3.6 Habitat, Wildlife, and Fish

This Programmatic Environmental Impact Statement (EIS) considers the adverse environmental impacts on habitat, wildlife, and fish 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 3.6.1 identifies regulatory, siting, and design considerations.
- Section 3.6.2 describes the affected environment.
- Section 3.6.3 describes the adverse environmental impacts.
- Section 3.6.4 describes Mitigation Measures.
- Section 3.6.5 identifies probable significant adverse environmental impacts on habitat, wildlife, and fish.
- Section 3.6.6 provides an environmental sensitivity map and criteria weighting for the siting of transmission facilities as it relates to habitat, wildlife, and fish, based on the identified considerations, adverse environmental impacts, and Mitigation Strategies.

3.6.1 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 analysis and mitigation. The federal, state, and local laws and regulations that apply to habitat, wildlife, and fish are summarized in **Table 3.6-1**.

Table 3.6-1: Laws and Regulations for Habitat, Wildlife, and Fish

Applicable Legislation	Agency	Summary Information
16 USC § 668 – Bald and Golden Eagle Protection Act	U.S. Fish and Wildlife Service	This act prohibits the take[1] of bald or golden eagles and their feathers, nests, eggs, or other parts, without a permit. See CFR 50 § 22.260 for information on eagle take permits.[2]
50 CFR § 22.260 – Permits for incidental take[3] of eagles by power lines	U.S. Fish and Wildlife Service	Transmission facility developers who have taken the required steps to reduce eagle mortalities resulting from transmission lines can apply for a permit to allow incidental eagle take. Application documents are specified under § 22.260; they must be submitted to the USFWS and include the total number of miles of transmission line, the state and county where it would be located, and the length or number of poles to be placed in areas with high risk of eagle collisions. Applicants must also include a collision response strategy,[4] a proactive retrofit strategy,[5] a shooting response strategy,[6] and a reactive retrofit strategy.[7]
16 USC §§ 1531–1544 – The Endangered Species Act	U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration - National Marine Fisheries Service	This act provides for the conservation of endangered and threatened species (including subspecies, varieties, and subpopulations) listed under the act and protects the habitats on which they rely. Incidental take permits[8] 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[9] must accompany an application for an incidental take permit.

[1] To harass, hunt, capture, kill an animal.

[2] A permit which can be applied for by proponents who have projects that may result in the incidental injury or killing of bald and golden eagles. This permit is issued to proponents who prove they meet the best practices for reducing eagle mortality, and who have created a Collision Response Strategy, A Proactive Retrofit Strategy, a Reactive Retrofit Strategy, and a Shooting Response Strategy.

[3] An unintentional, but not unexpected, take of a protected species.

[4] Describes how the permittee will identify eagle collision occurrences, identify factors that could have led to the collision, and implement risk-reduction measures.

[5] This plan developed by proponents will identify infrastructure which is not avian safe and include a timeline and strategy on how to retrofit it in an avian safe manner. More information can be found here: https://www.ecfr.gov/current/title-50/chapter-I/subchapter-B/part-22/subpart-E/section-22.260

[6] A plan developed by proponents to monitor eagle mortality and identify if shooting is the suspected cause, and if so to identify reduction measures and inform law enforcement. More information can be found here: https://www.ecfr.gov/current/title-50/chapter-I/subchapter-B/part-22/subpart-E/section-22.260

[7] This plan developed by proponents will identify measures that the proponent will take to identify and detect eagles that have been electrocuted. If an eagle is found, the pole that caused its mortality must be retrofitted unless it is already avian safe. More information can be found here: https://www.ecfr.gov/current/title-50/chapter-I/subchapter-B/part-22/subpart-E/section-22.260

[8] A permit that allows the accidental mortality or injury of a protected animal species if the permittee is taking the required steps to mitigate risk of such an occurrence.

[9] A plan developed by proponents to conserve the habitat of a species at risk if their project is expected to cause incidental take of the species.

Applicable Legislation	Agency	Summary Information
16 USC §§ 703–712 – Migratory Bird Treaty Act	U.S. Fish and Wildlife Service	This act prohibits taking (killing, capturing, selling, trading, and transporting) migratory bird species. Permits under the Migratory Bird Treaty Act are described under Part 21 of the act. This part describes the conditions under which the USFWS may consider permits.
33 USC § 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[10] 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 EPA the authority to issue water quality certifications, which are required for federal discharge permits[11] 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.
RCW 77, Fish and Wildlife	Washington Department of Fish and Wildlife[(d)]	This chapter provides the revised and reorganized game code of Washington State as of 1980 and clarifies and improves the administration of the state's game laws.

[10] 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).

[11] 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
RCW 77.55, Construction Projects in State Waters	Washington Department of Fish and Wildlife(d)	Under state law, a Hydraulic Project Approval from WDFW would be required prior to any activity that would divert, obstruct, or change the natural flow or bed of state waters. Bed is defined as the land below the ordinary high-water lines of state waters.
RCW 77.65.420, Wild Salmonid Policy	Washington Department of Fish and Wildlife(d)	This policy regulates the protection, management, and production of wild salmonids[12] in Washington.
RCW 90.48, Water Pollution Control Act	Washington State Department of Ecology(d)	This chapter establishes the legal framework for protecting water quality in Washington. This policy aims to maintain the highest standard for Waters of the State[13] to protect public health, public enjoyment, wildlife, birds, fish, and aquatic life, as well as support industrial development.
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. 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

[12] Belonging to the family Salmonidae such as salmon or trout.
[13] All salt and fresh waters that are waterward of the ordinary high water line and within the territorial boundaries of the state. This includes lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the state's jurisdiction.

Applicable Legislation	Agency	Summary Information
		▪ Washington State Ocean Resources Management Act and Ocean Management Guidelines ▪ The Marine Spatial Plan for Washington's Pacific Coast
WAC 173-201A, Water Quality Standards for Surface Waters of the State of Washington	Washington State Department of Ecology[d]	This chapter establishes surface water quality standards for State of Washington surface waters that are consistent with public health standards, recreational use, and the protection of fish and wildlife. Surface waters include lakes, rivers, streams, ponds, wetlands, inland waters, and saltwater.
WAC 220-610, State and Protected Species	Washington Department of Fish and Wildlife[d]	This regulation provides protection to state-listed species. It provides special protection for bald eagles only when they are listed as threatened or endangered in the state.
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 permit 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 2008)	Washington Department of Fish and Wildlife[d]	Priority habitats are unique habitats or features that support biodiversity. WDFW maintains a catalogue of priority habitats and species that are a priority for conservation and management. Priority species require protection due to decreasing population trends, sensitivity to disturbance and habitat alteration, or importance to communities.
Applicable local legislation	Local governments	Different towns, cities, counties, and other local governments may have specific legislation relevant to wildlife, habitat, trees, riparian setbacks, or vegetation protection. Proper permits and authorizations must be obtained in each local jurisdiction.

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 EPA, Ecology, or some Tribes.

Table 3.6-1 Notes (cont.)

[d] The agency responsible for administering most permits or authorizations for the identified regulation. However, if EFSEC is determined to be the lead agency, 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.

CFR = Code of Federal Regulations; **CWA** = Clean Water Act; **Ecology** = Washington State Department of Ecology; **EFSEC** = Energy Facility Site Evaluation Commission; **EIS** = Environmental Impact Statement; **EPA** = U.S. Environmental Protection Agency; **JARPA** = Joint Aquatic Resource Permit Application; **NPDES** = National Pollutant Discharge Elimination System; **RCW** = Revised Code of Washington; **SEPA** = State Environmental Policy Act; **USC** = United States Code; **USFWS** = U.S. Fish and Wildlife Service; **WAC** = Washington Administrative Code; **WDFW** = Washington Department of Fish and Wildlife

The siting of transmission facilities is determined by engineering, technical, environmental, and socioeconomic factors. **Table 3.6-2** summarizes guidance documents and management plans that outline the design considerations and BMPs generally used to avoid or minimize adverse environmental impacts on habitat, wildlife, and fish.

Table 3.6-2: Siting and Design Considerations for Habitat, Wildlife, and Fish

Siting and Design Consideration[a]	Description
Management Recommendations for Washington's Priority Species (MRWPS): Ferruginous Hawk (Watson and Azerrad 2024)	This guidance provides management recommendations for ferruginous hawks in Washington.
MRWPS: Western Gray Squirrel (Linders et al. 2010)	This guidance provides management recommendations for western gray squirrels in Washington.
MRWPS: Great Blue Heron (Azerrad 2012)	This guidance provides management recommendations for great blue herons in Washington.
MRWPS Volume I: Invertebrates (Larsen et al. 1995)	This guidance provides management recommendations for priority invertebrate species in Washington.
MRWPS Volume III: Amphibians and Reptiles (Larsen 1997)	This guidance provides management recommendations for priority amphibian and reptile species in Washington.
MRWPS Volume IV: Birds (Larsen et al. 2004, revised 2012)	This guidance provides management recommendations for priority bird species in Washington.
MRWPS, Volume V: Mammals (Interim) (WDFW 2010)	This guidance provides management recommendations for priority mammal species in Washington.

Siting and Design Consideration[a]	Description
Priority Habitats and Species Management Recommendations: Mazama Pocket Gopher (WDFW 2011; revised 2016)	This guidance provides management recommendations for Mazama pocket gophers in Washington.
Management Recommendations for Washington's Priority Habitats and Species (Rodrick and Milner 1991, revised 2018)	This guidance includes management recommendations for 60 species of fish and wildlife, some of which have been replaced by newer guidelines listed in this table.
Management Recommendations for Washington's Priority Habitats and Species: Riparian Pollinators (Martin and Azerrad 2023a)	This guidance provides mitigation, management recommendations, and BMPs intended to guide project-specific management plans regarding riparian areas and pollinators.
Management Recommendations for Washington's Priority Habitats and Species: Western Bumble Bee (Martin and Azerrad 2023b)	This guidance provides management recommendations for protecting western bumble bee habitat, mitigating harmful activities, and other information important to the conservation of this species.
Landscape Planning for Washington's Wildlife: Managing for Biodiversity in Developing Areas (WDFW 2009)	This publication provides guidelines and management strategies to reduce impacts on biodiversity in Washington.
Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (APLIC 2006)	This publication summarizes BMPs, biological factors that lead to collisions, engineering specifications for safe transmission lines, and other relevant information.
Reducing Avian Collisions with Power Lines: The State of the Art in 2012 (APLIC 2012)	This publication provides utility companies and wildlife agencies with current information and guidance on reducing avian collisions. This document is still a draft.
Best Management Practices for Electric Utilities in Sage-Grouse Habitat (APLIC 2015)	These BMPs address siting and maintenance within sage-grouse habitat. They were developed by the Avian Power Line Interaction Committee, along with federal and local government, utility companies, and state agency partners.
Wildlife and Powerlines (Martín Martín et al. 2022)	This publication contains information on the global impacts of transmission lines on wildlife, including case studies. It contains BMPs and recommendations for creating wildlife-safe transmission lines.
Recommended Standard Best Management Practices (USFWS n.d.)	These BMPs have been identified by the USFWS to manage impacts on aquatic ecosystems.
Water Crossing Design Guidelines (Barnard et al. 2013)	This publication provides guidance on design of culverts, bridges, tide gates, temporary crossings, culvert abandonment, and project plans.

Siting and Design Consideration[a]	Description
Stream Habitat Restoration Guidelines (Cramer 2012)	This publication provides guidelines for stream habitat restoration, including site, reach, and watershed assessment; problem identification; and general approaches to restoring stream and riparian habitat and restoration techniques.
Integrated Streambank Protection Guidelines (WDFW 2002)	This publication provides guidelines for evaluating and selecting the correct streambank treatments and techniques.
Management Practices Field Guide for ESA 4 (d) Habitat Protection (WSDOT 2018)	This publication provides guidance for WSDOT maintenance crews and regional maintenance environmental coordinators who work within sensitive priority areas.
Applicable sections in Stormwater Management Manual for Western Washington Volume IV Source Control BMPs (Ecology 2012a), including: ▪ S407 BMPs for Dust Control at Disturbed Land Areas and Unpaved Roadways and Parking Lots ▪ S414 BMPs for Maintenance and Repair of Vehicles and Equipment ▪ S415 BMPs for Maintenance of Public and Private Utility Corridors and Facilities ▪ S416 BMPs for Maintenance of Roadside Ditches ▪ S411 BMPs for Landscaping and Lawn/Vegetation Management ▪ S419 BMPs for Mobile Fueling of Vehicles and Heavy Equipment ▪ S426 BMPs for Spills of Oil and Hazardous Substances ▪ S429 BMPs for Storage or Transfer (Outside) of Solid Raw Materials, Byproducts or Finished Products	These manual sections provide stormwater BMPs that include schedules of activities; prohibitions of practices; maintenance procedures; and other physical, structural, and/or managerial practices that prevent or reduce the release of pollutants and other adverse environmental impacts on waters of Washington State in areas west of the Cascade Range crest. The BMPs can be used singularly or in combination.
Stormwater Management Manual for Eastern Washington Volume IV Source Control BMPs (Ecology 2024)	This manual provides stormwater BMPs that include schedules of activities; prohibitions of practices; maintenance procedures; and other physical, structural, and/or managerial practices that prevent or reduce the release of pollutants and other adverse environmental impacts on waters of Washington State in areas east of the Cascade Range crest. These BMPs can be used singularly or in combination.

Siting and Design Consideration[(a)]	Description
Vehicle and Equipment Washwater Discharges. Best Management Practices Manual (Ecology 2012b)	This guidance manual discusses the environmental concerns over discharges from washing the exterior surfaces of vehicles and equipment, such as cars and/or trucks, and light or heavy equipment.
State of Washington Alternative Mitigation Policy Guidance for Aquatic Permitting Requirements (WDFW 2019a)	This publication provides policy guidance on requiring or recommending mitigation to achieve no net loss of habitat functions by offsetting losses at the impact site through gains of mitigation.
Pend Oreille River in the Box Canyon Reservoir Riverbank Stabilization Guidelines (Mainstream Restoration Inc. 2007)	This publication provides guidelines for the five bank stabilization techniques supported by WDFW for this area.
Best Management Practices to Minimize Adverse Effects to Pacific Lamprey (*Entosphenus tridentatus*) (USFWS 2010)	This publication provides information on BMPs for Pacific lamprey that can be incorporated into any stream-disturbing activity (e.g., aquatic habitat restoration, prescribed fire, recreational development, grazing, gravel extraction/mining, water diversions, etc.) on lands managed by the U.S. Forest Service and Bureau of Land Management throughout the range of Pacific lamprey.
Fish Exclusion – Protocol and Standards (WSDOT 2023)	These standards provide guidance for work proposed in fish-bearing[14] waters to reduce the risk of potential injury to fish during construction.
Freshwater Avoidance Times (WDFW 2018)	This publication indicates times when spawning or incubating salmonids are least likely to be present in Washington State freshwater.
Riparian Ecosystems, Volume 2: Management Recommendations (Rentz et al. 2020)	These recommendations provide guidance to protect and restore healthy, intact, and fully functioning riparian ecosystems.
Wetland Mitigation in Washington State Part 1: Agency Policies and Guidance and Part 2: Developing Mitigation Plans (Ecology et al. 2006, 2021)	This publication provides basic principles of wetland mitigation and technical guidance for developing compensatory mitigation.
Recommended Siting Practices for Electric Transmission Developers (Americans for a Clean Energy Grid 2023)	This publication outlines best practices for siting electric transmission facilities. Recommended practices include: ▪ Early and transparent engagement ▪ Respect and fair dealing ▪ Environmental considerations ▪ Interagency coordination

[14] Streams, rivers, or other bodies of water that support fish populations at any time of the year. Fish-bearing watercourses provide essential habitats for various fish species, including spawning, rearing, and feeding areas.

Siting and Design Consideration[(a)]	Description
	▪ Use of existing infrastructure
The Arid Lands Initiative – Shared Priorities for Conservation at a Landscape Scale (Arid Lands Initiative 2014)	This initiative designates priority areas of shrubsteppe habitats for conservation in Washington.
Ungulate Migrations of the Western United States, Volume 4 (Kauffman et al. 2024)	This publication provides information on ungulate movement routes for species in the western United States, which can help transmission line developers avoid key areas.
Energy Development Guidelines for Mule Deer (Lutz et al. 2011)	This publication provides general guidelines for siting transmission lines to reduce impacts on mule and black-tailed deer.
IPaC: Information for Planning and Consultation (USFWS 2024a)	This tool was created by the USFWS to streamline the process for environmental review and permitting. Mapping tools can help proponents review federally listed species and critical habitat, as well as other protected environmental features such as wetlands, that overlap with their project area.
Site Specific Management: How to Avoid and Minimize Impacts of Development to Shrub-steppe (Azerrad et al. 2011)	This publication provides recommendations for shrubsteppe management in land development projects, including roads and utility corridors.
PHS Local Government User Guide: Shrub Steppe and Eastside Steppe Map (Folkerts et al. 2023)	This map contains information on shrubsteppe classification and provides mapping tools that can help the development and siting of long-term projects such as transmission lines in the Columbia Plateau.
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.
Managing for Monarchs in the West: Best Management Practices for Conserving the Monarch Butterfly and Its Habitat (Xerces Society 2018)	This publication provides guidance on how to manage monarch breeding and migratory habitat.
Washington Shrub steppe Restoration and Resiliency Initiative: Long-Term Strategy 2024 – 2054 (WDFW 2024a)	This publication identifies priority areas for conservation in shrub steppe 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.
Washington Habitat Connectivity Action Plan (Michalak et al. 2025)	This publication models terrestrial habitat connectivity that may support wildlife movement and areas susceptible to fragmentation due to transportation infrastructure, urban expansion, and other land-use changes.

Siting and Design Consideration[a]	Description
Biological Assessment Preparation Manual Chapter 7.0 Construction Noise Impact Assessment (WSDOT 2020)	This manual identifies noise reduction strategies (Section 7.2.3.3) for in-stream pile driving.

Notes:

[a] Additional BMPs, policies, and guidelines listed under other sections (e.g., Vegetation) are applicable to Biological Resources.

BMP = best management practice; **ESA** = Endangered Species Act; **IPaC** = Information for Planning and Consultation; **MRWPS** = Management Recommendations for Washington's Priority Species; **PHS** = Priority Habitats and Species; **USFWS** = U.S. Fish and Wildlife Service; **WDFW** = Washington Department of Fish and Wildlife; **WSDOT** = Washington State Department of Transportation

3.6.2 Affected Environment

This section describes habitat, wildlife, and fish within the Study Area (see Chapter 1, Introduction). The analysis of the affected environment incorporates the following:

- Wildlife
- Fish
- Migration Routes and Corridors

3.6.2.1 Wildlife

Habitat

Washington's landscape and climate are diverse and provide a variety of habitats for wildlife. Ecoregions are broadly defined areas that share similar characteristics, such as climate, geology, soils, and other environmental conditions. Ecoregions depict general areas with similar ecosystem types and wildlife communities. The Washington State Department of Natural Resources (DNR) divides Washington into nine ecoregions; west to east, these are: Northwest Coast, Puget Trough, West Cascades, North Cascades, East Cascades, Okanogan, Columbia Plateau, Canadian Rocky Mountains, and Blue Mountains (DNR 2022). The following sections provide a detailed discussion of each ecoregion.

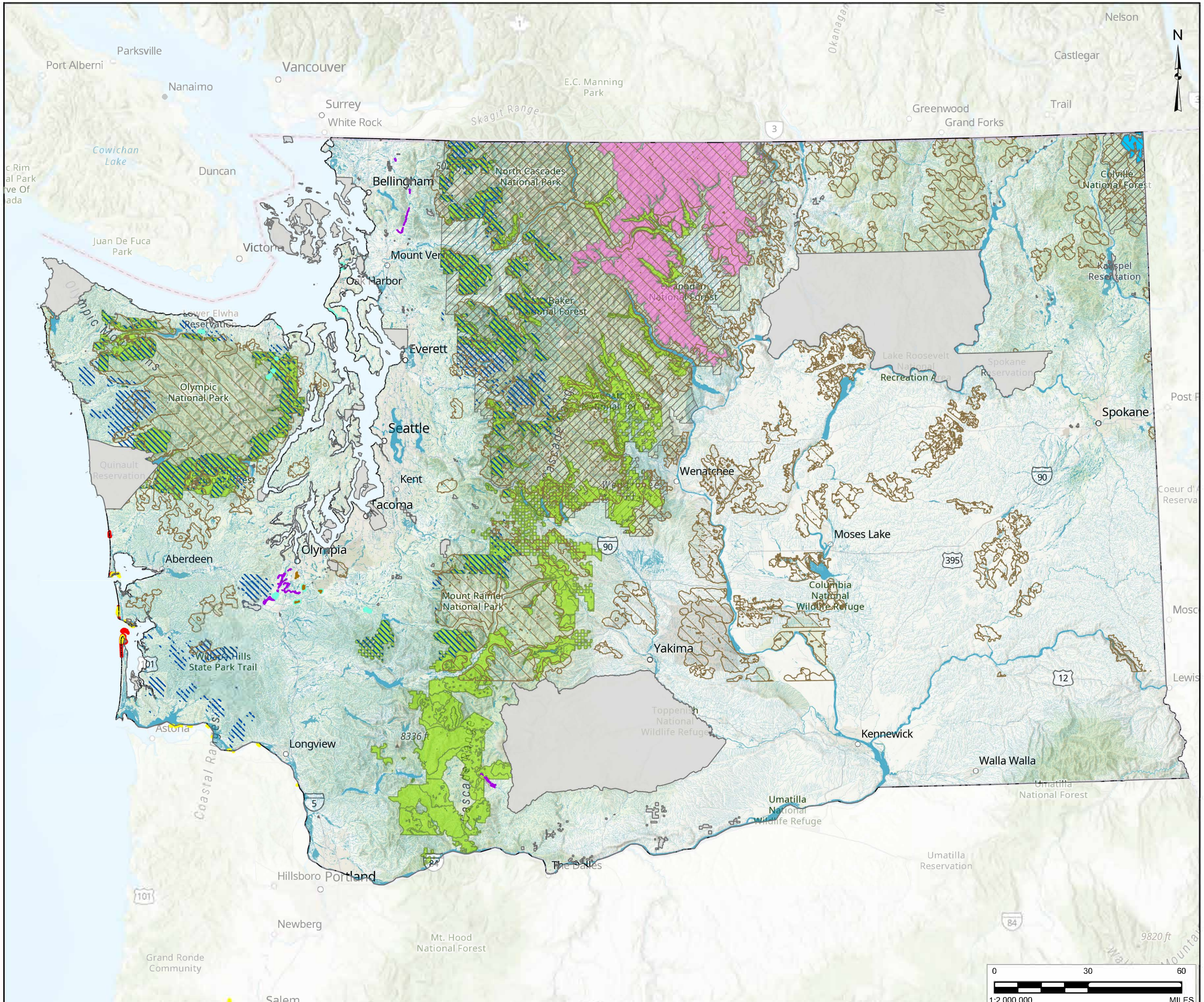
Northwest Coast Ecoregion

The Northwest Coast ecoregion includes most of the Olympic Peninsula, the coastal mountains of western Washington, and the lowlands along the west coast. This ecoregion experiences warm, relatively dry summers and mild, very wet winters.

Elevations range from sea level to over 3,940 feet (1,200 meters) above sea level (CEC 2011). Coastal estuaries, such as Grays Harbor and Willapa Bay, support large seasonal congregations of shorebirds and waterfowl (BirdWeb 2005). Uplands are predominantly coniferous forest, which provides nesting habitat for a variety of bird species such as band-tailed pigeon (*Patagioenas fasciata*), red-breasted sapsucker (*Sphyrapicus ruber*), Hutton's vireo (*Vireo huttoni*), chestnut-backed chickadee (*Poecile rufescens*), and purple finch (*Haemorhous purpureus*) (BirdWeb 2005). Old-growth forests in this ecoregion provide nesting habitat for marbled murrelet (*Brachyramphus marmoratus*), which is listed as threatened under the federal Endangered Species Act (ESA), listed as endangered by the Washington Fish and Wildlife Commission (WFWC), and has critical habitat throughout the region (**Figure 3.6-1**) (WDFW 2024b). The Northwest Coast ecoregion contains 10 state priority Important Bird Areas (IBAs),[15] four of which are off the coast of the Olympic Peninsula and not visible in **Figure 3.6-2**; one Oregon State priority IBA that overlaps with Washington; and five global priority IBAs interspersed throughout the region (**Figure 3.6-2**) (Audubon 2024).

Mammals in the Northwest Coast ecoregion include black-tailed deer (*Odocoileus hemionus columbianus*), Roosevelt elk (*Cervus canadensis roosevelti*), black bear (*Ursus americanus*), cougar (*Puma concolor*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), beaver (*Castor canadensis*), and Townsend's vole (*Microtus townsendii*) (CEC 2011). Amphibians and reptiles include the northwestern pond turtle (*Actinemys marmorata*), listed as endangered by the WFWC; western toad (*Anaxyrus boreas*), listed as a candidate species[16] by the WFWC; and the northwestern salamander (*Ambystoma gracile*) (WDFW 2024c).

[15] A site that provides an essential service for bird populations during a part of their annual movement cycle.
[16] A species that is currently under review to determine if it should be listed under the Endangered Species Act. This category is also used by state agencies such as the Washington State Department of Fish and Wildlife.



LEGEND

- Study Area
- Exclusion Areas
- Mapped Wetland (USFWS, 2024b)
- Habitat Concentration Area (WHCWG, 2016)

Critical Habitat (USFWS, 2024f)

- Mazama Pocket Gopher
- Streaked Horned Lark
- Western Snowy Plover
- Taylors Checkerspot
- Woodland Caribou
- Oregon Spotted Frog
- Canada Lynx
- Marbled Murrelet
- Spotted Owl
- Grizzly Bear

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Washington State Energy Facility Site Evaluation Council

PROJECT

PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE

IMPORTANT WILDLIFE HABITATS IN WASHINGTON STATE

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CONSULTANT wsp

FIGURE 3.6-1

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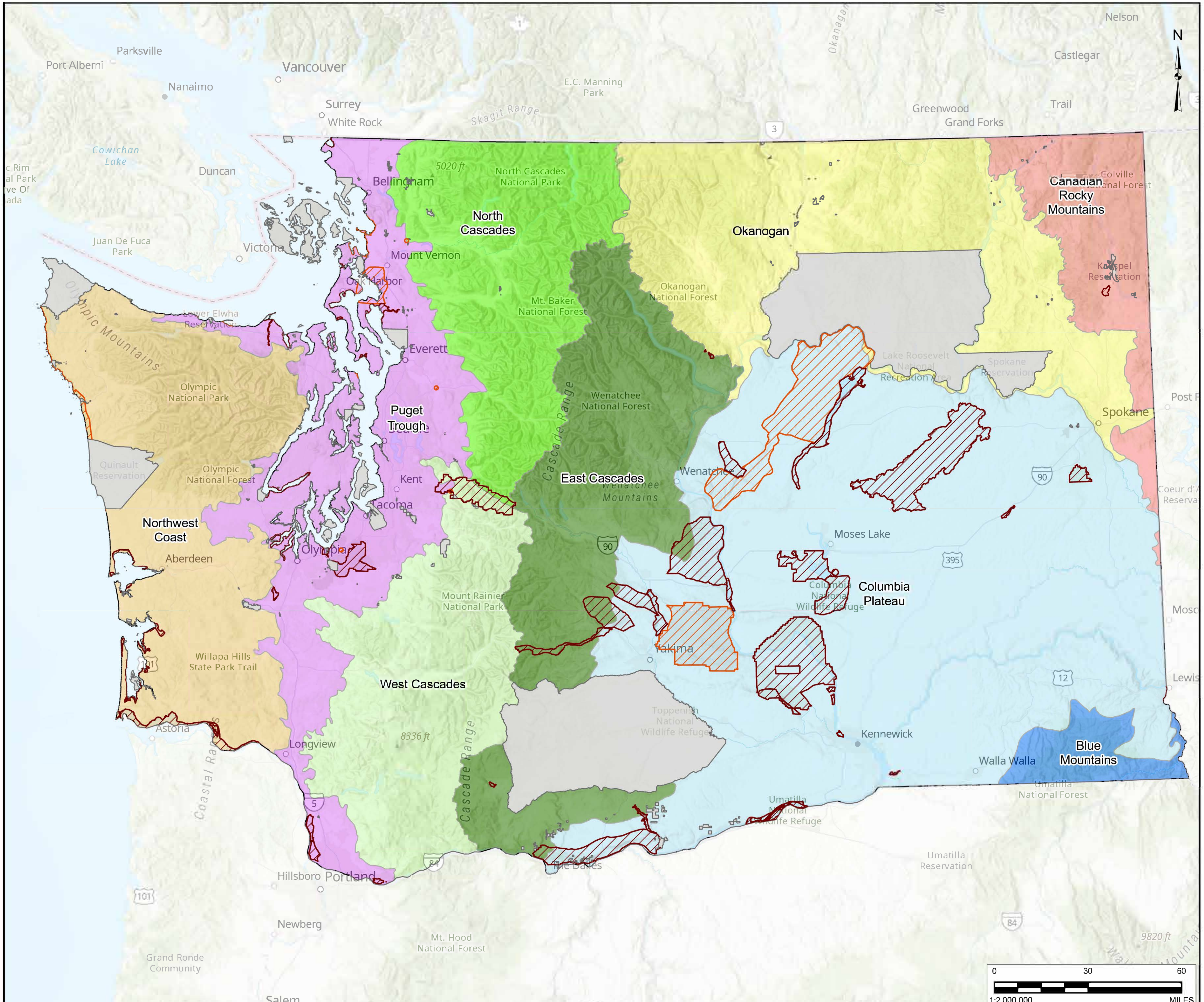

LEGEND

- Study Area
- Exclusion Areas

Important Bird Areas (Audubon 2025)

- Global Priority
- State Priority

Ecoregions (DNR 2022)

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

REFERENCES AND NOTES

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IMPORTANT BIRD AREAS OF WASHINGTON STATE

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FIGURE 3.6-2

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Puget Trough Ecoregion

The Puget Trough ecoregion occupies the lowland and marine waters between the Cascades and the Olympic Mountains. This ecoregion experiences warm, dry summers and mild, wet winters. Elevations range from sea level to 1,000 feet (310 meters) above sea level (BirdWeb 2005; CEC 2011). Coastal bays, estuaries, and marshes along Puget Sound support large seasonal congregations of shorebirds and waterfowl (BirdWeb 2005). Most of the ecoregion comprises broad, rolling lowlands dominated by evenly aged conifer-dominated tree stands and some prairie habitat to the south, which provide nesting habitat for a variety of bird species such as pileated woodpecker (*Dryocopus pileatus*), great horned owl (*Bubo virginianus*), marsh wren (*Cistothorus palustris*), evening grosbeak (*Hesperiphona vespertina*), and streaked horned lark *(Eremophila alpestris strigata),* which is listed as threatened under the ESA and endangered by the WFWC. The Puget Trough ecoregion contains 23 state-recognized IBAs, one of which is at the intersection of, and overlaps with, the North Cascades, West Cascades, and East Cascades, and seven globally recognized IBAs interspersed throughout the region (**Figure 3.6-2**) (Audubon 2024).

Mammals in the Puget Trough include black-tailed deer, elk (*Cervus canadensis*), black bear, red fox *(Vulpes vulpes*), beaver, and river otter (*Lontra canadensis*). Amphibians in the Puget Trough include the western toad and long-toed salamander (*Ambystoma macrodactylum*). Oregon spotted frog (*Rana pretiosa*), which is listed as threatened under the ESA and endangered by the WFWC, occurs in this ecoregion. Critical habitat for this species has been identified in the southern section of this ecoregion near Olympia (**Figure 3.6-1)** (WDFW 2024c). The Puget Trough is a highly fragmented habitat that is home to over 70 percent of Washington's human population. Human development, forestry, and agriculture have eliminated much of the original vegetation and habitat (BirdWeb 2005).

West Cascades Ecoregion

The West Cascades ecoregion includes west-central Washington between the Puget Trough and the East Cascades. This ecoregion experiences mostly dry, warm summers and mild to cool, very wet winters. Elevations range from 50 to 14,000 feet (20 to over 4,270 meters) above sea level (WDFW 2000). The steep ridges, extensive coniferous forests, and river valleys that characterize this ecoregion support a variety of bird species such as pileated woodpecker; mountain quail (*Oreortyx pictus*); mountain chickadee (*Poecile gambeli*); northern goshawk (*Accipiter gentilis*), listed as a candidate species by the WFWC; and northern spotted owl (*Strix occidentalis caurina*), listed as threatened under the ESA, listed as endangered by the WFWC, and has critical habitat throughout this ecoregion (**Figure 3.6-1**) (BirdWeb 2005; WDFW 2015). The West Cascades ecoregion contains one state-recognized IBA, located at the intersection of the North Cascades, Puget Trough, and East Cascades ecoregions, and one globally recognized IBA that is shared with the Puget Trough ecoregion (**Figure 3.6-2**) (Audubon 2024).

