission facility, and would remain non-vegetated throughout the life of the transmission facility. While some ecosystems may be compatible with restoration during the operation and maintenance stage of the transmission facility, other ecosystems, particularly those that include deep-rooted or woody species such as tall shrubs and trees, would be incompatible with underground transmission facilities and would not be restored within the transmission ROW during the life of the project. For example, the loss of forested habitats would be lost through new construction, operation and maintenance, and decommissioning, and would not be restored during the life of the project. Forests and similar ecosystems could start to reestablish post-decommissioning; however, it could take decades or centuries to achieve their pre-construction state, particularly for old and mature forests.

Temporary loss of native ecosystems and plants from the new construction of underground transmission facilities includes areas that are required for the new construction stage, but then restored and revegetated following construction. These losses would be similar to those described for the new construction of overhead transmission facilities, but due to the increased timeframe for the new construction of underground transmission facilities, the impact of temporary losses would remain longer.

Similar to the new construction of overhead transmission facilities, certain ecosystems (i.e., grasslands, shrubsteppe, some wetlands, or sparsely vegetated ecosystems) with low-growing vegetation that do not grow deep, complex root systems are more compatible with underground transmission facilities. Although vegetation clearing would occur during trench excavation, the ROW may be restored following new construction with native plant species similar to the impacted ecosystem.

A method that may be used to minimize above-ground disturbance is horizontal directional drilling (HDD). HDD is a method of tunneling under a feature, which would minimize above-ground vegetation disturbance. This method can be used to avoid adverse environmental impacts on features such as large waterbodies or sensitive features (e.g., wetlands). Disturbance related to HDD includes a launch pad footprint and a retrieval pad footprint on either side of the tunnel alignment. The area between the launch and retrieval pads is left intact, and the transmission line is pulled through an underground tunnel.

Alpine Ecosystems

Alpine ecosystems occur at high elevations, which are not typically the preferred alignment for linear transmission facilities, as this would increase the distance needed and associated costs for new construction. Alpine ecosystems are typically characterized by low-growing plant communities such as heathlands, alpine meadows, alpine grasslands, or sparsely vegetated communities such as late-snowbeds, glaciers, and alpine fell-fields. Many ecosystems have thin soils or are dominated by rock substrate, making them unsuitable for cut-and-cover trenching techniques. HDD may be a suitable option for alpine transmission facilities, but transmission facilities would likely be located at a lower elevation through a mountainside, and the adverse environmental impacts would be similar to those of new construction of overhead transmission facilities.

Forests and Woodlands

Adverse environmental impacts from new construction of underground transmission facilities would be similar to or greater than those described for new construction of overhead transmission facilities, since no deep-rooted species such as tall shrubs or trees would be re-established within the ROW during the life of the project. Forests and woodlands would likely be highly impacted by underground transmission facilities due to the permanent loss of forests and woodlands for the duration of the project.

Riparian Areas

Riparian areas include areas near waterbodies such as streams, lakes, ponds, and rivers. These areas may range from deciduous and mixed forests to shrub-dominated areas or herbaceous communities. The use of HDD to cross waterbodies, including riparian areas, would minimize the disturbance from the transmission facility footprint. Where cut-and-cover techniques are used in riparian areas, disturbance to vegetation would be required. Riparian areas dominated by low-growing and shallow-rooted species (e.g., grasses and forbs) may be re-established following new construction. Conversely, riparian areas containing tall shrubs or trees that are not compatible with underground transmission facilities would be subject to permanent adverse environmental impacts on ecosystem structure for the duration of the project.

Steppe and Prairie

Adverse environmental impacts from the new construction of underground transmission facilities would be similar to those described for new construction of overhead transmission facilities (i.e., vegetation clearing and grubbing for new construction). However, underground transmission facilities would require more vegetation clearing due to trench excavation in areas with low-growing vegetation, as the entire excavation width would need to be cleared regardless of vegetation type. Revegetation after new construction would be possible, and adverse environmental impacts would be largely temporary as these ecosystems are assumed to be compatible with restoration above underground transmission facilities.

Wetlands

Adverse environmental impacts on wetlands from new construction of underground transmission facilities would likely be similar to those described for new construction of overhead transmission facilities (i.e., clearing of large vegetation, building access roads through wetland complexes, and soil compaction). Trenching activities would impact the function of the ecosystem by changing hydrological regimes and altering water flow through the wetlands. These changes to the wetland structure may be long-lasting, and complete restoration of wetland function may not be possible. HDD methods to cross wetlands would reduce the disturbance to wetlands.

Plant Priority Species

Like overhead transmission facilities, direct loss of plant priority species and their habitat from new construction of underground transmission facilities could occur if a project were sited over habitat that supports rare plant populations. The severity of the loss of a population of plant priority species would vary depending on the vulnerability of the species, the ability of surrounding populations to “rescue” the population, and the species’ ability to withstand mitigation measures such as transplanting and propagation.

Impact Determination: Adverse environmental impacts on vegetation resulting from the loss of native ecosystems and plants during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Fragmentation

Similar to overhead transmission facilities, new construction of underground transmission facilities would result in linear features (i.e., roads and ROW) that traverse long distances, fragmenting the ecosystems on the landscape. The linear features have a high edge-to-interior ratio and increase the edges along natural ecosystems. Fragmentation can lead to ecosystem loss—in particular, as patch sizes become increasingly small and/or isolated from other patches. Fragmentation reduces species richness for both plants and animals and changes community composition, resulting in localized extirpation (Haddad et al. 2015).

Underground transmission facilities are anticipated to have fragmentation-related adverse environmental impacts on vegetation. The severity of the impact is a function of the degree of existing isolation of the ecosystem patches, the distance between ecosystem patches (i.e., the width of the direct disturbance area), the ability of species to disperse, and the length of time before decommissioning (i.e., the impact is removed). The following sections discuss the fragmentation-related adverse environmental impacts of constructing new underground transmission facilities in relation to broad ecosystem groups.

Alpine Ecosystems

The adverse environmental impacts of fragmentation from underground transmission facilities are expected to be similar to those described for the new construction of overhead transmission facilities. The isolated nature and small range of alpine ecosystems mean that strategic transmission facility placement may avoid fragmenting ecosystems.

Forests and Woodlands

Fragmentation due to the new construction of underground transmission facilities would be similar to that described for the new construction of overhead transmission facilities. Linear features would result in distinct boundaries between the transmission facility and the adjacent forest. Patches that are already small fragments may be at increased risk of loss compared to larger intact patches.

Riparian Areas

Similar to the new construction of overhead transmission facilities, the adverse environmental impacts of fragmentation from new construction of underground transmission facilities on riparian ecosystems are expected to vary. In already highly modified riparian habitats, such as those found in urban areas, further fragmentation could result in ecosystem loss. In more intact riparian habitats, the clearing of both low-growing and large vegetation would result in fragmentation during new construction. It would be possible to mostly re-establish low-growing vegetation (the width of access roads would remain fragmented) after new construction to reduce the long-term impact of fragmentation, but in areas with deeply rooted species, such as trees, the fragmentation would be permanent, and the width of the ROW would likely not result in ecosystem loss. The use of HDD methods is expected to minimize fragmentation of riparian areas.

Steppe and Prairie

Steppe and prairie ecosystems have been highly modified due to agricultural development in Washington. Patches of intact steppe and prairie remain, but these could be impacted by further fragmentation from new construction of overhead transmission facilities. Fragmentation may increase indirect impacts (such as invasive plants), resulting in degradation of the ecosystem. For larger patches, ecosystems may undergo increased indirect impacts, but large patches of steppe and prairie are anticipated to persist. Underground transmission facility placement involves excavating a linear trench along the length of the transmission facility. This would prevent plant migration between patches of land during new construction, but re-establishing vegetation would be possible after construction. In already fragmented areas of habitat, trenching activities would leave Steppe and Prairie habitats highly susceptible to ecosystem loss.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Sparsely vegetated ecosystems are isolated patches on the landscape. The species that populate these ecosystems are resilient and capable of dispersal in naturally isolating environments. However, due to the isolated nature of these habitats, trenching activities could leave ecosystems highly susceptible to adverse environmental impacts. HDD below these habitats is expected to minimize the adverse environmental impacts on these habitats.

Wetlands

Fragmentation-related adverse environmental impacts from the new construction of underground transmission facilities would be similar to those described for the new construction of overhead transmission facilities. Trenching activities and access road construction involved with underground transmission placement may result in changes to wetland hydrology and hydrological connections between wetlands and sections of the same wetland. The impact of fragmentation varies. Small, isolated patches of wetland would be highly susceptible to ecosystem loss. HDD below wetland complexes is expected to minimize the impact on these habitats. However, for larger wetland complexes, this method may not be feasible.

Plant Priority Species

The new construction of underground transmission facilities would have fragmentation-related adverse environmental impacts on plant priority species similar to those described for the new construction of overhead transmission facilities. Fragmentation can cause loss of populations of plant priority species as patch size decreases and patch isolation increases. Ultimately, this may lead to local extirpation if migration across populations is reduced (Haddad et al. 2015). Small populations of plant priority species are vulnerable to extirpation as unanticipated events may wipe out the population.

Impact Determination: Adverse environmental impacts on vegetation resulting from fragmentation during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Degradation of Soil

Adverse environmental impacts related to soil degradation from the new construction of underground transmission facilities would be similar to those described for overhead transmission facilities. However, the new construction of underground transmission facilities would require trenching, excavation, and disturbance of soil along the entire length of the transmission facility. During excavation, material may require stockpiling, which may degrade soil quality over time. The new construction of underground transmission facilities would require larger quantities of soil than overhead transmission facilities, causing the overall potential impact to be greater.

Alpine Ecosystems

The adverse environmental impacts of soil degradation in alpine ecosystems from the new construction of underground transmission facilities would be similar to or greater than those described for the new construction of overhead transmission facilities. Open-cut construction for underground transmission facilities may be challenging or altogether infeasible in alpine ecosystems with limited soil. Soil compaction and nutrient loss from soil due to stockpiling may result in degradation of soil where underground transmission facilities occur in alpine ecosystems.

Forests and Woodlands

The adverse environmental impacts of soil degradation in forests and wetlands from the new construction of underground transmission facilities would be similar to those described for the new construction of overhead transmission facilities.

Steppe and Prairie

The adverse environmental impacts of soil degradation in steppe and prairie from the new construction of underground transmission facilities would be similar to those described for the new construction of overhead transmission facilities; however, new underground transmission facility construction would affect a larger area of soil. Trenching activities along the length of the transmission facility would disturb and thereby degrade the soil crust. Re-stabilization of soil and revegetation may be difficult.

Sparsely Vegetated Ecosystems (Talus Sloped, Cliff, Bluffs, and Inland Dunes)

The adverse environmental impacts of soil degradation in sparsely vegetated ecosystems from the new construction of underground transmission facilities would be similar to those described for the new construction of overhead transmission facilities. Due to the lack of soil at these sites, trenching excavation may not be feasible. HDD is expected to minimize the impact on these ecosystems.

Wetlands

The adverse environmental impacts of soil degradation in wetlands from the new construction of underground transmission facilities would be similar to those associated with the new construction of overhead transmission facilities. The soil is particularly susceptible to compaction. Trenching activities to install a transmission facility may involve more compaction and soil degradation than overhead transmission facility construction.

Plant Priority Species

The adverse environmental impacts of soil degradation on plant priority species from the new construction of underground transmission facilities would likely be similar to those described for new overhead transmission facility construction.

Impact Determination: Adverse environmental impacts on vegetation resulting from the degradation of soil during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from low to high.

Edge Effects

The adverse environmental impacts of edge effects resulting from new construction of underground transmission facilities, such as the alteration of biophysical conditions and invasive species proliferation, would be similar to those of new construction of overhead transmission facilities.

Alpine Ecosystems

The adverse environmental impacts of edge effects on alpine ecosystems from new underground transmission facility construction would be less pronounced than those described for new overhead facility construction. Alpine environments are unlikely to be suitable for cut-and-cover trench techniques. HDD would minimize edge effects in alpine environments.

Forests and Woodlands

The adverse environmental impacts of edge effects on forests and woodlands from new underground transmission facility construction, such as changes to microhabitat characteristics and invasive plant proliferation, would be similar to those described for new overhead transmission facility construction.

Riparian Areas

The adverse environmental impacts of edge effects on riparian areas from new underground transmission facility construction, such as microhabitat changes and invasive plant proliferation, would be similar to those described for new overhead transmission facility construction.

Steppe and Prairie

The adverse environmental impacts of edge effects on steppe and prairie ecosystems, such as microhabitat changes and invasive plant proliferation, from new underground transmission facility construction would be similar to those described for new overhead transmission facility construction.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

The adverse environmental impacts of edge effects on sparsely vegetated ecosystems, such as microhabitat changes and invasive plant proliferation, from new underground transmission facility construction, would be similar to those of new overhead transmission facility construction.

Plant Priority Species

The adverse environmental impacts of edge effects on plant priority species from new underground transmission facility construction would be similar to those described for new overhead transmission facility construction.

Impact Determination: Adverse environmental impacts on vegetation resulting from edge effects during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Introduction or Spread of Invasive Plants or Noxious Weeds

New underground transmission facility construction is anticipated to involve greater soil disturbance than new overhead transmission facility construction. This presents greater opportunities for invasive plants and/or noxious weeds to establish along ROW corridors. Therefore, the potential for introduction or spread of invasive plants or noxious weeds from new construction of underground transmission facilities is anticipated to be greater than for new overhead transmission facility construction. Both types of facilities may alter the potential for introduction or spread, such as the proximity to human development, changes to soil productivity, and light abundance. This presents a greater opportunity for invasive plants and/or noxious weeds to establish along ROW corridors.

Alpine Ecosystems

The adverse environmental impacts related to invasive plants or noxious weeds in alpine ecosystems, from new underground transmission facility construction, would be similar to those described for new overhead transmission facility construction. Alpine ecosystems typically have limited human development, and the harsh conditions may prevent invasive species growth. Excavation required for new underground transmission facility construction is anticipated to increase the amount of soil disturbance, which could impact the introduction and spread of invasive plants.

Forests and Woodlands

The adverse environmental impacts related to invasive plants or noxious weeds in forests and woodlands, from new underground transmission facility construction, would be similar to those described for new overhead transmission facility construction. However, soil disturbance in forested and woodland areas may facilitate invasive species already present to proliferate along corridors.

Riparian Areas

The adverse environmental impacts related to invasive plants or noxious weeds in riparian areas, from new construction of underground transmission facilities, would be similar to those described for new overhead transmission facility construction. However, due to the extensive exposure of soil and removal of vegetation along the transmission facility ROW, the susceptibility of riparian areas to the establishment of noxious weeds and invasive plants is likely higher for new construction of underground transmission facilities.

Steppe and Prairie

The adverse environmental impacts related to invasive plants or noxious weeds in steppe and prairie, from new underground transmission facility construction, would be similar to those described for new overhead transmission facility construction. Spread of invasive plants may be aided by the substantial ground disturbance involved with underground transmission facility construction.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

The adverse environmental impacts related to invasive plants or noxious weeds in sparsely vegetated ecosystems, from new underground transmission facility construction, would be similar to those described for new overhead transmission facility construction.

Wetlands

The adverse environmental impacts of new underground transmission facility construction related to the introduction of invasive species would be similar to those of new overhead transmission facility construction, as wetlands are highly susceptible to invasive plant proliferation.

Plant Priority Species

The adverse environmental impacts on plant priority species related to invasive plants or noxious weeds, from underground transmission facility construction, would likely be similar to those described for overhead transmission facility construction.

Impact Determination: Adverse environmental impacts on vegetation resulting from the introduction or spread of invasive plants or noxious weeds during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Surface Runoff

Surface runoff that may occur during new underground transmission facility construction would produce adverse environmental impacts similar to those of overhead transmission facility construction. However, the extent and susceptibility of project sites for surface runoff would be larger due to the trenching activities involved with underground transmission facility construction. This type of construction would expose a larger amount of soil and therefore make the site susceptible to sediment mobilization, which could inundate or cover vegetation and potentially cause hydrology alterations due to sediment mobilization and deposition in new locations.

Alpine Ecosystem

The adverse environmental impacts of surface runoff in alpine ecosystems, from new underground transmission facility construction, would be similar to those described for new overhead transmission facility construction. Low-growing vegetation in these ecosystems would be susceptible to being covered by stockpiled or side-cast materials. Trenchless construction techniques would minimize this impact on alpine environments.

Forests and Woodlands

The adverse environmental impacts of surface runoff in forests and woodlands from new underground transmission facility construction would be minimal and similar to those described for new overhead transmission facility construction. Understory vegetation may be impacted, but overstory vegetation would be subject to minimal adverse environmental impacts.

Riparian Areas

The adverse environmental impacts of surface runoff in riparian areas, from new underground transmission facility construction, would be similar to those described for overhead transmission facility construction, as riparian areas are predisposed to natural sediment movement. However, due to the amount of soil that would be exposed during trenching activities, riparian areas would be more susceptible to habitat loss than during overhead transmission facility construction. Trenchless construction techniques would minimize this risk.

Steppe and Prairie

The adverse environmental impacts of surface runoff in steppe and prairie ecosystems, from new underground transmission facility construction, would be similar to those described for new overhead transmission facility construction.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

The adverse environmental impacts of surface runoff in sparsely vegetated ecosystems, from new underground transmission facility construction, would be similar to those described for overhead transmission facility construction.

Wetlands

The adverse environmental impacts of surface runoff in wetlands from new underground transmission facility construction would be similar to those described for new overhead transmission facility construction. However, the risk of large sedimentation events would be higher for underground construction due to the large amount of exposed soil during trenching activities. If large sedimentation events occur, they could impact or permanently alter the wetland through infilling the wetland with sediment or by altering the hydrology from deposition.

Plant Priority Species

The adverse environmental impacts of surface runoff on plant priority species from new underground transmission facility construction would be similar to those described for overhead transmission facility construction.

Impact Determination: Adverse environmental impacts on vegetation resulting from surface runoff during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Impacts from increased Dust

Increased dust that may occur during the new construction of underground transmission facilities is expected to result in adverse environmental impacts similar to those of overhead transmission facility construction. This includes dust created from construction activities (i.e., excavation and heavy machinery movement) and vehicles and equipment driving along access roads. Dust deposition on nearby vegetation can adversely affect growth. Underground transmission facility construction would cause more soil disturbance than new construction of overhead transmission facilities and, therefore, would likely create a dustier environment than underground transmission facility construction.

Alpine Ecosystems

The adverse environmental impacts of increased dust in alpine ecosystems due to new underground transmission facility construction would be similar to those described for new overhead transmission facility construction. However, trenchless construction techniques, such as HDD, may minimize the impact as construction would be isolated to the entrance and exit points for the drill.