Mammals in the West Cascades include black bear; Townsend's big-eared bat (*Corynorhinus townsendii*), listed as a candidate species by the WFWC; western gray squirrel (*Sciurus griseus*), listed as endangered by the WFWC; and wolverine (*Gulo gulo*), listed as threatened under the ESA and a candidate species by the WFWC. Five of the 11 endemic wildlife species in this region are amphibians, including Cascade torrent salamander (*Rhyacotriton cascadae*), listed as a candidate species by the WFWC; coastal giant salamander (*Dicamptodon tenebrosus*); Larch Mountain salamander (*Plethodon larselli*), listed as a sensitive species by the WFWC; Van Dyke's salamander (*P. vandykei*), listed as a candidate species by the WFWC; and the Cascades frog (*Rana cascadae*) (WDFW 2000).

North Cascades Ecoregion

The North Cascades ecoregion includes the northern extent of the Cascade Range in northwest Washington and an area encompassing the high Olympic Mountains west of the Puget Trough. This ecoregion experiences dry, warm summers and mild to cold, wet winters. Elevation in this area ranges from 500 to over 10,000 feet (150 to 3,050 meters) above sea level (CEC 2011; BirdWeb 2005). The rugged, glaciated mountains and U-shaped valleys support a variety of birds such as mountain chickadee, pileated woodpecker, grouse (*Tetraoninae sp*.), and osprey (*Pandion haliaetus*) (BirdWeb 2005; CEC 2011). Over 96 percent of the North Cascades ecoregion is uninhabited by humans, creating large, unfragmented critical habitat for species such as Canada lynx (*Lynx canadensis*), marbled murrelet, and northern spotted owl that are designated as threatened under the ESA, listed as endangered by the WFWC, and have critical habitat throughout this ecoregion (**Figure 3.6-1**) (BirdWeb 2005; WDFW 2024b). The North Cascades ecoregion contains a portion of one state-recognized IBA where the North Cascades and Columbia Plateau ecoregions meet and a portion of one globally recognized IBA shared with the Puget Trough (**Figure 3.6-2**) (Audubon 2024).

Mammals in the North Cascades include black bear, bighorn sheep (*Ovis canadensis*), mountain goat, black-tailed deer, mule deer (*Odocoileus hemionus*), cougar, coyote, bobcat, beaver, and fisher (*Pekania pennanti*), which is listed as endangered by the WFWC (CEC 2011; WDFW 2024d). Reptiles and amphibians in the North Cascades include northern alligator lizard (*Elgaria coerulea*), western toad, and terrestrial garter snake (*Thamnophis elegans*) (WDFW 2024c).

East Cascades Ecoregion

The East Cascades ecoregion is in central Washington in the rain shadow of the West Cascades ecoregion. This ecoregion experiences warm, dry summers and cold winters. Elevation ranges from 980 to over 8,200 feet (300 to 2,500 meters) above sea level (CEC 2011). Most of the terrain in this region comprises sloping mountains with open ponderosa pine (*Pinus ponderosa*) forests and high plateaus that support sagebrush and steppe vegetation and provide nesting habitat to a variety of bird species such as Cooper's hawk (*Accipiter cooperii*), osprey, sooty grouse (*Dendragapus fuliginosus*), and downy woodpecker (*Dryobates pubescens*) (BirdWeb 2005). The East Cascades ecoregion contains nine state-recognized IBAs throughout the region—three of which overlap with the Columbia Plateau ecoregion and one that overlaps with the North Cascades, West Cascades, and Puget Trough—and no globally recognized IBAs (**Figure 3.6-2**) (Audubon 2024).

Mammals in this ecoregion include black bear, black-tailed deer, mule deer, cougar, wolverine, coyote, and yellow-bellied marmot (*Marmota flaviventris*) (CEC 2011). Reptiles in the region include the common sharp-tailed snake (*Contia tenuis*) and California mountain kingsnake (*Lampropeltis zonata*), which is listed as a candidate species by the WFWC and only found in this ecoregion of Washington. Oregon spotted frog, which is listed as threatened under the ESA and endangered by the WFWC, has critical habitat in the southern portion of this ecoregion (**Figure 3.6-1**) (WDFW 2024c).

Okanogan Ecoregion

The Okanogan ecoregion covers north-central Washington and lies between the North Cascades to the west, the Columbia Plateau to the south, and the Northern Rockies to the east. This region experiences hot, dry summers and cool winters. Elevation ranges from about 700 to 9,000 feet (210 to 2,740 meters) above sea level (BirdWeb 2005). Rolling plateaus, wide valleys, and large glacial lakes characterize this ecoregion (BirdWeb 2024). The extensive forests comprising ponderosa pine, Douglas-fir, western larch, and quaking aspen provide nesting habitat for many birds, including Williamson's sapsucker (*Sphyrapicus thyroideus*), pine siskin (*Spinus pinus*), and yellow-rumped warbler (*Setophaga coronata*) (Dawson 2020; Hunt and Flaspohler 2020; Gyug et al. 2023). The Okanogan ecoregion contains one state-recognized IBA along the southern border shared with the Columbia Plateau ecoregion and one globally recognized IBA along the southwestern border shared with the East Cascades ecoregion (**Figure 3.6-2**) (Audubon 2024).

Mammals in this ecoregion include white-tailed deer (*Odocoileus virginianus*), black bear, bobcat, and coyote (CEC 2011). Reptiles and amphibians found in this ecoregion include western rattlesnake (*Crotalus oreganus*), long-toed salamander, and western toad (WDFW 2024c). Less than 10 percent of the Washington portion of this ecoregion has been converted to agricultural or urban use, leaving large swaths of unfragmented habitat (BirdWeb 2024).

Columbia Plateau Ecoregion

The Columbia Plateau ecoregion covers most of central and southeastern Washington and lies between the Cascade Range to the west, the Rocky Mountains to the northeast, and Idaho to the east. This region experiences hot, dry summers and cold winters. Elevation ranges from 100 to 4,200 feet (30 to 1,280 meters) above sea level (BirdWeb 2005). Undulating hills[17] and plateaus divided by steep-sided canyons characterize this ecoregion. The sagebrush steppe and grassland provide nesting habitat for a variety of birds, including western meadowlark (*Sturnella neglecta*), sage thrasher (*Oreoscoptes montanus*), savannah sparrow (*Passerculus sandwichensis*), and ferruginous hawk (*Buteo regalis*), which is listed as endangered by the WFWC (BirdWeb 2005; WDFW 2024b). The Columbia Plateau ecoregion contains 24 state-recognized IBAs, two of which overlap with the East Cascades; one Oregon State priority IBA that straddles the Washington-Oregon border; and two globally recognized IBAs interspersed throughout the region (**Figure 3.6-2**) (Audubon 2024).

Mammals in the Columbia Plateau include mule deer, pronghorn antelope (*Antilocapra americana*), coyote, and black-tailed jackrabbit (*Lepus californicus*), which is listed as a candidate species by the WFWC. Reptiles and amphibians include the western diamondback rattlesnake (*Crotalus atrox*); the Columbia spotted frog (*Rana luteiventris*), which is listed as a candidate species by the WFWC; the northern sagebrush lizard (*Sceloporus graciosus*), which is listed as a candidate species by the WFWC; and the northern leopard frog (*Lithobates pipiens*), which is listed as endangered by the WFWC (WDFW 2024c).

[17] A topography that has many hills

Canadian Rocky Mountains Ecoregion

The Canadian Rocky Mountains ecoregion includes the Northern Rocky Mountains in eastern Washington. This region experiences dry, warm summers and cold, snowy winters (CEC 2011). Elevation ranges from about 1,300 to 7,300 feet (400 to 2,230 meters) above sea level (BirdWeb 2005). This region is dominated by mountains supporting spruce and pine forests at higher elevations, Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine at lower elevations, wet valleys of western hemlock (*Tsuga heterophylla*) and western red cedar (*Thuja plicata*) forests, and deep canyons (CEC 2011). These features provide habitat for a variety of bird species, including mountain bluebird (*Sialia currucoides*), osprey, common raven (*Corvus corax*), and red-tailed hawk (*Buteo jamaicensis*) (BirdWeb 2005). The Canadian Rocky Mountains ecoregion contains one state-recognized IBA and no globally recognized IBAs (**Figure 3.6-2**) (Audubon 2024).

Mammals in the Canadian Rocky Mountains include elk; bighorn sheep; mule deer; moose (*Alces alces*); gray wolf (*Canis lupus*), which is listed as endangered by the ESA and the WFWC; grizzly bear (*Ursus arctos horribilis)*, which is listed as threatened by the ESA and endangered by the WFWC; black bear; mountain goat; cougar; American marten (*Martes americana*); Canada lynx; bobcat; wolverine; white-tailed deer; snowshoe hare (*Lepus americanus*); and caribou (*Rangifer tarandus*), which is listed as endangered under the federal ESA and by the WFWC and has critical habitat throughout this ecoregion (**Figure 3.6-1**) (CEC 2011; WDFW 2024e). Reptiles and amphibians include western toad, northern alligator lizard, and Columbia spotted frog (WDFW 2024c).

Blue Mountains Ecoregion

The Blue Mountains ecoregion includes the southeastern corner of Washington. This region experiences warm, dry summers and cold winters. Elevation ranges from 1,000 to over 9,840 feet (305 to 3,000 meters) above sea level (CEC 2011). Diverse landscapes from open mountain ranges supporting ponderosa pine and Douglas-fir forests to sagebrush steppe and juniper woodland provide habitat for a variety of birds, including pileated woodpecker, sage thrasher, western bluebird (*Sialia mexicana*), mountain bluebird, and chestnut-backed chickadee (BirdWeb 2005). The Blue Mountains ecoregion contains no state-recognized or globally recognized IBAs (**Figure 3.6-2**) (Audubon 2024).

Mammals in the Blue Mountains ecoregion include Rocky Mountain elk (*Cervus canadensis nelsoni*), mule deer, black-tailed deer, black bear, bighorn sheep, cougar, bobcat, coyote, and beaver (CEC 2011). Reptiles and amphibians include the Rocky Mountain tailed frog (*Ascaphus montanus*), which is listed as a candidate species by the WFWC; the western toad; and the long-toed salamander (WDFW 2024c).

Critical Habitat

Federally designated critical habitat is a parcel of land essential to the conservation of a species identified by the ESA to be endangered or threatened (USFWS 2017a). Designated critical habitat is located across the state, but most of the parcels are in central and western Washington. Critical habitat parcels are selected based on landscape features that threatened and endangered species require for survival. These polygons[18] may be identified based on models and may not be field verified; they may not be occupied at the time of assigning, but the designation is intended to manage landscape capacity for species recovery. The features may not be found anywhere else, and the species may have specialized habitat (i.e., breeding, foraging, wintering) requirements that can only be met by specific habitat features that are at risk of destruction, as in the case of old-growth forests being cut for logging and agriculture. Critical habitat selection aims to protect important physical and biological characteristics of an area necessary for species conservation (USFWS 2017b). Destruction or modification of critical habitat requires approval by the U.S. Fish and Wildlife Service (USFWS) if the proposed development involves a federal nexus (e.g., permit, license, or funding). In Washington, critical habitat parcels have been identified for 13 species, 12 of which are relevant to transmission facility development (WDFW 2024e).

DNR Protected Areas

The DNR manages 5.6 million acres of state-owned lands. These lands are administered for various purposes such as forestry, range, commercial, and natural resource uses. Two types of natural areas are managed for conservation purposes: Natural Area Preserves (NAPs) and Natural Resource Conservation Areas (NRCAs) (Figure 3.5-5).

The DNR manages 41,483 acres of NAPs across 58 sites. These areas have been identified to protect the best remaining example of ecological communities that support important plant and animal habitats. These preserves now support examples of unique habitats such as shrubsteppe, grassland, subalpine meadows, and salt marsh (DNR 2025).

[18] An identified area on a map that corresponds to an area of land.

In addition to NAPs, DNR manages over 127,981 acres distributed across 39 NRCAs. NRCAs have been created to preserve native ecosystems, important habitats for endangered, threatened, and sensitive plant and wildlife species, and scenic landscapes.

Important Bird Areas

An IBA is an area that is globally important for the conservation of bird populations (BirdLife International 2021). IBAs are identified based on a standard set of four criteria that protect habitat for globally threatened and endangered birds, birds restricted by range or habitat, and large congregations of birds (Bird Studies Canada 2024). The National Audubon Society, in partnership with BirdLife International, identifies IBAs in the United States, and each IBA is given one of three designations: global significance, continental significance, or state significance. There are 73 IBAs in Washington, of which 59 are state priority IBAs, 14 are global priority IBAs, and none are continental priority (**Figure 3.6-2**). Additionally, two Oregon State priority IBAs that overlap the Washington-Oregon border have been included in the IBA tabulation for the Northwest Coast and Columbia Plateau ecoregions (**Figure 3.6-2**) (Audubon 2024). IBAs are found throughout the state, but the highest concentration of IBAs is in central Washington, mainly in the Columbia Plateau ecoregion, along inlets and coastline in the west, and on the Oregon border in the south. IBA parcels can be on federal land, state land, or privately owned land, as their location is determined by bird use. IBAs are non-regulatory; however, they provide important information for planning purposes, as these areas have been identified based on bird habitat and population distribution.

General Wildlife Species

Mammals

Washington has 132 native mammal species subdivided into 90 terrestrial, 27 marine, and 15 bat species (Burke Museum 2013). The nine ecoregions in Washington support a diverse population of wildlife, from aquatic mammals, such as otters, that live in the state’s many rivers and estuaries, to terrestrial mammals such as yellow-bellied marmots, that thrive in the alpine meadows, to animals that inhabit desert climates, such as black-tailed jackrabbits. Precipitation varies widely across the state. The Coast Range ecoregion receives an average of 84.6 inches (214.9 centimeters [cm]) of precipitation annually, while the Columbia Plateau receives an average of 33.4 cm (13.2 inches) of precipitation annually (CEC 2011). Mammals in each ecoregion rely on the resources provided by the landscape to survive. Most terrestrial mammals in

Washington spend their entire lives within the state, meaning they require habitat in all four seasons for activities such as overwintering or hibernation, breeding, and raising young, and enough space for their offspring to maintain a territory. For example, the Coast Range ecoregion provides large tracts of unfragmented land for mammals like cougars, which require a complex territory of up to 19.3 square miles (mi^2) (50 square kilometers [km^2]) for foraging, breeding, and overwintering (NCC 2024). The Rocky Mountains and Cascade ecoregions also provide expansive, unfragmented habitat for animals, like mountain goats, that live on steep rocky mountainsides in alpine regions (WDFW 2024f).

Wolverines, which occur throughout Washington's Cascade Range and high ranges and plateaus of northeastern Washington, maintain a territory ranging from 38.6 to 768.3 mi^2 (100 to over 1,990 km^2) through alpine and subalpine habitats (WDFW 2024g). A smaller mammal, the Washington ground squirrel, which is a state and federal candidate species, lives in the Columbia Basin of eastern Washington in steppe and shrubsteppe habitats. This species' population has declined, due in part to habitat loss and fragmentation[19] related to development and agriculture (WDFW 2024h). Mule deer are found throughout most of Washington. Due to food availability, predator distribution, and winter weather, this species moves between separate summer and winter ranges and will migrate up to 31.7 miles (51 kilometers [km]) between ranges. Residential and agricultural development, increasing wildfire frequency, and human recreation are the greatest factors affecting corridor connectivity between ranges and range quality (WDFW 2016; Kauffman et al. 2024).

Two mammal species have been identified as priority invasive species by the Washington Invasive Species Council: nutria (*Myocastor coypus*) and feral pigs (*Sus scrofa*), with the latter not currently known to exist in the state (WISC 2025). Nutria are aquatic rodents that consume the roots and stems of wetland plants in a destructive manner that can impact riparian areas (WISC 2025). They can also populate quickly; they have spread throughout western Washington and are beginning to be found in the state's interior (WISC 2025). Feral pigs are not known to have populations in Washington, but they are present in Oregon and California. The potential economic, ecological, and health threats that feral pigs can pose for livestock and people have led to them being classified as a priority invasive species.

[19] The process by which habitat is divided into smaller pieces by a disturbance—typically an anthropogenic disturbance. For example, the construction of a road through a forest would lead to habitat fragmentation.

Birds

More than 500 species of birds occur in Washington at various times throughout the year due to the state's diverse habitats, such as alpine meadows, rainforests, shrubsteppe, old-growth forests, and wetlands (WDFW 2024i). Washington's old-growth forests provide important habitat for at-risk species like the northern goshawk and marbled murrelet. In the east, shrubsteppe and grassland provide habitat for state-listed endangered species like ferruginous hawk, greater sage-grouse (*Centrocercus urophasianus*), and Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*). In the lowlands, wetland habitat supports birds like sandhill crane and Clark's grebe (*Aechmophorus clarkii*) (WDFW 2024j). While birds occur across the state, some key locations for birds are the Skagit Wildlife Management Area, Dungeness National Wildlife Refuge, Olympic National Park, and Grays Harbor National Wildlife Refuge on the west coast; Mount Rainier National Park in the Cascade Range; and Leahy Junction – Moses Coulee, Yakima Training Center, and Columbia National Wildlife Refuge in central/eastern Washington (Audubon Washington n.d.).

Habitat selection for birds varies across species. Some birds that spend the entire year in Washington will nest in one location that provides quality nesting habitat, sufficient food, and shelter, then move to a different location for winter that has enough food and shelter to survive. Many bird species migrate large distances in the spring and fall between their breeding and wintering grounds, respectively. Birds that migrate long distances require a stopover[20] or staging grounds to rest and refuel before continuing their journey. They may use the same staging grounds every year, with thousands of other birds, or they may select a new location annually or semiannually (Warnock 2010). Examples of long-distance migrants are shorebird species like sanderling (*Calidris alba*), western sandpipers (*Calidris mauri*), and dunlins (*Calidris alpina*), which use the large sandy beaches on the west coast as stopover sites (Audubon Washington n.d.).

Some birds, like song sparrows (*Melospiza melodia*), may nest in the same general area but build a new nest each year (Arcese et al. 2020), while others, like great blue herons and American white pelicans (*Pelecanus erythrorhynchos*), nest in large colonies. For example, the heron colony in Reed Island State Park has approximately 180 nests that the birds reuse each year (Cullinan 2001). American white pelicans are also an example of a species that only occupies the state in the summer for breeding, along with several

[20] An important resting or feeding area for birds during migration.

warbler species, which migrate south in the fall (Audubon Washington n.d.). In the winter, many species of waterfowl use Washington as an overwintering area between breeding seasons (Audubon Washington n.d.). Some birds, like American robins (*Turdus migratorius*) and American crows (*Corvus brachyrhynchos*), are generalists[21] that have adapted alongside humans and will nest in a variety of locations and structures, while others, like marbled murrelets and northern spotted owls, have highly specific nesting habitat requirements that are sensitive to change and human development (Gutiérrez et al. 2020; Nelson 2020; Vanderhoff et al. 2020; Verbeek et al. 2024).

Amphibians and Reptiles

There are an estimated 25 species of amphibians and 28 species of reptiles in Washington (WDFW 2024k). Amphibians and reptiles inhabit a variety of ecosystems and can occur in most habitats across Washington, depending on life requisites.

Amphibians can be grouped into aquatic and terrestrial breeding obligates.[22] Terrestrial breeding obligates are the lungless salamanders in the family Plethodontidae. Aquatic breeding obligates consist of frogs, toads, newts, and mole salamanders in the family Ambystomatidae. Aquatic breeding obligates in Washington breed predominantly in slow-moving freshwater aquatic habitats, such as wetlands, beaver impoundments, ponds, ditches, and sloughs (Corkran and Thoms 1996). A few species, such as the Rocky Mountain tailed frog and coastal giant salamander, breed in fast-flowing streams. Terrestrial breeding obligates breed in moist, sheltered terrestrial habitats such as decaying logs, burrows, and rock piles (Corkran and Thoms 1996). Adults of both aquatic and terrestrial breeding amphibians spend variable amounts of time in terrestrial habitats outside of the breeding season (Corkran and Thoms 1996). Suitable terrestrial habitat for adult amphibians varies with species and seasonal use, but generally consists of forested habitat, open clear cuts, riparian habitat, and meadows (Corkran and Thoms 1996; COSEWIC 2012). However, some species, such as Larch Mountain salamanders, are adapted to unique environments, which occur in talus and scree slopes. Upland habitats are typically moist and provide shelter and thermoregulatory[23] microhabitat[24] features such as decaying logs, shrub cover, moist hollows, and debris or rock piles (Matsuda et al. 2006). Adult amphibians

[21] A species that has a high level of tolerance for different environmental conditions.
[22] A species that must live in a specific condition or environment to survive.
[23] The process of maintaining a certain temperature regardless of external temperature pressure.
[24] Small habitat features that typically provide special functions to a plant or animal in a certain landscape.

also require access to hibernation sites such as talus slopes, debris piles, burrows and holes, and wetland or pond habitats.

Reptiles inhabit a variety of ecosystems, from wetlands to shrubsteppe. Reptiles in Washington include turtles, snakes, and lizards. Turtles, like the northwestern pond turtle, which is state-listed as endangered, are primarily aquatic, living in ponds or lakes with plenty of basking locations and grasslands or open woodland nearby for nesting (WDFW 2024l). In general, regionally occurring snake and lizard species have a patchy distribution and are associated with shrubland, grassland, and canyons with access to suitable hibernacula (winter shelter used for hibernation) or hibernation habitat (e.g., loose soils for burrowing). Reptiles like the northern sagebrush lizard and striped whipsnake, which are both listed as candidate species in the state, require vegetated sand dunes with minimal disturbance and no grazing livestock (WDFW 2024m).

There are two invasive amphibian species in Washington that have been identified as priority species by the Washington Invasive Species Council (WISC): American bullfrog (*Lithobates catesbeianus*) and African clawed frog (*Xenopus laevis*) (WISC 2025). Both species are found in a variety of freshwater habitats, such as marshes, streams, ponds, reservoirs, wetlands, and ditches. They eat different types of native species, including amphibians, turtles, birds, fish, mammals, and young snakes (WISC 2025). They are expected to have contributed to amphibian declines across North America (WISC 2025). Africa clawed frogs also carry pathogens that can harm native amphibian and fish species (WISC 2025).

Invertebrates

Invertebrates are animals without a backbone. These include arthropods (i.e., arachnids, insects, crustaceans, centipedes, and millipedes), mollusks (i.e., snails and slugs), and annelids (i.e., segmented worms). Little is known about many invertebrate species, even though they make up 99 percent of animal species globally (WDFW 2015). Invertebrates are important for many ecological processes, such as soil nutrient cycling, soil creation, pollination, biocontrol, seed dispersal, and water filtration; are critical components of all food webs; and are critical to global ecosystems and economies (WDFW 2015; Schowalter et al. 2018). There is much less information about invertebrates than about other taxonomic groups (Harvey et al. 2023). Many invertebrate species are highly specialized, which allows them to partition resource use in ecosystems, but this can make them very sensitive to changes such as habitat loss, changes in host plant[25] phenology and abundance, climatic changes such as temperature and weather patterns, competition from invasive species, and pollutants (Harvey et al. 2023).

According to the citizen science platform iNaturalist, 3,728 species of native arthropods, 335 species of native mollusks, and 89 species of native annelids have been observed in Washington (iNaturalist Community 2024a, 2024b, 2024c). However, these estimates are likely lower than the actual number of species in each of these taxonomic groups in Washington, as, except for certain well-understood groups such as butterflies (Papilionidae), many invertebrate species are difficult to detect and classify taxonomically. Further, this group does not receive much attention from scientists relative to its diversity (van Klink et al. 2022). Some invertebrate groups in North America have been severely affected by humans—most notably, freshwater bivalves[26]—which are more species-rich in North America than anywhere else on earth, but a high number are imperiled or extinct. For example, 37 species in the United States alone are presumed extinct (WDFW 2015).

Washington's State Wildlife Action Plan (SWAP) lists animals of greatest conservation need and includes 37 species of invertebrate from orders such as Coleoptera (beetles), Hymenoptera (ants, bees, and wasps), Lepidoptera (butterflies and moths), Orthoptera (grasshoppers), Odonata (dragonflies and damselflies), Trichoptera (caddisflies), Plecoptera (stoneflies), and Ephemeroptera (mayflies) (WDFW 2015). Other invertebrate groups in the SWAP include mollusks, slugs, freshwater bivalves, marine bivalves, marine gastropods,[27] and one earthworm species. Many of the invertebrates listed in the SWAP are of concern due to habitat loss and fragmentation; critically low population sizes that can be geographically isolated; restricted ranges; habitat degradation, including pollution; and loss of host plants. Four species or subspecies of terrestrial invertebrates are listed as endangered either federally or in Washington, all of them butterflies (WDFW 2024b). These are the Mardon skipper (*Polites mardon*, state-listed as endangered, not federally listed), island marble (*Euchloe ausonides insulana*, state-listed as candidate, federally listed as endangered), Taylor's checkerspot (*Euphydryas editha taylori*, state-listed as endangered, federally listed as endangered), and Oregon silverspot (*Speyeria zerene hippolyta*, state-listed as

[25] A plant that is required by a species, typically an arthropod, for feeding, egg laying, or some other part of their lifecycle.
[26] An animal in the phylum Mollusca; a soft-bodied invertebrate that typically contains a calcium carbonate shell around its body.
[27] An animal in the class Gastropoda, such as a snail or slug.

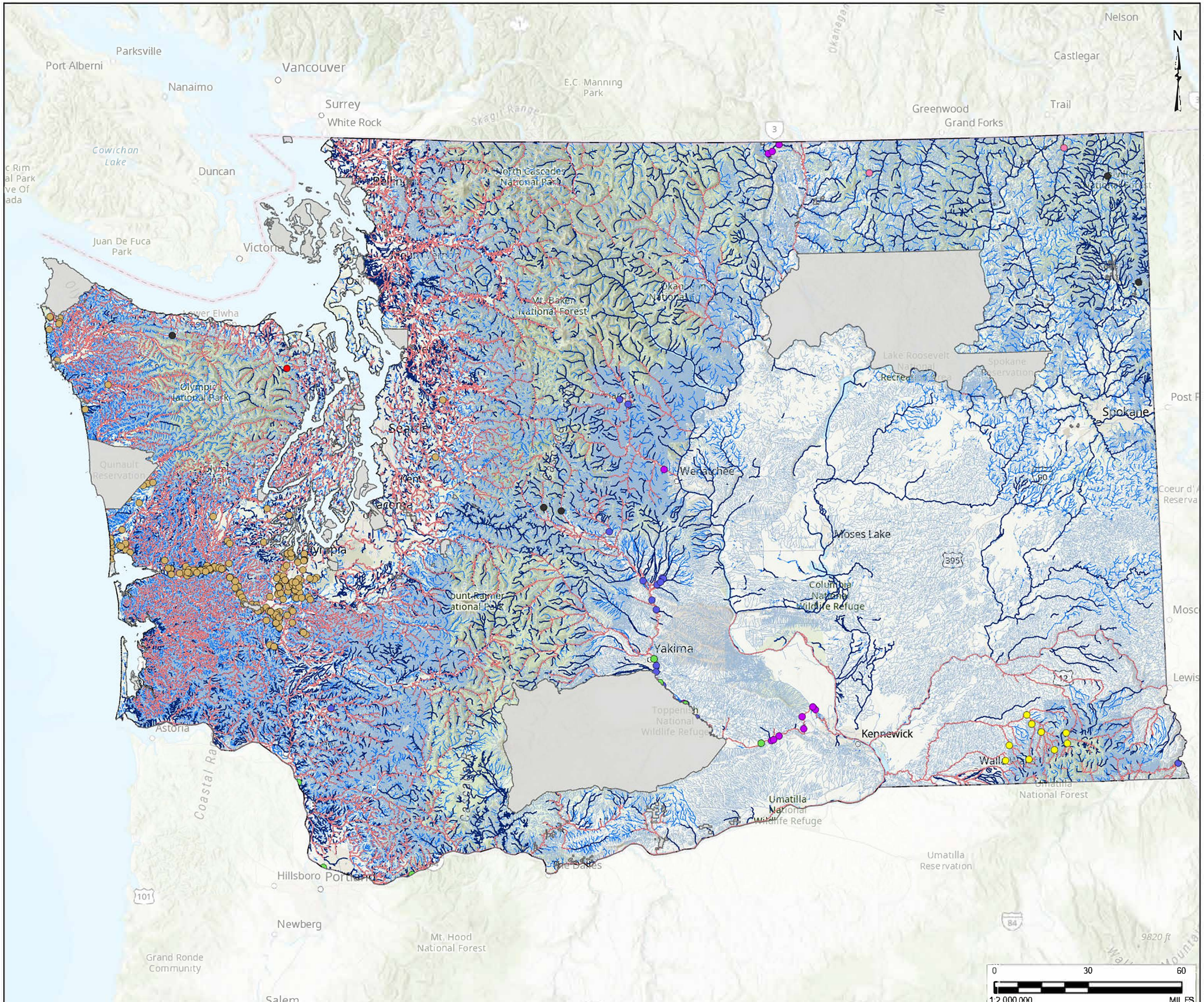
endangered, federally listed as threatened). More information about these species can be found in **Table 3.6-3**.

In Washington, there are 22 priority invasive invertebrate taxa identified by WISC, consisting of 13 invasive insect species and nine non-insect taxa, which are all aquatic and discussed under Section 3.6.2.2, Fish. Eight of these species have been found or have become established in the state, and the other five have the potential to become introduced and would have substantial adverse environmental impacts if they were to become established (WISC 2025). Some of the invasive species found in the state are agricultural pests, such as the apple maggot *(Rhagoletis pomonella*) and spotted wing drosophila (*Drosophila suzukii*), while others can be forest pests such spongy moth (*Lymantria dispar*), or threats to honeybees, such as the northern giant hornet (*Vespa mandarinia*). Other species of invasive insects occur in the state, but these are not identified as high priority by WISC.

General Fish Species

There is no consensus on the number of fish species in Washington. The Washington Biodiversity Council (2007) indicates that Washington provides a home to 470 freshwater and marine fish, whereas the WDFW (2024j) lists 190 species of marine and freshwater fish. Wydoski and Whitney (2003) reported 91 fish species that are represented by 22 families composed of 49 genera and 87 species; 50 are native fishes and 41 are introduced fishes. These 91 fish include subspecies; for example, cutthroat trout has three subspecies—coastal cutthroat trout (*Oncorhynchus clarkii clarkii)*, westslope cutthroat trout (*Oncorhynchus clarkii lewisi*), and Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*). They also include hybrid sport fish, such as tiger muskellunge (*E. Lucius x E. masquinongy*), which is a hybrid between northern pike (*Esox lucius*) and muskellunge (*Esox masquinongy*). The Olympic mudminnow (*Novumbra hubbsi*), which is a state-listed sensitive species, is the only fish species endemic to Washington and is found primarily in the lowland of the Olympic Mountains and Willapa Hills, including the Olympic Peninsula, the Chehalis River basin, south Puget Sound, and a few sites in Snohomish and King Counties (Wydoski and Whitney 2003; WDFW 2012a). Steelhead (*Oncorhynchus mykiss*) is the designated state fish of Washington (Wydoski and Whitney 2003). Fish distribution and known salmon/steelhead streams are identified in **Figure 3.6-3**.

There are 28 different invasive fish species in Washington, of which 19 are classified as prohibited and nine are regulated. Prohibited invasive species include those that are considered by the WFWC to have a high risk of becoming an invasive species and may not be possessed, imported, purchased, sold, propagated, transported, or released into state waters except as provided in Revised Code of Washington (RCW) 77.15.253 (WDFW 2024n). Regulated fish are considered by the WFWC to have some beneficial use, along with a moderate but manageable risk of becoming an invasive species, and may not be released into state waters except as provided in RCW 77.15.523 (WDFW 2024n). Invasive fish species of greatest concern in Washington with known distribution include the northern pike, which is classified as prohibited (WDFW 2024o). They occur in the Pend Oreille River watershed, including Boundary Reservoir and Box Canyon Reservoir. Other prohibited fish species include alligator gar (*Atractosteus spatula*), bighead carp (*Hypophthalmichthys nobilis*), black carp (*Mylopharyngodon piceus*), black piranha (*Serrasalmus rhombeus*), blackskin catfish (*Clarias meladerma*), bowfin (*Amia calva*), fathead minnow (*Pimephales promelas*), golden orfe (*Leuciscus idus – golden*), grass carp (*Ctenopharyngodon idella)*, longnose gar (*Lepisosteus osseus*), northern snakehead (*Channa argus*), red piranha (*Rooseveltiella nattereri),* red-bellied piranha (*Pygocentrus nattereri*), round goby (*Neogobius melanostomus*), rudd (*Scardinius erythropthalmus*), silver carp (*Hypophthalmichthys molitrix*), silver orfe (*Leuciscus idus – silver),* and walking catfish (*Clarias batrachus)* (WDFW 2024n).



LEGEND

- Study Area
- Exclusion Areas
- Statewide Integrated Fish Distribution (WDFW, 2024t)
- Salmon/Steelhead Stream (WDFW, 2024t)

Watercourse (WaDNR, 2021)

- Fish
- Non-fish/Unknown

Priority Fish Observation (WDFW, 2024t)

- Lake Chub
- Leopard dace
- Margined sculpin
- Mountain Sucker
- Olympic mudminnow
- Pygmy Whitefish
- Umatilla dace
- Westslope Cutthroat Trout

REFERENCES AND NOTES

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Washington State Energy Facility Site Evaluation Council

PROJECT

PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE

FISH PRIORITY SPECIES AND HABITAT DISTRIBUTION IN WASHINGTON STATE

YYYY-MM-DD 2025-09-05 CONSULTANT wsp FIGURE 3.6-3

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Wildlife Priority Species

For the purpose of this Programmatic EIS, special status wildlife species are defined as one or more of the following:

- Listed under the federal ESA
- Listed by Washington State as endangered, threatened, sensitive, or candidate species
- Protected under the Bald and Golden Eagle Protection Act (USFWS 2016)

There are 58 terrestrial[28] vertebrate special status wildlife species in Washington, comprising 18 mammals, 26 birds, nine amphibians, and five reptiles. In addition, 26 terrestrial invertebrate species, including insects and mollusks, that occur in Washington are either state- or federally listed, or state candidate species (**Table 3.6-3**).

[28] Excludes marine mammals and marine birds such as short-tailed albatross.

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Table 3.6-3: Federally or State-Listed Endangered, Threatened, or Sensitive Wildlife Species or State Candidate Species in Washington

Species[(a)]	Federal/ State Listing[(a)]	Ecoregions[(b)(c)]	Habitat[(b)]	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats[(b)]
Gray Wolf *Canis lupus*	FE/SE	▪ Okanogan ▪ Canadian Rocky Mountains ▪ Blue Mountains ▪ East Cascades ▪ West Cascades	Generalist	10,000 to > 1,000,000[(d)]	260 (2023)[(e)]	Increase[(e)]	Decline[(e)]	▪ Illegal killing of wolves ▪ Wolf-livestock conflicts
Grizzly Bear *Ursus arctos horribilis*	FT/SE	▪ North Cascades ▪ East Cascades ▪ Okanogan ▪ Canadian Rocky Mountains	Generalist	~27,800 (In Canada and Continental United States)[(f)]	70 to 80 (Selkirk Mountain Recovery Zone – northeastern Washington and northern Idaho; 2017)[(f)]	Increase[(f)]	Decline[(f)]	▪ Habitat loss ▪ Habitat degradation ▪ Public education ▪ Habitat fragmentation ▪ Lack of information
Wolverine *Gulo gulo*	FT/SC	▪ North Cascades ▪ West Cascades ▪ East Cascades ▪ Okanogan ▪ Canadian Rocky Mountains ▪ Blue Mountains	Boreal,[29] tundra, and taiga[30] ecosystems. In alpine and subalpine areas in Washington.	10,000 to >1,000,000[(d)]	Unknown	Decline to relatively stable[(d)]	Decline[(d)]	▪ Lack of information ▪ Habitat loss ▪ Habitat fragmentation ▪ Climate changes
Lynx *Lynx canadensis*	FT/SE	▪ North Cascades ▪ East Cascades ▪ Canadian Rocky Mountains	Subalpine and boreal forest. High-elevation conifer forests in Washington.	10,000 to > 1,000,000[(d)]	87 (early 2000s)[(b)]	Decline[(b)]	Decline[(b)]	▪ Wildfire ▪ Small population size ▪ Reduced habitat connectivity
Fisher *Pekania pennanti*	NA/SE	▪ Pacific Northwest Coast ▪ Puget Trough ▪ Canadian Rocky Mountains	Conifer and mixed conifer deciduous.	10,000 to >1,000,000[(d)]	90 (released from 2008 to 2010, thought to be increasing)[(b)]	Unknown, potential increase[(b)]	Decline[(b)]	▪ Incidental trapping[31] ▪ Highway collisions
Western Gray Squirrel *Sciurus griseus*	NA/SE	▪ Puget Trough ▪ West Cascades ▪ North Cascades ▪ East Cascades ▪ Okanogan	Transitional areas where conifer-dominated areas merge with open areas with oak and other deciduous trees.	18,000,000 (California in 2003)[(g)]	937 (1995 to 2005 survey efforts)[(h)]	Likely Increase (due to translocations)[(h)]	Decline[(h)]	▪ Habitat Loss ▪ Road collisions ▪ Disease ▪ Competition with non-native squirrels ▪ Loss of genetic diversity[(b)]

[29] A type of climatic zone related to northern forests, which are dominated by conifers.
[30] A climatic zone typically with sparse conifers mixed with rocks and shrubs. Generally, taigas are more northern than boreal areas and closer to the tree line and tundra.
[31] Inadvertently catching an animal in a trap or a structure designed for another purpose (e.g., open construction trench).

Species[(a)]	Federal/ State Listing[(a)]	Ecoregions[(b)(c)]	Habitat[(b)]	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats[(b)]
Cascade Red Fox *Vulpes vulpes cascadensis*	NA/SE	▪ West Cascades ▪ East Cascades ▪ Okanogan	Subalpine meadows and open forests in Cascade Range.	Endemic to Washington[(b)]	No population estimates. 51 individuals identified in southern Washington in genetic study.[(i)]	Decline[(b)]	Decline[(b)]	▪ Habituation[32] to people ▪ Lacking information ▪ Climate change
Woodland Caribou (South Selkirk Population) *Rangifer tarandus caribou*	FE/SE	▪ Canadian Rocky Mountains	Old-growth conifer forests above 4,002.63 feet (1,220 meters) with abundant arboreal[33] lichen.	18 (2014 South Selkirk Woodland Caribou population, mostly in British Columbia, Canada)[(b)]	18 (2014 South Selkirk Woodland Caribou population, mostly in BC, Canada)[(d)]	Decline[(b)]	Decline[(b)]	▪ Small population size ▪ Predation ▪ Highway collisions ▪ Snowmobile disturbance and other human activities ▪ Habitat loss
Columbian White-tailed Deer *Odocoileus virginianus leucurus*	FT/ST	▪ Puget Trough ▪ Pacific Northwest Coast	Riparian habitat within the Columbia River floodplain.	2,500 to 10,000 (2016)[(d)]	1,000 (2016)[(d)]	Increase[(d)]	Decline[(d)]	▪ Habitat loss ▪ Habitat degradation ▪ Water management ▪ Predation pressure ▪ Invasive plant species ▪ Inadequate recovery goals
Pygmy Rabbit (Columbia Basin population) *Brachylagus idahoensis*	FE/SE	▪ Columbia Plateau	Sagebrush stands in loose soil for burrowing.	Endemic to Washington[(b)]	>125 individuals[(j)]	Increase (after some decrease from 2017 to 2020)[(j)]	Decline[(j)]	▪ Habitat loss ▪ Lack of information ▪ Livestock habitat depreciation ▪ Insufficient reserve lands
Mazama Pocket Gopher *Thomomys mazama*	FT/ST	▪ Puget Trough ▪ Pacific Northwest Coast	Grasslands, prairies, and subalpine meadows with well-drained soil for burrowing.	100,000 to >1,000,000[(d)]	2,000 to >5,000 (2007)[(d)]	Unknown[(d)]	Decline[(d)]	▪ Habitat loss ▪ Habitat degradation ▪ Trapping and overharvesting ▪ Lack of information
Townsend's big-eared Bat *Corynorhinus townsendii*	NA/SC	▪ Whole state	Lowland conifer and deciduous forests, montane conifer forests, shrubsteppe, open areas.	10,000 to 1,000,000[(d)]	Unknown [(k)]	Stable/ Decline[(c)(k)]	Decline[(k)]	▪ Roost disturbance ▪ Pesticides ▪ Agricultural and silvicultural[34] practices

[32] The process of becoming accustomed to something; often used in wildlife biology to refer to a species becoming accustomed to people.
[33] An organism which is adapted to living in trees
[34] Describes the practice of managing the growth, composition, health, and quality of forests to meet diverse needs and values, such as timber production, wildlife habitat, water resources, and recreation.

Species[a]	Federal/ State Listing[a]	Ecoregions[b][c]	Habitat[b]	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats[b]
Keen's Myotis *Myotis keenii*	NA/SC	▪ Coast Range ▪ Puget Trough ▪ West Cascades	Moist, mature, low-elevation forests during warmer months, mid-elevation caves for hibernation.	10,000 to 100,000[d]	Unknown, presumed rare[b][k]	Unknown[b][k]	Decline[k]	▪ Lack of information ▪ Pesticides ▪ Habitat Loss
White-tailed Jackrabbit *Lepus townsendii*	NA/SC	▪ Columbia Plateau ▪ Okanogan	In summer, hilly sites with bunchgrass. In winter, sagebrush flats in valley bottoms.	10,000 to >1,000,000[d]	Unknown (low)[d]	Decline[b][d]	Decline[b][d]	▪ Habitat loss ▪ Low population size ▪ Disease ▪ Overharvesting
Black-tailed Jackrabbit *Lepus californicus*	NA/SC	▪ Columbia Plateau	Inhabits shrubsteppe areas with sagebrush and rabbitbrush. Feeds in grassy areas at night.	Unknown[d]	Unknown[d]	Relatively stable[d]	Decline[d]	▪ Habitat Loss ▪ Habitat Degradation ▪ Small population size ▪ Disease ▪ Overharvesting ▪ Lack of data
Washington Ground Squirrel *Urocitellus washingtoni*	NA/SC	▪ Columbia Plateau	Prefers shrubsteppe or grasslands with silty loam soil for burrowing. May inhabit disturbed sites when food is abundant.	Unknown,[l] 2,500 to 100,000[d]	Unknown[l]	Decline[b][c]	Decline[b][d]	▪ Habitat loss ▪ Habitat fragmentation ▪ Invasive plant species ▪ Overharvesting ▪ Lack of information
Townsend's Ground Squirrel) (South of the Yakima River) *Urocitellus townsendii*	NA/SC	▪ Columbia Plateau	Historically inhabited shrubsteppe, grassland, sagebrush habitat, now also found in agricultural areas and pastures.	Endemic to Washington State[b]	Unknown[m]	Decline[m][b][d]	Decline[m][b][d]	▪ Lack of information ▪ Habitat loss ▪ Fragmentation ▪ Invasive plant species ▪ Overharvesting
Olympic Marmot *Marmota olympus*	NA/SC	▪ Northwest Coast	Alpine and subalpine meadows in the Olympic Mountains. Typically prefers south-facing slopes.	Endemic to Washington State[b]	2,000 to 4,000[n]	Relatively stable[b][d]	Decline[b][d]	▪ Predation by invasive species ▪ Fire control ▪ Reduced snowpack ▪ Public education
Sandhill Crane *Grus canadensis*	NA/SE	▪ East Cascades ▪ Columbia Plateau	Flooded meadows, marshes, and wetlands.	8,000 (Central Valley population; 1993)[o]	60 (30 breeding pairs; 2015)[b]	Stable or increasing[b]	Declines and increases across range[d]	▪ Habitat loss ▪ Lack of information ▪ Agricultural effects such as changing water levels

Species[a]	Federal/ State Listing[a]	Ecoregions[b][c]	Habitat[b]	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats[b]
Western Snowy Plover *Charadrius nivosus nivosus*	FT/SE	▪ Pacific Northwest Coast	Coastal beaches, sandspits, and dunes. Breeds on dry mudflats[35] or beaches above hightide line.	10,000 to 100,000[c]	<50 (2014)[b]	Stable/ Increase[b]	Decline[d]	▪ Human disturbance ▪ Nest predation ▪ Degradation of habitat ▪ Resource information needs
Upland Sandpiper *Bartramia longicauda*	NA/SE	▪ None - Extirpated[b]	Prefers tall grass and wet meadows for nesting.	100,000 to >1,000,000 individuals[d]	0 – Extirpated[b]	Decline[d]	Decline[d]	▪ Lack of information ▪ Protection of historical breeding areas
Marbled Murrelet *Brachyramphus marmoratus*	FT/SE	▪ Pacific Northwest Coast ▪ Puget Trough	Marine species which breeds in coastal old-growth forests.	300,000 (1995)[o]	7,494 (2015)[p]	Decline[p]	Decline[p]	▪ Breeding habitat loss ▪ Low juvenile recruitment ▪ Environmental contamination ▪ Recreation activities near breeding sites
Columbian Sharp-Tailed Grouse *Tympanuchus phasianellus columbianus*	NA/SE	▪ East Cascades ▪ Okanogan ▪ Columbia Plateau	Grassland and steppe habitat	56,000 to 62,000 (2000)[q]	902 (2011)[q]	Decline[b]	Decline[b]	▪ Habitat fragmentation ▪ Small populations ▪ Habitat loss
Greater Sage-grouse *Centrocercus urophasianus*	NA/SE	▪ Columbia Plateau ▪ Okanogan	Shrubsteppe with dominant sagebrush.	142,000 (1998)[o]	<1000 (2014)[b]	Stable[b]	Decline[d]	▪ Habitat loss ▪ Wildfires ▪ Small populations ▪ Habitat fragmentation
Ferruginous Hawk *Buteo regalis*	NA/SE	▪ Columbia Plateau	Shrubsteppe and arid grasslands.	110,000 (2005 to 2014 Canada and U.S., estimated using BBS data)[o]	Unknown	Decline[r]	Decline[r]	▪ Habitat loss ▪ Habitat fragmentation ▪ Human disturbance at nest sites ▪ Poisoning of prey
Yellow-billed Cuckoo *Coccyzus americanus*	FT/SE	▪ None - Extirpated	Riparian areas, including willows and cottonwoods.	10,000 to >1,000,000[d]	0 – Extirpated[b]	Decline[d]	Decline[d]	▪ Habitat loss and degradation ▪ Lack of information
Northern Spotted Owl *Strix occidentalis caurina*	FT/SE	▪ Pacific Northwest Coast ▪ Puget Trough ▪ North Cascades ▪ West Cascades ▪ East Cascades	Coniferous forests with complex canopy and downed wood. Typically mid- and late-seral stage.	<15,000 (2016)[s]	671 Pairs (1987-1992 Surveys)[o]	Decline[d]	Decline[d]	▪ Habitat loss – old growth ▪ Barred owl predation

[35] A type of habitat consisting of a wet muddy area, typically near the ocean, which becomes muddy at low tide and is covered by water at high tide.

Species[a]	Federal/ State Listing[a]	Ecoregions[b][c]	Habitat[b]	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats[b]
Streaked Horned Lark *Eremophila alpestris strigata*	FT/SE	▪ Pacific Northwest Coast ▪ Puget Trough	Grasslands, coastal beaches, sparsely vegetated shorelines.	1170 to 1610 (2013)[b]	245 pairs (2013)[b]	Decline[d]	Decline[d]	▪ Lack of information ▪ Dredged material deposition ▪ Aircraft collisions ▪ Habitat loss ▪ Loss of genetic diversity
Oregon Vesper Sparrow *Pooecetes gramineus affinis*	90D/SE	▪ Puget Trough	Large prairie sites and pastures with scattered shrubs and grass.	3000 (2021)[t]	300 (2021)[t]	Decline[t]	Decline[t]	▪ Habitat loss ▪ Invasive plant species ▪ Military training exercises ▪ Increased predation pressure ▪ Herbicide and pesticides
Common Loon *Gavia immer*	NA/SS	▪ Pacific Northwest Coast ▪ Puget Trough ▪ North Cascades ▪ East Cascades ▪ Okanogan ▪ Canadian Rocky Mountains ▪ Columbia Plateau	Requires clear lakes for breeding with small islands or marshy shallow vegetation for nest sites.	100,000 to 1,000,000 (2014)[d]	Unknown	Relatively stable[d]	Decline[d]	▪ Habitat loss ▪ Habitat degradation ▪ Human disturbance at breeding areas ▪ Landowner engagement ▪ Public outreach requirements (lead fishing gear, gear entanglement, commercial bycatch)
American White Pelican *Pelecanus erythrorhynch os*	NA/SS	▪ Pacific Northwest Coast ▪ Puget Trough ▪ Columbia Plateau	Require isolated freshwater islands for nesting.	100,000 to 1,000,000 (2005)[d]	~2,000 adults (2012)[q]	Increase[d]	Decline[d]	▪ Nest and roost sites affected by dredging ▪ Lack of information on prey
Western Grebe *Aechmophorus occidentalis*	NA/SC	▪ Columbia Plateau ▪ Okanogan	Uses large lakes, reservoirs, and marshes for breeding, and protected marine areas during winter.	80,000-90,000 adults[u]	1,000 to 2,000 adults (2015) [b]	Relatively stable[u]	Decline [b][c]	▪ Reduced water in reservoirs affect breeding ▪ Boat wakes damage nests ▪ Bycatch in gill nets ▪ Prey declines ▪ Oil spills
Clark's Grebe *Aechmophorus clarkii*	NA/SC	▪ Columbia Plateau	Uses large lakes, reservoirs, and marshes for breeding, and protected marine areas during winter.	71,737 birds[v]	75 to 150[b]	Decline[b][c]	Decline[b][c]	▪ Reduced water in reservoirs affect breeding ▪ Boat wakes damage nests

Species[a]	Federal/ State Listing[a]	Ecoregions[b][c]	Habitat[b]	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats[b]
Northern Goshawk *Accipiter gentilis*	NA/SC	▪ Northwest Coast ▪ Puget Trough ▪ North Cascades ▪ West Cascades ▪ East Cascades ▪ Okanogan ▪ Canadian Rockies ▪ Blue Mountains [w]	Nests in stands of large conifers that contain structural complexity.[w]	1,000,000 to 2,499,999[u]	Unknown[w]	Unknown[w]	Unknown[u][w]	▪ Habitat loss ▪ Pesticides and herbicides[u]
Golden Eagle *Aquila chrysaetos*	NA/SC (Bald and Golden Eagle Protection Act)	▪ All ecoregions	Shrubsteppe, dry open areas, canyonlands. Nests on cliffs, rocky ledges, trees, and human-made structures.	57,000 (North America)[s]	300 breeding territories (occupancy of these are not well understood)[b]	Relatively Stable to Increase[s]	Unknown[b][c]	▪ Habitat loss ▪ Fragmentation ▪ Prey declines ▪ Collisions with wind turbines
Flammulated Owl *Otus flammeolus*	NA/SC	▪ East Cascades ▪ Okanogan ▪ Blue Mountains ▪ Canadian Rockies	Associated with mature ponderosa pine forests with snags, cavities, and a relatively open canopy.	11,000 (Canada and U.S.)[s]	Unknown[b]	Decline[u]	Unknown[b][c]	▪ Fire suppression practices ▪ Habitat loss
Burrowing Owl *Athene cunicularia*	NA/SC	▪ Columbia Plateau ▪ Okanogan	Shrubsteppe and open areas, including plains, and grasslands, and prairies.	1,100,000 (Canada and U.S.)[s]	Unknown [b]	Decline [d]	Decline[d]	▪ Habitat loss ▪ Pesticides and poisoning ▪ Lack of information
White-headed Woodpecker *Picoides albolarvatus*	NA/SC	▪ East Cascades ▪ Okanogan ▪ Canadian Rocky Mountains ▪ Blue Mountains	Associated with ponderosa pine and Douglas-fir forests with open canopies and large snags.	200,000 (Canada and U.S.)[s]	Unknown [b]	Stable[c][u]	Unknown[b]	▪ Fire suppression practices ▪ Habitat loss ▪ Lack of information
Black-backed Woodpecker *Picoides arcticus*	NA/SC	▪ East Cascades ▪ Okanogan ▪ Canadian Rocky Mountains ▪ Blue Mountains[m]	Mid-high-elevation conifer forests, specialists of recently burned standing dead forests.[m]	1,800,000 (Canada and U.S.)[s]	Unknown[b]	Stable to increase[s][u]	Relatively stable[d]	▪ Fire suppression practices ▪ Habitat loss[m]
Loggerhead Shrike *Lanius ludovicianus*	NA/SC	▪ Columbia Plateau ▪ Okanogan	Inhabits open areas, including shrubsteppe and grasslands with scattered perches and shrubs for nesting.	4,200,000 (Canada and U.S.)[s]	Unknown[b]	Decline[d]	Decline[d]	▪ Habitat loss ▪ Loss of sagebrush ▪ Lack of information
Slender-billed White-breasted Nuthatch *Sitta carolinensis aculeata*	NA/SC	▪ Puget Trough	Requires oak and oak conifer woodlands, with specific trees being Oregon white ash, Oregon ash, and black cottonwood. Inhabits the Puget Trough ecoregion.	Unknown[d]	<50 birds[b]	Decline[x]	Unknown	▪ Habitat loss ▪ Small population size ▪ Lack of information

Species[a]	Federal/ State Listing[a]	Ecoregions[b][c]	Habitat[b]	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats[b]
Sage Thrasher *Oreoscoptes montanus*	NA/SC	▪ Columbia Plateau ▪ Okanogan	Sagebrush is required for breeding, either in areas with expansive coverage or sometimes in small patches of sagebrush in agricultural fields.	6,600,000[s]	Unknown[b]	Relatively stable in Washington[b] or Decline[d]	Decline[b][d]	▪ Habitat loss ▪ Fragmentation ▪ Overgrazing by livestock ▪ Invasive plant species ▪ Lack of information
Sagebrush Sparrow *Artemisiospiza nevadensis*	NA/SC	▪ Columbia Plateau ▪ Okanogan	Areas containing large expanses of big sagebrush	4,700,000[s]	Unknown[b]	Relatively stable[u]	Unknown	▪ Habitat loss ▪ Fragmentation ▪ Overgrazing by livestock ▪ Invasive plant species ▪ Lack of information
Bald Eagle *Haliaeetus leucocephalus*	NA/NA (Bald and Golden Eagle Protection Act)	▪ All ecoregions	Typically breeds near large waterbodies such as oceans, lakes, rivers, and reservoirs. Requires large trees for nest construction.	200,000 mature individuals[s]	3,000 breeding birds (2005)[b]	Increase[b][c]	Decline[d]	▪ Habitat loss
Oregon Spotted Frog *Rana pretiosa*	FT/SE	▪ Puget Trough ▪ West Cascades ▪ Eastern Cascades and Foothills	Shallow wetlands associated with flowing water. Breeds in flooded wetland margins.	10,000 to 100,000 (2012)[d]	7368 adults (2012)[y]	Decline[d]	Decline[d][c]	▪ Lack of information ▪ Invasive plant species ▪ Invasive fish species ▪ Drying of wetlands
Northern Leopard Frog *Lithobates pipiens*	NA/SE	▪ Columbia Plateau ▪ Canadian Rocky Mountains	Requires specific habitat type. Needs shallow lentic areas for breeding, forages on moist areas on land, over winters in deep water that doesn't freeze.	100,000 to 1,000,000[c]	Unknown	Decline[d]	Decline[d]	▪ Invasive American bullfrogs ▪ Water management practices ▪ Agricultural practices ▪ Lack of information for disease effects ▪ Invasive aquatic plant species
Larch Mountain Salamander *Plethodon larselli*	NA/SS	▪ West Cascades ▪ East Cascades	Steep areas of scree, talus, and other rocky soils in various types of forested and non-forested habitats. Typically, north facing.	Unknown	Unknown	Relatively stable[d]	Decline[d]	▪ Lack of information ▪ Habitat loss and degradation ▪ Mining of rocks ▪ Climate change
Dunn's Salamander *Plethodon dunni*	NA/SC	▪ Northwest Coast	Habitat includes rocky areas and talus adjacent to streams in humid forests. They do not prefer flowing water, but areas that are constantly moist.	10,000 to 100,000[d]	Unknown	Decline to Stable[d]	Unknown[d]	▪ Lack of information ▪ Habitat loss
Van Dyke's Salamander *Plethodon vandykei*	NA/SC	▪ Northwest Coast ▪ West Cascades	Found in moist areas with cool temperatures, and is typically associated with streams, seepages, and rock outcrops.	2,500 to 100,000[d]	Unknown	Unknown[d]	Decline[d]	▪ Lack of information ▪ Habitat loss ▪ Fragmentation

Species[a]	Federal/ State Listing[a]	Ecoregions[b][c]	Habitat[b]	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats[b]
Cascade Torrent Salamander *Rhyacotriton cascadae*	90D/SC	▪ West Cascades ▪ Puget Trough	Found in streams, seepages, and waterfall splash zones that are cold and have a thick canopy cover.	Unknown[d]	Unknown	Unknown[b][c]	Unknown[c][d]	▪ Lack of information ▪ Habitat degradation ▪ Climate Change ▪ Habitat loss
Western Toad *Anaxyrus boreas*	NA/SC	▪ Northwest Coast ▪ Puget Trough ▪ West Cascades ▪ North Cascades ▪ East Cascades ▪ Okanogan ▪ Canadian Rocky Mountains ▪ Blue Mountains	Occurs in a wide range of habitat, including forests, prairies, canyons, Oregon oak, and ponderosa pine habitat. Breeds in a wide variety of water features.	100,000 to 1,000,000[d]	Unknown	Decline to Relatively stable[d]	Decline[d]	▪ Vehicle collision ▪ Habitat loss ▪ Habitat degradation ▪ Lack of information Chytrid fungus and other diseases
Columbia Spotted Frog *Rana luteiventris*	NA/SC	▪ East Cascades ▪ Okanogan ▪ Columbia Plateau ▪ North Cascades ▪ Blue Mountains	Inhabits a variety of still and slow-moving waterbodies like streams and creeks, or pools on the edge of moving watercourses.	100,000 to 1,000,000[d]	Unknown	Decline[d][u]	Decline[d]	▪ Introduced American bullfrog ▪ Lack of information ▪ Habitat loss
Rocky Mountain Tailed Frog *Ascaphus montanus*	NA/SC	▪ Blue Mountains	Inhabits fast-flowing streams in mature forests with rocky substrates and cold, clear water. Can occasionally persist in streams that have been modified by disturbances, including burns.	2,500 to 100,000[d]	229 observations on WDFW database (1997 to 2010)[b]	Decline to relatively stable[d]	Decline to relatively stable[d]	▪ Lack of information ▪ Habitat loss ▪ Habitat degradation
Northwestern Pond Turtle *Actinemys marmorata*	90D/SE	▪ Puget Trough ▪ West Cascades	In Washington, they inhabit lakes and ponds but leave water to lay eggs in surrounding habitat.	2,500 to 100,000 (2021)[d]	800-1000 (2015)[z]	Decline[z]	Decline[z]	▪ Habitat loss ▪ Invasive American bullfrogs ▪ Invasive plant species ▪ Lack of population information
Sagebrush Lizard *Sceloporus graciosus*	NA/SC	▪ Columbia Plateau ▪ Okanogan	Associated with sand dunes and sandy habitats that have bare ground and shrubs for cover.	>100,000[d]	Unknown[b]	Relatively stable[c][u]	Decline[d]	▪ Lack of information ▪ Habitat loss ▪ Invasive plant species
Common Sharp-tailed Snake *Contia tenuis*	NA/SC	▪ Puget Trough ▪ East Cascades ▪ Columbia Plateau	Found in Garry oak forests, riparian areas with deciduous trees, and shrubsteppe uplands with deciduous trees. Associated with rocks and rotting logs.	10,000 to 1,000,000[d]	Unknown[b]	Relatively stable[c][u]	Decline[d]	▪ Lack of information ▪ Habitat loss

Species[a]	Federal/ State Listing[a]	Ecoregions[b][c]	Habitat[b]	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats[b]
California Mountain Kingsnake *Lampropeltis zonata*	NA/SC	▪ East Cascades	Inhabits Oregon white oak and ponderosa pine forests, occurring in moist habits with rocks and woody debris.[36]	10,000 to 1,000,000[d]	Unknown but likely small[b]	Relatively stable[d]	Decline[d]	▪ Lack of information ▪ Habitat loss ▪ Fragmentation ▪ Overharvesting for pet trade
Striped Whipsnake *Coluber taeniatus*	NA/SC	▪ Columbia Plateau	Obligates of shrubsteppe, typically occurring in very dry areas of the Columbia Basin in habitats with basalt outcrops.	100,000 to 1,000,000[d]	Unknown[b]	Relatively stable[d]	Decline[d]	▪ Lack of information ▪ Habitat loss ▪ Fragmentation ▪ Habitat degradation ▪ Invasive plant species ▪ Overgrazing by livestock
Columbia Oregonian *Cryptomastix hendersoni* (snail)	NA/SC	▪ Columbia Plateau	Inhabits seeps and streams in the Columbia Basin, associated with logs, leaf litter, and other moist habitat features.	Unknown	Unknown	Decline[b]	Decline[d]	▪ Habitat degradation ▪ Habitat loss
Poplar Oregonian *Cryptomastix populi* (snail)	NA/SC	▪ Columbia Plateau	Found in canyons with surrounding sage scrub vegetation. Inhabits cool talus slopes and shrubby draws.[37]	Unknown	Unknown	Decline[b][d]	Decline[d]	▪ Lack of information ▪ Habitat loss ▪ Overgrazing by livestock
Dalles Sideband *Monadenia fidelis minor* (snail)	NA/SC	▪ West Cascades	Known from talus around seeps and springs that provide moist habitat and in forested upland areas.	Unknown	Unknown	Unknown[d]	Decline[d]	▪ Habitat loss
Blue-gray Taildropper *Prophysaon coeruleum* (slug)	NA/SC	▪ Puget Trough	Inhabits moist forests of either conifer or mixed-wood composition with an abundant layer of course woody debris and leaf litter.	Unknown[d]	Unknown[b]	Decline[b]	Unknown[d]	▪ Habitat loss
Oregon Silverspot *Speyeria zerene hippolyta*	FT/SE	▪ None - Extirpated	Coastal grasslands and coastal meadows.[aa]	823 (2018)[bb]	0 – Extirpated[bb]	Decline[d]	Decline[d]	▪ Invasive plant species ▪ Loss of host plants ▪ Habitat loss and degradation

[36] Debris, which can consist of downed trees, branches, rotting logs, or other woody materials.
[37] Also known as a reentrant, a draw is a terrain feature characterized by two parallel ridges with low ground in between. The low ground area itself is the draw. Draws are similar to valleys but on a smaller scale. Although valleys run parallel to a ridgeline, draws are perpendicular to the ridge and rise with the surrounding ground, often disappearing upslope.