Forests and Woodlands

The adverse environmental impacts of increased dust in forests and woodlands due to new underground transmission facility construction would be minimal and similar to those described for new overhead transmission facility construction.

Riparian Areas

The adverse environmental impacts of increased dust in riparian areas due to new underground transmission facility construction would be minimal and similar to those described for new overhead transmission facility construction.

Steppe and Prairie

The adverse environmental impact of increased dust in steppe and prairie ecosystems (which are typically dusty environments) due to the new construction of an underground transmission facility would be similar to those described for new overhead transmission facility construction.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

The adverse environmental impact of increased dust in sparsely vegetated ecosystems due to new underground transmission facility construction would be similar to that described for new overhead transmission facility construction.

Wetlands

The adverse environmental impacts of increased dust in wetlands due to new underground transmission facility construction would be similar to those described for new overhead transmission facility construction.

Plant Priority Species

The adverse environmental impacts of increased dust on plant priority species due to underground transmission facility construction would be similar to those described for new overhead transmission facility construction.

Impact Determination: Adverse environmental impacts on vegetation resulting from increased dust during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to low.

Introduction of Hazardous Materials

Accidental spills of hazardous materials that may occur during new underground transmission facility construction would likely produce adverse environmental impacts similar to those of new overhead transmission facility construction. Release of hazardous substances, such as oils, fuels, and hydraulic fluid, could have both immediate impacts on plant mortality and long-term impacts on ecosystem survival. Accidental spills may occur regardless of the ecosystem, and the adverse environmental impacts would be similar across all ecosystem types.

Impact Determination: Adverse environmental impacts on vegetation resulting from the introduction of hazardous materials during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Increased Risk of Fire

The risk of fire during new underground transmission facility construction would be similar to that of new overhead transmission facility construction. Changes to ecosystem structure and succession, and loss of vegetation and soil and vegetation moisture due to increased exposure, all contribute to an increased risk of fire during construction.

Alpine Ecosystems

The adverse environmental impacts of wildfire on alpine ecosystems due to new underground transmission facility construction would be similar to those described for new overhead transmission facility construction. Wildfires have the potential to devastate isolated alpine ecosystems, and due to the harsh environment, re-establishment after fire may take a greater amount of time.

Forests and Woodlands

The adverse environmental impact of wildfire on forests and woodlands due to new underground transmission facility construction would be similar to that described for new overhead transmission facility construction. Well-developed forests, such as mature and old-growth forests, and certain tree species, such as Douglas fir, are capable of withstanding lower-severity fires. However, forests contain large amounts of fuel for fires, and the potential for high-severity fires to develop, especially in remote areas, is high.

Riparian Areas

The adverse environmental impacts of wildfire on riparian areas due to new underground transmission facility construction would be similar to those described for new overhead transmission facility construction.

Steppe and Prairie

The adverse environmental impacts of wildfire on steppe and prairie ecosystems due to new underground transmission facility construction would be similar to those described for overhead transmission facility construction. These ecosystems, when intact, are capable of regeneration after fires.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

The adverse environmental impacts from wildfires on sparsely vegetated ecosystems due to new underground transmission facility construction would be similar to those described for new overhead transmission facility construction.

Wetlands

The adverse environmental impacts of wildfire on wetlands due to new underground transmission facility construction would be similar to those described for overhead transmission facility construction.

Plant Priority Species

The adverse environmental impacts of wildfire on plant priority species due to new underground transmission facility construction would be similar to those described for overhead transmission facility construction.

Impact Determination: Adverse environmental impacts on vegetation resulting from increased risk of fire during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Operation and Maintenance

Overhead Transmission Facilities

Activities for the operation and maintenance stage of overhead transmission facilities would vary based on the type of facility, scale, and site characteristics. Facilities are not expected to have staff on site daily, but maintenance crews are anticipated to be regularly deployed. Transmission facilities require ongoing maintenance for equipment and ROWs. Overhead transmission facilities could have the following adverse environmental impacts during the operation and maintenance stage:

- Loss of Native Ecosystems and Plants
- Fragmentation
- Degradation of Soil
- Edge Effects
- Introduction or Spread of Invasive Plants or Noxious Weeds
- Surface Runoff
- Impacts from Increased Dust
- Introduction of Hazardous Materials
- Increased Fire Risk

The following activities are expected to occur during the operation and maintenance of overhead transmission facilities:

- Maintenance of vegetation along the transmission ROW, including cutting or trimming back vegetation, mowing, or other means of physical disturbance to vegetation
- Spraying of vegetation with herbicide
- Removal of potentially hazardous vegetation within or adjacent to the ROW that has the potential to interact with the facility, such as cutting large, dead snags
- Maintenance of transmission facility infrastructure that may require heavy equipment and some temporary disturbance to vegetation to facilitate access and work areas

Loss of Native Ecosystems and Plants

Loss of native ecosystems and plants may occur during operation and maintenance. Vegetation clearing and grubbing are one of the main adverse environmental impacts on vegetation resources. Minor construction works may be required during operation and maintenance to replace infrastructure or repair damaged transmission facility components. Therefore, a small additional temporary or permanent disturbance may be required that would result in vegetation clearing and soil disturbance. Additional access roads may be required to facilitate the works. The severity of the loss of native ecosystems and plants during operation and maintenance is anticipated to be less than during new construction.

Use of non-selective pesticides along transmission facilities may also result in further loss to native ecosystems and plants during maintenance, in particular where these areas were left undisturbed during initial construction or restored to native ecosystems. Non-selective pesticides sprayed along ROWs may have adverse environmental impacts on vegetation in all ecosystem types and are dependent on the degree to which vegetation maintenance is required, the specificity of the pesticide used, and the susceptibility of native species to the pesticide.

Alpine Ecosystems

Due to the harsh environments, including strong winds and difficult access, it is unlikely that many alpine ecosystems would be suitable for overhead transmission facilities. For any overhead facilities in this ecosystem, however, given the harsh conditions, it could be challenging to re-establish vegetation where additional temporary clearing is required during operation and maintenance.

Forests and Woodlands

As described above, overhead transmission facilities would likely require the width of the ROW (130 to 260 feet) to be cleared. Further clearing of undisturbed forests and woodlands during operation and maintenance is not anticipated, as the clearing would be restricted to the maintained vegetation within the ROW, and additional adverse environmental impacts would be minimal.

Riparian Areas

The use of clear spanning for overhead transmission facilities would minimize disturbance in riparian areas. Additional loss of native ecosystems and plants would be restricted access roads and laydowns on either side of the crossing. The adverse environmental impacts of operation and maintenance would vary depending on the dominant vegetation in the riparian area and whether clear spanning is used.

Steppe and Prairie

Steppe and prairie ecosystems include areas dominated by low-growing plants. This ecosystem would be compatible with revegetating under overhead transmission facilities following construction. During operation and maintenance, additional loss to ecosystems and plants may be required to facilitate repairs or access to work areas within the ROW.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

When considering overhead transmission facilities, direct impacts on these ecosystems are anticipated to be limited to areas needed for temporary construction and permanent features. Because there is limited vegetation cover, additional clearing of vegetation during operation and maintenance is anticipated to be minimal.

Wetlands

Wetlands that occur within overhead transmission facility ROW are at risk of additional loss during operation and maintenance, should new access to transmission facilities be required, or if new temporary or permanent footprints are required for repairs. In some cases, overhead transmission facilities may clear span wetlands, with limited disturbance to the wetland or wetland buffer. In other instances, similar to new construction, fill may be required to create roads and platforms for transmission facility towers within wetlands that may result in further loss. This can also alter the function of the ecosystem by changing hydrological regimes.

Plant Priority Species

Where plant priority species are known to occur within an overhead transmission facility ROW, additional loss during operation and maintenance may occur. This may be due to the need to access areas for repair or expand temporary or permanent footprints to accommodate certain maintenance activities. In addition, these maintenance activities may result in the loss of suitable habitat for plant priority species.

Impact Determination: Adverse environmental impacts on vegetation resulting from the loss of native ecosystems and plants during the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to low.

Fragmentation

Fragmentation of vegetation resources occurs primarily during construction; however, the adverse environmental impacts from new construction could persist in most ecosystems through the operation and maintenance stage. As discussed above under new construction of overhead transmission facilities, adverse environmental impacts from fragmentation are not a one-time occurrence but can continue and increase as time passes (Haddad et al. 2015). For example, the longer ecosystems remain fragmented, the greater the number of native species that may experience localized extirpation. In addition, some maintenance activities may require additional disturbance, which could result in further fragmentation of residual ecosystems adjacent to the transmission facility. For example, it may be necessary to replace transmission poles after damage due to natural events, and temporary disturbance of vegetation may be required for work areas.

Fragmentation during the operation and maintenance of overhead transmission facilities is anticipated to persist for all areas of permanent direct disturbance. Fragmentation-related adverse environmental impacts are anticipated to be the greatest in forested and woodland ecosystems, treed and tall shrub riparian ecosystems, and treed and tall shrub wetlands because the entire ROW for an overhead transmission facility is expected to be maintained in an altered state from construction to decommissioning. In addition, where roads and transmission facility structures are established in wetlands, fragmentation-related adverse environmental impacts during operation and maintenance are expected to continue and could worsen if the hydrological connection is disrupted. Impacts of fragmentation on ecosystems with low-growing vegetation are anticipated to be less than in other ecosystems, and for the operation and maintenance stage, the width of fragmentation is reduced to the width of permanent access roads and transmission pole footprints.

Alpine Ecosystems

Fragmentation of alpine ecosystems during the operation and maintenance of overhead facilities is expected to be less than during the new construction of overhead transmission facilities. Low-growing vegetation can grow under overhead transmission facilities and would require limited maintenance.

Forests and Woodlands

The adverse environmental impact of fragmentation on forests and woodlands during new construction would persist throughout the operation and maintenance of overhead transmission facilities. As discussed above under the new construction of overhead transmission facilities, re-establishment of trees and tall shrubs would not be possible at any point during the operation and maintenance of an overhead transmission facility.

Riparian Areas

The adverse environmental impacts of fragmentation on riparian areas would persist throughout the operation and maintenance of overhead transmission facilities, but would likely be less than those described for new overhead transmission facility construction. Some vegetation maintenance around overhead transmission facilities may be required in riparian areas where trees and tall shrubs occur. If clear-spanning methods are used over riparian areas, the impact of fragmentation would be minimal.

Steppe and Prairie

The adverse environmental impact of fragmentation in prairie and steppe ecosystems during the operation and maintenance of overhead transmission facilities is expected to be minimal. Complete revegetation of the ROW, barring access roads and transmission tower footprints, would likely be possible. The low-growing vegetation of these ecosystems is not likely to require ongoing maintenance.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

The adverse environmental impacts of fragmentation on sparsely vegetated ecosystems during the operation and maintenance of overhead transmission facilities are anticipated to be minimal. Low-growing vegetation characteristic of these ecosystems is not likely to require ongoing maintenance.

Wetlands

The adverse environmental impacts of fragmentation in wetlands due to the operation and maintenance of overhead transmission facilities would depend on vegetation structure. Some vegetation maintenance may be required in wetlands with tall shrubs and trees, similar to forests and woodlands. Where hydrology is impacted due to permanent features during construction, the adverse environmental impacts of fragmentation may worsen during the operation and maintenance stage. In wetlands with low-growing vegetation or where clear spanning has been used, ongoing maintenance is anticipated to be minimal, and the impact would be reduced.

Plant Priority Species

The adverse environmental impacts of fragmentation on plant priority species during the operation and maintenance of overhead transmission facilities are anticipated to be minimal. However, if the species are not compatible with overhead transmission facilities (i.e., tree species), the impact of vegetation maintenance may be greater. In addition, species with restricted dispersal abilities may be impacted by fragmentation through operation and maintenance. Maintenance activities would not likely affect large areas; however, populations of plant priority species may be small and at risk of local loss.

Impact Determination: Adverse environmental impacts on vegetation resulting from the fragmentation during the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to medium.

Degradation of Soil

Operation and maintenance activities that require heavy equipment and temporary or additional permanent vegetation clearing and soil disturbance have the potential to cause degradation of soil. As described for new construction, soil is a fundamental component of a healthy ecosystem. Heavy equipment can cause soil compaction, affecting soil quality. Wet soil has an increased risk of soil compaction and, therefore, a greater risk of soil degradation. Degraded soil can impact plant growth and development. Similar to new construction, stockpiling of soil may be required during operation and maintenance of overhead transmission, in particular for larger maintenance or replacement work. Soil quality degrades over time when stockpiled. Finally, operation and maintenance may cause additional adverse environmental impacts on biological soil crusts or may re-disturb areas where biological soil crusts have re-established. This can destabilize soils, alter nutrient cycling, and change soil temperature. Re-establishing biological soil crust can take time and depends on multiple factors, including climate, soil conditions, and availability of nearby propagules. However, the overall severity of the impact during operation and maintenance is expected to be less than during new construction due to smaller areas requiring vegetation and soil disturbance or re-disturbing already disturbed areas from the initial construction.

Alpine Ecosystems

Soil can be limited in alpine ecosystems. Activities for operation and maintenance of overhead transmission facilities that result in the compaction of soil and reduced water absorption capacity could lead to increased soil runoff and soil loss, limiting the ability for revegetation.

Forests and Woodlands

Activities for operation and maintenance of overhead transmission facilities can lead to degradation of soil, such as the development of compaction layers, which affect the growth and development of trees. Trees may adapt but may develop shallow-rooted systems, making them more susceptible to windthrow.

Riparian Areas

The adverse environmental impacts of soil degradation in forested riparian areas due to the operation and maintenance of overhead transmission facilities would be similar to those described for forests and woodlands. Riparian areas are located adjacent to waterbodies, and vegetation is important for maintaining water quality and stabilizing banks. Similar to new construction of overhead transmission facilities, soil degradation can impact revegetation success and, if unsuccessful, could lead to changes in water quality and bank stability issues.

Steppe and Prairie

Biological soil crusts are an important component of shrubsteppe ecosystems and provide ecological functions that contribute to the health of shrubsteppe ecosystems; however, they are fragile to disturbance. Operation and maintenance activities for overhead transmission facilities that impact soil and result in the loss of biological soil crust can destabilize soil and increase erosion (McIntosh et al. 2007).

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Some sparsely vegetated ecosystems, such as talus slopes, cliffs, and bluffs, have naturally limited soil. Adverse environmental impacts on this ecosystem related to soil degradation, from the operation and maintenance of overhead facilities, would be limited.

Wetlands

Wetlands are characterized by waterlogged soils, and some wetlands have deep organic soils. These soil types are highly susceptible to compaction. Heavy machinery required for the operation and maintenance of overhead transmission facilities could result in degradation of wetland soils.

Plant Priority Species

Changes in the physical, chemical, and/or biological properties of soil from heavy machinery for the operation and maintenance of overhead transmission facilities can result in soil degradation. If the changes are severe enough, they can impact the growth and propagation of plants. Plant priority species are typically already under threat, and further loss could impact populations, resulting in further loss of plant priority species.

Impact Determination: Adverse environmental impacts on vegetation resulting from degradation of soil during the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to low.

Edge Effects

The severity of edge effects during the operation and maintenance of overhead transmission facilities would likely be correlated with the severity of habitat modification during new overhead transmission facility construction. It is expected that edge effects would continue to be present during operation and maintenance for some ecosystems, such as forests and woodlands, while other ecosystems that are able to reestablish after construction would have minimal continued edge effects during the operation and maintenance stage.

Alpine Ecosystems

The adverse environmental impacts due to edge effects in alpine ecosystems during the operation and maintenance of overhead transmission facilities would be less than during new construction. Low-growing vegetation is characteristic of this environment, which would likely require little to no maintenance and would likely be capable of re-establishing in the previously disturbed areas along the ROW. Access roads and transmission tower footprints would not be capable of re-vegetating; however, these impacts would likely be minimal.

Forests and Woodlands

Edge effects related to the operation and maintenance of overhead transmission facilities would continue throughout the life of the transmission facility. Forests and woodlands are expected to require maintenance during operation. Forests are typically not re-established under overhead transmission facilities due to safety concerns, and ongoing maintenance would likely be required to trim back branches or top trees. Revegetation of the ROW during operation would be different than the surrounding landscape. This would likely create new habitat for either existing or new species of vegetation and would have lasting edge effects throughout the life of the project.

Riparian Areas

The adverse environmental impacts of edge effects in riparian areas during the operation and maintenance of overhead transmission facilities would be less than during new construction. During the operation and maintenance stage, riparian areas with low-growing vegetation would likely be able to re-establish along the previously disturbed ROW, and minimal maintenance would be required to maintain the ROW. However, riparian areas that had trees or tall shrubs prior to construction would likely need to be maintained to keep vegetation low to the ground, meaning the edge effect created during construction would continue through operation and maintenance.

Steppe and Prairie

The adverse environmental impacts of edge effects from the operation and maintenance of overhead transmission facilities in steppe and prairie ecosystems would be less than during the new construction of overhead transmission facilities. These ecosystems are characterized by low-growing vegetation that would likely be able to re-establish along the ROW after construction is complete. The vegetation in these ecosystems would likely require little to no maintenance. Access roads and transmission bases would remain disturbed, but the edge effects related to those features would be minimal.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

The adverse environmental impacts of edge effects on sparsely vegetated ecosystems from the operation and maintenance of overhead transmission facilities would be minimal and similar to those described for the new construction of overhead transmission facilities. These ecosystems typically do not have a high density of vascular plants and likely would not require maintenance.

Wetlands

The adverse environmental impacts of edge effects in wetlands from the operation and maintenance of overhead transmission facilities would be less than those during the new construction of overhead transmission facilities. Changes to wetland vegetation and soil composition during construction may have lasting and potentially permanent impacts that could perpetuate edge effects during the operation and maintenance stage. However, if low-growing vegetation is re-established during operation and maintenance, the impact of edge effects in wetland ecosystems would be minimal.

Plant Priority Species

The adverse environmental impacts of edge effects on plant priority species during the operation and maintenance of overhead transmission facilities would be less than during the construction of overhead transmission facilities.

Impact Determination: Adverse environmental impacts on vegetation resulting from edge effects during the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to low.

Introduction or Spread of Invasive Plants or Noxious Weeds

Overhead transmission facility ROW can facilitate the spread of invasive species to nearby ecosystems. The spread of invasive plants or noxious weeds during the operation and maintenance of overhead transmission facilities would depend on multiple factors. If invasive species were introduced to the ROW during construction by either nearby invasive species or by new construction activities (i.e., brought in on heavy machinery) without proper management, invasive plants and or noxious weeds would readily proliferate along the overhead transmission facility ROW. If the ROW is close to human development or remediated to support human recreation (e.g., hiking trails), the impact of invasive plants and noxious weeds would be greater than if the overhead transmission ROW is not close to human development or easily accessible. Vehicle and equipment access along roads would continue to present opportunities for the introduction and spread of invasive plants throughout the operation and maintenance stage. If an overhead transmission facility site is already populated with invasive species before construction, invasive plant presence would continue during operation and maintenance. However, if the construction area requires minimal vegetation clearing or brushing and no invasive species are introduced, the adverse environmental impacts of invasive species during the operation and maintenance would likely be minimal or none.

Alpine Ecosystems

The adverse environmental impacts of invasive species in alpine ecosystems during the operation and maintenance of overhead transmission facilities would be similar to those described for the new construction of overhead transmission facilities. If invasive species were introduced during construction and able to establish, the impact would be greater than if no invasive species were introduced. Alpine ecosystems are typically harsh environments suited only to certain species, which may hinder the establishment of invasive plants or noxious weeds.

Forests and Woodlands

The adverse environmental impacts of invasive species during the operation and maintenance of overhead transmission facilities would be correlated to the level of invasive plant presence during construction. In previously disturbed forests with invasive species already present, invasive species would likely persist throughout the operation without mitigation measures. In mature or undisturbed forested areas without invasive species present, the impact of invasive species during the operation and maintenance stage would likely be minimal, as long as no invasive species are introduced.

Riparian Areas

Operation and maintenance of overhead transmission facilities in riparian areas would likely have less adverse environmental impact on the spread of invasive species than the new construction of overhead transmission facilities. Regular maintenance during the operation and maintenance stage in riparian areas impacted by invasive plants may help to slow or stop the spread of invasive species. Invasive plants in riparian areas hinder the function of riparian areas, such as flood and erosion protection, water filtration, and water management.

Steppe and Prairie

Invasive plants and noxious weeds are typically well established in steppe and prairie ecosystems. Without regular maintenance, invasive species, such as cheatgrass, would likely populate disturbed areas along the ROW, such as access road edges. The adverse environmental impacts of invasive plants during the operation and maintenance of overhead transmission facilities would likely be similar to those of new construction.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Most sparsely vegetated ecosystems are likely unsuitable for invasive species. However, inland dunes are susceptible to invasive cheatgrass proliferation. If invasive species were present or established during the new construction of overhead transmission facilities, they would likely continue to proliferate during the operation and maintenance stage.

Wetlands

If invasive species were introduced during new construction of overhead transmission facilities, regular maintenance would likely be required to prevent the spread of invasive species due to the susceptibility of wetland ecosystems to invasive species. The adverse environmental impacts of invasive plants and noxious weeds in wetlands would likely be similar to those of new construction.

Plant Priority Species

Invasive plants and noxious weeds may be able to outcompete plant priority species for resources (i.e., light, soil, water) and may alter the ecosystem to a point that is no longer capable of supporting at-risk plant species. Impacts from invasive plants and noxious weeds during operation and maintenance of overhead transmission facilities would be similar to those of new construction and could result in additional plant population loss.

Impact Determination: Adverse environmental impacts on vegetation resulting from the introduction and spread of invasive plants and noxious weeds during the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to medium.

Surface Runoff

Operation and maintenance of overhead transmission facilities may result in exposed soil. Sources of exposed soil during operation and maintenance include unpaved roads required for access, temporary or permanent clearing areas required for repairs, and excavated or stockpiled material required to access buried infrastructure. Similar to new construction, surface runoff from the site during the operation and maintenance stage could mobilize sediments from exposed soils to areas outside of the project footprint or in sensitive ecosystems. Movement and deposition of sediment could impact soil quality and vegetation in the surrounding area. Sedimentation-related adverse environmental impacts would vary depending on ecosystem type. Floodplain ecosystems and wetlands may be adapted to some sedimentation and require sediment to accumulate to maintain equilibrium; however, a large release of sediment could still have adverse environmental impacts on vegetation. These impacts are described above for the new construction of overhead transmission facilities. The risk of surface runoff during operation and maintenance is anticipated to be lower than that of new construction due to smaller areas of exposed soil anticipated at any given time.

Alpine Ecosystems

Alpine soils may be susceptible to erosion, particularly where there are steep slopes with limited vegetation cover. Alpine environments also have potential for wind erosion due to high winds and exposure of soils (Poulenard and Podwojewski 2004). Most vegetation in this ecosystem is low to the ground, and sedimentation may cover vegetation, impacting growth and survival. Soils exposed along access roads and for maintenance activities could be mobilized via wind or water runoff into surrounding alpine ecosystems.

Forests and Woodlands

Surface runoff from the operation and maintenance of overhead transmission facilities could impact adjacent areas and would mostly impact understory vegetation. Overall, ecosystem structure is expected to be maintained during the operation and maintenance of overhead transmission facilities (i.e., trees would have limited adverse environmental impacts from sedimentation and dust).

Riparian Areas

Flood events in riparian areas result in natural deposition and removal of sediments over time. Sedimentation from anthropogenic sources could impact riparian areas, but these ecosystems are expected to be resilient to some sedimentation due to their adaptation to natural processes. Riparian ecosystems play a role in protecting aquatic ecosystems, and if lost, there is limited vegetation to protect aquatic ecosystems from surface runoff. Increased sedimentation into riparian areas could occur during operation and maintenance due to runoff from access roads and flow changes at culvert crossings. Further, soils stockpiled during maintenance activities may be mobilized into riparian areas through surface runoff.

Steppe and Prairie

Steppe and prairie ecosystems occur predominantly in arid eastern Washington. Dry conditions can result in reduced infiltration of rain into the soil, resulting in risk for overland flow or flash floods, which can increase sedimentation. Vegetation is low to the ground, and sedimentation can impact growth. Soils exposed or stockpiled during operational activities could increase the amount of soils that could be mobilized during rain events.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Sparsely vegetated ecosystems occur across the state. Impacts of surface runoff on rock-dominated ecosystems would likely be limited during operation and maintenance due to limited soil resources in these ecosystems. Conversely, a fundamental characteristic of inland dunes is mobile substrate, and sedimentation may be an issue during extreme rain events.

Wetlands

Wetlands function as natural filtration systems for water; however, major releases of sediment can impact wetlands. Wetlands typically occur in lower slope positions and depressional areas, which naturally receive water from the surrounding landscape. Accidental release of sediment to wetlands can impact vegetation by burying plants and potentially impacting water quality. Large sedimentation events could result in infilling of portions of wetlands, resulting in cumulative loss of wetland area. Sediment mobilization from access roads and stockpiled soils during operation and maintenance could impact adjacent wetlands.

Plant Priority Species

Sedimentation may further degrade habitat for plant priority species or cause further mortality. Plant priority species are species that are already considered to be at risk of extinction to some degree, and indirect impacts may result in additional population loss. Sources of sedimentation during operation and maintenance include access roads and stockpiled materials.

Impact Determination: Adverse environmental impacts on vegetation resulting from surface runoff during the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to medium.

Impacts from Increased Dust

As described for the new construction of overhead transmission facilities, vehicles and equipment moving along temporary and permanent access roads could increase dust, as these roads are typically unpaved. This dust may travel up to 0.6 miles from the access roads. Increased ambient dust and dust settling onto nearby vegetation could impact plant growth and habitat health. During the operation and maintenance of overhead transmission facilities, the severity of dust generation would likely be less than during construction, as fewer vehicles and equipment would be moving along the road, and less overall disturbance would occur. Vegetation that was disturbed during construction would likely have re-established, making less soil vulnerable to movement. Operation and maintenance of overhead transmission facilities may result in increased dust.

Alpine Ecosystems

High winds may occur more frequently in alpine environments, which could increase ambient dust during dry conditions. Deposition of dust on the surrounding vegetation may impact growth and survival. Soils that are exposed during operation and maintenance activities, such as access roads and stockpiles, could be a source of dust.

Forests and Woodlands

An increase in dust could have adverse environmental impacts on forests and woodlands by affecting overall plant vigor. Soils that are exposed during operation and maintenance activities, such as access roads and stockpiles, could be a source of dust. However, overall ecosystem structure is expected to be maintained.

Riparian Areas

An increase in dust could have adverse environmental impacts on riparian areas by affecting overall plant vigor. Soils that are exposed during operation and maintenance activities, such as access roads and stockpiles, could be a source of dust. However, overall ecosystem structure is expected to be maintained.

Steppe and Prairie

Dust is more typical in the arid part of eastern Washington, where steppe and prairie ecosystems predominantly occur. These environments, and therefore the adverse environmental impacts from dust, may be greater than in other ecosystems more common in western Washington. Soils that are exposed during operation and maintenance activities, such as access roads and stockpiles, could be a source of dust.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Sparsely vegetated ecosystems occur across Washington. Talus slopes and cliffs have limited soil material, and dust-related adverse environmental impacts are anticipated to be low. Conversely, a fundamental characteristic of inland dunes is mobile substrates. Stabilizers used in dust suppression may have adverse environmental impacts on inland dunes, similar to stabilization from invasive plants.

Wetlands

Dust generated from operation and maintenance activities could impact wetlands. Dust may impact the overall health of wetlands, and dust could accumulate in pockets of water, affecting water quality in wetlands.

Plant Priority Species

Dust generated during operation and maintenance may further degrade habitat for plant priority species or cause further mortality of individuals. Adverse environmental impacts of dust on plant priority species are more severe the closer the transmission facility infrastructure is to known populations. Plant priority species are species that are already considered to be at risk of extinction to some degree, and indirect impacts may result in additional population loss.

Impact Determination: Adverse environmental impacts on vegetation resulting from increased dust during the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to low.

Introduction of Hazardous Materials

During the operation and maintenance of overhead transmission facilities, accidental spills remain a potential concern. Hazardous substances such as synthetic lubricants, hydraulic fluids, and diesel fuel may be present as part of ongoing maintenance activities, including refueling and equipment servicing. These spills can introduce harmful substances into the environment, causing direct mortality or reduced vigor in vegetation and priority plant species, and increasing susceptibility to disease. Substances such as oil that come into contact with plant surfaces can block stomata, resulting in impaired photosynthesis, increased thermal and oxidative stress, and other physiological impacts (da Silva Correa et al. 2022). Persistent contaminants in soil, such as oil residues, can reduce oxygen, water, and nutrient availability, adversely affecting root and leaf growth, overall plant development, and biomass (da Silva Correa et al. 2022). These adverse environmental impacts are not limited by ecosystem type and could occur wherever such facilities operate.

Impact Determination: Adverse environmental impacts on vegetation resulting from the release of hazardous materials during the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to low.

Increased Fire Risk

The risk of fire would be lower during the operation and maintenance of overhead transmission facilities than during new construction. Vehicle and equipment access would pose a potential wildfire risk. Extreme weather conditions can also lead to wildfires started by overhead transmission facilities (Mitchell 2013). If a fire were to start during the operation and maintenance stage, it could have devastating consequences on vegetation and wildlife populations, similar to those described for the new construction of overhead transmission facilities. In some cases, the succession of an ecosystem may be reset to pioneering species due to the loss of dominant climax species. In more severe cases, post-wildfire regeneration could encourage invasive plants and alter vegetation communities.

Alpine Ecosystems

Alpine ecosystems are typically dominated by low-growing vegetation, which would provide minimal fuel for wildfire; however, strong winds may make fire spread faster. The risk of fire in alpine ecosystems from the operation and maintenance of overhead construction facilities is anticipated to be minimal.

Forests and Woodlands

Without diligent and proper maintenance, there would be a risk of dead trees or other large vegetation falling onto a transmission facility and causing a fire. Forests and woodlands typically provide continuous fuel sources, which can facilitate the spread of wildfire. Further adjacent activities in forests (e.g., recreation and forestry operations) may increase the risk of wildfires in these ecosystems. The risk of fire causing adverse environmental impacts in forests and woodlands is greater than in more sparsely vegetated ecosystems.

Riparian Areas

Riparian areas vary in vegetation type, which would affect the rate of spread of wildfire. Fires in riparian areas could initiate through similar mechanisms as upland forests; however, as these systems are adjacent to waterbodies, those waterbodies could provide a nearby water source for wildfire suppression activities.

Steppe and Prairie

Wildfire is a natural disturbance in steppe and prairie, and many species are resilient to it; however, many invasive plants prevalent in these ecosystems also increase following wildfire events, which degrade natural ecosystems. These systems generally do not support trees that require maintenance through operation and maintenance; as such, wildfire risk in steppe and prairie during maintenance and operation due to transmission facilities is expected to be limited.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Sparsely vegetated ecosystems have limited fuel to facilitate wildfire spread, and effects on these ecosystem types are anticipated to be less than in other ecosystems. These systems generally do not support trees that require maintenance through operation and maintenance; as such, wildfire risk in sparsely vegetated ecosystems during maintenance and operation due to transmission facilities is expected to be limited.

Wetlands

Wetlands vary in vegetation type, which would affect the rate of spread of wildfire. Severe fires in which most vegetation is lost may impact wetland hydrology, as there would be few plants to uptake water. In addition, organic soils and peatlands contain large amounts of carbon and, if burnt, may release large quantities of greenhouse gases. Wetlands may support trees that require maintenance during operation to reduce fire risk, but often the vegetation in these ecosystems is low-growing, reducing the risk of wildlife. The likelihood of wildfires occurring in wetlands during the operation and maintenance of overhead transmission facilities is generally expected to be lower than that of new construction.

Plant Priority Species

Stochastic events, such as wildfire, that affect a population of plant priority species, may result in further loss. Wildfire may also alter habitat for plant priority species, either degrading or creating, depending on the species. The risk of wildfire from transmission facilities impacting priority plant species during operation and maintenance would vary depending on the plant's habitat association.

Impact Determination: Adverse environmental impacts on vegetation resulting from increased risk of fire during the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Underground Transmission Facilities

Similar to overhead transmission facilities, activities for the operation and maintenance of underground transmission facilities would vary based on the type of facility, scale, and site characteristics. Facilities are not expected to have staff on site daily, but maintenance crews are anticipated to be regularly deployed. Transmission facilities require ongoing maintenance for equipment and ROWs, similar to other linear industrial facilities. Underground transmission facilities could have the following adverse environmental impacts on vegetation resources during the operation and maintenance stage:

- Loss of Native Ecosystems and Plants
- Fragmentation
- Degradation of Soil
- Edge Effects
- Introduction or Spread of Invasive Plants or Noxious Weeds
- Impacts from Increased Dust
- Introduction of Hazardous Materials
- Increased Fire Risk

The following activities are expected to occur during operation and maintenance of underground transmission facilities:

- Maintenance of vegetation along the transmission ROW, including cutting or trimming back vegetation, mowing, or other means of physical disturbance to vegetation
- Spraying of vegetation with herbicide
- Removal of potentially hazardous vegetation adjacent to the ROW that has potential to interact with the facility, such as cutting large, dead snags or trees with root systems that encroach on the underground line
- Maintenance of transmission facility infrastructure that may require heavy equipment and some vegetation clearing to facilitate access and work areas

Loss of Native Ecosystems and Plants

Similar to overhead transmission facilities, loss of native ecosystems and plants may occur during operation and maintenance of underground transmission facilities. Vegetation clearing and grubbing is one of the main adverse environmental impacts on vegetation resources. Minor construction works may be required during operation and maintenance to replace infrastructure or repair damaged transmission facility components. Therefore, small additional temporary or permanent disturbance may be required that would result in vegetation clearing and soil disturbance. Most work to repair underground transmission facilities is anticipated to require some vegetation and soil disturbance, as the cables and supporting infrastructure are mostly buried. Additional access roads or laydowns may be required to facilitate the works. The severity of the loss of native and ecosystems and plants during operation and maintenance is anticipated to be less than during new construction for underground transmission facilities but more than the operation and maintenance of overhead transmission facilities.

Use of non-selective pesticides along the transmission facility ROW above an underground transmission facility may also result in further loss to native ecosystems and plants during maintenance, in particular where native ecosystems were restored following construction. Non-selective pesticides sprayed along ROWs may impact vegetation in all ecosystem types and are dependent on the degree to which vegetation maintenance is required, the specificity of the pesticide used, and the susceptibility of native species to the pesticide.

Alpine Ecosystems

Due to the harsh environments, it may be challenging to re-establish vegetation where additional temporary clearing is required during operation and maintenance.

Forests and Woodlands

As described for new construction, forests and woodlands would not be compatible with restoration above underground transmission facilities. Therefore, additional adverse environmental impacts on these ecosystems during operation and maintenance are anticipated to be minimal and restricted to only new areas needed beyond the ROW.

Riparian Areas

The use of trenchless crossings would minimize disturbance to riparian areas. Additional loss of native ecosystems and plants would be restricted to access roads and laydowns on either side of the crossing. Adverse environmental impacts would vary depending on the dominant vegetation in the riparian area and whether trenchless crossings were used.

Steppe and Prairie

Steppe and prairie ecosystems include areas dominated by low-growing plants. This ecosystem would be compatible with revegetation over underground transmission facilities following new construction. During operation and maintenance, additional loss of ecosystems and plants may be required to facilitate repairs or access to work areas within the ROW.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Direct impacts on sparsely vegetated ecosystems due to the operation and maintenance of underground facilities would be limited to areas needed for temporary construction and permanent features. Because there is limited vegetation cover, additional clearing of vegetation during operation and maintenance is anticipated to be minimal.

Wetlands

Wetlands that occur within an underground transmission facility ROW would be at risk of additional loss during operation and maintenance, should new access to transmission facilities be required, or if new temporary or permanent footprints are required for repairs. In some cases, underground transmission facilities may use trenchless methods to cross wetlands, with limited disturbance to the wetland or wetland buffer. In other instances, similar to new construction, cut and cover techniques may result in new disturbance and fill may be required to create roads for access within wetlands that may result in further loss. Fill material could also alter the function of the ecosystem by changing hydrological regimes if it blocks the flow.

Plant Priority Species

Where plant priority species are known to occur within an underground transmission facility ROW, additional loss during operation and maintenance may occur. This may be due to the need to access areas for repair or expand temporary or permanent footprints to accommodate certain maintenance activities. In addition, these maintenance activities may result in the loss of suitable habitat for plant priority species.

Impact Determination: Adverse environmental impacts on vegetation resulting from the loss of native ecosystems and plants during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to low.

Fragmentation

Fragmentation of vegetation resources mostly occurs during new construction; however, permanent fragmentation-related adverse environmental impacts during new construction of underground transmission facilities would persist during operation and maintenance. Impacts from fragmentation are not a one-time occurrence but continue and increase over time (Haddad et al. 2015). For example, the longer ecosystems remain fragmented, the greater the number of native species that may experience localized extirpation. Therefore, fragmentation is anticipated to persist through the operation and maintenance of underground transmission facilities, similar to overhead transmission facilities. In addition, some maintenance activities may require additional new disturbance, which could result in further fragmentation of residual ecosystems adjacent to a transmission facility.