Species[a]	Federal/ State Listing[a]	Ecoregions[b][c]	Habitat[b]	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats[b]
Taylor's Checkerspot *Euphydryas editha taylori*	FE/SE	▪ Puget Lowlands ▪ Coast Range	Lowland prairies and meadows, coastal and alpine meadows, dunes, forest clearings in old growth.	Unknown to >30,000[aa]	>30,000[aa] (Based on estimates from three sites in Washington; 2019)	Increase[aa]	Decline[b][cc]	▪ Invasive plant species ▪ Loss of host plants ▪ Habitat loss ▪ Habitat degradation
Island Marble *Euchloe ausonides insulana*	FE/SC	▪ Puget Trough	Coastal dunes, meadows, open disturbed areas, grasslands.	Endemic to Washington[b]	50 to 100 (2015)[b]	Decline[b]	Decline[b]	▪ Increased herbivore browsing ▪ Agricultural practices
Mardon Skipper *Polites mardon*	NA/SE	▪ Puget Trough ▪ East Cascades	Alpine meadows, glacial outwash prairies, grass-dominated sites.	Unknown to >35000[dd]	>35000[dd] (Based on abundance counts at the two highest population sites in Washington; 2022)	Increase[dd]	Decline[dd]	▪ Invasive plant species ▪ Lack of knowledge ▪ Habitat loss ▪ Habitat degradation ▪ Climate change ▪ Habitat fragmentation
Monarch Butterfly *Danaus plexippus*	FC/SC	▪ Columbia Plateau ▪ Blue Mountains ▪ Okanogan ▪ East Cascades	Typically occur in field margins where milkweeds grow, also near wetlands and riparian areas.	44,300,000 (including introduced populations)[u]	Unknown	Decline[d]	Decline[d]	▪ Lack of information ▪ Education needs ▪ Habitat loss
Western Bumble Bee *Bombus occidentalis*	90DSC	▪ Puget Trough ▪ West Cascades ▪ North Cascades ▪ East Cascades ▪ Columbia Plateau ▪ Canadian Rocky Mountains	A generalist that is typically associated with meadows, grasslands, and forests.	Unknown	Unknown	Decline[d]	Decline[d]	▪ Lack of information ▪ Agriculture practices
Beller's Ground Beetle *Agonum belleri*	NA/SC	▪ Puget Trough	Only inhabits sphagnum bogs at mid-low elevation in the Puget lowlands.	20 to 30 populations[b]	Unknown	Unknown[b]	Unknown[b]	▪ Habitat degradation ▪ Lack of information
Mann's Mollusk-eating Ground Beetle *Scaphinotus mannii*	NA/SC	▪ Columbia Plateau	Inhabits shrub-dominated springs and damp areas in canyons throughout the Snake River drainage.	<10 populations[b]	Unknown	Unknown[b]	Unknown[b]	▪ Habitat loss (from reservoirs) ▪ Agricultural practices ▪ Lack of information
Columbia River Tiger Beetle *Cicindela columbica*	NA/SC	▪ Columbia Plateau	Uses sandbars in the Columbia and Snake River systems that are not affected by high water levels.	Unknown[b]	Unknown[b]	Unknown[b]	Unknown[b]	▪ Habitat loss (from reservoirs) ▪ Lack of information

Species[a]	Federal/ State Listing[a]	Ecoregions[b][c]	Habitat[b]	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats[b]
Hatch's Click Beetle *Eanus hatchii*	NA/SC	▪ Puget Trough	Obligate of small sphagnum bogs found in small watersheds.	Unknown (only known from four bogs)[b]	Unknown[b]	Decline[b][c]	Decline[d]	▪ Habitat degradation
Columbia Clubtail *Gomphurus lynnae* (dragonfly)	NA/SC	▪ Columbia Plateau	Inhabits slow moving rivers with muddy or sandy banks, and gravelly rapids. Only one known population in Washington	Unknown[d]	Unknown - one known population[b]	Relatively Stable[d]	Unknown[d]	▪ Habitat degradation ▪ Small population size ▪ Habitat loss
Pacific Clubtail *Phanogomphus kurilis* (dragonfly)	NA/SC	▪ West Cascades ▪ Puget Trough	In Washington, inhabits lakes and large ponds with sandy to muddy substrates.	Unknown[d]	Unknown – two to three populations[b]	Decline[b]	Unknown[d]	▪ Habitat degradation ▪ Small population size ▪ Habitat loss
Sand-verbena Moth *Copablepharon fuscum*	NA/SC	▪ Puget Trough	Requires coastal dune sites that are non-stabilized and support sand verbena, its host plant.	Unknown[d]	Unknown – five populations[b]	Decline to Relatively Stable[d]	Decline[d]	▪ Habitat loss ▪ Small population size ▪ Habitat degradation
Yuma Skipper *Ochlodes yuma*	NA/SC	▪ Columbia Plateau	Inhabits marshes in the Columbia Basin that support its hostplant, native common reed.	Unknown[d]	Unknown – three to five populations[b]	Decline[b]	Unknown[d]	▪ Lack of information ▪ Habitat loss ▪ Invasive species
Makah Copper *Tharsalea mariposa makah*	NA/SC	▪ Northwest Coast	Requires coastal *Sphagnum* bogs that support bog cranberry, its hostplant.	Unknown	Unknown - 10 to 15 populations[b]	Decline[b]	Unknown	▪ Habitat loss ▪ Habitat degradation ▪ Climate change ▪ Lack of information
Chinquapin Hairstreak *Habrodais grunus herri*	NA/SC	▪ West Cascades	Requires its host plant, golden chinquapin. Spends most of its life in its canopy.	Unknown	Unknown – one to two populations[b]	Decline[b]	Unknown	▪ Lack of information ▪ Habitat loss ▪ Small population size
Johnson's Hairstreak *Callophrys johnsoni*	NA/SC	▪ Puget Trough ▪ Northwest Coast	Mature forests that support its host plant, dwarf mistletoe, which grows on western hemlock.	Unknown	Unknown – five to 10 populations[b]	Relatively Stable[d]	Decline[d]	▪ Habitat loss ▪ Lack of information
Juniper Hairstreak *Callophrys gryneus* (Columbia Basin segregate)	NA/SC	▪ Columbia Plateau	In Washington, inhabits shrubsteppe in the Columbia Basin where its host plant western juniper occurs.	Unknown	Unknown – five to 10 populations[b]	Unknown	Unknown	▪ Lack of information ▪ Habitat loss

Species[a]	Federal/ State Listing[a]	Ecoregions[b][c]	Habitat[b]	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats[b]
Puget Blue *Icaricia icarioides blackmorei*	NA/SC	▪ Northwest Coast ▪ Puget Trough	Inhabits low-elevation grasslands and subalpine meadows, host plants are sickle-keeled and broadleaf lupine.	Unknown	Unknown – seven to 10 populations[b]	Decline[b]	Unknown	▪ Lack of information ▪ Invasive plant species ▪ Habitat loss
Valley Silverspot *Speyeria zerene bremnerii*	NA/SC	▪ Puget Trough ▪ Northwest Coast	Restricted to meadows and grasslands in western Washington Olympic Mountains and Puget Sound area. Larval hostplant is early blue violet (*Viola adunca*)	Unknown	Unknown - 10 to 15 populations[b]	Decline[b]	Unknown	▪ Invasive plant species ▪ Lack of information ▪ Habitat degradation
Silver-bordered Fritillary *Boloria selene atrocostalis*	NA/SC	▪ Columbia Plateau ▪ Okanogan	Restricted to *Sphagnum* bogs and fens in the Columbia Basin. Larval hostplant is a species of violet.	Unknown	Unknown - 15 to 20 populations[b]	Decline[b]	Unknown	▪ Overgrazing by livestock ▪ Invasive plant species ▪ Habitat loss ▪ Habitat degradation
Great Arctic *Oeneis nevadensis gigas*	NA/SC	▪ Puget Trough	Inhabits open forest edges, meadow edges, and rocky slopes. Host plant is an unknown grass.	Unknown	Unknown – one population[b]	Unknown	Unknown	▪ Lack of information ▪ Small population size ▪ Habitat loss

Notes:

(a) WDFW 2024b
(b) WDFW 2015
(c) BirdWeb 2005
(d) NatureServe 2024
(e) Smith et al. 2024
(f) Lewis 2019
(g) USFWS 2003
(h) Wiles et al. 2023
(i) Akins 2016
(j) Hayes and Gallie 2024
(k) Hayes and Wiles 2013
(l) USFWS 2011
(m) WDFW 2013
(n) Cassola 2016
(o) Cornell Lab 2024
(p) Desimone 2016
(q) Stinson and Schroeder 2012
(r) Watson and Azerrad 2024
(s) Rosenberg et al. 2016
(t) Altman et al. 2020
(u) IUCN 2024
(v) Rosenberg et al. 2019
(w) Larsen et al. 2004
(x) OWI n.d.
(y) WDFW 2012b
(z) Hallock et al. 2017
(aa) Linders et al. 2020
(bb) Hays and Stinson 2019
(cc) Potter 2016
(dd) Combs et al. 2023

90D = USFWS has made a 90-day finding that listing may be warranted; **BBS** = breeding bird survey; **FC** = federally listed candidate; **FE** = federally listed endangered; **FT** = federally listed threatened; **NA** = not applicable **SC** = state candidate for listing; **SE** = state-listed endangered; **SS** = state sensitive species; **ST** = state-listed threatene

3.6.2.2 Fish

Habitat

Washington supports diverse fish habitats that include marine waters, estuaries, wetlands, rivers, lakes, and streams. There are approximately 8,000 lakes, 70,439 miles (113,361 km) of river, and nearly 3,000 miles (4,828 km) of saltwater shoreline (Wydoski and Whitney 2003; NWSRS n.d.). The number of fish species is generally lower in headland streams at higher elevations and increases downstream, with larger streams and rivers having more diverse habitats (Wydoski and Whitney 2003).

Freshwater

Major Subregions

The United States is divided and subdivided into hydrological units. At each level, beginning with the region, the drainages are described with a two-digit hydrologic unit code (HUC). Hydrographic regions are identified by a two-digit HUC, subregions are four digits (HUC4), basins are six digits (HUC6), subbasins are eight digits (HUC8), watersheds are 10 digits (HUC10), and subwatersheds are 12 digits (HUC12). The 16 subregions (HUC4) in Washington help in managing and studying the water resources in the state (see subsection 3.4.2 of Section 3.4, Water Resources).

Washington has 10 ecological drainage units that provide a means of characterizing and assessing ecological components within defined hydrological systems: Lower Fraser, Puget Sound, Olympic-Chehalis, Lower Columbia, Yakima-Palouse, Okanogan, Great Lakes/Columbia Mountains, Clark Fork, John Day-Umatilla, and Grande Ronde (Washington Biodiversity Council 2007). There are also eight salmon recovery regions in the state that aid in recovery planning and implementation: Hood Canal, Puget Sound, Washington Coast, Lower Columbia River, Middle Columbia River, Upper Columbia River, Northeast Washington, and Snake River.

Lakes and Rivers

Washington has approximately 70,439 miles (113,361 km) of river, of which 248.2 miles (399.4 km) are designated as wild, scenic, and/or recreational, including Illabot Creek, Klickitat River, Middle Fork Snoqualmie River, Pratt River, Skagit River, and White Salmon River.

The Columbia River is the principal river in the U.S. Pacific Northwest. The Columbia River estuary has a tidal zone that extends 146 miles (233 km) upstream, and the saltwater influence extends 30 miles (48 km) (WDFW 2024p). Major tributaries to the

Columbia River include the Klickitat River, Yakima River, Palouse River, Lower Crab Creek, Wenatchee River, Entiat River, Methow River, Okanogan River, Sanpoil River, Spokane River, and Pend Oreille River. There are also rivers that flow into Puget Sound, including the Nisqually, Puyallup, Skykomish, and Skagit Rivers. Other rivers that flow into the Pacific Ocean include the Nooksack River, which flows into the Strait of Georgia, and the Quinault and Chehalis Rivers, which flow directly into the Pacific Ocean (Wydoski and Whitney 2003).

Large lakes and reservoirs in Washington include Ozette Lake, Lake Crescent, Lake Chelan, Banks Lake, Potholes Reservoir, Lake Sacajawea, Lake Washington, Lake Quinault, Lake Wenatchee, Ross Lake, Lake Roosevelt, and Riffe Lake.

The DNR uses water typing to classify streams and other waterbodies to identify whether they are used by fish and whether they experience perennial or seasonal flow (DNR 2024). Water typing also helps identify the amount of riparian buffer protection required during forest practice activities. The Washington water typing classification system is presented in **Table 3.6-4**.

Table 3.6-4: Water Typing in Washington State

Type	Name	Definition
Type S (formerly type 1)	Shoreline	Streams and waterbodies that are designated "shorelines of the state" as defined in chapter 90.58.030 RCW.
Type F (formerly type 2 or 3)	Fish	Streams and waterbodies that are known to be used by fish or meet the physical criteria to be potentially used by fish. Fish streams may or may not have flowing water all year; they may be perennial or seasonal.
Type Np (formerly type 4)	Non-Fish	Streams that have a flow year-round and may have spatially intermittent[38] dry reaches downstream of perennial flow. Type Np streams do not meet the physical criteria of a Type F stream. This also includes streams that have been proven not to contain fish using methods described in Forest Practices Board Manual Section 13.
Type Ns (formerly type 5)	Non-Fish Seasonal	Streams that do not have surface flow during at least some portion of the year, and do not meet the physical criteria of a Type F stream.
Type X	-	Symbol on DNR maps that identifies various water features (for example: irrigation ditches, sanitation ponds, pipeline, etc.), which are not part of the above classifications.

[38] Bodies of water that flow only during certain times of the year, typically after rainfall or snowmelt.

Type	Name	Definition
Type U	-	Symbol on DNR maps that identifies unknown water features that need to be verified and identified on proposed forest practices activity maps.

Source: DNR 2024
DNR = Washington State Department of Natural Resources; **RCW** = Revised Code of Washington

Riparian

Riparian areas are priority habitats in Washington and provide a large portion of the state's fish and wildlife habitat (see Priority Habitat, below). In western Washington, these priority habitats are mostly forested, and the most abundant riparian areas occur in lower elevation floodplains (Quinn et al. 2020; WDFW 2024q). The WDFW defines riparian ecosystems as transitional between terrestrial and aquatic ecosystems, and they are distinguished by gradients in biophysical conditions, ecological processes, and biota (WDFW 2024q). Riparian ecosystems are areas through which surface and subsurface hydrology connect waterbodies with their adjacent uplands and include portions of terrestrial ecosystems that substantially influence exchanges of energy and matter with aquatic ecosystems (i.e., a zone of influence or sensitivity). The width of a riparian ecosystem is based on the zone of sensitivity, which is in turn based on the functions that affect aquatic habitats, including root strength, litter fall, coarse woody debris inputs to the stream, shading, and pollution removal (Quinn et al. 2020). In relation to fish, riparian ecosystems provide food and nutrient input, provide cover for fish in the form of large woody debris, regulate temperature by providing shade, and reduce contaminated materials or sediment. Riparian trees are important for the habitat of some fish species, such as Chinook salmon (*Oncorhynchus tshawytscha*), because they provide large woody debris that contributes to channels and shading that moderates temperature (WDFW 2015).

Priority Habitat

The WDFW has developed a list of 16 priority habitats and four priority habitat features, for which conservation measures should be taken. These include both terrestrial and aquatic priority habitats. A priority habitat is a habitat type or unique feature on the landscape that provides substantial value to multiple wildlife species (WDFW 2008). Because of the importance of priority habitats to multiple species, the requirement to conserve these spaces, and the threat posed by development to these aquatic resources, priority habitats were identified as a constraint in this Programmatic EIS.

This section includes freshwater aquatic-related priority habitats, summarized below; a description of terrestrial priority habitats can be found in Section 3.5, Vegetation.

- **Freshwater Wetland - Fresh Deepwater:**
  - Freshwater Wetland: Transitional land between terrestrial and aquatic systems where the water table is usually at or near the surface of the land, and is covered by shallow water.
  - Fresh Deepwater: Deepwater habitats contain permanently flooded lands lying below the deepwater boundary of wetlands. Deepwater habitats include environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live.
- **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.
- **Riparian:** The area adjacent to flowing or standing freshwater aquatic systems. Riparian habitat encompasses the area beginning at the ordinary high-water mark and extends to the portion of the terrestrial landscape that is influenced by, or that directly influences, the aquatic ecosystem.

General Aquatic Invertebrate Species

Washington State has identified 57 freshwater aquatic invertebrate species (both native and invasive), which include 22 arthropod species, 25 crustacean species, and 19 mollusk species (WDFW 2024j). Of 29 species of arthropods (i.e., caddisflies, mayflies, and stoneflies) known to occur within Washington, 22 spend their developmental life stages within freshwater aquatic habitats and then emerge during the adult stage to occupy terrestrial habitat (WDFW 2024l). The state has also identified 31 freshwater invasive invertebrate species (24 crustaceans and three mollusks) (WDFW 2024j, 2024q). However, for the majority of species identified, there are no data regarding distribution within Washington. All 31 invasive species have been classified as prohibited by the State of Washington. Both zebra mussel (*Dreissena polymorpha*) and quagga mussel (*Dreissena bugensis*) have been identified as invasive aquatic invertebrate species of greatest concern (WDFW 2024l). Neither species has yet been detected in watercourses in Washington. However, zebra mussels have been recorded in 2021 and 2023 in aquarium moss balls in retail pet and aquarium stores, and quagga mussels have been detected in the Snake River in Idaho, a watercourse that flows through Washington into the Pacific Ocean (WDFW 2023, 2024l).

Fish Priority Species

For this Programmatic EIS, special status fish and freshwater invertebrate species are defined as one or both of the following:

- Listed under the federal ESA
- Listed by Washington State as endangered, threatened, sensitive, or candidate species

There are currently eight fish species in Washington that are federally listed as either threatened or endangered. **Table 3.6-5** summarizes special-status fish species and their abundance status, population status trends, and threats. This list includes freshwater and anadromous fish species but not marine fish species.[39] Anadromous fish are those that primarily occupy marine habitats but will migrate up freshwater rivers to spawn. Some of these species, such as Chinook salmon, have specific populations that are federally listed. For example, there are four Chinook salmon populations (populations 1, 2, 8, and 15) that are present in Washington and federally listed as threatened, and one population (population 12) is listed as endangered. Other fish species, such as green sturgeon (*Acipenser medirostris*), have federally listed populations (i.e., southern populations) of which some individuals may be present in Washington and are thus included.

Ten fish species are listed as sensitive or candidate species in Washington. Three of these species are state-listed as sensitive: margined sculpin (*Cottus marginatus*), Olympic mudminnow, and pygmy whitefish (*Prosopium coulterii*) (**Table 3.6-5, Figure 3.6-3**).

In general, the short-term and long-term trends of these species' populations are relatively stable or in a state of decline. Threats include habitat degradation from various developments (dams, agriculture, aquaculture,[40] transportation crossings,

[39] Programmatic EIS documents address broad, overarching policies, plans, or programs rather than specific projects. Sea cables are considered to be too specific or detailed for the broad focus of this nonproject review. Additionally, sea cables, especially those that cross international water or state boundaries, may fall under different regulatory frameworks or jurisdictions, requiring separate, more specific environmental reviews. Lastly, the environmental impacts and technical considerations of sea cables can be significantly different from those of land-based transmission facilities. These differences might necessitate a distinct, focused EIS to adequately address the unique challenges and impacts. See Section 3.1.

[40] The practice of cultivating aquatic organisms (e.g., fish or shellfish) for food.

culverts, and shoreline industry), poor water quality (increased turbidity, pH[41] changes, but primarily increased water temperatures), and changes or altered flow regimes, including low summer flows (**Table 3.6-5**).

No freshwater invertebrate species are currently federally listed as either threatened or endangered in Washington. However, three freshwater invertebrate species are listed as candidate species at the state level (**Table 3.6-6**).

[41] A measurement of acidity and alkalinity.

Table 3.6-5: Special Status Fish Species in Washington

Species	Federal/ State Listing	Habitat	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats
Bull trout (Population 2) *Salvelinus confluentus*	FT/SC	Estuary, Marine, Freshwater	100,000 to >1,000,000 globally	No data	Stable (in British Columbia, Canada)	Declining	Increased water temperature, altered runoff timing, increased winter/spring flood events, lower summer flows.
Bull trout (Population 3) *Salvelinus confluentus*	FT/SC	Estuary, Marine, Freshwater	100,000 to >1,000,000 globally	No data	Stable (in British Columbia, Canada)	Declining	Habitat degradation and fragmentation, poor water quality, and introduced non-native fish species.
Chinook salmon (Population 1) *Oncorhynchus tshawytscha*	FT/NA	Estuary, Marine, Freshwater	100,000 to >1,000,000 globally	Spring run populations extirpated	Decline of 10–30%	Declined	Dams, agriculture and aquaculture side effects, habitat loss or degradation from development, transportation crossings, culverts, shoreline industrial uses; increased freshwater temperatures, lower summer flows, increased winter/spring flood events.

Species	Federal/ State Listing	Habitat	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats
Chinook salmon (Population 2) *Oncorhynchus tshawytscha*	FT/NA	Estuary, Marine, Freshwater	1,000 to 2,500	No data	Relatively Stable (<=10% change)	Decline of 80–90%	Dams, habitat loss or degradation from transportation crossings, water diversions and extractions; increased freshwater temperatures, lower summer flows, increased winter/spring flood events.
Chinook salmon (Population 8) *Oncorhynchus tshawytscha*	FT/NA	Estuary, Marine, Freshwater	250 to 500	No data	Relatively Stable (<=10% change)	Decline of >90%	Dams, agriculture, habitat loss or degradation from development, transportation crossings, culverts, shoreline industrial uses; increased freshwater temperatures, lower summer flows, increased winter/spring flood events.

Species	Federal/ State Listing	Habitat	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats
Chinook salmon (Population 15) *Oncorhynchus tshawytscha*	FT/NA	Estuary, Marine, Freshwater	10,000 to >1,000,000	10,000 to >1,000,000	Decline of 10–30%	No data	Dams, agriculture, habitat loss or degradation from development, transportation crossings, culverts, shoreline industrial uses; increased freshwater temperatures, lower summer flows, increased winter/spring flood events.
Chinook salmon (Population 12) *Oncorhynchus tshawytscha*	FE/NA	Estuary, Marine, Freshwater	2,500–10,000	No data	Decline of >30%	No data	Dams, agriculture, aquaculture side effects, habitat loss or degradation from development, transportation crossings, culverts, shoreline industrial uses; increased freshwater temperatures, lower summer flows, increased winter/spring flood events.

Species	Federal/ State Listing	Habitat	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats
Chum salmon (Population 2) *Oncorhynchus keta*	FT/NA	Estuary, Marine, Freshwater	10,000 to >1,000,000	9,500	Increase of >10%	Decline of 30–70%	Increased water temperature (freshwater and sea surface), increased winter/spring flood events, lower summer flows.
Chum salmon (Population 3) *Oncorhynchus keta*	FT/NA	Estuary, Marine, Freshwater	10,000 to >1,000,000	2,500 to 10,000	Relatively Stable (<=10% change)	Decline of >90%	Increased water temperature (freshwater and sea surface), increased winter/spring flood events.
Coho salmon (Population 1) *Oncorhynchus kisutch*	FT/NA	Estuary, Marine, Freshwater	1,000 to 2,500	1,000 to 2,500	Decline of >10%	Decline of >90%	Increased water temperatures (freshwater and sea surface), lower summer flows.
Eulachon smelt (Southern DPS) *Thaleichthys pacificus*	FT/NA	Estuary, Marine, Freshwater	No data	No data	Uncertain but likely relatively stable or slowly declining	Highly variable	Altered runoff timing and magnitude, increased water temperatures (fresh and ocean).

Species	Federal/ State Listing	Habitat	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats
Green sturgeon (Southern DPS) *Acipenser medirostris*	FT/NA	Estuary, Marine, Freshwater	250 to 10,000	No data	Decline of 10–30%	Decline of 50–70%	Harvest-related risk and estuarine degradation are risks. Increased ocean temperatures and declines in pH.
Lake chub *Couesius plumbeus*	NA/SC	Freshwater	>1,000,000	No data	Relatively Stable (<=10% change)	No data	Water temperature, water levels, and turbidity; habitat loss or degradation.
Leopard dace *Rhinichthys falcatus*	NA/SC	Freshwater	No data	No data	Uncertain but likely relatively stable or slowly declining	No data	Increased water temperature, low summer flows, altered timing/ magnitude of spring floods.
Margined sculpin *Cottus marginatus*	NA/SS	Freshwater	10,000 to 100,000	No data	Decline of <30% to relatively stable	No data	Increased water temperature, loss of habitat or degradation.
Mountain sucker *Catostomus platyrhynchus*	NA/SC	Freshwater	100,000 to >1,000,000	No data	Decline of <30% to relatively stable	No data	Increased water temperatures, altered flow regimes.
Olympic mudminnow *Novumbra hubbsi*	NA/SS	Freshwater	2,500 to 100,000	2,500 to 100,000	Relatively Stable (<=10% change)	Decline of <30% to relatively stable	Increased high flood events.

Species	Federal/ State Listing	Habitat	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats
Pygmy whitefish *Prosopium coulterii*	NA/SS	Freshwater	No data	No data	Uncertain but likely relatively stable or slowly declining	No data	Increased water temperatures, altered fire regimes
River lamprey *Lampetra ayresii*	NA/SC	Estuary, Marine, Freshwater	>1,000,000	No data	Decline of <30% to relatively stable	No data	Increased water temperatures, low summer/fall flows, increased winter flood events
Sockeye Salmon (Population 1) *Oncorhynchus nerka*	FE/NA	Estuary, Marine, Freshwater	No data	No data	No data	Decline of >90%	Impaired mainstem and tributary passage, habitat degradation, historical commercial fishery, chemical treatment of Sawtooth Valley Lakes (Idaho).
Sockeye salmon (Population 2) *Oncorhynchus nerka*	FT/NA	Estuary, Marine, Freshwater	10,000 to 100,000	10,000 to 100,000	Increasing	No data	Aquaculture side effects and habitat degradation from land use.

Species	Federal/ State Listing	Habitat	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats
Steelhead (Population 12) *Oncorhynchus mykiss*	FT/SC	Estuary, Marine, Freshwater	No data	No data	Decline of 10–30%	No data	Altered spring runoff timing and amount/magnitude, increased water temperature, lower summer flows.
Steelhead (population 13) *Oncorhynchus mykiss*	FT/SC	Estuary, Marine, Freshwater	10,000 to 100,000	No data	Unknown	Decline of >50%	Altered spring runoff timing and amount/magnitude, increased water temperature, lower summer flows.
Steelhead (Population 14) *Oncorhynchus mykiss*	FT/SC	Estuary, Marine, Freshwater	No data	No data	Decline of 10–30%	No data	Altered spring runoff timing and amount/magnitude, increased water temperature, lower summer flows.
Steelhead (Population 17) *Oncorhynchus mykiss*	FT/SC	Estuary, Marine, Freshwater	10,000 to >1,000,000	No data	Decline of 10–30%	No data	Altered spring runoff timing and amount/magnitude, increased water temperature, lower summer flows.

Species	Federal/ State Listing	Habitat	Total Abundance	Abundance in Washington	Short-Term Trends	Long-Term Trends	Threats
Steelhead (Population 37) *Oncorhynchus mykiss*	FT/NA	Estuary, Marine, Freshwater	No data	No data	No data	No data	Altered spring runoff timing and amount/magnitude, increased water temperature, lower summer flows. Increased flood events and associated sedimentation and/or scour.
Umatilla dace *Rhinichthys umatilla*	NA/SC	Freshwater	10,000 to >1,000,000	No data	Decline of 10–30%	No data	Lower stream flows.

Source: NatureServe 2024; WDFW 2024j

DPS = distinct population segment; **FE** = federally listed as endangered; **FT** = federally listed as threatened; **NA** = not applicable; **SC** = State Candidate for Listing; **SS** = state-listed sensitive species; **ST** = state-listed as threatened

Table 3.6-6: Special Status Aquatic Invertebrate Species in Washington

Species[a]	Federal/ State Listing[a]	Habitat[b]	Total Abundance	Abundance in Washington State	Short-Term Trends	Long-Term Trends	Threats[b]
Ashy pebblesnail *Fluminicola fuscus*	NA/SC	Occurs under rocks and on vegetation in cold, clear streams, in areas with slow to rapid current speeds.	Unknown[c]	Unknown	Decline[c]	Decline[b][c]	▪ Habitat degradation ▪ Habitat loss ▪ Lack of information
California floater mussel *Anodonta californiensis*	NA/SC	Inhabits lakes, reservoirs, and pools in rivers. Prefers sand and silt substrates.	100,000 to >1,000,000[c]	Unknown	Decline[c]	Decline[c]	▪ Habitat degradation ▪ Habitat loss ▪ Lack of information
Shortface lanx *Fisherola nuttalli*	NA/SC	Found in large streams and rivers with cobble-boulder substrates, where they live on rocks typically downstream of rapids.	Unknown (probably low)[b]	Unknown	Decline[b]	Decline[c]	▪ Habitat degradation ▪ Habitat loss ▪ Lack of information

Notes:

(a) WDFW 2024i, 2024m

(b) WDFW 2015

(c) NatureServe 2024

NA = not applicable (No Listing); **SC** = State Candidate for Listing

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3.6.2.3 Migration Routes and Corridors

Many of Washington's fish and wildlife species are migratory, moving between ecoregions to access the habitats required for their natural history. Migrations can cover distances exceeding hundreds of miles, such as the spring and fall bird migrations or salmon migrations to and from natal grounds. Other fish and wildlife movements or migrations may be shorter—for example, amphibians moving 1 to 2 miles (1.6 to 3.2 km) between natal ponds and upland living habitat. Both long and short migrations often follow routes that have been established by populations over several generations using landscape features, important stopping locations, available microhabitats, and other cues (e.g., electromagnetic). Information on where these movement corridors are or could be is variable, with some routes being well documented but many poorly understood. The following sections provide descriptions of some of the movement corridors and migration routes in Washington.

Aerial (Birds, Bats, and Monarch Butterflies)

Washington lies within the Pacific Flyway[42] bird migration route. The Pacific Flyway extends from Alaska to Patagonia and connects summer and winter grounds along the western portion of the continent (Newcombe et al. 2019). In Washington, the Pacific Flyway extends from the Pacific Ocean to the Rocky Mountain Range. Birds that migrate along this route require stopover locations during their migration, which can be found statewide (Audubon Washington n.d.). One stopover location is Grays Harbor National Wildlife Refuge in western Washington, which supports large congregations of shorebirds and waterfowl, such as snow geese (*Anser caerulescens*), black-bellied plovers (*Pluvialis squatarola*), dunlins (*Calidris alpina*), and western sandpipers (*Calidris mauri*) as they rest during their migration north in the spring, and south in the fall (Audubon Washington n.d.). Similarly, locations such as the WDFW Sunnyside-Snake River Wildlife Area support large concentrations of migrating sandhill crane (WDFW 2021).

Bats migrate during spring and fall, but their migratory routes are poorly understood. Hoary bats (*Lasiurus cinereus*) and silver-haired bats (*Lasionycteris noctivagans*) are long-distance migrants that overwinter in southern North America. In addition, several of the 15 bat species in Washington are thought to be short-distance migrants

[42] A path that is annually flown by migratory birds.

that move to winter roosts at a different elevation with suitable hibernation temperatures (Hayes and Wiles 2013; Weller et al. 2016).

Monarch butterflies typically arrive in Washington in June, where they lay eggs that will hatch in the summer (Xerces Society 2018, 2019). Summer adults migrate south to California in late summer/early fall. This species relies on milkweed plants during its migration, which typically occurs in the Columbia Plateau in Washington.

Land

Terrestrial wildlife species, including mammals, reptiles, and amphibians, seasonally move across the landscape to access breeding, foraging, and hibernating habitats. These movements vary depending on the species and season and are generally poorly recorded.

WDFW and the Washington State Department of Transportation have developed the Washington Habitat Connectivity Action Plan. This plan provides a statewide analysis of landscape connectivity, the results of which are a map-based tool that depicts existing landscape connectivity value (**Figure 3.6-4**). The model was completed by synthesizing ten data layers that represent existing ecosystems, habitats that support species of greatest conservation need, and focal species connectivity, network importance and permeability, effects of climate change, and regional specific layers (e.g. Arid Lands Initiative and Washington Shrubsteppe Restoration and Resilience Initiative) (Michalak et al. 2025).

The Plan uses the landscape connectivity conservation values to identify 13 major pathways of statewide significance and numerous smaller regionally significant pathways (**Figure 3.6-5**). The major pathways of statewide significance depict broad linkages that represent areas where conditions are expected to support important landscape connectivity, although they have been fragmented by existing land use, particularly in the Columbia Plateau. Connected landscapes of regional significance identify smaller linkages between those of statewide significance. The regionally significant connections may represent remnant linkages and therefore provide important habitat that support regional redundancy and support the resilience of statewide Connected Landscapes of Statewide Significance.