Fragmentation during the operation and maintenance of underground transmission facilities would persist in all ecosystems for areas of permanent infrastructure. For forested and woodland ecosystems, treed and tall shrub riparian ecosystems, and treed and tall shrub wetlands, fragmentation-related adverse environmental impacts are anticipated to be the greatest because the entire ROW for underground transmission facilities is expected to be maintained in an altered state from construction to decommissioning. In addition, where roads are established in wetlands, fragmentation-related adverse environmental impacts during operation and maintenance are expected to continue, and potentially worsen if the hydrological connection is disrupted. Impacts of fragmentation on ecosystems with low-growing vegetation are anticipated to be less than those with taller vegetation, and during operation, the width of fragmentation would be limited to the width of permanent access roads.

Alpine Ecosystems

Fragmentation of alpine ecosystems during the operation and maintenance of underground transmission facilities is expected to be less than that of new construction. The low-growing vegetation would require minimal ongoing maintenance and would likely be able to re-establish pre-construction conditions.

Forests and Woodlands

The fragmentation created by new underground transmission facility construction would continue throughout the facility’s operation and maintenance. Trees and tall shrubs are unable to regrow within the ROW, as the area must remain clear of deeply rooted species. Routine vegetation clearing and management are required to prevent encroachment, further limiting natural forest regeneration and sustaining the adverse environmental impacts of fragmentation over time.

Riparian Areas

Some disturbance to vegetation may be necessary for occasional access or repairs. In riparian areas with low-growing vegetation, once the underground transmission facilities are installed and the land is restored, vegetation would likely recover, allowing for more natural regeneration and reducing the long-term effects of fragmentation. However, in habitats with trees or tall shrubs, the impact of fragmentation would continue through the operation and maintenance stage, similar to forest and woodland ecosystems. Where clear-spanning is used, adverse environmental impacts from fragmentation are anticipated to be less.

Steppe and Prairie

Fragmentation of prairie and steppe ecosystems during the operation and maintenance of underground transmission facilities is expected to be minimal. Complete revegetation of the ROW with native vegetation can be completed during post-construction revegetation, except for areas required for above-ground infrastructure. The low-growing vegetation typical of these areas likely would not need ongoing maintenance.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

The impact of fragmentation on sparsely vegetated ecosystems during the operation and maintenance of underground facilities would depend on the construction techniques used to install the facilities. Adopting trenchless crossing techniques beneath these habitats is expected to help reduce the impact of fragmentation during operation and preserve the integrity of these ecosystems. Meanwhile, if trenching techniques were used during construction, and isolated habitats were fragmented, the impact of fragmentation may be more pronounced and carry through the operation and maintenance stage.

Wetlands

Fragmentation of wetlands would be influenced by the vegetation structure of overlapping wetlands. In wetlands where deep-rooted, tall shrubs and trees are present, frequent vegetation maintenance would be required above the underground transmission facility, and the original vegetation would not be allowed to re-establish until the transmission facility is decommissioned, similar to forests and woodlands. In wetlands with low-growing vegetation, ongoing maintenance is unlikely to be required, and the impact on the wetland environment would likely be minimal. Further, if hydrological regimes are impacted by operation and maintenance activities, this could cause additional fragmentation of wetlands.

Plant Priority Species

The impact of fragmentation on plant priority species during underground transmission facility operation and maintenance is expected to be minimal. However, habitat for plant priority species may remain fragmented through operation and maintenance, depending on the type of ecosystem where the priority species occur. Maintenance would likely disturb only small areas, but small populations of priority species could still be at risk of local loss.

Impact Determination: Adverse environmental impacts on vegetation resulting from fragmentation during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to medium.

Degradation of Soil

Similar to overhead transmission facilities, underground facility operation and maintenance activities that require heavy equipment and temporary or additional permanent vegetation clearing and soil disturbance have the potential to cause degradation of soil. However, as most infrastructure is buried, soil disturbance for repairs during operation and maintenance of underground facilities is anticipated to be more frequent than for overhead transmission facilities. As described above, the new construction of underground transmission facilities may result in degradation of soil quality due to compaction and stockpiling. Additional adverse environmental impacts may occur on biological soil crusts or may re-disturb areas where biological soil crusts have re-established. This can destabilize soil, alter nutrient cycling, and change soil temperature. Re-establishing biological soil crust can take time and depends on multiple factors, including climate, soil conditions, and availability of nearby propagules. The adverse environmental impact during the operation and maintenance of underground transmission facilities is expected to be less than that resulting from new construction due to smaller areas requiring vegetation and soil disturbance or re-disturbing already disturbed areas, but greater than during the operation and maintenance of overhead transmission facilities.

Alpine Ecosystems

Soil can be limited in alpine ecosystems. Activities during operation and maintenance resulting in the compaction of soil and reduced water absorption capacity, such as driving machinery over these ecosystems, could lead to increased soil runoff and soil loss, limiting the ability for revegetation.

Forests and Woodlands

Degradation of soil during operation and maintenance, such as the development of compaction layers from driving machinery over ecosystems, can affect the growth and development of trees. Trees may adapt but may develop shallow-rooted systems, making them more susceptible to windthrow.

Riparian Areas

Forested riparian areas would have adverse environmental impacts similar to those of forests and woodlands. Riparian areas are located adjacent to waterbodies, and vegetation is important for maintaining water quality and stabilizing banks. Similar to new construction of underground transmission facilities, soil degradation from operation and maintenance could impact revegetation success and, if unsuccessful, could lead to changes in water quality and bank stability issues. Trenchless crossing techniques would minimize the impact of soil degradation by limiting the need for soil disturbance.

Steppe and Prairie

Biological soil crusts are an important component of shrubsteppe ecosystems and provide ecological functions that contribute to the health of shrubsteppe ecosystems; however, they are fragile to disturbance. Underground transmission facility operation and maintenance activities that impact soil, resulting in the loss of biological soil crust, could destabilize soil and increase erosion (McIntosh et al. 2007).

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Some sparsely vegetated ecosystems, such as talus slopes, cliffs, and bluffs, have naturally limited soil. Impacts on soil degradation during operation and maintenance activities are anticipated to be limited in these ecosystem types.

Wetlands

Wetlands are characterized by waterlogged soils, and some wetlands have deep organic soils. These soil types are highly susceptible to compaction. Heavy machinery required for underground transmission facility operation and maintenance activities could result in degradation of wetland soils. Soil disturbance within the ROW, which was disturbed during construction, may have minimal additional soil degradation and adverse environmental impacts.

Plant Priority Species

Changes in the physical, chemical, and/or biological properties of soil can result in soil degradation. If changes are significant enough, this can impact the growth and propagation of plants. Plant priority species are typically already under threat, and further loss could impact populations, resulting in further loss of plant priority species.

Impact Determination: Adverse environmental impacts on vegetation resulting from degradation of soil during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to low.

Edge Effects

The scale of edge effects associated with underground transmission facilities during operation and maintenance of underground transmission facilities is similar to that described for overhead facilities. Since underground facilities are buried, the initial new construction may cause adverse, yet temporary, habitat modification—such as trenching and soil disruption. However, ecosystems characterized by deeply rooted species would require ongoing maintenance through the operation and maintenance stage, similar to overhead transmission facilities.

Some edge effects may still occur, especially if permanent access roads or maintenance routes are needed. These linear features can fragment habitats, alter patterns of drainage, and create microclimatic changes that may persist even after vegetation regrows above the underground transmission facilities. In urban or agricultural environments, edge effects from underground facilities are typically minimal due to pre-existing land disturbance, but in sensitive or undisturbed habitats, restoration success and the degree of habitat fragmentation should be carefully monitored.

Alpine Ecosystems

It is expected that the adverse environmental impacts due to edge effects on alpine ecosystems during the operation and maintenance of underground transmission facilities would be less than those experienced during new construction. The naturally low-growing vegetation typical of this environment is likely to require minimal maintenance and should readily re-establish itself in previously disturbed areas along the ROW. While access roads and the footprints of underground vaults or connection points would not be able to fully re-vegetate, the overall impact from these features is anticipated to be minor.

Forests and Woodlands

Similar to the operation and maintenance of overhead transmission facilities, edge effects related to the operation and maintenance of underground transmission facilities would persist throughout the lifespan of the transmission facility. Vegetation would be cleared from the ROW during construction, and the cleared area would be revegetated with low-growing plants not typical for the ecosystem or typical of an early succession forest ecosystem. Restoration would only occur once the facility is decommissioned. Frequent maintenance prevents the growth of large shrubs or trees. Persistent edge effects and habitat changes last as long as a facility is in operation, creating long-term differences from the surrounding environment.

Riparian Areas

The adverse environmental impact of edge effects in riparian areas is expected to be less during the operation and maintenance stage of underground transmission facilities than during new construction. Once new construction is complete, low-growing vegetation in riparian zones can typically re-establish within the previously disturbed ROW, requiring minimal maintenance to sustain the underground infrastructure. In areas that originally supported trees or tall shrubs, the impact of edge effects in riparian areas during the operation and maintenance stage would be comparable to those observed in forests and woodlands. As a result, the altered structure and function introduced during new construction are likely to persist throughout the operational life of the transmission facilities.

Steppe and Prairie

The adverse environmental impacts of edge effects in steppe and prairie ecosystems during the operation and maintenance of underground transmission facilities are expected to be similar to those described for overhead facilities. These ecosystems, characterized by low-growing vegetation, would likely be compatible with revegetation above underground transmission facilities. Maintenance needs for the re-established vegetation should be minimal. While access roads and underground facility access points would remain disturbed, the associated edge effects from these features are anticipated to be minimal.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

The adverse environmental impacts of edge effects on sparsely vegetated ecosystems from underground transmission facilities would likely be less than during new construction. If trenchless crossing techniques are employed, the disturbance would be minimal unless access roads are required for equipment or maintenance. Even in such cases, edge effects would remain small due to the limited footprint and low density of vascular plants typically present in these environments.

Wetlands

Operation and maintenance of underground transmission facilities within wetlands is expected to result in edge effects that are generally similar to those associated with overhead transmission facilities. Most lasting adverse environmental impacts on wetland vegetation and soils would occur during new construction, as excavation and installation can alter soil structure and plant communities, leading to potentially permanent changes that may continue to influence edge effects throughout the operation and maintenance stage. However, with effective restoration and the re-establishment of appropriate low-growing vegetation, the ongoing edge effects during operation are likely to be minimal.

Plant Priority Species

The adverse environmental impact of edge effects on plant priority species during the operation and maintenance of underground transmission facilities would likely be less than during new construction. Changes to the biophysical characteristics of habitat for plant priority species due to edge effects may affect available habitat or the population's persistence.

Impact Determination: Adverse environmental impacts on vegetation resulting from edge effects during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to low.

Introduction or Spread of Invasive Plants or Noxious Weeds

Underground transmission facility ROW can spread invasive species to nearby ecosystems, similar to overhead transmission facilities. Invasive plants or weeds may be introduced during new construction through equipment or nearby sources and can quickly spread without management. Proximity to human activity or recreational use increases this risk. Continued road access also allows further spread. If invasive species are present before new construction, they would persist during operation and maintenance. However, if little clearing is needed and no invasive species are introduced, the impact would likely be minimal. Overall, the spread of invasive species during the operation and maintenance of underground transmission facilities would be similar to that for overhead transmission facilities.

Alpine Ecosystems

The adverse environmental impacts of invasive species in alpine ecosystems during the operation and maintenance of underground transmission facilities would be similar to those of overhead transmission facilities. If invasive species are introduced during new construction and become established, adverse environmental impacts during operation and maintenance would be comparable to those during new construction.

Forests and Woodlands

The adverse environmental impacts of invasive species in forests and woodlands during the operation and maintenance of underground transmission facilities would closely relate to the degree of invasive plant presence introduced during new construction. Because underground installations result in a persistently altered ecosystem throughout operation and maintenance, the risk for invasive establishment is higher than in other ecosystems. In areas previously disturbed and already infested with invasive species, these species are likely to persist or expand without proactive mitigation. Conversely, in undisturbed locations initially free of invasive species, the continual disturbance and altered conditions inherent to underground transmission facilities create increased vulnerability to new invasive species establishment during the operation and maintenance stage.

Riparian Areas

The adverse environmental impacts of invasive species in riparian areas during the operation and maintenance of underground transmission facilities would be comparable to those of overhead transmission facilities. Regular maintenance during the operation and maintenance stage in riparian zones affected by invasive plants may help to slow or prevent further spread of these species. However, in riparian areas containing tall shrubs or trees, the impact of underground transmission facilities would be greater due to the need for more extensive vegetation clearing and ground disturbance. Invasive plants in riparian areas hinder vital ecological functions such as flood and erosion protection, water filtration, and overall water management.

Steppe and Prairie

The adverse environmental impacts of invasive plants in steppe and prairie during the operation and maintenance of underground transmission facilities would be similar to those of overhead facilities, as disturbed areas may be colonized by species like cheatgrass without regular maintenance.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

The adverse environmental impacts of invasive plants in sparsely vegetated ecosystems during the operation and maintenance of underground transmission facilities would be similar to those of overhead transmission facilities. Sparsely vegetated areas may not support invasive plants, but where invasive species like cheatgrass are present, they may persist or spread after construction.

Wetlands

The vulnerability of wetland ecosystems to invasive species remains a concern during the operation and maintenance stage of underground transmission facilities. Should invasive species be introduced at this stage, ongoing management would likely be necessary to control their spread. The effects of invasive plants and noxious weeds in wetlands during the operation and maintenance stage are expected to be similar to those during new construction.

Plant Priority Species

Invasive plants and noxious weeds may outcompete priority plant species for vital resources such as light, soil, and water, potentially altering the ecosystem to the point where it can no longer sustain at-risk plant populations. During the operation and maintenance of underground transmission facilities, the adverse environmental impacts of invasive plants and noxious weeds on plant priority species would be similar to those during new construction and may lead to further loss of sensitive plant populations.

Impact Determination: Adverse environmental impacts on vegetation resulting from the introduction and spread of invasive plants and noxious weeds during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to medium.

Surface Runoff

The operation and maintenance of underground transmission facilities may result in exposed soil, similar to overhead transmission facilities. Sources of exposed soil during operation and maintenance include unpaved roads required for access, temporary or permanent clearing areas required for repairs, and excavated or stockpiled material required to access underground infrastructure. Similar to new construction, surface runoff from a site during operation and maintenance could mobilize sediments from exposed soils to areas outside of the project footprint or in sensitive ecosystems. Movement and deposition of sediment could impact soil quality and vegetation in the surrounding area. Adverse environmental impacts related to sedimentation may vary depending on ecosystem type. Floodplain ecosystems and wetlands may be adapted to some sedimentation and require sediment to accumulate to maintain equilibrium; however, a large release of sediment could still have adverse environmental impacts on vegetation. These impacts are described above under the new construction of overhead transmission facilities. The risk of surface runoff during operation and maintenance is anticipated to be lower than that of new construction due to smaller areas of exposed soil anticipated at any given time.

Alpine Ecosystems

Alpine soils may be susceptible to erosion, particularly where there are steep slopes with limited vegetation cover. Alpine environments also have potential for wind erosion due to high winds and exposure of soils (Poulenard and Podwojewski 2004). Most vegetation in this ecosystem is low to the ground, and sedimentation may cover vegetation, impacting growth and survival. Soils exposed along access roads and for maintenance activities could be mobilized via wind or water runoff into surrounding alpine ecosystems.

Forests and Woodlands

Surface runoff from the operation and maintenance of transmission facilities could impact adjacent areas and would mostly impact understory vegetation. Overall ecosystem structure is expected to be maintained during the operation and maintenance of underground transmission facilities (i.e., trees would have limited adverse environmental impacts from sedimentation and dust).

Riparian Areas

Flood events in riparian areas result in natural deposition and removal of sediments over time. Sedimentation from anthropogenic sources could impact riparian areas, but these ecosystems are expected to be resilient to some sedimentation due to their adaptation to natural processes. Riparian ecosystems play a role in protecting aquatic ecosystems, and if lost, there is limited vegetation to protect aquatic ecosystems from surface runoff. Increased sedimentation into riparian areas could occur during operation and maintenance due to runoff from access roads and flow changes at culvert crossings. Further, soils stockpiled during maintenance activities may be mobilized into riparian areas through surface runoff.

Steppe and Prairie

Steppe and prairie ecosystems occur predominantly in arid eastern Washington. Dry conditions can result in reduced infiltration of rain into the soil, resulting in risk for overland flow or flash floods, which can increase sedimentation. Vegetation is low to the ground, and sedimentation can impact growth. Soils exposed or stockpiled during operational activities could increase the soil that could be mobilized during rain events.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Sparsely vegetated ecosystems occur across the state. Impacts of surface runoff to rock-dominated ecosystems would likely be limited during operation and maintenance, due to limited soil resources in rock-dominated ecosystems. Conversely, a fundamental characteristic of inland dunes is mobile substrate, and sedimentation may be an issue during extreme rain events.

Wetlands

Wetlands function as natural filtration systems for water; however, major releases of sediment can impact wetlands. Wetlands typically occur in lower slope positions and depressional areas, which naturally receive water from the surrounding landscape. Accidental release of sediment to wetlands can impact vegetation by burying plants and potentially impacting water quality. Large sedimentation events could result in infilling of portions of wetlands, resulting in cumulative loss of wetland area. Sediment mobilization from access roads and stockpiled soils during operation and maintenance could impact adjacent wetlands.

Plant Priority Species

Sedimentation may further degrade habitat for plant priority species or cause further mortality. Plant priority species are species that are already considered to be at risk of extinction to some degree, and indirect impacts may result in additional population loss. Sources of sedimentation during operation and maintenance include access roads and stockpiled materials.

Impact Determination: Adverse environmental impacts on vegetation resulting from surface runoff during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to medium.

Impacts from Increased Dust

The adverse environmental impacts related to dust during the operation and maintenance of underground transmission facilities are expected to be less than the impacts during new construction. Vehicles on unpaved access roads can generate dust, which may travel up to 0.6 miles and settle on nearby vegetation, affecting plant growth and habitat. However, operation typically involves less traffic and disturbance, so overall dust generation is expected to be lower than during construction, though the nature of the adverse environmental impacts would be similar. Repairs or maintenance of underground transmission facility infrastructure are anticipated to require excavation, which would provide a dust source as well during operation. Operation and maintenance of underground transmission facilities may result in increased dust.

Alpine Ecosystems

High winds may occur more frequently in alpine environments, which could increase ambient dust during dry conditions. Deposition of dust on the surrounding vegetation may impact growth and survival. Soils that are exposed during operation and maintenance activities, such as access roads and stockpiles, could be a source of dust.

Forests and Woodlands

An increase in dust could impact forests and woodlands by affecting overall plant vigor. Soils that are exposed during operation and maintenance activities, such as access roads and stockpiles, could be a source of dust. However, overall ecosystem structure is expected to be maintained.

Riparian Areas

An increase in dust could impact riparian areas by affecting overall plant vigor. Soils that are exposed during operation and maintenance activities, such as access roads and stockpiles, could be a source of dust. However, overall ecosystem structure is expected to be maintained.

Steppe and Prairie

Dust is more typical in the arid part of eastern Washington, where steppe and prairie ecosystems predominantly occur. These environments, and therefore, the adverse environmental impacts from dust may be greater than in other ecosystems more common in western Washington. Soils that are exposed during operation and maintenance activities, such as access roads and stockpiles, could be a source of dust.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

Sparsely vegetated ecosystems occur across the state. Talus slopes and cliffs have limited soil material, and dust adverse environmental impacts are anticipated to be low. Conversely, a fundamental characteristic of inland dunes is mobile substrates. Stabilizers used in dust suppression may have adverse environmental impacts on inland dunes, similar to stabilization from invasive plants.

Wetlands

Dust generated from operation and maintenance activities could impact wetlands. Dust may impact the overall health of wetlands and could accumulate in pockets of water, affecting water quality in wetlands.

Plant Priority Species

Dust generated during the operation and maintenance of underground transmission facilities may further degrade habitat for plant priority species or cause further mortality of individuals. Dust-related impacts on plant priority species would be more severe the closer the transmission facility infrastructure is to priority species populations. By definition, plant priority species are already considered to be at risk of extinction to some degree, and indirect impacts may result in additional population loss.

Impact Determination: Adverse environmental impacts on vegetation resulting from increased dust during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to low.

Introduction of Hazardous Materials

During the operation and maintenance of underground transmission facilities, accidental spills of hazardous substances—such as lubricants, hydraulic fluids, and diesel fuel—pose risks similar to those described for the operation and maintenance of overhead transmission facilities. These spills can harm vegetation and soil by blocking stomata, disrupting nutrient and water uptake, and reducing plant growth and vigor (da Silva Correa et al. 2022). For further details, see the preceding discussion of overhead transmission facilities, as the risks and adverse environmental impacts are nearly identical. Impacts are anticipated to be less during the operation and maintenance stage than during new construction due to fewer vehicles and heavy equipment on site. The risks and impacts would be similar across different ecosystems.

Impact Determination: Adverse environmental impacts on vegetation resulting from the release of hazardous materials during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to medium.

Increased Fire Risk

The risk of fire during the operation and maintenance of underground transmission facilities would be lower than during new construction. While vehicle and equipment access would present some potential for wildfire, it would be less likely than during new construction. Extreme weather has less direct impact on underground facilities than on overhead facilities, thereby lowering the chance of wildfires resulting from their operation (Mitchell 2013). Nonetheless, a fire incident during operation, though rare, could still have consequences on nearby vegetation and wildlife, similar to those described above for the new construction of underground transmission facilities.

Alpine Ecosystems

The adverse environmental impacts of wildfire on alpine ecosystems due to underground transmission facility operation and maintenance would likely be similar to those of overhead transmission operation and maintenance. Wildfires have the potential to devastate isolated alpine ecosystems, and, due to the harsh environment, re-establishment after fire in these areas may take longer.

Forests and Woodlands

The adverse environmental impacts of wildfire on forests and woodlands due to underground transmission facility operation and maintenance would likely be similar to those of overhead transmission facilities. Well-developed forests like mature and old-growth forests, and certain tree species, like Douglas fir, are capable of withstanding low-severity fires. However, forests contain large amounts of fuel for fires, and the potential for high-severity fires to develop, especially in remote areas, is high.

Riparian Areas

The adverse environmental impacts of wildfire on riparian areas due to underground transmission facility operation and maintenance would likely be similar to those of overhead transmission facility construction. Riparian vegetation provides fuel sources for fire, but adjacent waterbodies may act as barriers to fire movement or provide a water source for wildfire suppression.

Steppe and Prairie

The adverse environmental impacts of wildfire on steppe and prairie ecosystems due to underground transmission facility operation and maintenance would likely be similar to those of overhead transmission facilities. These ecosystems, when intact, are capable of regeneration after fires.

Sparsely Vegetated Ecosystems (Talus Slopes, Cliff, Bluffs, Inland Dunes)

The adverse environmental impacts of wildfire on sparsely vegetated ecosystems would be similar to those of overhead transmission facilities. These ecosystems have limited vegetation and may function as fuel breaks, limiting wildfire spread.

Wetlands

The adverse environmental impacts of wildfire on wetlands due to underground transmission facility construction would likely be similar to those of overhead transmission facilities.

Plant Priority Species

The risk of wildfire during the operation and maintenance of underground transmission facilities would likely be less than during new construction, as described above under the construction of underground transmission facilities. However, because some plant species at risk have small, vulnerable populations, even a slight increase in wildfire risk or exposure could have severe and potentially irreversible adverse environmental impacts, as these species may lack the numbers needed to recover after a wildfire.

Impact Determination: Adverse environmental impacts on vegetation resulting from increased risk of fire during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Upgrade

Overhead Transmission Facilities

Upgrades to overhead transmission facilities would occur within existing ROWs without expanding the existing facility footprint or causing new ground disturbance. However, these upgrades may result in adverse environmental impacts on vegetation, including:

- Loss of Native Ecosystems and Plants
- Fragmentation
- Degradation of Soil
- Edge effects
- Introduction or Spread of Invasive Plants or Noxious Weeds
- Surface Runoff
- Impacts from Increased Dust
- Introduction of Hazardous Materials
- Increased Fire Risk

The adverse environmental impacts from upgrading overhead transmission facilities are often comparable to those of maintaining overhead transmission facilities. These adverse environmental impacts are generally anticipated to be lower than those for modifying or constructing a new transmission facility due to several factors. Table 2.3-1 highlights how upgrading existing transmission facilities would generally result in fewer or less impactful adverse environmental impacts.

Underground Transmission Facilities

Upgrades to underground transmission facilities would occur within existing ROWs without expanding the facility footprint or causing new ground disturbance. However, these upgrades may result in adverse environmental impacts on vegetation, including:

- Loss of Native Ecosystems and Plants
- Fragmentation
- Degradation of Soil
- Edge Effects
- Introduction or Spread of Invasive Plants or Noxious Weeds
- Surface Runoff
- Impacts from Increased Dust
- Introduction of Hazardous Materials
- Increased Fire Risk

The adverse environmental impacts from upgrading underground transmission facilities are often comparable to those of maintaining underground transmission facilities. These adverse environmental impacts are generally anticipated to be lower than those for modifying or constructing a new transmission facility due to several factors. Table 2.3-1 highlights how upgrading existing transmission facilities would generally result in fewer or less impactful adverse environmental impacts.

Modification

Overhead Transmission Facilities

Modifying existing overhead transmission facilities typically involves several key steps, each with specific requirements, timelines, and settings, as outlined in Chapter 2, Overview of Transmission Facilities, Development Considerations, and Regulations. The adverse environmental impacts of modifying existing transmission facilities would vary depending on the scale of the project-specific application. Overhead transmission facilities could have the following adverse environmental impacts on vegetation during the modification stage:

- Loss of Native Ecosystems and Plants

- Fragmentation
- Degradation of Soil
- Edge Effects
- Introduction and Spread of Invasive Species
- Surface Runoff
- Impacts from Increased Dust
- Introduction of Hazardous Materials
- Increased Fire Risk

Adverse environmental impacts of modifying overhead transmission facilities could be similar to those of new construction but are anticipated to be lower. Table 2.3-2 highlights how modifying existing transmission facilities would generally result in fewer or less impactful adverse environmental impacts.

Underground Transmission Facilities

Modifying existing underground transmission facilities typically involves several key steps, each with specific requirements, timelines, and settings, as outlined in Chapter 2, Overview of Transmission Facilities, Development Considerations, and Regulations. The adverse environmental impacts of modifying existing transmission facilities would vary depending on the scale of the project-specific application. Underground transmission facilities could have the following adverse environmental impacts on vegetation during the modification stage:

- Loss of Native Ecosystems and Plants
- Fragmentation
- Degradation of soil
- Edge Effects
- Introduction and Spread of Invasive Species
- Surface Runoff
- Impacts from Increased Dust
- Introduction of Hazardous Materials

- Increased Fire Risk

Adverse environmental impacts of modifying underground transmission facilities could be similar to those of new construction but are anticipated to be lower. Table 2.3-2 highlights how modifying existing transmission facilities would generally result in fewer or less impactful adverse environmental impacts.

3.5.3.3 No Action Alternative

Under the No Action Alternative, the Programmatic EIS would not be adopted as a planning or analytical framework. Instead, transmission facility siting and development would continue under existing state and local regulatory processes, with each project evaluated for environmental compliance without the benefit of the environmental review provided in this document. This approach would lack the advanced notice of potential serious environmental concerns for those planning transmission facilities, as well as the Mitigation Strategies developed under the Programmatic EIS. As a result, environmental outcomes could be less predictable and consistent, and adverse environmental impacts could be greater.

3.5.4 Mitigation Measures

Under SEPA, there are six recognized forms of mitigation that agencies can apply to reduce or address adverse environmental impacts:

- **Avoiding the adverse environmental impact** altogether by not taking a certain action or parts of an action.
- **Minimizing adverse environmental impacts** by limiting the degree or magnitude of the action and its implementation.
- **Rectifying the adverse environmental impact** by repairing, rehabilitating, or restoring the affected environment.
- **Reducing or eliminating the adverse environmental impact** over time by preservation and maintenance operations during the life of the action.
- **Compensating for the adverse environmental impact** by replacing or providing substitute resources or environments.
- **Monitoring the adverse environmental impact** and taking appropriate corrective measures.

This section describes the Avoidance Criteria and Mitigation Measures that could apply to adverse environmental impacts from new construction, operation and maintenance, upgrade, and modification of transmission facilities.

All General Measures adopted for this Programmatic EIS, identified in Section 3.1, are relevant to this resource section. Applicants would be responsible for providing information within their application materials documenting their implementation of the General Measures.

Avoidance Criteria[33] that are relevant to this resource section are described below:

AVOID-2 – Wetland Disturbance: Avoid having equipment or infrastructure within 300 feet of all wetlands.

Rationale: Protecting wetlands would decrease the chances of wetland degradation during new construction activities, as these areas are important for sustained wetland function. Wetlands within the project footprint would be delineated following the U.S. Army Corps of Engineers wetland delineation methodology and rated using the ECY's Western Washington, Version 2, and Eastern Washington, Version 1.

AVOID-4 – Floodplains: Avoid having equipment or infrastructure within floodplains.

Rationale: This Avoidance Criterion would eliminate the potential for damage to infrastructure and electrical safety hazards because of inundation and would avoid some riparian ecosystems.

AVOID-6 – Old-Growth and Mature Forests: Avoid old-growth forests, which include forests older than 200 years in western Washington and greater than 150 years in eastern Washington, and mature forests, which include forests greater than 80 years.

Rationale: This Avoidance Criterion would reduce direct loss of old-growth and mature forests, which have already lost the majority of their historical extent. Old-growth and mature forests are particularly susceptible to long-term adverse environmental impacts due to the time lag to reestablish current ecological functions if clearing occurs. In addition, linear features through old and mature

[33] The complete list of Avoidance Criteria and their rationales can be found in Section 3.1 and Appendix 3.1-1.

forest stands increase the adverse environmental impacts from edge effects, such as the spread of invasive plants.

AVOID-7 – Rare, Endangered, or Threatened Plant Species and Sensitive Ecosystems: Avoid having equipment or infrastructure in areas occupied by rare, endangered, or threatened plant species and sensitive ecosystems.

Rationale: Avoiding rare, endangered, or threatened plant species and sensitive ecosystems would reduce both direct and indirect impacts on, and fragmentation of, these communities whose populations are at risk of disappearing.

AVOID-8 – Important Habitat: Avoid having equipment or infrastructure in areas occupied by important and sensitive wildlife habitat, such as those listed in Appendix 3.1-1.

Rationale: This Avoidance Criterion aims to reduce habitat loss and fragmentation that can be caused by linear features, such as transmission facilities.

AVOID-19 – Wilderness Areas: Avoid having equipment or infrastructure near or within the viewshed of designated wilderness areas.

Rationale: This Avoidance Criterion aims to protect designated wilderness areas. Wilderness areas are valued for their untouched natural beauty. The Wilderness Act of 1964 mandates the preservation of the natural conditions of designated wilderness areas.

The Programmatic EIS is intended to support more efficient and effective siting and permitting of transmission facilities, consistent with the legislative direction in RCW 43.21C.408, by streamlining environmental review where projects incorporate the recommended planning and Mitigation Strategies. Applicants would be responsible for providing information within their application materials documenting the project's compliance with the above Avoidance Criteria. While total avoidance of all adverse environmental impacts is not required in order to use the Programmatic EIS, applicants are expected to demonstrate how their project aligns with the intent of the Avoidance Criteria to the extent practicable. If specific Avoidance Criteria are not met, the applicant would provide an explanation and supporting information. Additional environmental analyses would be required as part of the documentation for SEPA for the Project. Additional mitigation could be required, depending on the nature of the deviation and its potential to result in probable significant adverse environmental impacts.

Mitigation Measures have been identified to minimize adverse environmental impacts from transmission facility projects. These measures are intended to be broad so that they can be applied to most projects that would be covered under this Programmatic EIS. However, project-specific plans would be needed to adapt the measures for project-specific applications. The inclusion of a Mitigation Measure in this Programmatic EIS does not imply that a given adverse environmental impact is presumed to occur. Rather, the measures are provided to support early planning and the avoidance of adverse environmental impacts, streamlining project-specific environmental reviews when impacts are identified. Mitigation Measures are intended to serve as a set of potential strategies that the SEPA Lead Agency and applicants can draw from, depending on the specific environmental context and project footprint. Applicants and the SEPA Lead Agency retain discretion to:

- Propose alternative mitigation strategies that achieve equivalent or better outcomes.
- Demonstrate that certain Mitigation Measures are not applicable due to the absence of relevant impacts.

When impact determinations are identified as medium or high, then either the applicant would adopt applicable Mitigation Measures from this Programmatic EIS, or the SEPA Lead Agency may require applicable mitigation to be implemented to reduce project-specific adverse environmental impacts. When impact determinations are low, applicable Mitigation Measures should still be considered by the applicant and the SEPA Lead Agency, as these Mitigation Measures would help to further reduce project-specific adverse environmental impacts, including the project’s contribution to cumulative impacts. These Mitigation Measures would be implemented in addition to compliance with laws, regulations, environmental permits, plans, and design considerations required for transmission facilities.

The following Mitigation Measures could be adopted to mitigate adverse environmental impacts:

Veg-1 – Site Transmission Facilities in Existing ROW or Disturbed Areas: Site transmission facilities in existing ROW or disturbed areas, to the greatest extent practicable.

Rationale: Using existing ROW or disturbed areas would minimize the loss of vegetation and habitat and reduce fragmentation that can be caused by linear features, such as transmission facilities. This Mitigation Measure also addresses impacts on historic and cultural properties.

In addition to the above Mitigation Measure, the following Mitigation Measures[34] developed for other resources may be applicable:

Geo-1 – Minimize Soil Disturbance: Minimize soil disturbance, including footprints related to access roads and permanent structures, to the greatest extent practicable. Minimize the use of construction techniques that would be harmful to topsoil composition, where feasible.

Geo-3 – Drainage Control: Implement effective drainage systems and manage water runoff to reduce soil saturation.

Geo-4 – Minimize Impacts on Sensitive Soils: Design projects to minimize adverse environmental impacts on high erodibility zones and areas sensitive to degradation.

W-2 – Clear Spanning or Trenchless Methods for Water Crossings: When feasible, use clear spanning for new overhead transmission or trenchless construction for underground transmission to minimize disturbance to riparian areas, wetlands and wetland buffers, and surface waters.

W-4 – Store Chemicals, Operate Equipment, and Conduct Maintenance away from Water: Store fuel, oils, and lubricants away from watercourses. Maintain, repair, and/or service vehicles and equipment away from watercourses and at designated repair facilities whenever possible. Operate equipment and machinery from the top of the bank and outside of riparian areas, wetlands and wetland buffers, and surface waters.

W-5 – Implement Erosion and Sediment Control Measures: Implement effective and appropriate erosion control measures in new construction and operation to mitigate runoff into streams.

[34] The rationales for the identified Mitigation Measures are provided in their respective resource sections.

W-6 – Minimize Hydrology Changes: Minimize water diversions and changes to natural hydrology or hydroelectric dam flow regimes to the greatest extent possible.

Hab-1 – Use of Pesticides, Herbicides, and Fungicides: Minimize the use of harmful chemicals, including pesticides, herbicides, and fungicides, during the new construction and operation and maintenance stages of transmission facility projects.

Hab-3 – Decommission the Nonpermanent Roads: Decommission and restore any access roads not required for operation and maintenance.

Hab-4 – Woody Debris Salvage and Restoration: Salvage and retain large, coarse, woody debris during construction and in-stream works. The post-construction revegetation and restoration plan would include planting native shrubs and replacing woody debris unless prohibited by a state authority due to fire risk. Post-construction revegetation and restoration plans would be provided to the Washington Department of Fish and Wildlife for review prior to approval by the State Environmental Policy Act Lead Agency.

Hab-6 – Worker Education Program: Develop a worker education program for implementation during new project construction and operation. The program would train workers on operating near sensitive wildlife habitat and features, sensitive wildlife periods, working around watercourses and riparian features, management of wildlife attractants, management of special status species, wildlife reporting, and wildlife mortality reporting.

Hab-7 – Retain Wildlife Trees where Practicable: Wildlife trees are trees with features that are especially beneficial to wildlife. These typically include living and dead trees that are decaying and those that have cavities or good conditions for cavity creation, sloughing bark that can provide roost sites for bats, branches for perching, basal cavities for denning, and foraging opportunities for woodpeckers and other wildlife. Wildlife trees would be retained where safe to do so.

Wild-10 – Access Management Plan: Develop an access management plan to manage human and predator access on the ROW.

Fish-5 – Delineate Riparian Management Zones: Delineate riparian management zones or buffers where certain activities (vegetation clearing or herbicide treatment) may be restricted.

Fish-7 – Work in Dry Conditions: Plan and schedule work in streams during dry conditions or when flows are anticipated to be at their lowest, when possible.

Fish-9 – Decontaminate All Gear: Control the spread of invasive species and diseases by minimizing work in areas known to support invasive plant species, and use decontamination procedures on all equipment and gear as specified for the species or disease.

Fish-13 – Use Bioengineering: Design stabilization structures to incorporate bioengineering principles; for example, use of living and nonliving plant materials in combination with natural and synthetic support material for slope stabilization, erosion reduction and vegetation establishment.