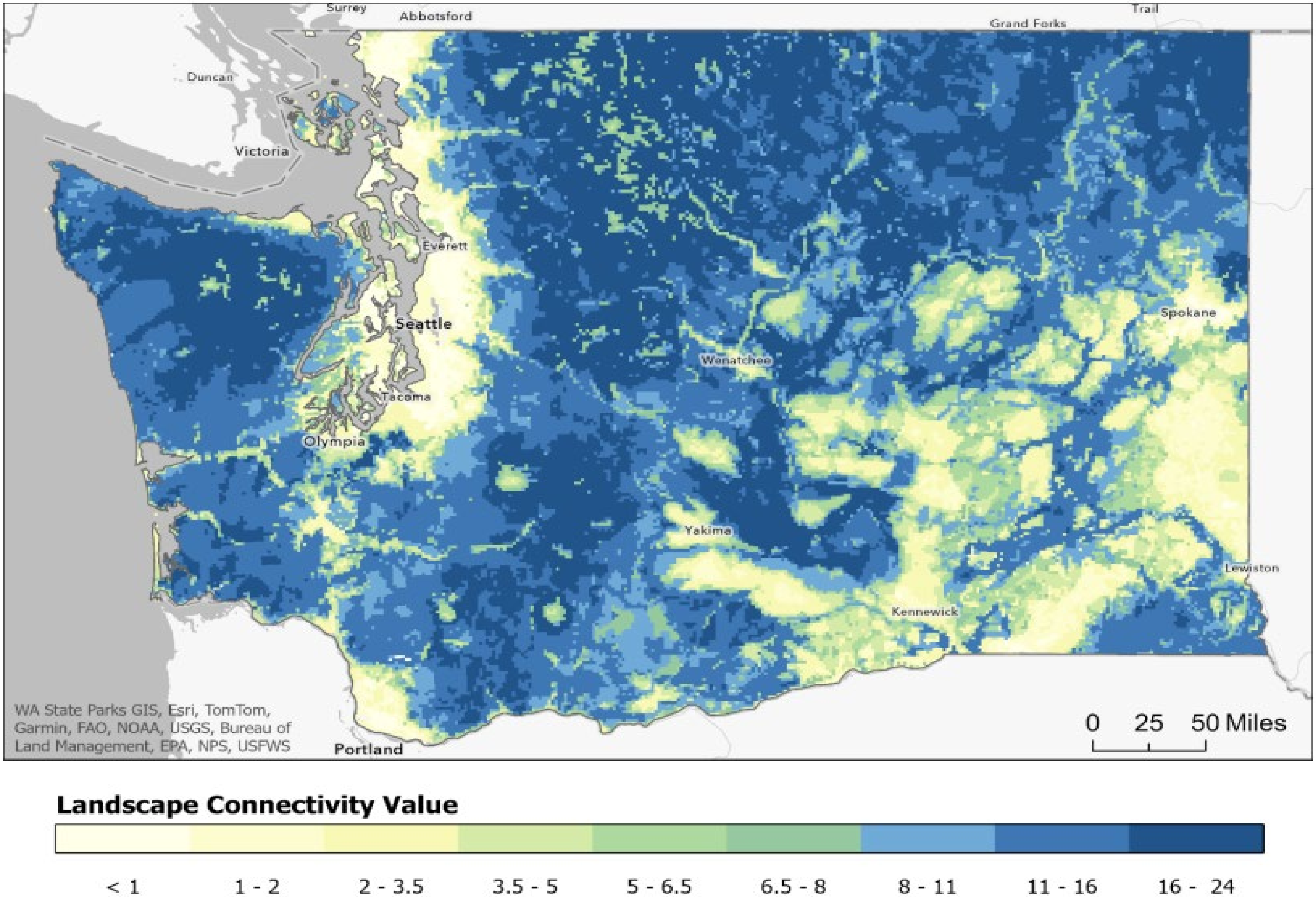

Figure 3.6-4: Landscape Connectivity Value
Source: WDFW 2025

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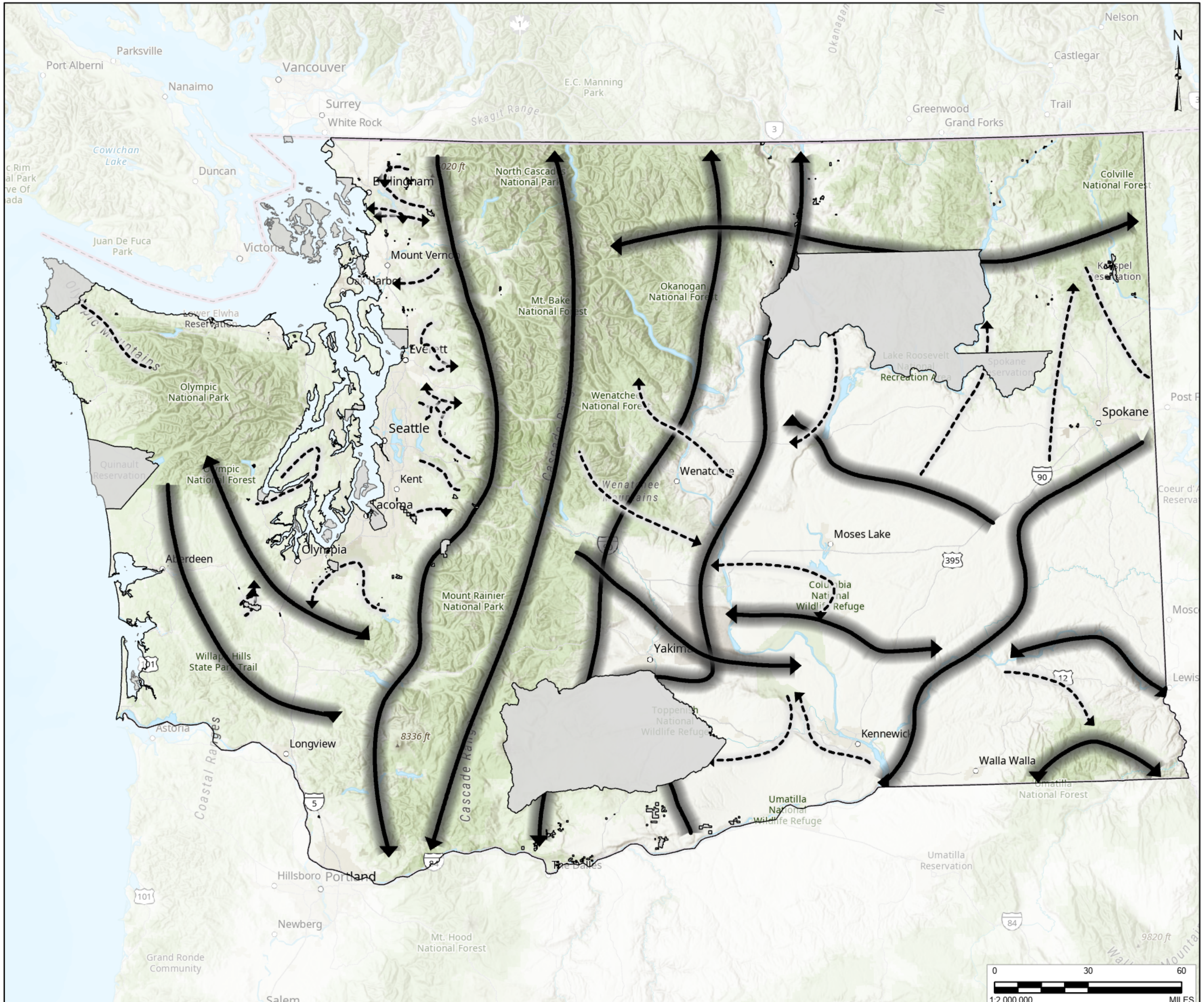

LEGEND

- Study Area
- Exclusion Areas

Landscape Priorities (CLOSS and CLORS)

- Connected Landscapes of Statewide Significance
- Connected Landscapes of Regional Significance

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 (WASHINGTON DEPARTMENT OF FISH AND WILDLIFE) 2025. WASHINGTON HABITAT CONNECTIVITY ACTION PLAN SPATIAL DATA. ACCESSED AUGUST 26, 2025. HTTPS://WDFW.MAPS.ARCGIS.COM/HOME/ITEM.HTML?ID=CD2F9FF6E6CF47FB8630DAA02A70C45F

Washington State Energy Facility Site Evaluation Council

PROJECT

PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE

LANDSCAPE CONNECTIVITY CORRIDORS

YYYY-MM-DD 2025-09-18 | CONSULTANT wsp | FIGURE 3.6-5

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Landscapes in montane regions of Washington, such as the Cascade Range, are relatively intact and provide general connectivity north-south along the range. Wildlife movement in this area is generally affected by linear features such as road networks (WHCWG 2012). High landscape connectivity value has been modeled along the Cascade Range, the Olympic Peninsula, and along northern Washington State as depicted by the three Connected Landscapes of Statewide Significance running along the Cascades, two connecting the Olympics to the Cascade, and one connecting the Cascades to the Rockies.

These routes are fairly contiguous except when bisected by road networks and urban centers such as Olympia and Centralia. Notably, connectivity is currently impacted in this region by US Highway 12, Interstate 5, and State Route 8 (WHCWG 2024). Further, connectivity between the Cascade Range and Puget Sound is limited due to urban development, although several regionally significant connectivity pathways have been identified (Michalak et al. 2025).

Conversely, habitat connectivity in the Columbia Plateau Ecoregion has been fragmented by land development, limiting movement corridors to narrow bands between patches of remnant habitat[43] (WHCWG 2012). Six pathways of Statewide Significance have been identified in and around the Columbia Plateau Ecoregion, interconnected and supported by several regionally significant linkages. Given the regional landscape changes experienced in the Columbia Plateau, these connectivity pathways provide important linkages that are regionally limiting.

Movement between Washington and British Columbia is generally unrestricted, with large concentrations of unfragmented habitat along the Cascade/Coastal range and Purcell Mountains (Conservation Biology Institute 2024). However, movement corridors in the central part of Washington into the Okanagan region of British Columbia are more restricted (Conservation Biology Institute 2024).

The Washington State Department of Transportation has mapped and prioritized roadway habitat connectivity investments throughout the state. While this program does not identify wildlife movement corridors, it does identify areas of higher priority to improve wildlife habitat connectivity and reduce road-based mortality. High-priority areas are located throughout the state, but longer segments are concentrated

[43] An area of land that retains its original natural vegetation and ecological characteristics, having avoided significant disturbance from human activities such as agriculture, urban development, or logging.

in the Cascade Range, north of Olympic National Park, along the western edge of the Columbia Plateau, and north of Spokane (WSDOT 2024).

Aquatic (Fish)

For anadromous fishes, such as salmon, the Columbia and Snake Rivers, as well as other smaller coastal streams, are important movement corridors that provide direct access to the ocean. Construction of obstacles that limit migration (such as dams) has affected the distribution and survival of salmon stocks. The mainstem of the Columbia River has 11 dams in Washington, while the Snake River has four dams in Washington. To pass these dams, salmon must navigate through fishways (if the dam has one) to get to their natal streams. The timing of migration for salmon depends on the species' life history strategy, population, and location. Some populations of salmon are spring-run or fall-run populations, meaning that adults enter freshwater in either spring or fall on their way to their natal spawning grounds (WDFW 2015). Some juvenile salmon out-migrate to estuaries or to the ocean shortly after emergence, or they can rear for several years in freshwater before migrating out to the ocean, which can begin in late winter, extending into the summer (WDFW 2015). For some populations, their natal streams are in other states (e.g., Idaho), and Washington is mostly a movement corridor to their spawning grounds (e.g., sockeye salmon [*Oncorhynchus nerka*] population 1), while others have short migrations (e.g., sockeye salmon population 2 through the Ozette River to hold in Ozette Lake) (NOAA Fisheries 2015; WDFW 2015). Other fish that use the lower portion of the Columbia River for migration include eulachon smelt and green sturgeon. Similarly, river lamprey (*Lampetra ayresii*) migrate to saltwater in late spring/early summer and back to freshwater to spawn in April to June. Some resident freshwater fish also demonstrate spawning migrations between lakes and rivers or within rivers; these include mountain sucker (*Catostomus platyrhynchus*) and lake chub (*Couesius plumbeus*), which may migrate up to 1 mile (1.6 km) between spawning and non-spawning habitat (WDFW 2015).

3.6.3 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.

Transmission facilities have various effects on wildlife populations. This section summarizes the adverse environmental impacts of transmission facilities on wildlife, biological factors that contribute to impacts, transmission facility features that contribute to impacts, and how transmission facility corridors and structures may occasionally benefit wildlife.

Adverse environmental impacts on wildlife, including fish, from transmission facilities can be broadly grouped into five general categories:

- Direct habitat loss
- Indirect habitat loss (disturbance)
- Mortality
- Barriers to movement, and
- Habitat fragmentation

These broad categories of adverse environmental impacts can be further refined as impacts on wildlife through changes to home range, changes in reproductive success, changes in behavior, changes in gene flow, changes in predator/prey dynamics, and changes in mortality rates (Biasotto and Kindel 2018). Cumulatively, these changes can alter wildlife population dynamics through the establishment of new populations (e.g., invasive plants), an increase or decrease in existing population size, isolation of populations, and extirpation (Biasotto and Kindel 2018). These population changes could result in ecosystem or landscape-level changes to species biodiversity and abundance.

The subsequent sections discuss these five impact categories as they apply to each stage of a transmission facility. They also discuss how these five general impacts could impact birds, mammals, amphibians, reptiles, invertebrates, fish, special status species, and movement corridors.

3.6.3.1 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 wildlife preserves, refuges, or conservation areas.

- **Aquatic Ecosystems:** Any adjacent rivers, streams, lakes, wetlands, or other waterbodies that could be impacted by the project.
- **Critical Habitat:** Areas designated as critical habitat under the ESA for endangered or threatened species.
- **Sensitive Species Habitat:** Habitats important to the survival of state or federally listed sensitive and priority species. These could include identified core habitats, breeding grounds, nesting sites, overwintering sites, and feeding areas.
- **Movement Corridors:** Routes used by wildlife for migration that might be disrupted by the project.

This Programmatic EIS analyzes the affected environment and adverse environmental impacts on habitat, fish, and wildlife 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.

Potential interactions between a transmission facility project and wildlife and habitat during new construction, operation and maintenance, upgrade, and modification were identified based on information obtained from a review of literature and published information. Information reviewed to identify adverse environmental impacts on habitat, wildlife, and fish in the Study Area was obtained from federal agencies, state agencies, local planning documents, and public scoping. The analysis of impacts and characterization of potential adverse environmental impacts is organized by project stage (i.e., new construction, operation and maintenance, upgrade, and modification), overhead and underground transmission, and impact category as follows:

- **Direct habitat loss (permanent and temporary):** Occurs when habitat is removed to construct a transmission facility project. Direct habitat loss can be permanent if it is replaced by project components such as transmission facility towers or substations, or it can be temporary if it is required for short-term activities (e.g., construction workspace) and is then restored. However, temporary direct habitat loss can be permanent if it exists in a sensitive ecosystem that will not recover in a reasonable amount of time, such as old-growth forest and mature shrubsteppe.

- **Indirect habitat loss:** May occur due to project-related changes in habitat quality or wildlife use. Indirect habitat loss does not result in the removal of habitat, but rather in a change in the quality of habitat that may reduce its function for wildlife species (e.g., increased noise disturbance) or that occurs later in time or farther away from the project location (e.g., downstream).
- **Mortality:** Sources of wildlife mortality that could result from a transmission facility project include collisions, strikes, electrocution, interaction with toxic materials, and destruction of wildlife that becomes a nuisance.
- **Barriers to wildlife movement:** Occur when project features prevent or change species' ability to move across the landscape. Barriers can include physical constraints (e.g., fencing), as well as features that species may avoid crossing. Barriers to movement are considered qualitatively in this assessment based on existing literature, including modeled landscape connectivity.
- **Habitat fragmentation**: Occurs when extensive, continuous tracts of habitat are divided into smaller, more isolated patches (Meffe and Carroll 1994; St-Laurent et al. 2009). The potential for transmission facility projects to fragment wildlife habitat was qualitatively analyzed using data on ecosystem distribution across the state.

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 3.6-7** 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 habitat, wildlife, and fish resources in the Study Area was obtained from federal agencies, state agencies, local planning documents, and public scoping.

Information on the affected environment and adverse environmental impacts provided in this section is based on data and scientific knowledge available at the time of writing. It is expected that the available science on species in Washington and impacts from transmission facilities will change over time. Given the broad nature of the Programmatic EIS and the variability of adverse environmental impacts across fish and wildlife populations, the impact determination is based on a worst-case scenario. That is, the rating has been assigned based on the species group that is expected to be most impacted by a transmission facility project.

Table 3.6-7: Criteria for Assessing the Impact Determination on Habitat, Wildlife, and Fish

Impact Determination	Description
Nil	No foreseeable adverse environmental impacts are expected. A project would not adversely affect habitat, wildlife, and fish.
Negligible	A project would have minimal adverse environmental impacts on habitat and wildlife and fish populations. Changes would either be non-detectable or, if detected, would have only slight effects. A project would result in direct and indirect habitat loss; however, the losses would not change the natural variability in wildlife populations or result in impacts on special status species. Negligible impacts would be short term in duration. BMPs and design considerations are expected to be effective.
Low	A project would result in noticeable adverse environmental impacts on habitat, wildlife, and fish, even with the implementation of BMPs and design considerations. These adverse environmental impacts may include the direct and indirect loss of habitat, but such changes would fall within the viability and resiliency of the affected species or its population over a long period of time. Adverse environmental impacts on habitat, wildlife, and fish would be localized. Adverse environmental impacts may be short or long term in duration.
Medium	A project would result in adverse environmental impacts on habitat, wildlife, and fish, even with the implementation of BMPs and design considerations. A project would result in incremental direct and indirect losses of habitat that result in a clearly defined change to wildlife and fish populations over shorter or longer periods of time. However, these changes would not exceed the resiliency and adaptability of a species or population. Population levels would stabilize at a slower rate or lower abundance compared to pre-disturbance conditions. Medium impacts may be short or long term in duration.
High	A project would result in adverse and potentially severe environmental impacts on wildlife, habitat, and fish, even after the implementation of BMPs and design considerations. A project would cause incremental direct and indirect habitat losses, which would substantially change habitats. These changes would exceed the resiliency and adaptability of the affected species or populations, thereby impacting the viability of the species or populations such that they would be at risk of extirpation. 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 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 other 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 impacts, including the project's contribution to cumulative impacts. These measures would be implemented in addition to compliance with laws, regulations, environmental permits, plans, and design considerations required for transmission facilities.

3.6.3.2 Action Alternative

New Construction

Overhead Transmission Facilities

Activities during the new construction of overhead transmission facilities would vary according to 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 habitat, wildlife, and fish during new construction:

- Direct Habitat Loss
- Indirect Habitat Loss
- Mortality

- Fragmentation
- Barriers to Movement

Direct Habitat Loss

Site clearing and grubbing are typically one of the most noticeable adverse environmental impacts of a project. New construction of overhead transmission facilities would require clearing of habitat for structure placement, access roads, right-of-way (ROW), and substations, which would have impacts on birds, mammals, amphibians, reptiles, invertebrates, and fish. In general, direct habitat loss occurs early in the construction of a project, initiated by vegetation clearing and ground preparations, but the impacts continue through operation and maintenance until the project is removed and land restored.

Tall vegetation, such as shrubs and trees, is typically cleared from the width of the ROW. Complete clearing of the ROW for overhead transmission facilities may not be required in habitats that are naturally devoid of trees, such as talus, shrubsteppe, and meadows. Typical ROW width is 130 to 200 feet (40 to 60 meters) for transmission facilities of at least 230 kilovolts (kV) (Nextgen Highways 2023).

In general, direct habitat loss is expected to be more pronounced in the forested ecosystems primarily found in the western portion of the state, in ecoregions such as the Northwest Coast, Puget Trough, West Cascades, North Cascades, East Cascades, and Canadian Rocky Mountains. Naturally open ecosystems generally found in central and eastern Washington in the Columbia Plateau ecoregion and portions of the Blue Mountains ecoregion are likely to be less impacted by direct habitat loss because portions of these habitats can be spanned by transmission facilities without a regularly cleared ROW.

Habitat loss can generally be classified as permanent, temporary, or modified. Permanent habitat loss can include the construction of poles or towers, substations, and access and maintenance roads. Once lost, this habitat would no longer be available for wildlife until the transmission facility is decommissioned. Temporary habitat loss often occurs from construction activities such as laydown areas and construction roads, and can be restored post-construction. Although temporary habitat loss can be restored post-construction, the time needed for ecosystems to re-establish varies depending on ecosystem type. Some ecosystems, such as old growth and mature shrubsteppe, may never recover, making the habitat loss permanent. Modified habitat would be altered to accommodate a new transmission facility’s disturbance footprint or ROW, but it would continue to be available for wildlife in a different state. For example, where a new overhead transmission facility bisects forested areas, trees could be removed and replaced by grass, forb, or low shrub habitat, which could change habitat suitability for some wildlife species, depending on their life requisites.

The extent of the direct habitat loss would vary depending on project siting and would only be measurable once a project has been proposed. It is expected that the areas cleared for new construction of transmission facilities would be approximately 130 to 200 feet (40 to 60 meters) wide.

Wildlife

The following sections describe adverse environmental impacts on wildlife resulting from the new construction of overhead transmission facilities and associated direct habitat loss. These adverse environmental impacts include considerations for:

- Birds
- Mammals
- Amphibians and Reptiles
- Invertebrates
- Movement Corridors

Birds

Direct habitat loss associated with transmission facilities could result in the loss of nesting habitat, foraging areas, and stopover habitat for migrating bird species. Native vegetation that may support food production or be important for insect or mammalian prey may be removed or altered, resulting in a loss or change of food availability (Narango et al. 2017). Birds occur in a variety of habitat types throughout Washington; however, the adverse environmental impact of direct habitat loss is expected to be more pronounced for birds associated with forested habitat, such as the northern goshawk, and birds with limited habitat range in the state, such as the greater sage-grouse (Staude et al. 2019; Betts et al. 2022).

Clearing forest habitat removes the structural complexity required by forest-dwelling birds for life requisites such as nesting, as is the case for the northern spotted owl (Chamberlain et al. 2021). This habitat would be replaced by open grass, forb, or shrub habitat under the transmission line that would likely not provide all the habitat components required to support forest-dwelling birds.

Removal of habitat that supports bird species with small ranges in Washington or birds that occupy specific habitat types (e.g., sand dunes) could result in a disproportionate impact on these species, as they may not be able to relocate away from the impacted area. Many birds that have small ranges in Washington or rely on specific habitat types are federally or state listed and are therefore discussed under Special Status Species, below.

Some bird species, such as the American white pelican, great blue heron, and some grouse species, concentrate at specific locations during mating and nesting (Larsen et al. 2004; WDFW 2015). Removal of unique habitat features, such as lek sites or breeding colonies, would have a larger effect on these populations than removing equal amounts of habitat in other parts of their range (Larsen et al. 2004). Similarly, snags and trees with cavities provide unique nesting sites for birds but are often removed during project construction as they are considered hazard trees (James 1984). Cavity-nesting birds, like pileated woodpeckers, create nesting cavities that can be used in the future by other species, such as Barrow’s goldeneye (*Bucephala islandica*) (Ducks Unlimited Canada 2008). These unique habitat features are generally limited in the landscape, and their removal could result in local population declines (James 1984).

Birds that occur in urban areas or open habitats, or that are habitat generalists, would be less impacted by direct habitat loss during new construction than birds that occur in forested habitats or require specific habitat features (e.g., colonial nesters). Direct habitat loss in urban areas and open habitats would be limited to infrastructure footprints, as clearing and grubbing of the entire ROW is not expected to be required. Generalist species can adapt to new habitat types and are more likely to use modified habitat within a transmission facility ROW (Shurtliff and Whiting 2021).

Loss of staging grounds and stopover sites where migratory birds rest, refuel, and sometimes molt during their journeys between breeding and wintering grounds can be detrimental to bird populations. These areas are important for the survival of many bird species, as they provide the necessary resources for birds to regain energy and prepare for the next leg of their migration (Warnock 2010).

The adverse environmental impact of direct habitat loss on birds would depend on the habitat type impacted, the extent of habitat impacted, and the species of bird impacted. The impact of habitat loss could vary between facilities in urbanized or modified habitats and facilities in mature forest areas. Similarly, mobile species that are generalists, such as the American crow, are not likely to be impacted by new construction of a transmission facility; however, the impact of habitat loss on species with a limited distribution or niche habitat requirements (such as the tricolored blackbird; *Agelaius tricolor*) could result in more substantial effects on those populations.

The impact of direct habitat loss on birds is expected to range from negligible to medium. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Mammals

The adverse environmental impact of vegetation clearing and grubbing on mammal species would vary by wildlife guild[44] and habitat type. Conversion of forested or dense shrub habitat could remove forage material and cover for mammals.

Small mammals, such as rodents and insectivores, use shrubs and woody debris as cover from predators (Weldy et al. 2019). Clearing the ROW, particularly in forested and shrub habitats, is expected to remove cover objects required by small mammals, thereby modifying habitat for this group of animals. This effect is expected to be less pronounced in naturally open habitats where direct habitat loss would be generally limited to infrastructure footprints. In open habitat, project construction could remove microhabitat features, such as small mammal burrows; however, it is expected that small mammals could re-establish these features post-construction. Small mammal communities can be robust in transmission facility ROWs with well-managed vegetation (Fortin and Doucet 2008).

Medium-sized mammals, such as martens, that occur in forested habitats require the structural complexity of these habitats to provide tree cavities for denning, cover from predators, and access to prey (Stone 2010). Clearing trees would remove these microhabitat features for medium-sized mammals. New construction of transmission facilities in open habitats could remove burrows; however, it is expected that mammals can re-establish these features after construction.

Large mammals, such as bears and ungulates,[45] generally range widely over the landscape to access different habitats for specific life requisites (e.g., denning, foraging) (Lyons et al. 2003; Eggeman et al. 2016; Borowik et al. 2020). Large mammals may use a variety of habitats, from forests to alpine meadows to valley bottoms, depending on seasonal requirements. Direct loss of forested habitat is expected to have

[44] A group of species that is similar in a specific way, such as in acquiring nutrients, habitat requirements, or in movement mechanisms.
[45] A mammal with hooves, including deer, moose, elk, and caribou.

a more pronounced adverse environmental impact on ungulates that require the tree canopy for snow interception in winter (Merems et al. 2022). Conversion of forest to grass, forb, or shrub habitat may increase foraging opportunities for some species, such as bears and ungulates (Bartzke et al. 2014). Direct loss of habitat in open areas is not expected to substantially reduce the availability of large-mammal habitat.

The adverse environmental impact of direct habitat loss on mammals would depend on the habitat type impacted, the extent of the impact, and species of mammals impacted. Generalist mammal species that can re-establish in ROWs, such as some species of rodent, are likely to be less affected than mammal species that rely on mature forests.

The impact of direct habitat loss on mammals is expected to range from negligible to medium. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Amphibians and Reptiles

Vegetation clearing and grubbing during new construction can result in direct habitat loss for amphibians and reptiles. Amphibians require specific habitats for breeding (moist areas and aquatic breeding sites), summer foraging habitat, and overwintering sites (Merrell 1977). Direct loss of habitat required for one of the amphibian life requisites can impact local populations. In addition, some amphibian populations, such as Larch Mountain salamanders, have small ranges, which makes them vulnerable to habitat loss (WDFW 2015).

Similar to amphibians, reptiles use different habitats in winter and summer. Loss of one of these habitats can impact reptile populations. Loss of microhabitat features, such as rock crevices, debris piles, or talus that are used as hibernacula, can have a disproportionate effect on reptile populations as these features are critical to reptile lifecycles and are typically limited on the landscape (Lesbarrères et al. 2014).

The adverse environmental impact of direct habitat loss on amphibians and reptiles would depend on the site characteristics (disturbed or undisturbed) and the species present. The impact of habitat loss could vary between projects that do not interact with amphibian and reptile habitat, including projects located in urban or previously highly disturbed areas without features required by amphibians and reptiles, and projects that occur in undisturbed habitats that contain unique features that support amphibian and reptile life requisites, such as wetlands, talus slopes, and streams.

The adverse environmental impact of direct habitat loss on amphibians and reptiles is expected to range from nil to medium. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Invertebrates

Terrestrial invertebrates occupy all terrestrial ecosystems in Washington, and the extent of habitat loss for this group would depend on habitat requisites. Species that occur in forest and shrub ecosystems, as well as those that require small, unique habitats, such as vernal pools, are likely to be more impacted by direct habitat loss than species that occupy open areas (Parks Canada Agency 2005). Transmission facility corridors can occasionally provide habitat for invertebrates. Two taxa that have been observed to increase in richness and abundance near transmission facilities are butterflies and bees. Management activities by utility companies typically keep vegetation at an early successional stage,[46] providing favorable conditions for these insects, which rely on floral resources (Berg et al. 2016; Wagner et al. 2019). Regardless of location, the extent of the adverse environmental impact of direct habitat loss on invertebrate populations is expected to vary depending on the time of year clearing and grubbing is conducted. For example, loss of floral resources during summer months would be expected to have a greater effect on pollinators that rely on these resources.

The adverse environmental impact of direct habitat loss on invertebrates would depend on site characteristics (forested vs. open), timing of new construction activities, and the species present. The impact of habitat loss could vary between species adapted to open ecosystems and those that require flowering plants that grow in ROWs, and those species adapted to forested or shrub environments, rely on rare host plants, and/or have niche habitat requirements.

The adverse environmental impact of direct habitat loss on invertebrates is expected to range from nil to medium. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Movement Corridors

Movement corridors are the routes that wildlife use when crossing the landscape to access other habitats or habitat patches.[47] Wildlife may move across the landscape seasonally to access breeding grounds and hibernation sites or within seasons to follow

[46] First stages after disturbance of an ecosystem (e.g., clearing or fire) where plants and animals first start recolonizing an area.
[47] Small areas of habitat. Typically used in the context of habitat loss, where only habitat patches remain.

changes in food sources. Movement distances vary widely across species, with smaller animals, such as amphibians (Develop with Care 2014), moving up to several miles and large animals, such as ungulates, moving several hundred miles (van de Kerk et al. 2021). Movement may also be elevational, with animals moving between high-elevation habitats and valley bottoms (Seip and Jones 2013). Elevational movements may be undertaken to access calving grounds, access available food (e.g., berries), and avoid deep snow cover.

Wildlife movements on the landscape can follow the same or similar routes seasonally or annually. An example is the Pacific Flyway, which is the route followed by many bird species when migrating between winter and summer grounds (Newcombe et al. 2019). These corridors provide important linkages between habitats that, if lost, can result in habitat fragmentation and barriers to movement.

New construction of transmission facilities in wildlife movement corridors can result in loss of habitat and microhabitat features that support how these corridors function. For example, smaller wildlife may use shrub cover and woody debris to provide shelter from predators when moving across a landscape. New construction activities that remove these features, such as grubbing, may result in a loss or degradation of movement corridors.

Loss of habitat in movement corridors during new construction could be temporary if the habitat can be restored post-construction, or permanent if the area of loss occurs within a project footprint. Similar to the loss of other habitat types, conversion of treed habitat or shrubsteppe habitat to low-growing vegetation under a transmission line could be considered a permanent loss of habitat for species that will not use open habitat for movement.

The adverse environmental impact of habitat loss in movement corridors would vary depending on the type of habitat being removed and the extent of similar habitat available to wildlife. For example, loss of habitat in the Pacific Flyway may have less of an impact on migratory songbirds due to their high dispersal capabilities than the loss of habitat at a stopover location on the Pacific Flyway. Removal of habitat along movement corridors used by reptile and amphibian species could result in more substantial impacts on local reptile and amphibian populations, as these species groups require connectivity between breeding and overwintering habitats to maintain populations.

The impact of direct habitat loss on movement corridors is expected to range from medium to high. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Impact determination: Adverse environmental impacts on birds, mammals, amphibians, reptiles, invertebrates, and movement corridors resulting from direct habitat loss 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.

Fish

Direct loss of fish habitat is defined as the immediate and permanent loss or destruction of habitat, which can result from new construction activities such as clearing of riparian zones and alteration of stream banks (WDFW 2019b). Riparian vegetation stabilizes watercourse banks, prevents bank erosion, and improves the quality of instream habitat such as spawning or feeding areas (Manitoba Hydro 2010). Loss or alteration of riparian habitat could reduce riparian functions and the services it provides for aquatic resources. These functions include litter fall, coarse woody inputs, debris to stream, shading, and pollution removal (Beschta 1997; WDFW 2024q). Many of these functions also lead to indirect instream habitat loss, which is discussed in the next section. The type of vegetation that is effective in providing shade varies by riparian zone and stream size, as well as adjacent land use (e.g., agriculture, rangeland, forestry) (Beschta 1997). New construction of culverts and bridges for access roads can constrict watercourses and change flows, which can alter fish habitat. Disturbance to aquatic habitat also may be caused by the operation of construction vehicles or machinery in or near watercourses (Manitoba Hydro 2010).

Impact Determination: Adverse environmental impacts on fish resulting from direct habitat loss 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.

Special Status Species

The causes of direct habitat loss for special status species are expected to be similar to those described above for other wildlife guilds. However, direct habitat loss may have a greater adverse environmental impact on special status species because their populations are already threatened due to human influence or limited range (WDFW 2015). Habitat loss and degradation are a threat to most special status species, such as the northern spotted owl and Chinook salmon (WDFW 2015). Other special status species occupy small ranges in Washington or occur in niche habitats that are not widely available (e.g., talus slope) (WDFW 2015). These species tend to have small populations given their limited habitat extent and are vulnerable to habitat loss (WDFW 2015). Sensitive or important habitat for special status species has been identified for some species through mapping of core or critical habitat (WDFW 2015). These areas have been identified by Washington State or the U.S. Fish and Wildlife Service (USFWS) as locations that are critical to the persistence and recovery of special status species. Loss or degradation of core or critical habitat for special status species can have a disproportionate effect on their populations.

Special status species are also vulnerable to loss or changes of important features in their ranges required for denning, nesting, or foraging (WDFW 2015). For example, direct loss of grassland and shrubsteppe habitat due to development has been identified as a large contributing factor to the population decline of ferruginous hawks, a species listed as endangered in Washington (Hayes and Watson 2021).