Fish-14 – Removal of Riparian Vegetation: Minimize disturbance to low-growing shrubs and grass species in riparian areas, or tree removal in steep gulches.

3.5.5 Probable Significant Adverse Environmental Impacts

Determining the significance of an adverse environmental impact involves consideration of context and intensity, which, in turn, depend on the magnitude and duration of the impact. "Significant" in SEPA means a reasonable likelihood of more than a moderate adverse environmental impact on environmental quality. An adverse environmental impact may also be significant if its chance of occurrence is not great, but the resulting impact would be severe if it occurred (WAC 197-11-794).

Identification of adverse environmental impacts and assignment of discipline-specific ratings are based on a structured evaluation consistent with the criteria outlined in WAC 197-11-330. Significance determinations consider the context and intensity of potential adverse environmental impacts, using both quantitative and qualitative information where appropriate. Professional expertise does not substitute for regulatory compliance. Regulatory requirements establish the baseline for environmental analyses and mitigation. Professional experience is used to supplement this baseline, providing additional insight to identify whether mitigation beyond what is required by regulation may be warranted. In cases where data are incomplete or unavailable, a conservative approach has been applied to ensure that potential adverse environmental impacts are not underestimated.

This Programmatic EIS weighs the potential adverse environmental impacts on vegetation resources that could result from transmission facilities after considering the application of laws and regulations; siting and design considerations, including agency guidance and BMPs; and Mitigation Strategies, and makes a resulting determination of significance for each impact. **Table 3.5-9** summarizes the adverse environmental impacts anticipated for the construction, operation and maintenance, upgrade, and modification of transmission facilities.

This Page Intentionally Left Blank

Table 3.5-9: Summary of Adverse Environmental Impacts, Mitigation Strategies, and Significance Rating for Vegetation Resources

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[(a)]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
Vegetation – Loss of Native Ecosystems and Plants	New Construction	Construction of a new transmission facility would result in the loss of vegetation, particularly forested and tall shrub-dominated ecosystems that cannot be maintained in the ROW, whether overhead or underground. The extent and permanence of the adverse environmental impact vary based on the ecosystem and the amount of clearing required for ROWs, access, and infrastructure. Many ecosystems characterized by low-growing vegetation may be compatible with revegetation in the ROW of underground or overhead transmission facilities, except forested and tall shrub-dominated ecosystems. However, overhead transmission facilities may be able to avoid disturbance to some low-growing vegetation, while underground transmission facilities would still require initial disturbance from excavation. Areas of vegetation lost in permanent infrastructure footprints for the transmission facility (e.g., permanent access roads) would be lost for the duration of the project. For forested and tall shrub-dominated ecosystems, the entire width of the ROW is anticipated to be lost.	**Overhead**: nil to high **Underground**: nil to high	▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-4:** Floodplains ▪ **AVOID-6:** Old-Growth and Mature Forests ▪ **AVOID-7:** Rare, Endangered, or Threatened Plant Species and Sensitive Ecosystems ▪ **AVOID-8:** Important Habitat ▪ **AVOID-19:** Wilderness Areas ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas ▪ **Geo-1:** Minimize Soil Disturbance ▪ **Geo-3:** Drainage Control ▪ **Geo-4:** Minimize Impacts on Sensitive Soils ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **W-4:** Store Chemicals, Operate Equipment, and Conduct Maintenance Away from Water ▪ **W-5:** Implement Erosion and Sediment Control Measures ▪ **W-6:** Minimize Hydrology Changes ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-3:** Decommission the Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-6:** Worker Education Program	Less than Significant	Focusing on the avoidance and minimization of direct impacts on native vegetation is most important for plants and ecological communities. While restoration-related measures can restore some ecosystems, they may not be able to provide the functions they once did before construction activities began. Some native plants are challenging to propagate and use in restoration, and for at-risk species, loss of individuals could be irreversible. However, it is expected that the implementation of BMPs, Avoidance Criteria, and Mitigation Measures would reduce adverse environmental impacts to a less than significant level.
	Operation and Maintenance	Operation and maintenance activities may cause temporary and permanent loss of vegetation resources and habitat beyond initial construction. Some disturbance to vegetation for maintenance work may be required for both overhead and underground transmission facilities. In addition, vegetation would be managed in the ROW for the life of the project. Maintenance may include mechanical removal, herbicide spraying, or other means to limit vegetation encroachment on the transmission facility. The extent and permanence of the adverse environmental impact vary depending on the ecosystem and the amount of clearing required for operation and maintenance.	**Overhead**: nil to low **Underground**: nil to low			
	Upgrade	Upgrading existing transmission facilities without increasing the disturbance footprint reduces the need for new land clearing and would minimize the potential for adverse environmental impacts to occur in comparison to new construction.	**Overhead**: nil to low **Underground**: nil to low			

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[a]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
		Native plants and ecosystems that exist within an existing ROW may be resilient to the disturbances associated with the operation and maintenance of a transmission facility. Since upgrades typically involve impacts similar to those of routine operation and maintenance, it is expected that this stage will minimize the potential for adverse environmental impacts compared to new construction.		▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Wild-10:** Access Management Plan ▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-9:** Decontaminate All Gear ▪ **Fish-13:** Use Bioengineering ▪ **Fish-14:** Removal of Riparian Vegetation		
	Modification	Modifying existing transmission facilities and utilizing existing ROWs reduces the need for extensive new development, thereby minimizing the potential for adverse environmental impacts to occur on vegetation in comparison to new construction. Additionally, native plants and ecosystems persisting within and adjacent to an existing ROW may be resilient to the type of disturbance associated with constructing and operating a transmission facility. Similarly, populations of plant priority species outside of new disturbance areas that have persisted along the ROW may have increased resilience.	**Overhead**: nil to high **Underground**: nil to high			
Vegetation – Fragmentation	New Construction	New construction of an overhead or underground transmission facility is anticipated to create new fragmentation in the landscape. This would increase the edge effects where previously intact ecosystems occurred. Constructing new transmission facility ROWs through natural ecosystems, particularly in tree- and shrub-dominated habitats, is expected to result in long-term changes to those ecosystems by creating smaller patches. Fragmentation of priority habitats such as shrubsteppe has been identified as a major threat.	**Overhead**: nil to high **Underground**: nil to high	▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-4:** Floodplains ▪ **AVOID-6:** Old-Growth and Mature Forests ▪ **AVOID-7:** Rare, Endangered, or Threatened Plant Species and Sensitive Ecosystems ▪ **AVOID-8:** Important Habitat ▪ **AVOID-19:** Wilderness Areas	Less than Significant	

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[(a)]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
	Operation and Maintenance	Fragmentation that occurred during construction would persist through the operation and maintenance stage, which can cause further degradation of the ecosystems and vegetation. The degree of adverse environmental impacts is dependent on the length of time that fragmentation persists and the vulnerability of the species or ecosystem.	**Overhead**: nil to medium **Underground**: nil to medium	▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas ▪ **Geo-1:** Minimize Soil Disturbance ▪ **Geo-3:** Drainage Control ▪ **Geo-4:** Minimize Impacts on Sensitive Soils ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **W-4:** Store Chemicals, Operate Equipment, and Conduct Maintenance Away from Water ▪ **W-5:** Implement Erosion and Sediment Control Measures ▪ **W-6:** Minimize Hydrology Changes ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-3:** Decommission the Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-6:** Worker Education Program ▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Wild-10:** Access Management Plan ▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-9:** Decontaminate All Gear ▪ **Fish-13:** Use Bioengineering ▪ **Fish-14:** Removal of Riparian Vegetation		Focusing on the avoidance and minimization of direct impacts on native vegetation is most important for plants and ecological communities. When direct impacts are avoided or minimized, fragmentation is avoided or minimized. The implementation of BMPs, Avoidance Criteria, and Mitigation Measures would reduce adverse environmental impacts on vegetation from fragmentation to a less than significant level.
	Upgrade	Plants and ecosystems that occur within an existing ROW may be resilient to the disturbances associated with the operation and maintenance of a transmission facility. Since upgrades typically involve impacts similar to those of routine operation and maintenance, it is expected that this stage will minimize the potential for adverse environmental impacts compared to new construction.	**Overhead**: nil to medium **Underground**: nil to medium			
	Modification	Although modifications to existing transmission facilities could extend the existing ROW for safety clearances, it is expected that these activities will primarily utilize the existing ROWs. Reusing, modifying, or enhancing existing transmission facilities and utilizing existing ROWs would reduce the need for extensive new development, thereby minimizing the potential for adverse environmental impacts to occur on vegetation in comparison to new construction.	**Overhead**: nil to high **Underground**: nil to high			

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[(a)]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
Vegetation – Degradation of Soil	New Construction	The construction of overhead and underground transmission facilities can lead to soil degradation in several ways. Compaction from heavy machinery reduces the amount of air and water pores in soil, while stockpiling can alter microbial communities and nutrient levels. Both negatively impact plant growth and ecosystem health. Additionally, new construction also often requires temporary access roads, which can compact the soil. Excavation for underground transmission facilities often involves digging trenches, which can compact the soil along the trench lines and adjacent areas.	**Overhead**: nil to medium **Underground**: low to high	▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-4:** Floodplains ▪ **AVOID-6:** Old-Growth and Mature Forests ▪ **AVOID-7:** Rare, Endangered, or Threatened Plant Species and Sensitive Ecosystems ▪ **AVOID-8:** Important Habitat ▪ **AVOID-19:** Wilderness Areas ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas ▪ **Geo-1:** Minimize Soil Disturbance ▪ **Geo-3:** Drainage Control ▪ **Geo-4:** Minimize Impacts on Sensitive Soils ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **W-4:** Store Chemicals, Operate Equipment, and Conduct Maintenance Away from Water ▪ **W-5:** Implement Erosion and Sediment Control Measures ▪ **W-6:** Minimize Hydrology Changes ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-3:** Decommission the Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration	Less than Significant	It is expected that the implementation of BMPs, such as soil aeration, geotextiles, and drainage systems, would address potential adverse impacts of soil degradation. Once the infrastructure is in place, the need for further compaction is minimal, reducing long-term impacts. With the implementation of Mitigation Measures, impacts related to soil degradation would be reduced to a less-than-significant level.
	Operation and Maintenance	Similar activities described for new construction can occur during the operation and maintenance stage, which could lead to soil degradation. However, it is expected that less heavy machinery will be needed during operation and maintenance, and most maintenance tasks can be performed with lighter equipment or by personnel on foot. Therefore, less disturbance and degradation of soil are anticipated during the operation and maintenance stage.	**Overhead**: nil to low **Underground**: nil to low			
	Upgrade	Upgrades may cause additional soil degradation through additional heavy equipment on-site or material storage at locations previously disturbed by the original project.	**Overhead**: nil to low **Underground**: nil to low			

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[a]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
	Modification	Similar impacts as new construction can lead to degradation of soil during the modification of existing transmission facilities. It is assumed that at least some of the area would have been previously disturbed during initial construction, minimizing new soil disturbance.	**Overhead**: nil to medium **Underground**: low to high	▪ **Hab-6:** Worker Education Program ▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Wild-10:** Access Management Plan ▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-9:** Decontaminate All Gear ▪ **Fish-13:** Use Bioengineering ▪ **Fish-14:** Removal of Riparian Vegetation		
Vegetation – Edge Effects	New Construction	The new construction of an overhead or underground transmission facility is anticipated to increase edge effects where previously intact ecosystems occurred. The creation of new transmission corridors through natural ecosystems, particularly in tree- and shrub-dominated habitats, is expected to result in long-term changes to those ecosystems. Edge effects can alter the biophysical conditions at the boundary between the natural ecosystem and the disturbed area, potentially changing microclimates, introducing invasive plants, and impacting community composition for hundreds of feet into adjacent habitats.	**Overhead**: nil to high **Underground**: nil to high	▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-4:** Floodplains ▪ **AVOID-6:** Old-Growth and Mature Forests ▪ **AVOID-7:** Rare, Endangered, or Threatened Plant Species and Sensitive Ecosystems ▪ **AVOID-8:** Important Habitat ▪ **AVOID-19:** Wilderness Areas ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas **Geo-1:** Minimize Soil Disturbance ▪ **Geo-3:** Drainage Control ▪ **Geo-4:** Minimize Impacts on Sensitive Soils ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **W-4:** Store Chemicals, Operate Equipment, and Conduct Maintenance Away from Water ▪ **W-5:** Implement Erosion and Sediment Control Measures	Less than Significant	Mitigation Measures applied to reach a less than significant rating focus on avoidance and minimization of direct impacts on native vegetation. These two steps in the mitigation hierarchy are most important for plants and ecological communities. When direct impacts are avoided or minimized, edge effects are avoided or minimized. The implementation of BMPs, Avoidance Criteria, and Mitigation Measures would further reduce the potential for edge effects to have adverse environmental impacts on vegetation.
	Operation and Maintenance	Operation and maintenance are anticipated to have fewer new disturbances compared to new construction. It is expected that edge effects would continue to be present during operation and maintenance for some ecosystems, such as forests and woodlands, while other ecosystems that are able to reestablish after construction would have minimal continued edge effects during the operation and maintenance stage. Depending on the vegetation type, some may be able to partially recover under the overhead transmission lines if they do not pose a risk to the transmission facility. Shrub or tree habitats cannot be established over underground transmission facilities and would have lasting edge effects throughout the life of the project.	**Overhead**: nil to low **Underground**: nil to low			

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[(a)]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
	Upgrade	Similar impacts as new construction may result from edge effects; however, upgrading existing transmission facilities is anticipated to use areas of existing disturbance from the initial construction, and new disturbance or edge effects would be limited.	**Overhead**: nil to low **Underground**: nil to low	▪ **W-6:** Minimize Hydrology Changes ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-3:** Decommission the Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-6:** Worker Education Program ▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Wild-10:** Access Management Plan ▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-9:** Decontaminate All Gear ▪ **Fish-13:** Use Bioengineering ▪ **Fish-14:** Removal of Riparian Vegetation		
	Modification	Modifying an existing transmission facility utilizes an area where edge effects have already occurred. It is anticipated that the width of the ROW or disturbance may increase, which could lead to an increase in dispersal distance, and the patch size may be reduced. However, it is anticipated that edge effects would already be impacting the adjacent ecosystems due to the existing transmission facility.	**Overhead**: nil to high **Underground**: nil to high			
Vegetation – Introduction or Spread of Invasive Plants or Noxious Weeds	New Construction	Construction activities, including the use of heavy machinery, excavating, and maintaining equipment, have the potential to introduce or spread invasive plants. Creating new ROW corridors for overhead or underground transmission facilities can facilitate the spread of invasive species by disturbing soil and vegetation, which allows them to outcompete and displace native plants.	**Overhead**: nil to high **Underground**: nil to high	▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-4:** Floodplains ▪ **AVOID-6:** Old-Growth and Mature Forests ▪ **AVOID-7:** Rare, Endangered, or Threatened Plant Species and Sensitive Ecosystems ▪ **AVOID-8:** Important Habitat ▪ **AVOID-19:** Wilderness Areas	Less than Significant	

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[a]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
	Operation and Maintenance	The operation and maintenance activities can lead to the introduction or spread of invasive species by being brought in on machinery, vehicles, or equipment. These adverse environmental impacts can spread from the construction site to adjacent areas, leading to the degradation of nearby ecosystems. However, native plants and ecosystems re-established within and adjacent to an existing ROW may be resilient to the type of disturbance associated with operating and maintaining the transmission facility. Therefore, fewer adverse environmental impacts are anticipated.	**Overhead**: nil to medium **Underground**: nil to medium	▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas ▪ **Geo-1:** Minimize Soil Disturbance ▪ **Geo-3:** Drainage Control ▪ **Geo-4:** Minimize Impacts on Sensitive Soils ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **W-4:** Store Chemicals, Operate Equipment, and Conduct Maintenance Away from Water ▪ **W-5:** Implement Erosion and Sediment Control Measures ▪ **W-6:** Minimize Hydrology Changes ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-3:** Decommission the Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-6:** Worker Education Program ▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Wild-10:** Access Management Plan ▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-9:** Decontaminate All Gear ▪ **Fish-13:** Use Bioengineering ▪ **Fish-14:** Removal of Riparian Vegetation		Mitigation Measures applied to reach a less than significant rating focus on the avoidance and minimization of direct impacts on native vegetation. These two steps in the mitigation hierarchy are most important for plants and ecological communities. When direct impacts are avoided and/or minimized, the potential for introducing invasive species is also minimized. The implementation of BMPs, Avoidance Criteria, and Mitigation Measures would further reduce the potential for the introduction or spread of invasive plants or noxious weeds to have adverse environmental impacts on vegetation.
	Upgrade	Potential sources for the introduction and spread of invasive species are similar to new construction; however, given past disturbance from the original construction, sources of invasive plants may already be existing, or native plants and ecosystems that have been re-established could be resilient to the disturbances associated with the operation and maintenance of a transmission facility.	**Overhead**: nil to medium **Underground**: nil to medium			
	Modification	Potential sources for the introduction and spread of invasive species are similar to new construction; however, given past disturbance from the original construction, sources of invasive plants may already exist within or adjacent to the transmission facility ROW. Additionally, re-established native plants and ecosystems may be resilient to the type of disturbance associated with the new construction and maintenance of a transmission facility. Similarly, populations of plant priority species outside of new disturbance areas that have persisted along the ROW may have increased resilience.	**Overhead**: nil to high **Underground**: nil to high			

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[(a)]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
Vegetation – Surface Runoff	New Construction	Exposed soil from the new construction of overhead and underground transmission facilities can lead to sediment runoff that alters the movement and deposition of sediment, which could impact soil quality and vegetation in the surrounding area. Sedimentation could alter hydrology by blocking flow channels, which could impact ecosystems that depend on hydrological connections, such as wetlands.	**Overhead**: nil to high **Underground**: nil to high	▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-4:** Floodplains ▪ **AVOID-6:** Old-Growth and Mature Forests ▪ **AVOID-7:** Rare, Endangered, or Threatened Plant Species and Sensitive Ecosystems ▪ **AVOID-8:** Important Habitat ▪ **AVOID-19:** Wilderness Areas ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas **Geo-1:** Minimize Soil Disturbance ▪ **Geo-3:** Drainage Control ▪ **Geo-4:** Minimize Impacts on Sensitive Soils ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **W-4:** Store Chemicals, Operate Equipment, and Conduct Maintenance Away from Water ▪ **W-5:** Implement Erosion and Sediment Control Measures ▪ **W-6:** Minimize Hydrology Changes ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-3:** Decommission the Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-6:** Worker Education Program ▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Wild-10:** Access Management Plan ▪ **Fish-5:** Delineate Riparian Management Zones	Less than significant	Mitigation Measures applied to reach a less than significant rating focus on the avoidance and minimization of direct impacts on native vegetation. These two steps in the mitigation hierarchy are most important for plants and ecological communities. When direct impacts are avoided and/or minimized, the potential for surface runoff is also minimized. The implementation of BMPs, Avoidance Criteria, and Mitigation Measures would further reduce the potential for surface runoff to have adverse environmental impacts on vegetation.
	Operation and Maintenance	Sources of exposed soil during operation and maintenance of overhead and underground transmission facilities may result from activities associated with using unpaved roads required for access, temporary or permanent clearing areas required for repairs, and excavated or stockpiled material required to access buried infrastructure. Exposed soil from transmission facilities can lead to sediment runoff that negatively impacts surrounding ecosystems by altering soil quality, reducing vegetation growth, and disrupting water flow. The risk of surface runoff during operation and maintenance is anticipated to be lower than that of new construction due to smaller areas of exposed soil anticipated at any given time.	**Overhead**: nil to medium **Underground**: nil to medium			
	Upgrade	Surface runoff during the upgrade of overhead and underground transmission facilities may require minor construction works to replace infrastructure or upgrade conductors. However, these activities are not expected to cause exposed soils or surface runoff since upgrading existing transmission facilities would not be expected to increase the disturbance footprint.	**Overhead**: nil to medium **Underground**: nil to medium			
	Modification	Surface runoff during the modification of overhead and underground transmission facilities can occur due to heavy equipment and temporary or additional permanent vegetation clearing and soil disturbance. Exposed soil can lead to sediment runoff that negatively impacts surrounding ecosystems by altering soil quality, reducing vegetation growth, and disrupting water flow.	**Overhead**: nil to high **Underground**: nil to high			

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[(a)]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
				▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-9:** Decontaminate All Gear ▪ **Fish-13:** Use Bioengineering ▪ **Fish-14:** Removal of Riparian Vegetation		
Vegetation – Impacts from Increased Dust	New Construction	The new construction of overhead and underground transmission facilities could increase ambient dust from site preparation and clearing activities, excavation, and concrete works. In addition, vehicles and equipment moving along temporary and permanent access roads could increase dust, as these roads are typically unpaved. Increased ambient dust can travel substantial distances, negatively impacting adjacent vegetation by settling on plants, which reduces photosynthesis and chlorophyll content, and ultimately impacts plant vigor and leaf growth.	**Overhead**: nil to low **Underground**: nil to low	▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-4:** Floodplains ▪ **AVOID-6:** Old-Growth and Mature Forests ▪ **AVOID-7:** Rare, Endangered, or Threatened Plant Species and Sensitive Ecosystems ▪ **AVOID-8:** Important Habitat ▪ **AVOID-19:** Wilderness Areas ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas ▪ **Geo-1:** Minimize Soil Disturbance ▪ **Geo-3:** Drainage Control ▪ **Geo-4:** Minimize Impacts on Sensitive Soils ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **W-4:** Store Chemicals, Operate Equipment, and Conduct Maintenance Away from Water ▪ **W-5:** Implement Erosion and Sediment Control Measures ▪ **W-6:** Minimize Hydrology Changes ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-3:** Decommission the Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration	Less than Significant	Mitigation Measures applied to reach a less than significant rating focus on the avoidance and minimization of direct impacts on native vegetation. These two steps in the mitigation hierarchy are most important for plants and ecological communities. When direct impacts are avoided and/or minimized, the potential for dust is also minimized. The implementation of BMPs, Avoidance Criteria, and Mitigation Measures would further reduce the potential for increased dust to have adverse environmental impacts on vegetation.
	Operation and Maintenance	During the operation and maintenance of overhead and underground transmission facilities, an increase in ambient dust can occur from vehicles and equipment moving along unpaved access roads. Increased ambient dust and dust settling onto nearby vegetation could impact plant growth and habitat health. During the operation and maintenance of overhead and underground transmission facilities, dust generation would likely be less than during construction, as fewer vehicles and equipment would be moving along the road, and less overall disturbance would occur.	**Overhead**: nil to low **Underground**: nil to low			
	Upgrade	The upgrade of overhead and underground transmission facilities may require minor construction works to replace infrastructure or upgrade conductors, which could lead to increased dust. Construction activities associated with upgrades would generally result in fewer or less impactful adverse environmental impacts due to minimized disturbance, utilization of existing infrastructure, and the potential for increased vegetation resiliency within an existing ROW.	**Overhead**: nil to low **Underground**: nil to low			

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[a]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
	Modification	The modification of overhead and underground transmission facilities may lead to increased dust. However, construction activities associated with modifying existing transmission facilities would generally result in fewer or less impactful adverse environmental impacts due to minimized disturbance, utilization of existing infrastructure, and the potential for increased vegetation resiliency within an existing ROW.	**Overhead**: nil to low **Underground**: nil to low	▪ **Hab-6:** Worker Education Program ▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Wild-10:** Access Management Plan ▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-9:** Decontaminate All Gear ▪ **Fish-13:** Use Bioengineering ▪ **Fish-14:** Removal of Riparian Vegetation		
Vegetation – Introduction of Hazardous Materials	New Construction	Accidental spills of hazardous substances, such as oil or fuel, can occur during the new construction of overhead and underground transmission facilities. These activities could include those related to the refueling of vehicles and equipment, vehicle and equipment maintenance, and concrete mixing. These activities can lead to direct mortality of vegetation or plant priority species, loss of vigor, and increased susceptibility to pathogens. Hazardous materials can block stomata, resulting in adverse environmental impacts on photosynthesis, thermal stress, and oxidative stress. Hazardous spills can also degrade soil quality, which reduces the availability of essential resources for plant growth.	**Overhead**: nil to medium **Underground**: nil to high	▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-4:** Floodplains ▪ **AVOID-6:** Old-Growth and Mature Forests ▪ **AVOID-7:** Rare, Endangered, or Threatened Plant Species and Sensitive Ecosystems ▪ **AVOID-8:** Important Habitat ▪ **AVOID-19:** Wilderness Areas ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas ▪ **Geo-1:** Minimize Soil Disturbance ▪ **Geo-3:** Drainage Control ▪ **Geo-4:** Minimize Impacts on Sensitive Soils ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **W-4:** Store Chemicals, Operate Equipment, and Conduct Maintenance Away from Water	Less than Significant	Mitigation Measures applied to reach a less than significant rating focus on the avoidance and minimization of direct impacts on native vegetation. These two steps in the mitigation hierarchy are most important for plants and ecological communities. When direct impacts are avoided and/or minimized, the potential for spills of hazardous substances is also minimized. The implementation of BMPs, Avoidance Criteria, and Mitigation Measures would further reduce the potential for hazardous materials to have adverse environmental impacts on vegetation.
	Operation and Maintenance	Hazardous substances such as synthetic lubricants, hydraulic fluids, and diesel fuel may be present as part of ongoing maintenance activities, including refueling and equipment servicing. These spills can result in similar impacts as those described for the new construction of overhead and underground transmission facilities. The risk of hazardous materials being introduced during the operation and maintenance of overhead and underground transmission facilities is anticipated to be lower than that of new construction.	**Overhead**: nil to low **Underground**: nil to medium			

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[(a)]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
	Upgrade	The upgrade of overhead and underground transmission facilities may require minor construction works to replace infrastructure or upgrade conductors, which have the potential for spills or leaks of hazardous materials. Activities associated with upgrades would generally result in fewer or less impactful adverse environmental impacts due to minimized disturbance and utilization of existing infrastructure.	**Overhead**: nil to low **Underground**: nil to medium	▪ **W-5:** Implement Erosion and Sediment Control Measures ▪ **W-6:** Minimize Hydrology Changes ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-3:** Decommission the Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-6:** Worker Education Program ▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Wild-10:** Access Management Plan ▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-9:** Decontaminate All Gear ▪ **Fish-13:** Use Bioengineering ▪ **Fish-14:** Removal of Riparian Vegetation		
	Modification	The modification of overhead and underground transmission facilities has the potential for spills or leaks of hazardous materials similar to those described for new construction.	**Overhead**: nil to medium **Underground**: nil to high			
Vegetation – Increased Fire Risk	New Construction	The use of equipment and the potential for sparks from transmission facilities carries a risk of starting wildfires, which can lead to the widespread loss of vegetation and ecosystems, changes to ecosystem structure and succession, large releases of carbon and nutrients to the soil, and potential for the spread of invasive species.	**Overhead**: nil to high **Underground**: nil to high	▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-4:** Floodplains ▪ **AVOID-6:** Old-Growth and Mature Forests ▪ **AVOID-7:** Rare, Endangered, or Threatened Plant Species and Sensitive Ecosystems ▪ **AVOID-8:** Important Habitat ▪ **AVOID-19:** Wilderness Areas	Less than Significant	The implementation of BMPs, Avoidance Criteria, and Mitigation Measures would further reduce the potential for increased fire risk to have adverse environmental impacts on vegetation.

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[a]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
	Operation and Maintenance	The use of equipment and the potential for sparks from the operation and maintenance of overhead and underground transmission facilities would be less than during new construction. Therefore, the risk of starting wildfires is expected to be lower. However, the impacts, should one occur, would result in similar impacts as those described for new construction.	**Overhead**: nil to high **Underground**: nil to high	▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas ▪ **Geo-1:** Minimize Soil Disturbance ▪ **Geo-3:** Drainage Control ▪ **Geo-4:** Minimize Impacts on Sensitive Soils ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **W-4:** Store Chemicals, Operate Equipment, and Conduct Maintenance Away from Water ▪ **W-5:** Implement Erosion and Sediment Control Measures ▪ **W-6:** Minimize Hydrology Changes ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-3:** Decommission the Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-6:** Worker Education Program ▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Wild-10:** Access Management Plan ▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-9:** Decontaminate All Gear ▪ **Fish-13:** Use Bioengineering ▪ **Fish-14:** Removal of Riparian Vegetation		
	Upgrade	The use of equipment and the potential for sparks from the upgrade of existing transmission facilities would be less than during new construction. Therefore, the risk of starting wildfires is expected to be lower. However, the impacts, should one occur, would result in similar impacts as those described for new construction.	**Overhead**: nil to high **Underground**: nil to high			
	Modification	The use of equipment and the potential for sparks from the modification of existing transmission facilities would be less than during new construction. Therefore, the risk of starting wildfires is expected to be lower. However, the impacts, should one occur, would result in similar impacts as those described for new construction.	**Overhead**: nil to high **Underground**: nil to high			

Notes:

[a] Appendix 3.1-1 provides a detailed listing of each Mitigation Strategy. This appendix serves as a reference section that can be consulted independently of the main text. This is particularly useful for detailed guidance and technical specifications that may be referred to multiple times. Additionally, including this information in an appendix allows for easier updates and revisions. If Mitigation Strategies or guidance changes, the appendix can be updated without altering the main content.

BMPs = Best management practices; **ROW** = right-of-way

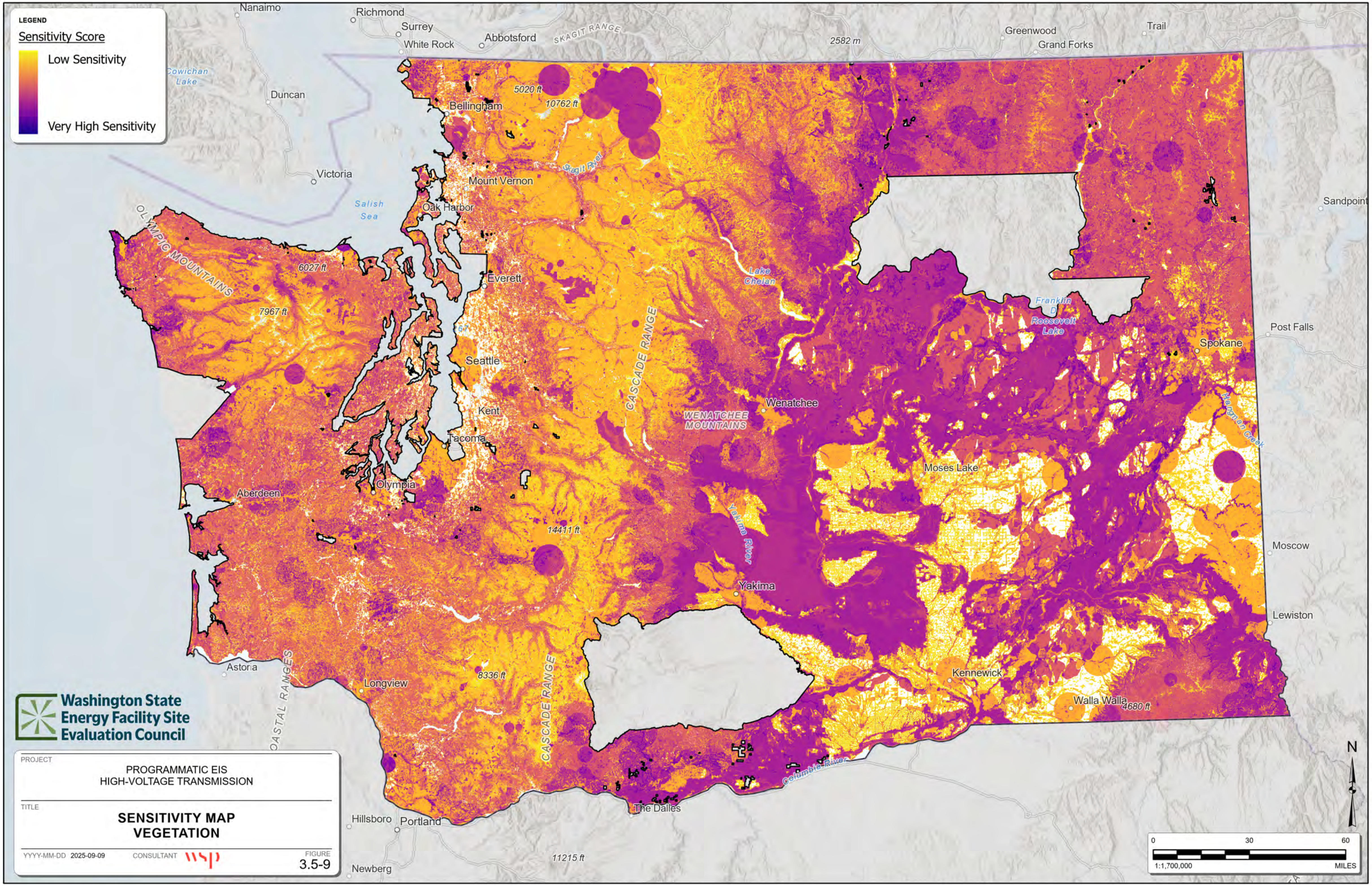
3.5.6 Environmental Sensitivity Map

Project-specific applications require a comprehensive analysis to identify the site-specific adverse environmental impacts on resources and determine the suitability of this Programmatic EIS. Environmental review may be phased by incorporating relevant information from this Programmatic EIS by reference while evaluating site-specific adverse environmental impacts of individual project applications. For more information on phased reviews, please refer to Chapter 1, Introduction.

Each project-specific application would include details about the proposal's location and site-specific conditions. This Programmatic EIS provides environmental sensitivity maps that, when used alongside project-specific data, could support more informative and efficient environmental planning. An online mapping tool has also been developed to provide public access to the most current data used in creating these environmental sensitivity maps.

Figure 3.5-9 presents the environmental sensitivity map for vegetation, identifying areas of varying sensitivity based on the siting criteria described in the following sections.

This Page Intentionally Left Blank



Washington State Energy Facility Site Evaluation Council

PROJECT
PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE
SENSITIVITY MAP
VEGETATION

YYYY-MM-DD 2025-09-09 CONSULTANT wsp FIGURE 3.5-9

This Page Intentionally Left Blank

3.5.6.1 Environmental Sensitivity Map Criteria Cards

The environmental sensitivity map evaluates various siting criteria and assigns sensitivity levels to geographic areas based on their potential for adverse environmental impacts, as analyzed in this Programmatic EIS. Each criterion was assigned a sensitivity level (1, 2, or 3), with Level 3 representing the highest sensitivity. Criteria cards illustrate the spatial extent of the siting criteria chosen. A summary of the criteria cards is provided below. Appendix 3.1-2 details the data preparation process for the criteria cards.

Unlike other resource sections, criteria cards are presented from higher to lower sensitivity because lower sensitivity areas often represent setbacks adjacent to higher sensitivity areas. This organization ensures that the most environmentally critical areas are identified first, providing a clearer context for interpreting surrounding lower-sensitivity areas.

Sensitive Ecosystems and Species at Risk – Sensitivity Level 3

Figure 3.5-10 illustrates the spatial extent of LANDFIRE areas considered to be highly sensitive, various species and habitats listed in the WDFW PHS database, current rare and imperiled species and plant communities as cataloged by the WNHP, natural area preserves, natural resource conservation areas, and “core areas” and “corridors” mapped by the WSRRI within Dry (Xeric), Wet (Mesic), and greater sage-grouse priority areas (BLM and USFS 2024; WDFW 2024d, 2025b; DNR 2025b, 2025c). The PHS habitat included in this criteria were the Oregon white oak, the Columbia Plateau Regional Biodiversity Areas and Corridors, PHS-listed palustrine wetlands plus a 300-foot buffer, cave or cave-rich locations plus a 100-foot buffer, and PHS regions classified as “Caves Or Cave-rich Areas,” “Biodiversity Areas And Corridor,” “Inland Sand Dunes,” “Aspen Stands,” “Wetlands,” and “Old-growth/mature Forest” (WDFW 2024e).

This category includes priority habitats and species, as well as highly sensitive ecological communities from the LANDFIRE database. Highly sensitive ecological communities included those groups in the LANDFIRE database where the ecological communities comprising the group were predominantly rated as S1 or S2 by NatureServe. S1 and S2 rankings indicate ecosystems and species that are at risk of extinction and incompatible with disturbance, such as transmission facilities. Priority habitats have been identified as at-risk. The most sensitive included those that are generally incompatible with transmission facilities and would be challenging or impossible to restore, those that would have a long time lag before the ecosystem is restored to its previous condition, and those that protect areas of high biodiversity. Highly sensitive species include those identified by the WNHP current database.

Sensitive Ecosystems and Species at Risk – Sensitivity Level 2

Figure 3.5-11 illustrates the spatial extent of LANDFIRE areas considered to be moderately sensitive, historical rare and imperiled species and plant communities as cataloged by the WNHP, and "growth opportunity areas" mapped by the WSRRI within the Dry (Xeric), Wet (Mesic), greater sage-grouse ecosystem priority area (BLM and USDA 2024; DNR 2025d; WDFW 2025b). The PHS habitat and species included in this criterion were PHS Shrubsteppe, PHS Eastside steppe, and regions categorized as "Herbaceous Bald," "Juniper Savannah," "Talus Slopes," "Prairie," and "Cliffs/bluffs" (WDFW 2024e).