Direct adverse environmental impacts on special status fish species are the same as for all fish species, but some special status fish have small ranges in Washington or occur in niche habitats that are not widely available. These species tend to have small populations, given their limited habitat extent, and are vulnerable to habitat loss. For example, the Olympic mudminnow is endemic in Washington and only occurs in the lowlands of the Olympic Mountains and Willapa Hills, so loss of habitat in this region could have a disproportional impact on populations of this species.

Special status species may be disproportionately affected by direct habitat loss as they may rely on rare habitats, have restricted ranges, have small population numbers, and face increased risks of extirpation from the state or complete extinction. Adverse environmental impacts may range, as some special status species are able to colonize transmission facility ROWs, such as the Mazama pocket gopher (*Thomomys mazama*), while other species exist in habitat types that are not readily replaceable, such as the northern spotted owl in old-growth forests.

Impact Determination: Adverse environmental impacts on special status species resulting from direct habitat loss 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 low to high.

Indirect Habitat Loss

Indirect habitat loss refers to a change in habitat quality or perceived change associated with the development of a project. Indirect habitat loss can occur due to changes in biotic (e.g., vegetation composition) and abiotic (e.g., noise, artificial light, wind, soil condition) conditions adjacent to a project (Tyler et al. 2014; Biasotto and Kindel 2018). For example, a forest cleared for an ROW will create a new forest edge that is subject to changed light regimes and changes in exposure to wind, which can affect soil conditions (Biasotto and Kindel 2018; ECOSTEM Ltd. 2019). These changes in abiotic factors can alter vegetation composition, and therefore habitat suitability, for wildlife along the edge.

Indirect habitat loss can also result from a perceived change in habitat condition. In these cases, the vegetation characteristics of the habitat might not change, but changes in noise levels, human presence, or structures in the landscape can still result in wildlife avoiding the area or changing their behavior. Sensory disturbance from noise and visual distraction can cause habitat loss through displacement (Drewitt and Langston 2006). When this happens, the habitat is still present but is no longer functional or provides the same resources to wildlife. Multiple studies indicate that bird and mammal abundance decrease with increasing proximity to infrastructure, effectively reducing the habitat quality near a project (Drewitt and Langston 2006; Benítez-López et al. 2010; Smith et al. 2020). How different species respond to infrastructure projects varies due to differences in their abilities to co-exist with humans; however, multiple studies have found that infrastructure causes indirect adverse environmental impacts on wildlife and wildlife habitat that are greater than the sum of the direct habitat loss impacts (Benítez-López et al. 2010). Changes in ambient conditions such as noise, light, and view-scape may result in a change in wildlife behavior; however, the extent and duration of these changes are difficult to predict.

Noises above certain levels tend to alter wildlife behavior, potentially increasing their metabolic rates and stress levels (Manci et al. 1988), and can contribute to increased energy expenditures due to increased movement around infrastructure (Bradshaw et al. 1997). Depending on the timing and level of stress, potential results of noise-related stressors include interference with communication and reduced reproductive success (Habib et al. 2007). For example, noise may cause changes in the frequency and duration of amphibian calling effort and may decrease the pairing success of birds due to interference with communication (Habib et al. 2007; Lengagne 2008). A synthesis of literature on the effects of noise on wildlife suggests that terrestrial wildlife generally respond to noise levels around 40 A-weighted decibels (dBA), with most showing impacts around 50 dBA (Shannon et al. 2016).

There is limited research examining the adverse environmental impacts of light on wildlife. It is often difficult to separate the combined influence of industrial noise, artificial light, and edge effect on wildlife species. Artificial light has the potential to affect the timing of reproductive behavior of wildlife species (Kempenaers et al. 2010). The construction of new transmission facilities could require artificial lighting for nighttime work and at new construction hubs, such as worker camps.

New construction of overhead transmission facilities is expected to increase noise and light levels throughout the construction period from activities such as vegetation clearing, earthworks, transportation of materials, heavy machinery use, nighttime work, and general movement around the construction site. These activities could reduce wildlife use of adjacent habitat or change wildlife behavior near the project. The extent of indirect loss adjacent to new construction sites would vary by habitat and species. In general, wildlife is expected to respond to changes in noise levels that are 10 decibels (dB) above ambient levels, with some species avoiding construction by over a mile (CALTRANS 2016; Eftestøl et al. 2016; Babic 2017).

Wildlife

The following sections describe the adverse environmental impacts on wildlife resulting from the new construction of overhead transmission facilities and associated indirect habitat loss. These adverse environmental impacts include considerations for:

- Birds
- Mammals
- Amphibians and Reptiles
- Invertebrates
- Movement Corridors

Birds

Overhead transmission facility projects may result in indirect habitat loss for birds through increased noise, light, and human presence during new construction. Bird species respond to these changes differently, with some species acclimatizing to activities and others avoiding areas under construction (Schöll and Nopp-Mayr 2021). Anthropogenic[48] noise that exceeds ambient noise can have a variety of adverse effects on birds, including interference with acoustic communication, changes to foraging location and behavior, masking important biological signals such as sounds of predators or prey, temporary or permanent hearing loss, increased stress, and altered hormone levels (CALTRANS 2016). Birds may leave areas with high noise levels, resulting in a reduction of usable habitat (Bergamini et al. 2024). However, one report summarizing research on the effects of noise on birds determined that many studies are unable to separate the effects of noise from other variables (Environmental BioAcoustics 2007). The number of different bird species and bird abundance have been found to be lower in areas with greater anthropogenic noise (Bayne et al. 2008; Francis et al. 2009; Proppe et al. 2013). Early laboratory studies on noise masking of bird vocalizations led to a noise level limit guideline of 60 dBA for continuous noise; however, the noise level at which masking occurs can vary between species by up to 10 dBA (CALTRANS 2016). The criteria developed by Environment and Climate Change Canada for assessing noise disturbance to land birds is 10 dBA above ambient levels, or greater than 50 dBA (Babic 2017).

Artificial light at night can affect bird behaviors such as activity partitioning between day and night, physiology such as melatonin production and circadian clocks, inter-specific interactions such as predation risk and competition, and population dynamics such as immigration, emigration, births, and deaths (Gaston et al. 2013; Gaston and Bennie 2014).

Increased human presence during new construction may also affect bird population density. Transmission facilities through undeveloped landscapes would cause a greater adverse environmental impact on bird populations than facilities in developed areas. New transmission facility construction could result in the mortality of smaller animals that are unable to move away from machinery during clearing and ground preparation works, leading to less prey available for birds that rely on smaller animals for food. The relationship between population density and habitat availability is influenced by many factors that may operate independently of habitat, including population densities of the target species and other species in the area, and the effects of predation pressure, competition, and harvest (Garshelis 2000).

[48] Caused or created by humans.

The adverse environmental impact of indirect habitat loss on birds due to the new construction of transmission facilities would be most pronounced during activities that produce high noise levels, such as tree clearing, blasting, and helicopter use; activities that produce new or increased light pollution; and vehicle traffic. The adverse environmental impact of indirect habitat loss could vary between areas with higher levels of existing disturbance and species that are adapted to co-existing with humans, such as the American crow, and activities conducted near populations that are sensitive to disturbance or have limited ranges or population numbers, or in areas with less existing disturbance.

The adverse environmental impact of indirect habitat loss on birds is expected to range from negligible to medium. These adverse environmental impacts have been considered in the overall impact determination for indirect habitat loss on wildlife.

Mammals

There is limited research on noise effects on small mammals outside of laboratory settings (Wilson 2016). Consistent exposure to noise levels above 85 dB can result in hearing loss and reduced fertility (NRC 2011). Beyond the physical auditory effects of noise (i.e., hearing loss), laboratory mammals show increased stress response, increased blood pressure, changes in estrus cycles, decreased fertility, loss of pregnancy, slower wound healing, and changes in sleep patterns in response to increased noise (Turner et al. 2005). D'Souza and Martin (1974) reported that sudden noise can result in inhibited milk intake and growth in tree shrews. When greater white-toothed shrews (*Crocidura russula*) were exposed to traffic noise in laboratory experiments, observed behavioral changes included decreases in activity and feeding, and increases in fleeing response. These differences varied slightly between individuals captured from an urban setting and those from a rural setting, with the former showing a greater propensity for feeding and remaining active despite the introduced noise (Oliveira et al. 2021). This may indicate a degree of habituation to disturbances associated with urban environments, though short-term effects are still observable (Oliveira et al. 2021). Anecdotal evidence suggests that mustelids in captivity are sensitive to loud and/or unfamiliar noises, particularly during parturition and kit rearing (AZA Small Carnivore TAG 2010).

Acute noise, like that of a construction site, can startle wildlife, eliciting a flight response. Noise also masks communication cues, impedes foraging activities due to increased visual vigilance, and reduces hunting success for predators. Ungulates rely on hearing for predator detection. In oil and gas development projects, noisy areas have been shown to reduce mule deer habitat, with caribou and white-tailed deer similarly avoiding these areas (Rutherford et al. 2023). Large-bodied mammals like ungulates tend to avoid areas with disturbance and increase their movement, leaving them more vulnerable to predators and with less opportunity to forage (Rutherford et al. 2023).

When an existing 300 kV transmission line in northern Scandinavia was upgraded to 420 kV, research found that during construction, reindeer activity decreased by 10 percent within 3.7 miles (6 km) of the line during the calving season and decreased by 12 percent and 13 percent within 2.2 miles (3.5 km) of the line during summer and fall, respectively (Eftestøl et al. 2016).

The adverse environmental impact of indirect habitat loss on mammals due to the new construction of a transmission facility would be most pronounced during activities that produce high noise levels, such as tree clearing, blasting, and helicopter use; activities that produce new or increased light pollution; and vehicle traffic. The adverse environmental impact of indirect habitat loss could range between areas with higher existing levels of disturbance and species that are adapted to co-existing with humans, and activities conducted near populations that are sensitive to disturbance or have limited ranges or population numbers, or in areas with less existing disturbance.

The adverse environmental impact of indirect habitat loss on mammals is expected to range from negligible to medium. These adverse environmental impacts have been considered in the overall impact determination for indirect habitat loss on wildlife.

Amphibians and Reptiles

Noise created during the amphibian breeding season may interfere with calling and mate location. Increases in noise while adults are calling can disturb calling patterns, length of calling, and call assemblages[49] (Barrass 1985; Sun and Narins 2005; Parris et al. 2009; Kaiser et al. 2011). Increased noise during breeding can also affect a female's ability to locate calling males (Bee and Swanson 2007). Amphibian species use different strategies to call and locate mates. For example, northern red-legged frogs call quietly, making calling patterns susceptible to interference from increased ambient noise levels. The coastal populations of the western toad do not produce an advertisement call;[50] therefore, mate detectability would be less affected by noise for these populations (COSEWIC 2012). Traffic noise has also been shown to result in

[49] The collection of different calls from different animals at the same time.
[50] A call male frogs use to advertise to female frogs during the breeding season.

behavioral changes of tadpoles occurring in roadside ditches. Cuban treefrog (*Osteopilus septentrionalis*) and southern toad (*Anaxyrus terrestris*) tadpoles have displayed increased activity levels, potentially increasing susceptibility to detection by predators, along with decreases in food consumption (Castaneda et al. 2020).

Little information is available on noise thresholds above which potential effects may be observed in amphibian species native to Washington. However, a review of available literature on the effects of noise levels on other amphibian species provides some insight. In European tree frogs (*Hyla arborea*), increased noise intensity above 88 dBA has been shown to result in a 50 percent reduction in calling effort due to changes in the frequency and duration of amphibian calling, while noise intensity above 72 dBA resulted in a 29 percent reduction in calling effort (Lengagne 2008). Couch's spadefoot toads (*Scaphiopus couchii*) emerged from burrows when exposed to recorded motorcycle noises of 95 dBA. Noise intensity of 120 dBA has resulted in immobilization of northern leopard frogs (Nash et al. 1970).

Amphibians have evolved behavioral responses to the daily cycle of night and day (Perry et al. 2008, as cited in Mitchell et al. 2008). Artificial light that disrupts this natural variation of lighting has negative consequences for amphibians. Artificial light required for construction can change foraging strategies, as light can attract prey. Higher prey concentration can benefit amphibians by increasing foraging efficiency; however, it can also result in higher mortality from vehicle strikes due to the location of the lighting, such as along roads (Perry et al. 2008). Alternatively, artificial nighttime lighting can alter natural amphibian behavior. Nocturnal foraging species, such as Pacific chorus frogs, tend to feed during the darkest periods of night. Artificial light can delay nighttime emergence and thus reduce foraging time. The physiology of frogs' eyes is adapted to adjust to the brightest light (Fain et al. 2001), with hours required for new adjustments to be made (Cornell and Hailman 1984). This could reduce foraging efficiency and affect frogs' movement patterns (Cornell and Hailman 1984; Fain 2001; Perry et al. 2008). Another effect of artificial light during nocturnal periods is the stimulation of melanin production, which is normally produced at a higher rate during the night. Melatonin has multiple functions in amphibians, including regulating hormones involved in metamorphosis, gonadal development, reproductive behavior, and thermoregulation (Erskine and Hutchison 1982; Vanecek 1998; Wise and Buchanan 2006). These can affect individuals' fitness and overall survival. For example, delayed metamorphosis may result in mortality in cases where amphibians breed in ephemeral aquatic habitats[51] that may be susceptible to drying out.

Research on sensory disturbance to reptiles is limited; however, snakes are known to be sensitive to both ground and airborne vibrations (a product of sound) and are able to perceive sounds through both the inner ear and somatic hearing[52] (Wever 1978; Young 2003; O'Neill and Yurk 2017). Auditory sensitivities are high at lower frequencies (<500 hertz), where somatic hearing is less sensitive but has an increased frequency range (Young 2003). Studies of lizards reported temporary hearing loss when an individual was exposed to sound pressure levels of 95 dB referenced to 20 micropascals[53] for 510 seconds (Manci et al. 1988). Little is known about behavioral responses to these vibrations (O'Neill and Yurk 2017).

Similar to amphibians, reptiles have evolved to respond to fluctuating natural light, and the introduction of artificial light may have various behavioral and physiological effects (Perry et al. 2008). Artificial lighting may increase successful foraging, but it may also increase predation on reptiles (Bouskila 1995). Conversely, some snake prey species are less active as a response to the introduction of artificial light at night, reducing foraging opportunities for snakes (Bouskila 1995; Bowers 1988). Reductions in prey availability and detectability may reduce the quality of otherwise usable habitat for reptiles.

The adverse environmental impact of indirect habitat loss on amphibians and reptiles would vary depending on the proximity of the noise source to unique habitats, such as amphibian breeding ponds; the sensitivity of species to noise, light, or other disturbance (e.g., calling amphibians); and the nature of the disturbance source. For example, the impact from periodic loud sound sources, such as blasting, is expected to result in a different impact than continuous noise sources, such as vehicle engine noise. The adverse environmental impact could also vary depending on the seasonal overlap between project construction and species presence. The adverse environmental impact of indirect habitat loss on amphibians and reptiles is expected to range from nil to medium. These adverse environmental impacts have been considered in the overall impact determination for indirect habitat loss on wildlife.

[51] A water-based habitat that exists only during certain times of the year when conditions are wet enough.
[52] Hearing by picking up sonic vibrations through the body.
[53] A unit of measurement which is a millionth of a pascal. A pascal is a unit of pressure.

Invertebrates

As with larger animals, anthropogenic noise and light can change the behavior, development, and habitat use for invertebrates as well (Boyes et al. 2021; Van den Broeck et al. 2021). Anthropogenic light pollution is expected to be one of the primary drivers of global insect declines, especially nocturnal insects such as moths (Boyes et al. 2021). Anthropogenic noise has been observed to disrupt communication in some insects, as vibrations caused by human activity can overlap with those used for insect communication (Janža et al. 2024).

If new transmission facility construction were to increase the movement of damaging invasive insect species that feed on native tree species, such as spongy moth, this would lead to indirect habitat loss for forest species (WISC 2025). If agricultural pest insects were able to spread during new construction, this could cause the loss of fruit trees, which may affect wildlife that use them, such as native pollinators.

The adverse environmental impact of indirect habitat loss on invertebrates is expected to range from negligible to medium. These adverse environmental impacts have been considered in the overall impact determination for indirect habitat loss on wildlife.

Movement Corridors

Indirect adverse environmental impacts on movement corridors during construction are expected to be similar to those described above in terms of changes in biotic and abiotic features. The adverse environmental impacts on wildlife that use these corridors are expected to vary seasonally with their use.

Similar to the direct adverse environmental impacts on movement corridors described above, the adverse environmental impact of indirect habitat loss on movement corridors could vary from negligible to high, depending on site characteristics (e.g., stopover locations), the species affected, and the season.

Adverse environmental impacts from indirect habitat loss on movement corridors from new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. The adverse environmental impact of indirect habitat loss on movement corridors is expected to range from negligible to high. These adverse environmental impacts have been considered in the overall impact determination for indirect habitat loss on wildlife.

Impact Determination: Adverse environmental impacts on birds, mammals, amphibians, reptiles, invertebrates, and movement corridors resulting from indirect habitat loss during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project, site-specific conditions, guilds impacted, and the presence of movement corridors. In the absence of mitigation, these adverse environmental impacts could range from nil to high.

Fish

Indirect habitat loss for fish primarily results from increased human activity, pollution, and changes in land use adjacent to transmission facility corridors. It may change the character or state of the habitat over time by changing water quality and quantity (WDFW 2019b). Water quality degradation arising from soil erosion, sedimentation, and potential contaminants from maintenance activities or accidents related to transmission facilities can degrade fish habitat and cause injury or mortality in fish. Changes to water quality and quantity may occur during the new construction of transmission facilities and access roads. Changes to water quality include changes in water temperature, pH, nutrient concentrations, pollution, and sediment. Changes to water quantity could result from the removal of riparian vegetation that may impact the water table or increase the risk of flash flooding. In addition, noise vibrations during construction (explosives used in or near water or pile driving) may cause damage to incubating eggs or larvae or cause injury or mortality to fish (Wright and Hopky 1998; Popper et al. 2006). Sublethal effects on fish may also occur from in-water noise, including changes in the behavior of fish (Wright and Hopky 1998). These changes can lead to changes in fish habitat and aquatic resources over time, which ultimately can affect fish. For example, once salmonids leave the ocean and enter freshwater, they are dependent on the quality of water and instream habitat, particularly for spawning and rearing (Beschta 1997).

Impact Determination: Adverse environmental impacts on fish resulting from indirect habitat loss 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 negligible to medium.

Special Status Species

It is expected that new construction of a transmission facility would result in indirect habitat loss for special status species similar to those described above for birds, mammals, amphibians, reptiles, invertebrates, and fish. The extent of indirect habitat loss adjacent to a transmission facility would vary by species. Species that are sensitive to human activity would be the most affected, as they would maintain the largest distances from new construction activities. For example, Stewart et al. (2016) report that wolverines, which are a wide-ranging species, spend less time in habitats close to human-modified areas and generally move through these areas quickly. Greater sage-grouse and Columbian sharp-tailed grouse avoid habitat near tall structures, such as transmission facility poles and towers, because they provide perches for raptors and increase predation risk (Stinson and Shroeder 2012).

However, other special status species are more tolerant of human activity and may be more likely to use habitats near transmission facilities. For example, Scobie et al. (2016) report that burrowing owls did not substantially avoid habitats with artificial sound associated with compressor stations, oil wells, traffic, and towns, but would change habitat use if changes in vegetation affected prey availability. Similarly, ferruginous hawk nest densities increased by 37 percent after the installation of transmission towers in southwest Alberta, Canada, but returned to pre-construction levels after their removal (Parayko et al. 2021). This may be related to the limited availability of nesting structures in the region.

Beyond species-specific responses to construction disturbance, the extent of indirect habitat loss due to transmission facility construction varies depending on the type of machinery used, construction activities, and surrounding habitat. Project-specific indirect habitat loss can be estimated by analyzing changes in noise levels using project-specific noise modeling, reviewing the proximity of roadways and construction lighting to sensitive wildlife features (e.g., streams and wetlands), and considering the seasonality of construction activities. Project-specific information is required to quantify the extent of indirect habitat loss on special status species.

Impact Determination: Adverse environmental impacts on special status species resulting from indirect habitat loss 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 low to high.

Mortality

This section is limited to general adverse environmental impacts on wildlife from construction-related mortality. These effects can be difficult to predict as data may be hard to obtain and are often incomplete when available (Lehman et al. 2010; Manitoba Hydro 2010). Sources of wildlife mortality during the new construction of transmission facilities may include the following:

- Vegetation clearing and grubbing activities

- Wildlife-vehicle collisions
- Nest/den destruction and failure
- Removal of nuisance wildlife[54]

Site preparation works, including vegetation clearing and grubbing, are likely to pose the greatest risk of wildlife mortality, particularly for less mobile species such as amphibians, reptiles, and small mammals, which may not be able to move away from machinery and grubbing activity. Young wildlife (e.g., tadpoles, bird nestlings) and wildlife in an immobile stage (eggs) are also at higher risk of mortality from clearing and grubbing.

Wildlife-vehicle collisions may occur when wildlife cross roads to access habitat patches. Wildlife-vehicle collisions may occur during new construction, operation, and decommissioning; however, vehicle traffic is expected to be highest during construction. Road mortalities are generally site-specific, and frequencies of mortality depend on the species and circumstances, such as location, traffic volume, and speed (Oxley et al. 1974; Jalkotzy et al. 1997). Collisions are typically more common during dusk and nighttime, when nocturnal species are active and visibility is poor (Gunson et al. 2003).

Wildlife

The following sections outline the adverse environmental impacts of wildlife mortality associated with the new construction of overhead transmission facilities. These adverse environmental impacts include considerations for:

- Birds
- Mammals
- Amphibians and Reptiles
- Invertebrates

Birds

Vegetation clearing and site preparation work may result in the destruction or disturbance of bird nests. Adult birds can move away from clearing activities, but their young may not be able to move if clearing is conducted prior to fledging,[55] resulting in

[54] Wildlife that can cause a problems or danger for humans, such as bears which become accustomed to eating garbage.
[55] The process by which an immature bird develops flight feathers.

the mortality of eggs or young. In addition, birds that are disturbed by construction activities may abandon nests, resulting in nest failure. The adverse environmental impact of potential mortality is expected to vary depending on the season when work is conducted. For example, vegetation clearing during the bird breeding season has a higher risk of causing bird mortality due to the presence of bird nests, eggs, and fledglings than if such work is performed during the winter.

In addition, nests placed on or near the ground could be crushed by vehicles, equipment, and workers moving around the construction site. In open habitats, many bird species nest on the ground, like western meadowlarks; close to the ground, like sage thrashers; or underground, like burrowing owls; these nests are often cryptic[56] and difficult to detect.

Collisions between birds and construction traffic are another potential source of bird mortality. Mortality risk depends on several variables, including traffic volume and speed (Erritzøe et al. 2003; Oddone Aquino and Nkomo 2021); road configuration (Husby 2016); adjacent habitat (Erritzøe et al. 2003; Bishop and Brogan 2013); and bird density and species composition (Santos et al. 2016). The highest bird mortality rates were reported to occur on roads through wetlands, followed by roads through mixed and broadleaf forests (Bishop and Brogan 2013). Traffic volume and velocity are generally positively correlated with the number of avian mortalities, though this is not always the case (Erritzøe et al. 2003; Oddone Aquino and Nkomo 2021).

Adverse environmental impacts on birds from mortality due to new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions, including habitat and seasonality of construction activities. Adverse environmental impacts could be nil for projects located in urban areas with limited bird abundance and nesting potential to low in more complex habitats. These adverse environmental impacts have been considered in the overall impact determination for wildlife mortality.

Mammals

Vegetation clearing and site preparation work may result in the destruction or disturbance of small mammal dens. Small mammal dens may be destroyed during ground-disturbing work, resulting in the mortality of animals in the den. The adverse

[56] Designed for concealing or camouflage.

environmental impact of potential mortality is expected to vary depending on the season when work is conducted.

Vegetation clearing during construction could result in direct mortality of small mammals through destruction of occupied burrow sites and collisions with construction vehicles and equipment. Burrow sites are often used year-round, and the potential for mortality remains consistent throughout the year. Mammals, particularly small mammals, that cross construction access roads are at risk of collision with vehicles and equipment moving to and from construction work fronts. Vegetation clearing could result in bat mortality through clearing trees with occupied tree roosts. Removal of anthropogenic structures that provide day and maternity roosts could also result in bat mortality.

Construction materials and household waste created during construction can attract mammals, such as bears, to construction sites, resulting in increased human-wildlife conflicts. The conflicts can result in wildlife mortality. Further, wildlife may consume toxic or hazardous construction materials, such as petroleum products, which can also result in mortality.

Adverse environmental impacts on mammals from mortality due to new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions, including habitat characteristics, the species present, and the seasonality of construction activities. For example, adverse environmental impacts could range from nil in areas with limited habitat (e.g., urban areas) to low in more natural habitats. These adverse environmental impacts have been considered in the overall impact determination for wildlife mortality.

Amphibians and Reptiles

Amphibians and reptiles have limited mobility due to their small size and may not be able to move away from machinery used for clearing and grubbing, making them susceptible to mortality during these activities. Species may be more susceptible at certain times of the year. For example, amphibians are typically less mobile while in the larval life phase (spring/summer) and while hibernating during winter. Amphibians are susceptible to mortality during inter-season movements if access roads are constructed over their migration and dispersal routes (Fukumoto and Herrero 1998). The risk of mortality during amphibian movements would vary depending on road placement and the distance that amphibians move. For example, western toads can move between 0.9 and 3.7 miles (1.5 and 6 km) between breeding and hibernation sites (Bull 2006; Browne and Paszkowski 2010; Wind 2021), increasing the likelihood of encountering a construction access road compared to salamanders in the Ambystomatidae family that typically move short distances (105.3 to 656.2 feet [32.1 to 200 meters]) between breeding and upland habitat (Semlitsch 1998; Maxcy and Richardson 2000). Amphibians may also become trapped in borrow pits,[57] ditches, and other excavated structures, as well as construction materials and equipment that are present during construction. These excavated structures can fill with water and could act as population sinks[58] if they dry up, are drained, or disturbed during the amphibian breeding season.

Reptiles are more susceptible to mortality from grubbing and moving debris piles during the winter hibernation period when they are congregated in hibernacula, are less mobile, and are not visible. During times when they are active, they may use debris piles for cover and may be susceptible to mortality if the material is disturbed. Reptiles are also prone to vehicle strikes because they use roads to thermoregulate and can freeze as a defensive response when approached by a vehicle (Wagner et al. 2021). Vehicle collisions are more common at night in the spring and summer when reptiles are active. Reptiles may also become entrapped in excavated cavities and construction material, which could lead to mortality.

The introduction of invasive species such as the American bullfrog and African clawed frog could impact native amphibians by introducing new predators for native amphibian species and competition for aquatic resources and habitat (WISC 2025). African clawed frogs can also carry diseases that could cause mortality for native species (WISC 2025).

Adverse environmental impacts on amphibians and reptiles from mortality due to new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions, including the proximity of construction activities to sensitive features (e.g., wetlands, hibernacula), the seasonality of construction activities, and the limited mobility of amphibians and reptiles. The adverse environmental impact of mortality on amphibians and reptiles is expected to range from nil to medium. These adverse environmental impacts have been considered in the overall impact determination for wildlife mortality.

[57] An excavated area where dirt has been dug to be used to fill another location.
[58] A type of habitat that can attract organisms but does not have enough resources to support them, resulting in their eventual extirpation from the sink, unless it is constantly supplied by another population.

Invertebrates

Invertebrate mortality from collisions with vehicles could occur during the spring and summer, when insects are most active (Baxter-Gilbert et al. 2015). Vehicle collisions are expected to be greatest during the construction, when vehicle traffic is the highest. Clearing of vegetation and grubbing during the winter, when many insects are overwintering, could result in the mortality of insects that are not able to move out of the way of vehicles and construction equipment.

Adverse environmental impacts on invertebrates from mortality due to the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions, such as the habitat being impacted and the seasonality of construction activities. These adverse environmental impacts have been considered in the overall impact determination for wildlife mortality.

Impact Determination: Adverse environmental impacts on the overall wildlife mortality of birds, mammals, amphibians and reptiles, and invertebrates due to 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.

Fish

Death or injury of fish can occur during project construction due to changes in water flow, erosion, or physical injury or death due to the adverse environmental impact of equipment, debris, or noise, and/or due to the physical presence of transmission facilities. Some activities have a higher risk of mortality or injury than others (WDFW 2019b). Instream works during the new construction of transmission facilities may include access roads that cross rivers and streams. Direct mortality and/or injury of fish may occur from equipment and other construction vehicles in aquatic habitats, including culverts and bridges that are installed for road crossings. Sedimentation can smother aquatic insects, mussels, and eggs and damage fish gills, which may lead to mortality (Newcombe and Jensen 1996).

Impact Determination: Adverse environmental impacts on fish resulting from mortality due to 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 negligible to low.

Special Status Species

Sources of mortality of special status species during project construction are expected to be the same as described above for wildlife guilds. Populations of special status species are expected to be more vulnerable to loss of individuals because these populations are typically either naturally small or lower than historical levels.

Impact Determination: Adverse environmental impacts on special status species from mortality due to 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.

Barriers to Movement

Habitat fragmentation (discussed under Fragmentation, below) isolates populations by creating physical or perceived barriers to movement. Physical barriers to movement are features that wildlife are not capable of crossing, such as construction fencing and sediment fencing. Perceived barriers to movement represent landscape features such as ecotones,[59] habitat gaps,[60] or matrix habitats[61] that wildlife are physically capable of crossing, but typically do not due to behavioral constraints. Barriers to movement can result in decreased genetic flow and less resilient populations, failure to reach breeding grounds or foraging sites, and reduced rates of recolonization[62] (Haddad et al. 2015; Hanski 2015).

New construction of an overhead transmission facility could create both physical and perceived barriers to wildlife movement. Physical barriers, such as new construction fencing, sediment and erosion control measures, and material laydowns, would be removed at the end of new construction. Perceived barriers would be created during new construction and are expected to continue through operation. The following sections discuss sources of barriers to movement specific to new construction.

Wildlife

The following sections outline the adverse environmental impacts from the creation of barriers to the movement of wildlife associated with the new construction of overhead

[59] The zone between two different ecological communities.
[60] A gap between two different habitats caused by human infrastructure like roads.
[61] Habitat that occurs between, and connects, habitat patches.
[62] The reestablishment of a species into an area after it was extirpated.

transmission facilities. These adverse environmental impacts include considerations for:

- Birds
- Mammals
- Amphibians and Reptiles
- Invertebrates
- Movement Corridors

Birds

Some bird species may change their behavior to avoid noise and human presence, thereby avoiding approaching or crossing construction areas. Perceived barriers to movement, like construction noise, light, and human presence, generally restrict local or landscape-level movements such as movement within a home range, seasonal shifts in a home range, or dispersal (Harris and Reed 2002). Sensory disturbance associated with construction activities taking place within a transmission facility corridor may further reduce the willingness of birds to cross it. Transmission facility corridors can extend for hundreds of kilometers and may negatively impact access to resources like breeding areas and foraging grounds for birds like some small, forest-dwelling songbirds that are unwilling to cross transmission facility corridors. Daily movement corridors from roosting to foraging sites may overlap with project-related activities, potentially resulting in a new perceived barrier to movement.

Some species adapted to human presence, anthropogenic structures, or disturbed environments may perceive fewer barriers to movement than species that are sensitive to noise and human presence. Physical barriers to movement would have a more substantial impact on less mobile species and during the bird breeding season, when young birds are less capable of movement.

Adverse environmental impacts from the creation of barriers to the movement of birds from the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. For example, adverse environmental impacts could vary from nil in urban areas where birds are adapted to co-exist with human disturbance to low in areas with less pre-existing disturbance. These adverse environmental impacts have been considered in the overall impact determination for wildlife barriers to movement.

Mammals

Noise, light, and human presence may deter mammals from approaching or crossing construction areas. Fencing around construction sites creates physical barriers that can prevent wildlife from accessing or moving through construction sites. Artificial lighting, like that used on construction sites, along bat movement corridors has been shown to reduce activity substantially (Stone et al. 2009; Barré et al. 2023). Exposure to artificial lighting along movement corridors may result in avoidance and longer flying times, potentially resulting in lower fitness levels (Barré et al. 2023). As with foraging, artificial lighting affects bat movement variably, depending on species.

The movement of mammals through their habitat can be restricted by human presence. In areas with high human activity, wildlife movement has been observed to be one-half to one-third that of areas with no human activity (Tucker et al. 2018). Migratory ungulates are highly sensitive to human disturbance. Fencing has been found to have strong negative effects on pronghorn movement, distribution, and resource selection in Alberta, Manitoba, and Montana. Pronghorn are reluctant to cross fence lines and actively avoid fenced areas (Jones et al. 2019). Construction activities and fencing may have a similar adverse environmental impact on migratory and resident ungulates by reducing or blocking their movement to quality and reliable sources of food, rearing habitat, and shelter.

Adverse environmental impacts from the creation of barriers to the movement of mammals due to the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. For example, the adverse environmental impact of barriers to movement for mammals during construction is expected to vary from nil in areas that are outside of movement corridors to medium if construction is expected to bisect movement corridors or substantially change habitat characteristics (e.g., removing vegetation cover). These adverse environmental impacts have been considered in the overall impact determination for wildlife barriers to movement.

Amphibians and Reptiles

Construction activities that overlap or bisect amphibian and reptile habitats may create barriers to amphibian and reptile movement, particularly if construction sites are located between different seasonal habitats, such as those used for breeding and overwintering. Amphibians and reptiles may avoid crossing construction access roads due to changes in microclimate conditions and a lack of cover objects. In addition, sediment fencing, berms, and other features of construction sites can create physical barriers to amphibian and reptile movement (Jochimsen et al. 2004).

Reptiles and amphibians are particularly vulnerable to both perceived and physical barriers to movement. They have specific habitat requirements and are vulnerable to changes in their environment. The impact would be greatest where ROWs present a barrier to movement between habitats used for breeding, dispersal, and hibernation.

Adverse environmental impacts from the creation of barriers to movement on amphibians and reptiles due to the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions, including the time of year and the barriers present at the project site. These adverse environmental impacts have been considered in the overall impact determination for wildlife barriers to movement.

Invertebrates

There is limited information on barriers to invertebrate movement during construction activities. Adverse environmental impacts from the creation of barriers to movement on invertebrates due to the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions, including habitat, species mobility, and the seasonality of construction activities. For example, the adverse environmental impact would vary from nil in areas that have been highly modified to low in habitats that would be substantially modified by construction activities (e.g., forests). These adverse environmental impacts have been considered in the overall impact determination for wildlife barriers to movement.

Movement Corridors

Landscape-level habitat connectivity is important for wildlife to access seasonal habitats, juvenile dispersal, and gene flow. Wildlife movements can range from a few miles for small animals (e.g., amphibians) to hundreds of miles for larger species (e.g., ungulates). Development in movement corridors not only removes habitat but can also impede or prevent wildlife movement in the landscape. The creation of barriers to movement would be initiated during construction, but the effects would occur predominantly during operation, given the duration of this stage. Therefore, the adverse environmental impacts of transmission facilities on wildlife movement corridors are discussed under the operation and maintenance stage.

Creation of barriers to movement that interact with landscapes with high modeled connectivity value and identified state and regionally significant connected landscape pathways is expected to result in a higher adverse environmental impact on wildlife movement than barriers outside of these routes. However, the adverse environmental impact of barriers to movement on wildlife corridors is expected to vary from nil for projects sited outside of movement corridors, to negligible for projects in broad migratory pathways such as the Pacific Flyway, to medium for projects sited in modeled landscapes with high connectivity value for wildlife. Medium impacts could also occur on reptile and amphibian species if barriers are created between two important habitat areas, such as breeding and overwintering grounds. These adverse environmental impacts have been considered in the overall impact determination for wildlife barriers to movement.

Impact Determination: Adverse environmental impacts from the creation of barriers to movement on birds, mammals, amphibians and reptiles, invertebrates, and movement corridors due to 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.

Fish

Barriers to movement can cause changes to fish behavior or health that can reduce the ability of fish or shellfish to survive and grow (WDFW 2019b). For example, barriers may inhibit migrating salmon from reaching native spawning grounds. Migration routes may be disrupted by linear developments, including access roads. Construction of culverts and bridges, if inappropriately designed and installed, can cause velocity barriers,[63] bank erosion, slumping,[64] insufficient resting areas, noise, and debris jams,[65] which may cause migration blockage to fish.

Impact Determination: Adverse environmental impacts from the creation of barriers to the movement of fish due to the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific

[63] When the flow velocity over a river structure (e.g., culverts or road crossings) exceeds the swimming capacity of the fish and hinders its movements.

[64] Vertical collapse of the bank cause by a slide or rotation away, leaving a concave scar or scarp and a clump of sediment at the base. Can occur when structures are built too close to the bank of a river, or when riparian vegetation is removed.

[65] Buildup of woody material of variable sizes and quantities into a distinctive unit.

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

Special Status Species

The sources of barriers to movement for special status species during the new construction of overhead transmission facilities are expected to be consistent with the other wildlife guilds described above. However, due to the sensitivity of special status species to changes in habitat connectivity, barriers to movement are expected to result in increased adverse environmental impacts on these populations.

Impact Determination: Adverse environmental impacts from the creation of barriers to movement on special status species due to 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

Habitat fragmentation refers to the division of continuous habitat into smaller, isolated patches through habitat loss (Haddad et al. 2015). Continued fragmentation can result in a patchwork of habitats over the landscape that may be partially connected or completely isolated from each other. Fragmentation results in more habitat exposed to edge effects (described under Indirect Habitat Loss) and can isolate wildlife populations through the creation of movement barriers (described under Barriers to Movement). Habitat fragmentation resulting from the new construction of overhead transmission facilities is expected to begin during new construction and persist throughout the operation and maintenance stage. Given that the duration of fragmentation will predominantly occur during the operation and maintenance stage, detailed descriptions of the adverse environmental impacts can be found under that stage.

Wildlife

Habitat fragmentation resulting from the new construction of overhead transmission facilities is expected to begin during the new construction and persist throughout the operation and maintenance stage. Given that the duration of fragmentation would predominantly occur during the operation and maintenance stage, a detailed description of the adverse environmental impacts of fragmentation has been provided under the operation and maintenance stage. The same considerations identified during the operation and maintenance stage are applicable to new construction.

Impact Determination: Adverse environmental impacts from fragmentation on wildlife 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, adverse environmental impacts on wildlife could range from nil to medium.

Fish

Habitat fragmentation resulting from the new construction of overhead transmission facilities is expected to begin during the new construction and persist throughout the operation and maintenance stage. Given that the duration of fragmentation would predominantly occur during the operation and maintenance stage, the detailed description of the adverse environmental impacts of fragmentation has been provided under the operation and maintenance stage. The same considerations identified during the operation and maintenance stage are applicable to new construction.

Impact Determination: Adverse environmental impacts from fragmentation on habitat, wildlife, and fish during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. The adverse environmental impact of fragmentation on fish could be nil to medium.

Special Status Species

Habitat fragmentation resulting from the new construction of overhead transmission facilities is expected to begin during the new construction and persist throughout the operation and maintenance stage. Given that the duration of fragmentation would predominantly occur during the operation and maintenance stage, the detailed description of the adverse environmental impacts of fragmentation has been provided under the operation and maintenance stage. The same considerations identified during the operation and maintenance stage are applicable to new construction.**Impact Determination:** Adverse environmental impacts from fragmentation on habitat, wildlife, and fish during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. The adverse environmental impact of fragmentation on special status species could be nil to high.

Underground Transmission Facilities

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

- Direct Habitat Loss
- Indirect Habitat Loss
- Mortality
- Barriers to Movement
- Fragmentation

Direct Habitat Loss

In general, the adverse environmental impacts of direct habitat loss for the new construction of an overhead transmission facility would be similar to those for an underground transmission facility. Clearing of the ROW would be required prior to the new construction of underground transmission facilities. Additional grubbing may be required for the excavation of a trench. Therefore, while it is expected that naturally open ecosystems could be retained under overhead transmission facilities, this may not be possible during the new construction of underground transmission facilities. The exception would be habitats that are traversed using trenchless construction methods.

Wildlife

The following sections outline the adverse environmental impacts of direct habitat loss on wildlife associated with the new construction of underground transmission facilities. These impacts include considerations for:

- Birds
- Mammals
- Amphibians and Reptiles
- Invertebrates
- Movement Corridors

Birds

Direct loss of bird habitat due to new underground transmission facility construction would be consistent with the adverse environmental impacts described previously, except for species that occur in naturally open habitats, as these habitats would also be cleared to install underground transmission facilities. Shrubs cannot be reestablished on top of underground transmission facilities due to the potential electrification of root systems. Therefore, habitat along the ROW would remain as modified grass-dominated areas throughout operation, reducing the availability of foraging and nesting habitat.

Similar to new overhead construction, the adverse environmental impact of direct habitat loss on birds would depend on the habitat type impacted, the extent of habitat impacted, and the species of bird impacted. The impact of habitat loss could vary from negligible for facilities in urbanized or modified habitats to medium for facilities in mature forest areas. Similarly, mobile species that are generalists, such as the American crow, are not likely to be impacted by the new construction of a transmission facility; therefore, the impact would be negligible. However, the adverse environmental impact of habitat loss on species with a limited distribution or niche habitat requirements, such as the tricolored blackbird, could be medium. These impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Mammals

Direct loss of mammal habitat due to new underground transmission facility construction would be consistent with the adverse environmental impacts described previously, except for species that occur in naturally open habitats, as these habitats would also be cleared to install underground transmission facilities. Shrubs cannot be reestablished on top of underground transmission facilities due to the potential electrification of root systems. Therefore, habitat along the ROW would remain as modified grass-dominated areas throughout operation, reducing the availability of shelter sites for smaller mammals.

The adverse environmental impact of direct habitat loss on mammals depends on the species, habitat type impacted, and extent of the impact. Generalist mammal species that can re-establish in ROWs, such as some species of rodent, are likely to be less affected than mammal species that rely on mature forests. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Amphibians and Reptiles

Direct loss of amphibian and reptile habitat due to new construction of underground transmission facilities would be consistent with the adverse environmental impacts described for overhead transmission facilities, except for species that occur in naturally open habitats, as these habitats would also be cleared to install underground transmission facilities. As shrubs cannot be reestablished on top of underground transmission facilities, shelter sites for amphibians and reptiles in the ROW are expected to be limited.

The adverse environmental impacts of direct habitat loss on amphibian breeding habitat from the installation of an underground transmission facility would depend on the installation methods applied. Use of trenchless construction methods with appropriate conditions would have little to no impact on amphibian aquatic breeding sites.

The adverse environmental impact of direct habitat loss on amphibians and reptiles would depend on the site characteristics (disturbed or undisturbed) and the species present. The adverse environmental impact of habitat loss could range from nil for projects that do not interact with amphibian and reptile habitat, including projects located in urban or previously highly disturbed areas without features required by amphibians and reptiles, to medium for projects that occur in undisturbed habitats that contain unique features that support amphibian and reptile life requisites such as wetlands, talus slope, and streams. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Invertebrates

Direct loss of invertebrate habitat due to new underground transmission facility construction would be consistent with the adverse environmental impacts described previously, except for species that occur in naturally open habitats, as these habitats would also be cleared to install underground transmission facilities.

The adverse environmental impact of direct habitat loss on invertebrates would depend on site characteristics (forested vs. open), timing of new construction activities, and the species present. The impact of habitat loss could range from nil for species adapted to open ecosystems and those that require flowering plants that grow in ROWs, to medium for invertebrates adapted to forested or shrub environments, rely on rare host plants, and/or have niche habitat requirements. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Movement Corridors

The adverse environmental impact of direct loss of movement corridors is expected to be consistent with the previous description except for corridors through open habitat, as vegetation in these areas would be removed during construction.

The adverse environmental impact of habitat loss in movement corridors would vary depending on the type of habitat being removed and the extent of similar habitat available to wildlife. For example, loss of habitat in the Pacific Flyway may have a negligible to low impact on migratory songbirds due to their high dispersal capabilities, while loss of habitat at a stopover location on the Pacific Flyway would result in a larger (medium to high) impact on migrating birds. Removal of habitat along movement corridors used by reptile and amphibian species could result in medium impacts on local reptile and amphibian populations, as these species groups require connectivity between breeding and overwintering habitats to maintain populations. These impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Impact Determination: Adverse environmental impacts from direct habitat loss on birds, mammals, amphibians and reptiles, invertebrates, and movement corridors from 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.

Fish

Adverse environmental impacts during construction are dependent on the construction methods used. Trenchless construction is the method that has the lowest adverse environmental impacts on watercourses. Trenchless construction has little to no impact on rivers, lakes, or streams as the construction occurs under the water feature and potentially also avoids riparian areas. If trenchless construction is undertaken under inappropriate soil stabilization conditions, it may result in accidental spills ("frac-outs"[66]), causing degradation of aquatic habitat due to the release of deleterious substances, including drilling fluid or sediment-laden groundwater.

Impact Determination: Adverse environmental impacts from direct habitat loss on fish from new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence

[66] An unintentional return of drilling fluids to the surface.

of mitigation, these adverse environmental impacts could range from negligible to medium.

Special Status Species

The adverse environmental impacts on special status species from the installation of underground transmission facilities are expected to be consistent with the descriptions above for general wildlife groups. However, special status species may be disproportionately affected by direct habitat loss as they may rely on rare habitats, have restricted ranges, have small population numbers, and face increased risks of extirpation from the state or complete extinction.

Adverse environmental impacts may range from low for some special status species that have been observed to colonize transmission facility ROWs, such as the Mazama pocket gopher, to high for species that exist in habitat types that are not readily replaceable, such as the northern spotted owl in old growth forests.

Impact Determination: Adverse environmental impacts from direct habitat loss on special status species from 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.

Indirect Habitat Loss

Wildlife

The adverse environmental impact of indirect habitat loss during new construction of underground transmission facilities is expected to be consistent with new construction of overhead transmission facilities, as described previously, for birds, mammals, amphibians and reptiles, invertebrates, and movement corridors.

Impact Determination: Adverse environmental impacts from indirect habitat loss on wildlife from 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.

Fish

During construction, accidental releases may cause turbidity plumes[67] and this sediment may be deposited downstream, and its effect downstream may be longer in

[67] Fine sediments remain suspended in a surface freshwater layer and cause cloudiness or muddiness.

duration (Brosius 2010). Sediment deposition downstream can increase embeddedness and change the morphology of the stream (Brosius 2010). Typically, these changes to streambed conditions are considered short term (six weeks to two years post-construction), but channel morphology changes at the crossing location may be longer term (up to four years) (Brosius 2010). In addition, fuels, lubricants, and hazardous materials may enter the watercourse, altering water quality or causing mortality to fish. Direct mortality to fish is further described in the following section. Sediment released during construction can also alter the productivity of benthic[68] invertebrates for one to two years (Brosius 2010). In addition, accidental releases may contain hazardous sediments (e.g., mine waste) that are exposed during construction. Similar to overhead transmission facilities, noise generated during in-water construction may impact fish and fish habitat.

Impact Determination: Adverse environmental impacts from indirect habitat loss on fish from 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 negligible to high.

Special Status Species

The adverse environmental impact of indirect habitat loss during the new construction of underground transmission facilities is expected to be consistent with the new construction of overhead transmission facilities for special status species.

Impact Determination: Adverse environmental impacts from indirect habitat loss on special status species from 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.

Mortality

The sources of potential wildlife mortality during new construction of underground transmission facilities are expected to be consistent with those described for new construction of overhead transmission facilities and include mortality during clearing and grubbing (e.g., destruction of bird nests) and collisions with vehicles. In addition, non-aerial species are at risk of being trapped in open excavations. Mammals, amphibians, reptiles, and some invertebrates may fall into trenches and not be able to

[68] Occurring at the bottom of a body of water.

escape. Fauna may inadvertently fall into trenches and become entrapped as they move through a construction site (Doody et al. 2003). A study of a pipeline construction trench in Australia found that most of the entrapped species in trenches were reptiles (mainly lizards), followed by mammals (commonly small mammals), frogs, birds (mainly fledglings who could not yet fly), and fish. During the two-year survey period, more than 7,400 animals were retrieved from approximately 497 miles (800 km) of trench (Doody et al. 2003; Randall et al. 2018).

Wildlife

The following sections outline the adverse environmental impacts of wildlife mortality associated with the new construction of overhead transmission facilities. These adverse environmental impacts include considerations for:

- Mammals
- Amphibians and Reptiles

Mammals

In addition to the risks of mammal mortality described earlier, the new construction of underground transmission facilities involves the excavation of open trenches to install transmission facilities. These trenches would remain open for days to weeks, creating a barrier to movement and a potential death trap for mammals. Mammals, particularly small mammals, that inadvertently fall into open trenches are often unable to escape. Small mammals trapped in trenches without ground cover to conceal themselves become easy prey for predators that may, in turn, become trapped in the open trenches while attempting to eat. Mammals that fall into trenches or borrow pits may become stuck in the muddy bottom of the pits or drown in pooling water (Doody et al. 2003). Larger mammals, like deer, that have poor depth perception are frequently able to jump over obstacles like trenches, but fawns and other young mammals may not be capable of jumping over the trench and may fall in and be unable to get out (Enge et al. 1996).

The adverse environmental impact of mammal mortality due to the new construction of underground transmission facilities is expected to range from negligible in areas with limited habitat (e.g., urban areas) to low in more natural habitats. The level of impact would depend on habitat characteristics, the species present, and the seasonality of new construction activities. These adverse environmental impacts have been considered in the overall impact determination for wildlife mortality.

Amphibians and Reptiles

In addition to the risks of amphibian mortality described previously, open trenches and borrow pits that fill with water can provide amphibian breeding habitat. Amphibians that breed in an active construction site can be crushed by machinery or killed when these features are drained. Further, depressions and other anthropogenic features that are not specifically designed to support amphibian breeding can become a population sink[69] by attracting amphibian breeding but providing lower-suitability breeding and rearing habitat than natural systems. Amphibians that breed in these features often have lower survival rates than those that breed in natural systems.

Dispersing adult and juvenile amphibians could fall into open trenches and become entrapped, thus increasing their risk of being crushed by construction equipment (Doody et al. 2003; Randall et al. 2018).

The adverse environmental impact of amphibian and reptile mortality associated with the construction of an underground transmission facility is expected to vary from nil to medium, depending on the proximity of construction activities to sensitive features (e.g., wetlands, hibernacula), seasonality of construction activities, extent of trenching or creation of breeding areas that could attract amphibians, and the limited mobility of amphibians and reptiles. These adverse environmental impacts have been considered in the overall impact determination for wildlife mortality.

Impact Determination: Adverse environmental impacts on wildlife mortality of mammals, amphibians, and reptiles from 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 medium.

Fish

Buried cables may emit magnetic or electromagnetic fields (EMF), depending on the strength of the electric current, cable shielding, and other factors that may cause changes in fish behavior. Fish mortality from EMF has not been documented, but exposure to EMF may change embryonic development of some salmonids (Formicki and Winnicki 1998; Copping et al. 2021). However, the research is currently inconclusive as to whether these changes are necessarily negative. Similar to overhead transmission facilities, death or injury to fish can occur during project construction

[69] A type of habitat that can attract organisms but does not have enough resources to support them, resulting in their eventual extirpation from the sink, unless it is constantly supplied by another population.

due to changes in water flow, erosion, or physical injury or death due to the impact of equipment, debris, noise, or the physical presence of transmission facility infrastructure.

Impact Determination: Adverse environmental impacts from indirect habitat loss on the mortality of fish from 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 negligible to medium.

Special Status Species

Sources of mortality of special status species during project construction are expected to be the same as described above for wildlife guilds. Populations of special status species are expected to be more vulnerable to loss of individuals, as these populations are typically either naturally small or lower than historical levels. Western toad, which is a special status species, is known to breed in trenches and ditches created during new construction, which can lead to mortality if they are disturbed.

Due to the sensitivity of special status species to population decline, mortality would have an increased adverse environmental impact, possibly resulting in changes at a population level. Similar to the wildlife guilds described above, the impact would vary for projects in modified areas with limited habitat for special status species or projects located in unique habitats, near sensitive wildlife features, and consideration for seasonality and how new construction coincides with sensitive wildlife periods, such as when special status amphibian species may be breeding.

Impact Determination: Adverse environmental impacts from indirect habitat loss on the mortality of special status species from 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.

Barriers to Movement

New construction of underground transmission facilities could create both physical and perceived barriers to wildlife movement. Physical barriers, such as construction fencing, sediment and erosion control measures, and material laydowns, would be removed at the end of new construction. Perceived barriers would be created during new construction and are expected to continue through operation. The following sections discuss sources of barriers to movement specific to construction. Barriers to movement associated with the creation of linear corridors are discussed under the operation and maintenance stage.

Wildlife

The new construction of underground transmission facilities is expected to create the same barriers to movement as the new construction of overhead transmission facilities for birds, mammals, invertebrates, and movement corridors, except as described below for amphibians and reptiles.

Amphibians and Reptiles

Amphibians may move large distances between foraging, overwintering, and breeding habitats to facilitate movement. Amphibians rely on ground cover like trees, logs, coarse woody debris, and snags to avoid detection by predators and exposure to weather. Excavations, including open trenches, can create barriers to amphibian movement between habitats and may influence seasonal movement, population dispersal, and gene flow (Randall et al. 2018). These adverse environmental impacts have been considered in the overall impact determination for wildlife barriers to movement.

Impact Determination: Adverse environmental impacts from the creation of barriers to movement on birds, mammals, invertebrates, amphibians, and reptiles, including individual movement corridors due to 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.

Fish

Fish may experience barriers to movement when bridge or culvert construction works are isolated from flowing water and coffer dams are erected, which prevent upstream and downstream movement. Fish also tend to avoid areas of increased sedimentation. Inappropriately designed bridges and culverts that may be required for access can also create velocity or vertical drop barriers that prohibit fish passage.

Underground transmission facilities may emit EMF. EMF sensitivity varies by aquatic species, and some aquatic species have been reported to be sensitive to EMF, including salmonids and sturgeon (Fisher and Slater 2010; McIntyre et al. 2016; Copping et al. 2021). For example, salmonids may use the Earth’s magnetic field for navigation, and EMF from other sources may disrupt their migration routes (Copping et al. 2021). However, research has not yet determined whether EMF from transmission facilities has an adverse environmental impact on fish species, as most of these studies have focused on marine cables or have taken place in laboratory settings. The research is also inconclusive regarding whether migration is impacted, which may depend on fish species, depth of the water, and cable properties (Fisher and Slater 2010; McIntyre et al. 2016; Copping et al. 2021).

Impact Determination: Adverse environmental impacts from barriers to movement on fish from 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 negligible to medium.

Special Status Species

The sources of barriers to movement for special status species during the new construction of underground transmission facilities are expected to be consistent with the other wildlife guilds described above. However, due to the sensitivity of special status species to changes in habitat connectivity, barriers to movement are expected to result in increased adverse environmental impacts on these populations.

Impact Determination: Adverse environmental impacts from the creation of barriers to movement on special status species due to 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

Wildlife

Habitat fragmentation resulting from the new construction of underground transmission facilities is expected to begin during the new construction and persist throughout the operation and maintenance stage. Given that the duration of fragmentation would predominantly occur during the operation and maintenance stage, the detailed description of the adverse environmental impacts of fragmentation has been provided under the operation and maintenance stage. The same considerations identified during the operation and maintenance stage are applicable to new construction.

Impact Determination: Adverse environmental impacts from fragmentation on wildlife, including birds, mammals, amphibians and reptiles, and invertebrates from 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, the adverse environmental impacts on wildlife could range from nil to medium.

Fish

Given that the duration of fragmentation would predominantly occur during the operation and maintenance stage, a detailed description of the adverse environmental impacts of fragmentation has been provided under the operation and maintenance stage. The same considerations identified during the operation and maintenance stage are applicable to new construction.

Impact Determination: Adverse environmental impacts from fragmentation on fish from 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, the adverse environmental impacts of fragmentation on fish are anticipated to vary and could range from negligible to medium.

Special Status Species

Given that the duration of fragmentation would predominantly occur during the operation and maintenance stage, a detailed description of the adverse environmental impacts of fragmentation has been provided under the operation and maintenance stage. The same considerations identified during the operation and maintenance stage are applicable to new construction.

Impact Determination: Adverse environmental impacts from fragmentation on special status species, from 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, impacts on special status species are anticipated to vary and 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:

- Direct Habitat Loss
- Indirect Habitat Loss
- Mortality
- Barriers to Movement
- Fragmentation

Direct Habitat Loss

The effects of direct habitat loss during project construction are expected to continue through the operation and maintenance stage, except for temporary disturbances such as laydown areas. ROWs established during project construction would be maintained during the operation and maintenance stage of a project. The method of vegetation management is expected to vary depending on topography, proximity to water, and ecosystem type. Vegetation maintenance is likely to be conducted using a combination of mechanical clearing, either by machine or hand, and herbicide application. The description of adverse environmental impacts on wildlife from direct habitat loss provided under new construction, above, would continue through the operation and maintenance stage. Typically, no new direct habitat loss occurs during the operation and maintenance stage, with the exception of minor and targeted clearing of vegetation that could come in contact with the transmission line, such as hazard trees.

Wildlife

The following sections describe adverse environmental impacts on wildlife resulting from the operation and maintenance of overhead transmission facilities and associated direct habitat loss. These impacts include considerations for:

- Birds
- Mammals
- Amphibians and Reptiles
- Invertebrates
- Movement Corridors

Birds

The operation and maintenance of an overhead transmission facility often includes maintaining vegetation under the transmission line and within the ROW. Vegetation removal could be conducted in a variety of ways, including mechanical removal, hand cutting, and herbicide application. Disturbance of vegetation during the bird nesting period can lead to a decrease in bird density along the ROW (Bramble et al. 1986; Bramble et al. 1992). Decreased bird abundance and diversity are generally greater with maintenance that removes habitat structural complexity required to support nesting and foraging, such as mechanical clearing (Bramble et al. 1992).

Invasive plant species can also propagate along transmission facility ROWs (see Section 3.5, Vegetation), potentially resulting in dense monocultures and reduced habitat complexity. Areas with extensive invasive plant infestations are generally associated with a reduction in bird biodiversity (Nelson et al. 2017).

Birds, particularly large-bodied birds like raptors, can use overhead transmission facility structures, such as lattice poles, as nesting structures. These structures are often used in open habitats (e.g., agricultural fields, shrubsteppe) where natural features are limited. Lines and poles can also provide perches for birds, serving as a vantage point for foraging (Biasotto and Kindel 2018). Transmission facility structures may artificially increase limiting habitat features in open habitats, but can also result in avoidance behavior for prey species (see Indirect Habitat Loss).

The adverse environmental impact of direct habitat loss on birds during the operation and maintenance stage would be consistent with the impact during new construction, as habitat loss initiated during construction would persist through operation and maintenance. As such, the impact of habitat loss could vary from negligible for facilities in urbanized or modified habitats to medium for facilities in mature forest areas. Species that are able to use the habitat in the ROW during the operation and maintenance stage could experience periodic habitat loss after vegetation maintenance; however, these habitats are expected to regenerate quickly, and therefore, the adverse environmental impact is considered low. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Mammals

As with birds, vegetation maintenance along an ROW can change habitat suitability for mammals. Cutting vegetation to ground level removes cover that could be used by small mammals. Multiple studies show that maintenance of native vegetation with proper cover for small mammals results in small mammal communities with greater diversity and abundance (Fortin and Doucet 2008; Ferrer et al. 2020).

Forest-dwelling, medium-sized mammals may not use the habitat in a transmission facility ROW, as it does not provide the requisite features for their natural behavior. Generalist species such as coyotes, black bears, and Canada lynx, however, are expected to use habitat in the ROW for foraging (Dickie et al. 2020; Benoit-Pépin et al. 2024). ROWs may provide access for these generalist species to previously inaccessible areas, which can influence predator/prey dynamics.

Ungulates' use of ROW would vary between species adapted to forests and species that can use clearings and open grasslands. Reports of moose using ROWs versus forested habitat away from the ROW are variable, and selection of the ROW likely changes with the stage of plant regeneration (Hill 2003; Bartzke et al. 2014). ROW maintenance could temporarily reduce foraging for ungulates, with browsing increasing with plant regeneration (Hill 2003; Bartzke et al. 2014). However, while some studies show that certain ungulates prefer ROWs, some species may also avoid them (Bartzke et al. 2014). This is dependent on a variety of factors, such as ROW width and vegetation management. Similarly, grasses and forbs that may grow along an ROW after maintenance could provide a food source for omnivores like bears. Bats may also use openings for foraging and could forage over ROW areas during operation.

The adverse environmental impact of direct habitat loss on mammals initiated during new construction would persist through operation, and new direct habitat loss would be limited to ROW maintenance and periodic clearing of adjacent hazard trees that are at risk of falling into the transmission facility. The impact would depend on the habitat type impacted, the extent of the impact, and the species of mammals impacted. It is expected that the impact might range from negligible to medium. Generalist mammal species that can re-establish in ROWs, such as some species of rodent, may experience repeated habitat loss during line maintenance. Because these habitats can typically re-establish quickly, however, adverse environmental impacts are expected to be low. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Amphibians and Reptiles

Amphibian species that occur in naturally open habitats (e.g., shrubsteppe) or that can occur in cleared areas (e.g., western toad) could continue to use upland and wetted habitat in the ROW for breeding and living, depending on the level of habitat complexity that remains in the ROW. This is expected to be similar for reptiles that occur in open habitats. The ROW would continue to be considered habitat loss for forest-dwelling species. Similarly, reptiles may continue to use ROW habitat for living and shelter if suitable cover structures are available. The state-listed endangered and federally listed threatened Oregon spotted frog has found habitat in transmission line corridors, showing that with proper management and limited use of herbicides and pesticides, amphibians can make use of ROWs (BPA 2019).

Periodic ROW maintenance may remove vegetation cover used by amphibians and reptiles for thermoregulation and shelter. Therefore, direct habitat loss could recur for amphibians and reptiles using the ROW; however, these habitat types are expected to re-establish quickly.

Direct loss of amphibian and reptile habitat initiated during construction would continue through operation along the ROW. Similar to new construction, the adverse environmental impact of direct habitat loss would depend on site characteristics (disturbed or undisturbed) and the species present. The impact of habitat loss could range from nil for projects that do not interact with amphibian and reptile habitat (e.g., in urban or previously highly disturbed areas) to medium for projects that occur in undisturbed habitats that contain unique features that support amphibian and reptile life requisites, such as wetlands, talus slope, and streams. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Invertebrates

Invertebrate habitat lost during new construction would generally persist through operation and maintenance; however, butterfly and bee species richness and abundance have been reported to increase near transmission facilities. This is because management activities by utility companies typically keep vegetation at an early successional stage, which favors insects that rely on floral resources (Berg et al. 2016; Wagner et al. 2019; Twerd et al. 2021). In forested habitats, the conversion of tree-covered areas to open habitats with an increase of flowering plants and shrubs can be especially beneficial to pollinators (Berg et al. 2016). Invasive plant management within these corridors is important to provide a habitat dominated by native plants on the ROW.

The adverse environmental impact of direct habitat loss on invertebrates would depend on site characteristics (forested versus open), timing of new maintenance activities, and the species present. Habitat for some species may be increased by the creation of early seral stage habitat; however, it is expected that the impact of direct habitat loss during the operation and maintenance stage of a transmission facility would be low. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Movement Corridors

Habitat in movement corridors lost during the new construction of a transmission facility would continue to be lost through operation, except for areas, such as laydowns and construction roads, that can be restored post-construction. Loss of habitat used for wildlife movement would be most pronounced in treed areas that cannot be reestablished under a transmission facility, and unique habitats, such as stopover locations. Periodic maintenance of the ROW may continue to disturb early seral stage habitats that establish under the ROW; however, these habitats are expected to be able to re-establish rapidly.

The adverse environmental impact of direct loss of movement corridors during project construction would continue through operation and would vary depending on the type of habitat that was removed and the extent of similar habitat available to wildlife. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Impact Determination: Adverse environmental impacts on wildlife, including birds, mammals, amphibians, reptiles, invertebrates, and movement corridors resulting from direct habitat loss 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.

Fish

Regular riparian vegetation maintenance would be required during operation and maintenance to prevent vegetation from interacting with or falling onto transmission facilities. Clearing/maintenance of riparian zones and alteration of stream banks can cause direct habitat losses to fish and aquatic species, as described for the construction stage.

Impact Determination: Adverse environmental impacts on fish resulting from direct habitat loss 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.

Special Status Species

Forest, woodland, and shrub habitats that support special status species lost during construction would remain lost during project operation, reducing the capacity of these systems to support special status species that rely on these habitat types. Special status species that are adapted to open habitats may be able to recolonize the habitat in an ROW during the operation and maintenance stage. For example, Mazama pocket gopher has been reported to colonize transmission facility corridors as they can provide open habitat, which this species prefers (Stinson 2020). However, corridors can become overgrown with invasive plant species, which limits their usability (Stinson 2020). With management practices focusing on providing habitat for priority species, transmission facilities have the potential to continue to provide modified habitat.