Moderately sensitive groups from the LANDFIRE database were those groups that predominantly contained ecological communities ranked as S3 by NatureServe, which are ecosystems or species at a reduced risk of extinction. It also included those ecological communities where there are uncertainties regarding status or current extent, or have already been identified as extinct, so are considered unlikely to occur (e.g., rankings by NatureServe of SU, SH, SNR, or SX). Within the priority habitats, moderately sensitive ecosystems include those that do not have a long-term lag to be restored and can be restored within transmission facility ROWs. Moderately sensitive species include those identified in the WNHP historic database.

Fragmentation of High Sensitivity Areas – Sensitivity Level 2

Figure 3.5-12 illustrates a "ring buffer" from 0 to 775 feet around the furthest extent of PHS datasets classified as "Sensitivity Level 3" and excluding the internal area of the dataset itself. These PHS datasets include Oregon white oak, the Columbia Plateau Regional Biodiversity Areas and Corridors, a 300-foot buffer around PHS-listed Palustrine wetlands, a 100-foot buffer around cave or cave-rich locations, and PHS regions classified as caves or cave-rich areas, biodiversity areas and corridors, inland sand dunes, aspen stands, wetlands, or old-growth and mature forest (WDFW 2024e).

Maintaining buffers around sensitive ecosystems and species minimizes the risk of indirect impacts and fragmentation. In addition, intact buffers provide corridors for species between existing habitat patches. Edge effects from the anthropogenic disturbance can extend from 25 to 775 feet, can result in changes to microclimatic conditions such as soil moisture, and can facilitate the spread of invasive plants (Bentrup 2008).

Sensitive Ecosystems and Species at Risk – Sensitivity Level 1

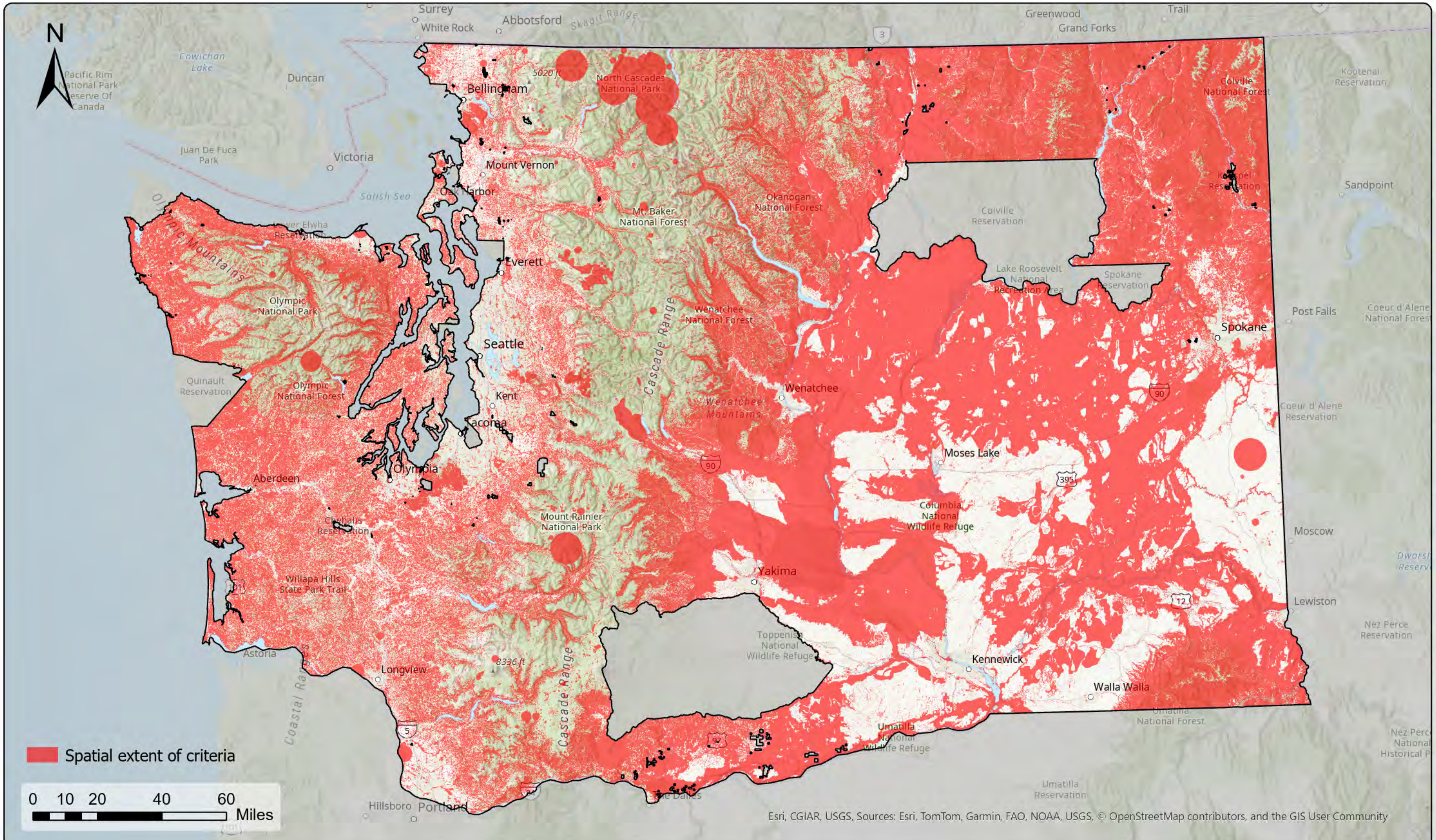
Figure 3.5-13 illustrates the spatial extent of LANDFIRE areas considered low sensitivity, along with "other habitat areas" mapped by the WSRRI within Dry (Xeric), Wet (Mesic), and greater sage-grouse priority ecosystem areas (BLM and USFS 2024, WDFW 2025b). Also included in this criterion is a "ring buffer" from 0 to 775 feet around the further extent of PHS datasets classified as "Sensitivity Level 2" and excluding the internal area of the dataset itself. These PHS datasets include PHS Shrubsteppe, PHS Eastside steppe, and PHS regions categorized as "Herbaceous Bald," "Juniper Savannah," "Talus Slopes," "Prairie," and "Cliffs/bluffs" (WDFW 2024e). This category also includes "'other habitat'" identified by WSRRI for Dry (Xeric), Wet (Mesic), and greater sage-grouse ecosystem priority areas.

This criterion includes natural vegetated areas that are not currently considered at risk. Low-sensitivity native ecosystems in the LANDFIRE database include those groups in which most ecological communities are rated by NatureServe as S4 and S5, which indicate the ecosystem is apparently secure or secure. Natural vegetation areas are important habitats for wildlife and plant species. Preserving intact natural areas is important to conserve species and to minimize the chance of these ecosystem types becoming at risk.

This Page Intentionally Left Blank

Sensitive Ecosystems and Species at Risk – Sensitivity Level 3

Washington State Energy Facility Site Evaluation Council



VEGETATION

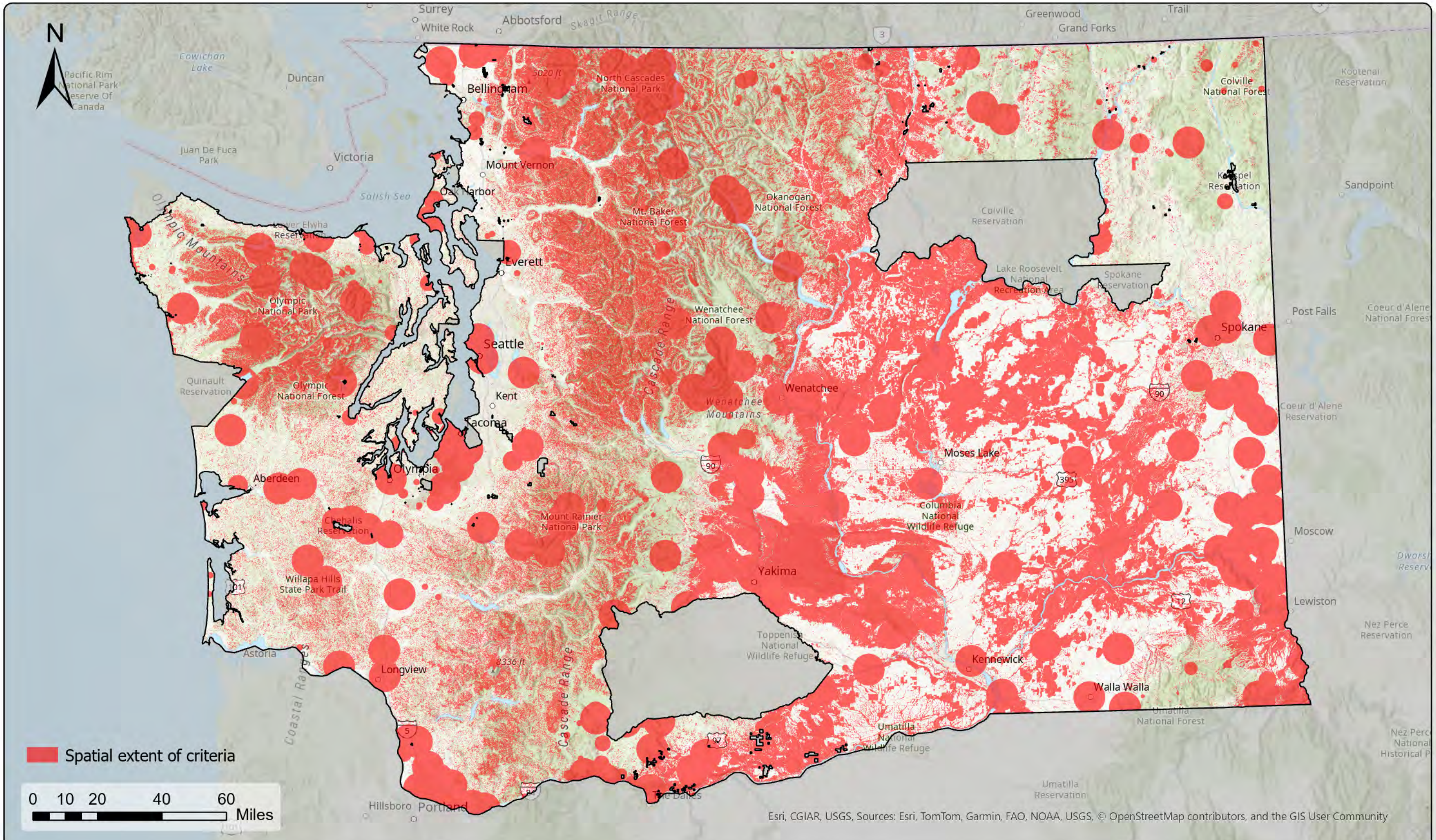
wsp

Figure 3.5-10

This Page Intentionally Left Blank

Sensitive Ecosystems and Species at Risk – Sensitivity Level 2

Washington State Energy Facility Site Evaluation Council



VEGETATION

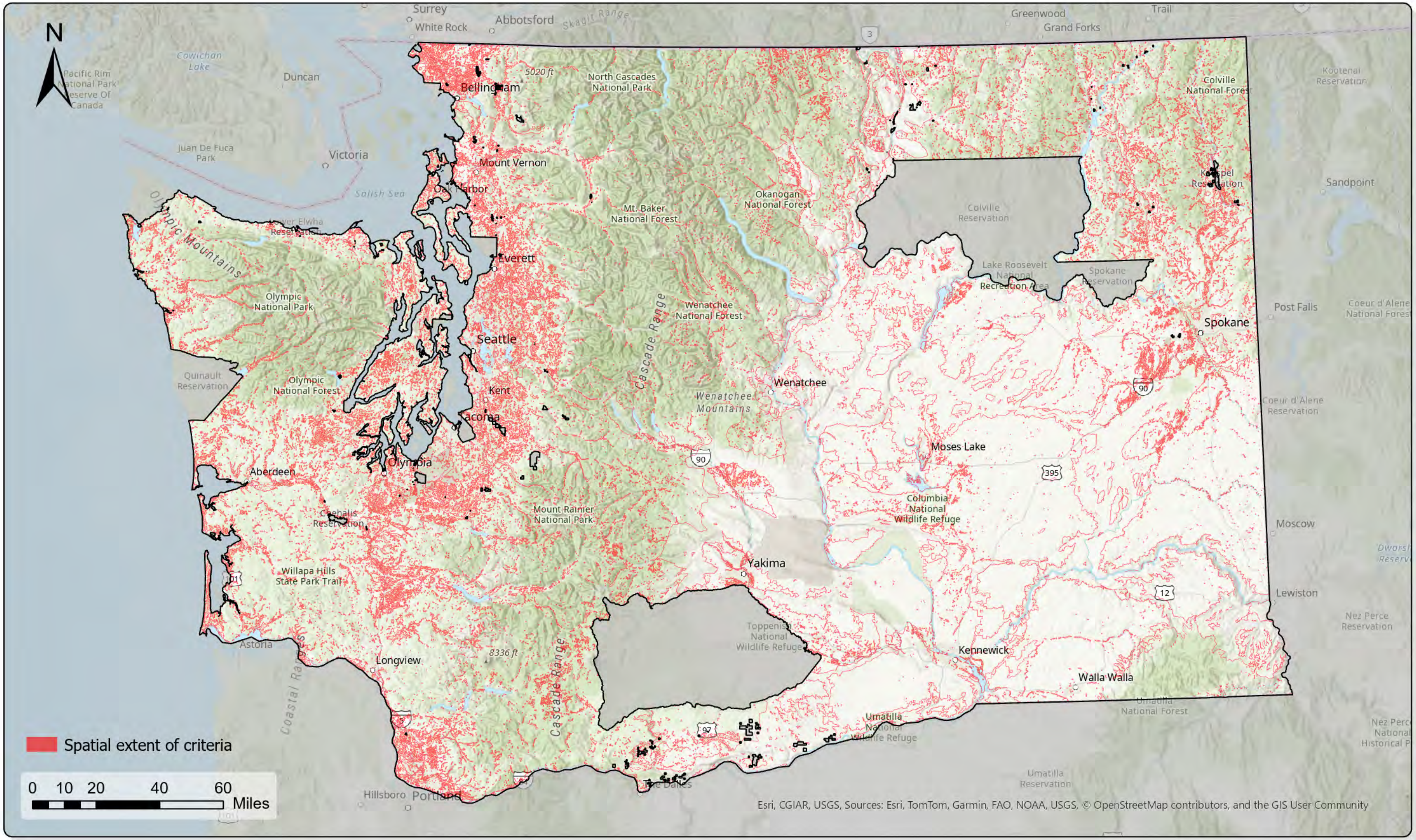
wsp

Figure 3.5-11

This Page Intentionally Left Blank

Fragmentation of High Sensitivity Areas – Sensitivity Level 2

Washington State Energy Facility Site Evaluation Council



VEGETATION

wsp

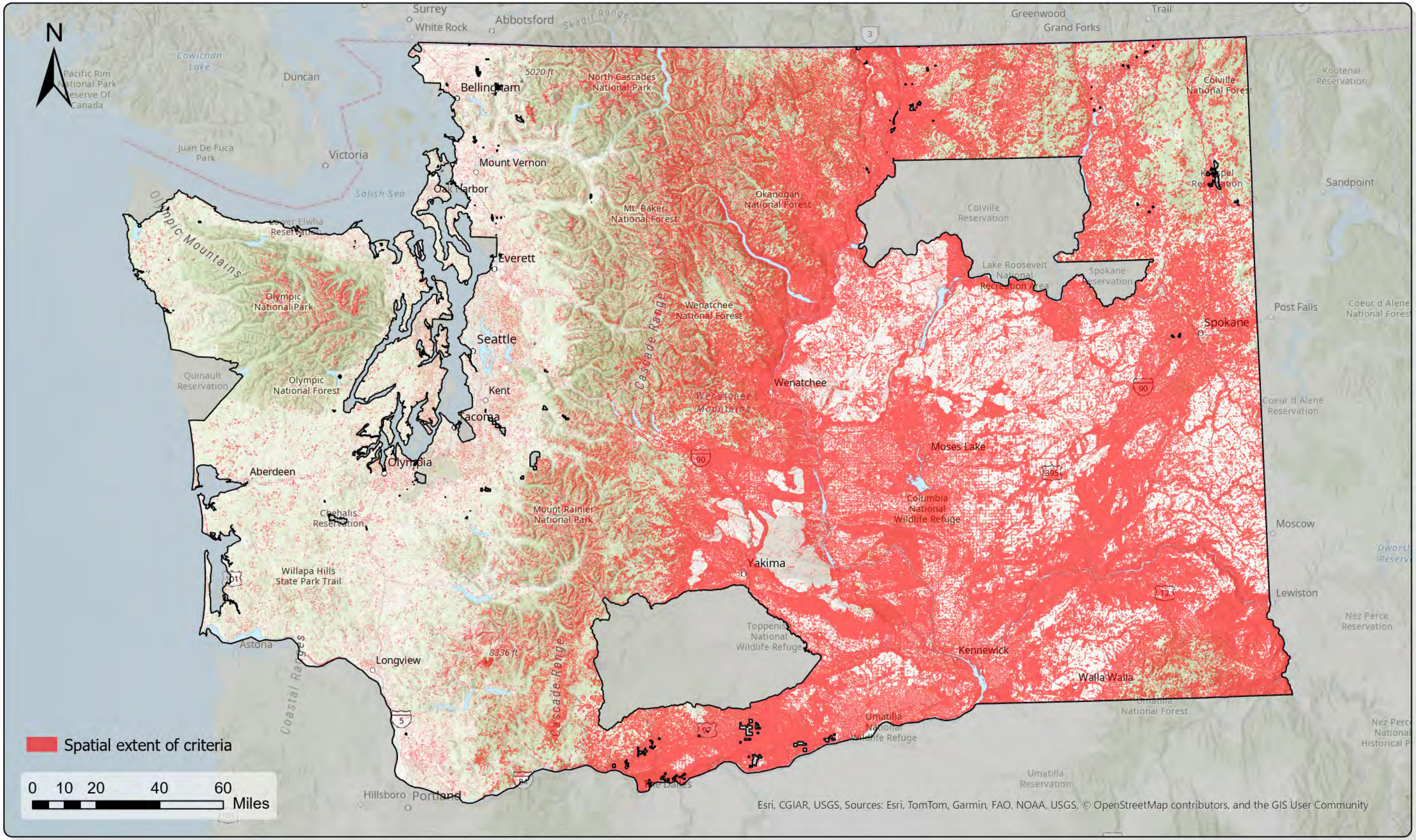
Figure 3.5-12

This Page Intentionally Left Blank

Sensitive Ecosystems and Species at Risk – Sensitivity Level 1

Washington State Energy Facility Site Evaluation Council

VEGETATION



wsp

Figure 3.5-13

This Page Intentionally Left Blank