Northern spotted owl, marbled murrelet, and other species that exist in forested habitats would be susceptible to direct habitat loss from transmission facility development. The old-growth forests that these species use have already been highly impacted by forestry and development, and further habitat loss and fragmentation would jeopardize their recovery and continued existence.

Special status species may continue to be disproportionately affected by habitat loss during construction, as these groups typically rely on rare habitats, have restricted ranges, have small population sizes, and face increased risks of extirpation from the state or complete extinction.

Impact Determination: Adverse environmental impacts on fish and wildlife special status species resulting from direct habitat loss 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 low to high.

Indirect Habitat Loss

Sources of indirect habitat loss that occur during new construction of a transmission facility, such as construction-related noise and light, would not persist into the operation and maintenance stage. Maintenance of a transmission facility would require periodic repairs and vegetation maintenance. These are expected to be infrequent activities and not a substantial source of disturbance to wildlife; however, physical and biological changes to habitat along the edge of an ROW (edge effect) that were initiated during new construction would continue through operation and maintenance. Edge effects are expected to be most pronounced in forested areas, where a contiguous ecosystem type cannot be maintained under the transmission line. Disturbance to wildlife from mechanical noise and light would occur periodically during maintenance activities, but would be less frequent and intense than during new construction. In addition, transmission lines may introduce new sources of noise, generally from the hum of electricity in the wire, corona discharge,[70] and noise created by wind passing over wires and structures. Unlike construction noise, transmission line noise is expected to be at a low level and consistent. As such, wildlife are more likely to habituate to the noise source than to the type of intermittent loud sounds emitted during construction.

EMFs produced by transmission facilities are a source of indirect habitat loss that would be introduced during operation. The response of wildlife to EMF has not been well studied, and the extent of the effect is not well understood (Biasotto and Kindel 2018).

Finally, improved human access to previously inaccessible areas due to new access roads and cleared ROW can disturb wildlife on or near the ROW.

Wildlife

The following sections describe the adverse environmental impacts on wildlife resulting from the operation and maintenance of overhead transmission facilities and associated indirect habitat loss. These adverse environmental impacts include considerations for:

- Birds
- Mammals
- Amphibians and Reptiles
- Invertebrates
- Movement Corridors

Birds

Birds may avoid habitat adjacent to the ROW during project operation due to continued disturbance, perceived predation risk near the forest edge, and electromagnetic radiation. For example, a study in the subarctic found that the density

[70] A discharge of electricity at the surface of a conductor or between two conductors on the same transmission line. There is often an ionization of the surrounding atmosphere and power loss and noise produced.

of ground-nesting birds was lower within 164 feet (50 meters) of transmission facilities than approximately 1,476 to 1,640 feet (450 to 500 meters) away (Pálsdóttir et al. 2022). This could be related to an increase in perceived predation risk or due to the introduction of electromagnetic radiation and noise in the landscape, as transmission facilities can emit ultraviolet (UV) light not perceivable to humans (Pálsdóttir et al. 2022). Not all bird species in the study were affected by transmission facilities, with some breeding with the same density near and far from the facility. This study suggests that transmission facilities could cause indirect habitat loss through sensory disturbance not detectable to humans.

Another study found that greater sage-grouse and lesser prairie-chickens avoid areas up to 0.4 and 0.3 miles (0.6 and 0.5 km) from transmission facilities, respectively, while others, such as northern bobwhite (*Colinus virginianus*), appear to be indifferent to transmission line presence at distances less than 0.15 miles (0.25 km) (Biasotto and Kindel 2018).

Improved human access to previously inaccessible areas along transmission facility ROWs may have local negative effects on birds of prey, such as eagles, which are vulnerable to human disturbance (Manitoba Hydro 2010).

The adverse environmental impact of indirect habitat loss on birds due to the operation and maintenance of a transmission facility would vary depending on the habitat and the sensitivity of bird species to features of a transmission facility, such as EMF and the presence of tall structures. As such, the adverse environmental impact of indirect habitat loss is expected to range from negligible in urbanized areas, where species are able to co-exist with human infrastructure, to medium for facilities located in more natural areas or near populations of species that are more sensitive to EMF or edge effects. These adverse environmental impacts have been considered in the overall impact determination for indirect habitat loss on wildlife.

Mammals

Non-aerial mammals are likely to continue to respond to indirect effects from edge habitat initiated during construction. New noises generated from the transmission lines may continue to deter mammals from using the habitat under the transmission lines and in adjacent ecosystems.

Transmission lines emit low-frequency EMFs that are thought to cause bats to avoid transmission facility corridors and may have adverse environmental impacts on their migration paths and movement (Zastrow 2014; Froidevaux et al. 2023). However, bats can be attracted to transmission facilities during high-humidity conditions. Their attraction stems from insects moving toward transmission facilities in these conditions due to the UV light emitted as corona discharges. This attraction does not pose a direct threat to bats as they are able to avoid transmission lines, but it does change their foraging habits.

The adverse environmental impact of indirect habitat loss on mammals during the operation and maintenance stage of a transmission facility is expected to be most pronounced for species that need continuous habitat and avoid edge habitat, as well as species sensitive to EMF. However, there are limited data concluding that mammals avoid transmission corridors due to EMF. The adverse environmental impact of indirect habitat loss on mammals could range from negligible in areas with higher existing levels of disturbance and species that are adapted to co-existing with humans to low for species that generally avoid edge habitat. These adverse environmental impacts have been considered in the overall impact determination for indirect habitat loss on wildlife.

Amphibians and Reptiles

Amphibians may be sensitive to electromagnetic radiation, along with chemical pollutants such as herbicides and pesticides, decreased water quality, exposure to novel pathogens,[71] and habitat loss, which have all likely contributed to population declines in amphibians and an increase in deformities (Balmori 2006). Electromagnetic radiation from cellphone towers has been linked to increased deformities, a decrease in movement coordination in tadpoles, and a subsequent increase in mortality (Balmori 2010). However, the effects of extremely low-frequency (ELF) EMF, such as those emitted by transmission facilities, on amphibians are not well understood.

Use of herbicides to control vegetation along the ROW during maintenance activities could degrade the water quality of ponds and pools in and adjacent to the ROW if chemicals are used near these features. Degradation of these features could lead to continued indirect loss of amphibian aquatic breeding habitat through operation.

The adverse environmental impact of indirect habitat loss on amphibians and reptiles would vary depending on the proximity of the facilities to unique habitats, such as amphibian breeding ponds, the sensitivity of species to EMF, and the procedures

[71] A pathogen that a population has never experienced before. A pathogen is a bacteria, fungus, parasite or virus which can cause disease in its host.

implemented to apply herbicides and other chemicals during operation. The adverse environmental impact of indirect habitat loss on amphibians and reptiles during project operation and maintenance is expected to range depending on proximity to amphibian habitat and application of standard BMPs that would reduce herbicide use near waterbodies. These adverse environmental impacts have been considered in the overall impact determination for indirect habitat loss on wildlife.

Invertebrates

Terrestrial invertebrates, such as insects, can perceive EMF and UV light not detected by humans. For example, transmission facilities emit ELF EMF, which have been shown to affect honeybees (*Apis mellifera*) by reducing learning abilities; changing flight, foraging, activity, and feeding patterns; and increasing aggression (Shepherd et al. 2019). Changes to honeybee behavior could impact their ability to pollinate plants and crops. Bees contribute approximately 80 percent of insect pollination, so this could impact vegetation and habitat for other wildlife.

Insects like butterflies, flies, ants, bees, and cockroaches can detect ELF EMF and use it for movement and navigation. High-voltage transmission facilities emit levels of EMF that mimic real-world phenomena like electrical storms and can impact insect behavior and physiology and, potentially, their distribution. Changes to insect distribution can have whole-ecosystem impacts, including on plant and animal species.

In addition, invertebrates are attracted to the UV corona light emitted from transmission facilities (Zastrow 2014; Froidevaux et al. 2023). This can change the abundance of invertebrates and predator/prey dynamics.

The extent to which invertebrates might respond to EMF, ELF EMF, and UV corona light is not well understood but is expected to change invertebrate behavior near facilities. The adverse environmental impact of indirect habitat loss on invertebrate populations during operation is expected to range depending on the types of invertebrates occurring near the facilities. These adverse environmental impacts have been considered in the overall impact determination for indirect habitat loss on wildlife.

Movement Corridors

Sources of potential indirect habitat loss in movement corridors would be the same as those described above, including edge effect, noise associated with the transmission facilities, and EMF. The adverse environmental impacts on wildlife from indirect habitat loss in movement corridors would also be similar to what has been described for guilds above, except that these impacts may be more pronounced as movement corridors are typically important and limiting features on the landscape. Degradation of these areas can disproportionately affect wildlife's ability to access adjacent habitats. The impact of indirect habitat loss on movement corridors could vary depending on site characteristics (e.g., stopover locations), the species affected, and the season. These adverse environmental impacts have been considered in the overall impact determination for indirect habitat loss on wildlife.

Impact Determination: Adverse environmental impacts on wildlife, including birds, mammals, amphibians, reptiles, invertebrates, and movement corridors, from indirect habitat loss 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.

Fish

Increased human activity, pollution, and changes in land use can cause indirect habitat loss for fish and aquatic species. Herbicides entering streams harm fish and fish habitat. Maintenance of ROW involves chemical or mechanical control of vegetation, which can contribute to the loss of native plant species diversity, and cleared ROW may be a continuous source of sedimentation into waterways (USFWS 2024c). Roads can also increase runoff and erosion into watercourses, which is detrimental to fish and fish habitat (Knight 2009).

Impact Determination: Adverse environmental impacts on fish resulting from indirect habitat loss 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 negligible to medium.

Special Status Species

The indirect adverse environmental impacts of transmission facilities on special status species are expected to be similar to the impacts described above, except that populations of special status species may be less resilient to changes in their habitat. For example, transmission facilities have been directly correlated with long-term negative impacts on habitat suitability for greater sage-grouse (LeBeau et al. 2019). A six-year study in Wyoming during the nesting, brooding-rearing, and summer periods found that sage-grouse selected leks further from transmission facilities constructed in high-quality habitat. This study also suggests that transmission facilities reduce habitat suitability for sage-grouse by increasing predation risk by providing avian predators with more locations for perching (LeBeau et al. 2019).

Impact Determination: Adverse environmental impacts on special status fish and wildlife species from indirect habitat loss 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 low to high.

Mortality

Electrocution and collisions with the overhead transmission lines and other overhead structures are the primary causes of wildlife mortality during the operation and maintenance stage. Risk of collision is greatest for aerial species such as birds and bats. Wildlife mortality could also occur through changes in predator-prey dynamics and collisions with maintenance equipment and vehicles.

Wildlife

The following sections outline the adverse environmental impacts of wildlife mortality associated with the operation and maintenance of overhead transmission facilities. These adverse environmental impacts include considerations for:

- Birds
- Mammals
- Amphibians and Reptiles
- Invertebrates

Birds

Electrocution and collisions with transmission lines are the primary sources of mortality for birds during the operation and maintenance stage of an overhead transmission facility. It is estimated that between 8 and 57 million birds are killed each year in the United States from collisions with transmission lines, and another 0.9 to 11.6 million are killed by electrocution (Loss et al. 2014). Electrocutions occur primarily at distribution lines, but collisions occur at both distribution and transmission lines (Loss et al. 2014).

Electrocution risk depends on several factors, including biological factors, habitat, and engineering design. Electrocution is more common on distribution lines than transmission lines, as there is less separation between energized components (APLIC 2006; Martín Martín et al. 2022). However, the risk of electrocutions on transmission lines can increase depending on design (e.g., configuration of post insulators, overhead static wire) (APLIC 2006). Body size is one of the most important factors in electrocution risk, as birds with greater wing spans are typically at greater risk of electrocution due to the risk of both wings touching two energized conductors (APLIC 2006). For electrocutions to occur, fleshy parts of the bird, such as the bill, feet, or wrist (i.e., bend in the wing), need to connect the conductors, as feathers act as insulators. Raptors, such as eagles, hawks, and owls, are particularly vulnerable to electrocution, especially since they tend to use transmission poles as perches in open areas. Eagles are most often electrocuted, followed by hawks in the genus *Buteo*, and golden eagles are at a much higher risk than bald eagles. It is estimated that 504 golden eagles are electrocuted annually in the United States (USFWS 2016), though this value includes electrocutions from both distribution and transmission lines. This is attributed to many old transmission lines not being properly retrofitted to be avian safe and providing perching spots in golden eagle habitat. Owls are also electrocuted, but less often than diurnal[72] raptors. The great horned owl is the most commonly electrocuted owl in North America (APLIC 2006), but snowy owls (*Bubo scandiacus*) have also been known to be electrocuted (APLIC 2006). Another group of birds susceptible to electrocution is corvids (i.e., crows, ravens, and magpies). Common ravens are the most impacted bird in some parts of North America (APLIC 2006). Small birds can also be electrocuted when closely spaced energized equipment is present, such as on transformers, though they are much less vulnerable than larger species (APLIC 2006).

Habitat is the second key factor that can lead to avian electrocution. In habitats where natural perches are limited, especially for raptors in areas with sparse vegetation, transmission line poles and towers are frequently used for perching, hunting, roosting, and nesting. Transmission lines in forested habitats where natural perches are abundant typically have fewer reported electrocutions than those in open habitats (APLIC 2006).

Engineering design is the third key factor in avian electrocution risk, as described below.

- Electrocutions can occur when the distance between two energized components, or an energized and a grounded component, is less than the distance between

[72] Active during the day.

the wrists of a bird or between the head and the feet. Avian-safe construction standards presented by the Avian Power Line Interaction Committee (APLIC) suggest that the minimum distance between energized conductors and grounded hardware should be 150 cm (60 inches) (APLIC 2006). High-voltage transmission facilities are typically safer than low-voltage facilities because they typically have larger separation between phase conductors (APLIC 2006).

- Distribution poles made of wood are typically safer than metal ones (APLIC 2006).
- The presence of grounded or bonded hardware on top of pole assemblies typically increases the risk of avian electrocution, as there is more energized or grounded hardware in close proximity (APLIC 2006).
- Metal crossarms can pose additional electrocution potential, as electrocutions can occur from contact with a phase conductor and a crossarm (APLIC 2006).
- Transformers are known to cause a disproportionate number of avian electrocutions, as are other structures with energized equipment that is exposed (APLIC 2006).
- Energized jumper wires, such as those found on dead-end distribution structures that accommodate line terminations, directional change, and lateral taps, can pose electrocution risks, especially if they are mounted over the crossarms (APLIC 2006).
- Armless pole configurations can result in avian electrocutions if the conductors are mounted on horizontal post insulators, where a perching bird can simultaneously contact the energized conductor and either the grounded insulator base or a bonding conductor (APLIC 2006).

Bird collisions with transmission lines can be another source of mortality. Mortality estimates for grassland birds have been estimated as 50 deaths per kilometer of transmission line during one migration and one breeding season (Martín Martín et al. 2022). Collision risk is related to several factors, including biological, environmental, and engineering.

Biological factors related to collision risk in birds include morphology, behavior, and vision capabilities. In general, birds with high wing loading (i.e., the ratio of body weight to wing area) and a low wing aspect ratio (i.e., ratio of the square of the wingspan to the wing area) are more susceptible to collisions with transmission lines because they lack the maneuverability to quickly avoid obstacles (APLIC 2012; Smith and Dwyer 2016; Bernardino et al. 2018). Groups of birds that are at the greatest risk of collision include grouse, pelicans, and cranes (Martín Martín et al. 2022). Waterfowl are also susceptible to transmission line collisions, due to their heavy bodies and fast flight style (APLIC 2012; Smith and Dwyer 2016; Bernardino et al. 2018). Collisions with transmission lines have been reported as one of the main causes of population decline in birds, including rare species (Biasotto and Kindel 2018). The cumulative effects of mortality resulting from transmission lines may take decades to become apparent, at which point the adverse environmental impact on a species may be irreversible (Biasotto and Kindel 2018).

An indirect adverse environmental impact of avian electrocution by transmission lines is the potential for electrified birds to ignite and cause wildfires. A study in 2022 compiled 44 reports in California from 2014 to 2018 on fires ignited by avian electrocutions and urged utility companies to create avian-safe transmission lines to reduce these fires (Barnes et al. 2022).

Environmental factors such as surrounding habitat and landscape features can affect birds' exposure to transmission facilities. Transmission lines that are perpendicular to topographic features that concentrate flight paths, such as coastlines, rivers, mountain passes, and ridges, may pose greater collision risk than when they are parallel (APLIC 2012). Transmission lines located in or near areas of high avian use (e.g., foraging, nesting, or roosting sites) may increase exposure and collision risk. This appears to be especially true when high-use areas are separated by only a short distance because birds typically fly between them at low altitudes, potentially within the range of heights of transmission facilities. Conversely, transmission lines that are in forested habitat and are at or below the height of the surrounding trees generally present low collision risk because birds would be flying at higher altitudes than the canopy and thus avoid the transmission line (Thompson 1977; APLIC 2012; Bernardino et al. 2018).

Finally, engineering factors such as wire diameter, line placement, line configuration (e.g., vertical or horizontal arrangement of phase conductors), line height, and span length can all contribute to bird collision risk. A study on the use of near-UV light to reduce sandhill crane collisions with transmission lines demonstrated potential novel ways to reduce avian mortality (Dwyer et al. 2019).

Vegetation maintenance within transmission facility ROWs has the potential to result in bird mortality through the destruction of nests containing eggs or young, if it is conducted during the bird nesting season. Herbicide application to control vegetation growth below transmission lines may lead to negative effects on bird development and physiology. More research needs to be done to determine long-term adverse environmental impacts of herbicides on avian development (Ruuskanen et al. 2020).

With the application of standard BMPs, such as those prepared by APLIC (2006, 2012) for reducing avian collision and electrocution risk, the adverse environmental impact of mortality for birds during operation and maintenance is expected to range depending on their location relative to areas of high bird use and flight paths, the scale of the project, and site-specific conditions. These adverse environmental impacts have been considered in the overall impact determination for wildlife mortality.

Mammals

Mammals are at risk of mortality from transmission facilities due to both electrocution and the effects that linear features can have on predator-prey interactions. There is evidence of large mammals being electrocuted by transmission lines, including cougars in the United States and Eurasian lynx (*Lynx lynx*) in Iran (Martín Martín et al. 2022), though it is unclear how serious a threat electrocutions are to large mammals. Evidence of other mammalian species being electrocuted by transmission facilities has been observed in other countries, and the effects of transmission line electrocutions globally are poorly understood (Martín Martín et al. 2022).

The presence of linear features, such as transmission facility corridors, in landscapes has been shown to change predator-prey dynamics, primarily between ungulate species such as moose and woodland caribou (*Rangifer tarandus caribou*) and their predators such as wolves, black bears, and Canada lynx (Dickie et al. 2020; Benoit-Pépin et al. 2024). The presence of linear features in boreal ecosystems is associated with population declines of woodland caribou due to the reduction in areas where caribou can hide during calving and the increase in access for wolves (DeMars and Boutin 2018). White-tailed deer fawns have also been observed to experience greater mortality closer to linear features, probably because predators have better olfactory detection and hunting success in areas that have been cleared for linear features (Johnson-Bice et al. 2023).

Small mammals may experience greater predation near transmission facilities that raptors are using for perching. This effect could be difficult to detect when transmission facility corridors can provide quality habitat for some small mammals (Fortin and Doucet 2008).

Transmission ROWs and access roads can increase human use in areas not previously accessible due to terrain or forest. This can lead to increased hunting pressure on species that are subject to hunting. Transmission facility ROWs are a preferred area for hunting moose (Bartzke et al. 2014). In a study conducted by Goodwin (1975), 89 of 107 hunters said they were hunting in a transmission facility ROW.

Less is known about collisions and electrocutions of bats than of birds. Large fruit-eating bats can be prone to electrocution, but these species are much larger than the bat species in Washington, and they have different life history strategies (Tella et al. 2020). Bats have been found in bird mortality searches around transmission facilities, though little is known about what causes them to collide with transmission lines and what mitigation could reduce these mortalities (Manville 2016). It is possible that the same BMPs suggested by APLIC, including line marking, could also benefit bats (APLIC 2006, 2012; Manville 2016).

Adverse environmental impacts of mortality on mammals from the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. They are expected to range from nil in areas with limited habitat and low wildlife abundance to negligible for facilities in areas with higher-quality habitat. These adverse environmental impacts have been considered in the overall impact determination for wildlife mortality.

Amphibians and Reptiles

Vehicle traffic on access roads is expected to be lower during the operation and maintenance stage than during new construction; however, there is still risk of amphibian mortality from vehicle strikes, especially if access roads are also used by public vehicles (Fukumoto and Herrero 1998; Wagner et al. 2021). Arboreal snakes and even amphibians have been electrocuted in other parts of the world, but it is unlikely that the amphibians and reptiles in Washington would be at risk of this due to behavioral differences (Martín Martín et al. 2022).

Use of herbicides near amphibian breeding sites along the ROW could also result in decreased survivorship of eggs and tadpoles. Lab studies have shown that a common herbicide, Roundup Regular, whose active ingredient is glyphosate, was lethally toxic to several amphibian species of the Pacific Northwest at concentrations within the safe drinking levels identified by the U.S. Environmental Protection Agency (King and Wagner 2010).

Ditches and artificial ponds created at borrow pits can become populated by native and invasive amphibian species, such as American bullfrog and African clawed frog, during the operation and maintenance stage. Introduction or proliferation of invasive species can lead to native amphibian mortality through competition and disease spread, as well as predation (WISC 2025). While this mortality risk is possible, it is expected to be managed through proper site closure and ditch design.

The adverse environmental impact of amphibian and reptile mortality during the operation and maintenance of overhead transmission facilities is expected to vary, depending on the proximity to sensitive features (e.g., wetlands, hibernacula), vehicle traffic, and vegetation management techniques.

Adverse environmental impacts of mortality on amphibians and reptiles from the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. These adverse environmental impacts have been considered in the overall impact determination for wildlife mortality.

Invertebrates

Invertebrates are expected to have some level of mortality from vehicle strikes on access roads, as described for mortality associated with new construction and from the potential effects of EMF. There would be less traffic during transmission facility operation; however, corona discharges from transmission facilities could attract insects to the ROW, increasing mortality from vehicles (Froidevaux et al. 2023).

The adverse environmental impact of invertebrate mortality during the operation and maintenance of overhead transmission facilities is expected to vary, depending on habitat characteristics and vehicle traffic. These adverse environmental impacts have been considered in the overall impact determination for wildlife mortality.

Impact Determination: Adverse environmental impacts on wildlife, including birds, mammals, amphibians, reptiles, and invertebrates, resulting from mortality 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.

Fish

Linear projects such as transmission facilities and their access roads have the potential to create or increase access to previously inaccessible fishing areas, which may affect fish populations, depending on the remoteness of the population and the number of fishers that may take advantage of the new access (Manitoba Hydro 2010; Cott et al. 2015). New access to fishers could result in changes in fish populations that persist throughout the operation and maintenance stage.

Impact Determination: Adverse environmental impacts on fish resulting from mortality 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.

Special Status Species

Potential sources of mortality for special status species are electrocution, collisions with transmission lines and vehicles, changes in predator/prey dynamics, maintenance activities, and the use of herbicides. As these species are generally protected, hunting pressure is not expected to increase their mortality. These populations are typically small or are in decline and are unable to adapt to increased mortality. As such, populations may become vulnerable if they lose even a few individuals. For example, greater sage-grouse and Columbian sharp-tailed grouse are both negatively affected by transmission facility development, which creates perches for raptors and results in increased predation risk for grouse (Stinson and Shroeder 2012).

The adverse environmental impact of mortality on special status species during the operation and maintenance of overhead transmission facilities is expected to vary depending on the species and habitat characteristics. Due to the typically small or declining population size of special status species, relatively few mortalities could result in lower abundance.

Impact Determination: Adverse environmental impacts on special status species from mortality 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.

Barriers to Movement

Barriers to movement occur when infrastructure bisects a movement corridor or habitat, reducing or preventing wildlife movement between habitat patches. These barriers can be physical constraints, such as fencing, but also include perceived barriers, such as forest openings, roads, and transmission facilities. While linked to habitat fragmentation, barriers to movement can occur in already fragmented landscapes where wildlife persists. Barrier effects on wildlife can be relatively short term and limited to new construction of projects or can be long term over the life of a project until restoration occurs. Vehicle traffic can also result in barriers to movement on a daily or seasonal scale.

Clearing for transmission facility corridors can create access to a previously inaccessible area, increasing propagation of invasive plant species, particularly near urban centers and agricultural areas. Transmission facility corridors also provide access for recreational activities like all-terrain vehicle riding, snowmobiling, hunting, trapping, gathering, fishing, and hiking (Manitoba Hydro 2010). A study by Lewis et al. (2021) reported that human recreation increased wildlife mortality, spatial and temporal avoidance of trails, altered behavior, and prevalence of invasive species and reduced fitness across wildlife species. Wildlife sensitivity to human presence is dependent on the species. Wildlife that are moderately to highly sensitive to human presence, like black bear and bobcat, will shift their daily activity patterns to avoid times of day when humans are most active. Diurnal and crepuscular[73] species were the most impacted by human presence and shifted their activity patterns the most, while nocturnal species showed the least amount of activity shift in response to human presence (Lewis et al. 2021).

Many species move throughout the landscape annually or seasonally, following food or shelter resources, to survive. For migratory animals, movement may be over hundreds or thousands of miles. Migration routes are often used by multiple generations of animals. Human land development, like transmission facility corridors, creates obstacles and barriers that can impede movement during migration, which can lead to increased wildlife mortality (TOCS 2024).

Wildlife

The following sections outline the adverse environmental impacts from the creation of barriers to movement on wildlife associated with the operation and maintenance of overhead transmission facilities. These adverse environmental impacts include considerations for:

- Birds
- Mammals

[73] Active primarily during dusk and dawn.

- Amphibians and Reptiles
- Invertebrates
- Movement Corridors

Birds

Most movement barriers for birds are perceived, not physical. Features that birds perceive as barriers can affect local or landscape-level movements such as movements within a home range, seasonal movements, or dispersal (Harris and Reed 2002). Considering that birds migrate across whole continents and large bodies of water, transmission facility development is not expected to be a physical barrier for birds. However, it may be a perceived barrier. Birds may change their flight patterns to avoid transmission facilities, indicating that some birds may view transmission facilities and tower guy wires as barriers (Biasotto and Kindel 2018; TOCS 2024).

The permeability of perceived barriers to movement varies across species based on differences in flying ability, habitat preference, and vulnerability to predation, among other things (Bélisle and St. Clair 2001). At the population level, barriers to movement can influence site occupancy, genetic diversity, and population persistence[74] (Tremblay and St. Clair 2011). Forest birds, specifically, may perceive transmission facility ROW as a barrier to movement. Forest bird movements can be influenced by gaps in forest cover as small as 164 feet (50 meters) (Desrochers and Hannon 1997; St. Clair et al. 1998). Empirical studies have reported that increased habitat gap width reduces its permeability to movement[75] for forest songbirds (Langlois et al. 2023). A literature review by Harris and Reed (2002) summarized threshold distances for 24 temperate forest bird species from studies using recordings to lure birds across habitat gaps, translocation experiments,[76] and observational studies. A threshold distance is one where a small change in distance produces an abrupt reduction in the probability of movement across habitat gaps (Harris and Reed 2002). For small bird species, reported threshold distances were typically less than 328 feet (100 meters), though distances over 656 feet (200 meters) have been reported for several woodpecker species, including 1,969 feet (600 meters) for northern flicker (*Colaptes auratus*) (Harris and Reed 2002).

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[74] The ability of a population of organisms to continue living.
[75] An area's ability to allow animals to move through it. An area with low permeability will allow less movement through it, and an area with high permeability will allow more movement.
[76] An experiment which involves moving an organism from one place to another to see how it adapts and if it can colonize the area.

Little is known about the effects of introduced linear barriers on raptors and herons. Avoidance behavior has been reported in migrating raptors, though this is predominantly associated with new wind power facilities, which include tall infrastructure and generally cover large areas (Cabrera-Cruz and Villegas-Patraca 2016). Human activity has been linked to nest abandonment in great blue herons; however, this species is also capable of habituation, including where both human pedestrians and vehicles are active below colonies (Butler 1997; Vennesland 2000). Further, great blue herons exhibit movement patterns between colony sites and foraging areas of such a distance that it is likely that individuals routinely cross habitat gaps (Butler 1991).

The adverse environmental impact of barriers to movement on birds during operation and maintenance of overhead transmission facilities is expected to vary from nil in open habitats, where the ROW would not constitute an abrupt change in habitat type, to low in habitats such as mature forest, where the ROW may constitute a perceived barrier to movement for some bird species that inhabit the forest interior. These adverse environmental impacts have been considered in the overall impact determination for wildlife barriers to movement.

Mammals

Barriers to mammal movement vary across this taxonomic group. Ungulate distribution and density are impacted by transmission facility ROW, likely due to higher risk of predation, hindered movement, and decreased habitat quality. However, some studies have found that ungulates are not negatively impacted by transmission facilities and react neutrally toward them (Biasotto and Kindel 2018). In a study conducted by Goodwin (1975), 89 of 107 hunters said they were hunting in a transmission facility ROW, suggesting that these areas continue to support ungulates and are permeable to movement by this group of mammals.

Depending on the species, some mammals may use linear features for dispersal or hunting, but others may avoid fragmented landscapes. It is well documented that predators prefer to use open spaces and human trails as travel corridors. This provides predators with easier access to prey and restricts prey movement (Kays et al. 2017). Ungulate species, such as caribou and moose, tend to avoid linear features and fragmented landscapes, as these can be used by their predators for hunting (Dickie et al. 2020; Benoit-Pépin et al. 2024).

Due to their size and relatively limited mobility, small mammal movements are constrained by multiple types of natural and anthropogenic barriers, such as transmission facility ROW and roads. Small mammals are generally deterred from open linear features due to factors such as lack of cover from predators, disturbances from human activity, and changes in ground surface conditions (e.g., a hard road surface) (Oxley 1974; Gerlach and Musolf 2000; Lambert et al. 2014). For small forest-dwelling mammals, transmission facility ROW may present a nearly impassable barrier due to the loss of canopy cover that negatively impacts their movements (Biasotto and Kindel 2018).

Bats' responses to transmission facilities as barriers to movement vary by species and life requisites. Bat species that use open habitats and fly at higher altitudes may avoid transmission facilities altogether (Kahnonitch et al. 2018; Froidevaux et al. 2023). Avoidance of transmission facilities may be more common in low-humidity climates, where there are few corona discharges that attract insects (Froidevaux et al. 2023). The reason why bats avoid transmission facilities is poorly understood, but could be associated with ELF EMF emitted by transmission facilities, potentially combined with the physical presence of transmission facility structures.

The adverse environmental impact of barriers to movement on mammals during the operation and maintenance of overhead transmission facilities is expected to vary from nil, as in the case of some large mammals that regularly cross or travel along ROWs, to medium for some forest-dwelling small mammal species that may avoid crossing ROWs with unsuitable habitat. These adverse environmental impacts have been considered in the overall impact determination for wildlife barriers to movement.

Amphibians and Reptiles

Connectivity between breeding, hibernation, and living habitats is important for amphibian population persistence but is frequently lost or modified by land development (Chan-McLeod 2003; Rothermel 2004). Temporary ponds and wet depressions are important for thermoregulation during the dry summer months, outside of breeding. Non-breeding waterbodies also provide "stepping stones" for juvenile amphibians during dispersal and are important for colonization/recolonization of new habitats (Mazerolle and Desrochers 2005). Linear developments, such as transmission facilities, can create barriers to amphibian movement, and, due to their size and relative lack of mobility, amphibians may not be capable of navigating over linear features and substantially modified habitats. Gravel and regularly maintained areas also have different microclimatic conditions than naturally vegetated areas. This can increase amphibians' risk of desiccation,[77] particularly in dry weather, and may lead to avoidance of these areas as amphibians elect to move through moist, vegetated areas instead (Ervin et al. 2001; Gravel et al. 2012). Transmission ROW may limit habitat and population connectivity for small vertebrates like salamanders, but reptiles do not seem to be similarly impacted (Biasotto and Kindel 2018).

Transmission facility ROWs may facilitate human access to previously inaccessible wildlife habitat. In a review of 274 scientific papers examining the effects of recreation on wildlife, Larson et al. (2016) observed that 59 percent of the impacts caused by recreation on wildlife were negative. Those negative effects were most frequently documented for reptiles, amphibians, and invertebrates (Colorado State University 2016; Larson et al. 2016). Human recreation in urban areas does not have as much of an impact on wildlife communities as recreation in rural or undeveloped areas (Kays et al. 2017).

The adverse environmental impact of barriers to movement on amphibians and reptiles during the operation and maintenance of overhead transmission facilities is expected to vary from nil to medium, depending on habitat characteristics. The adverse environmental impact would be greatest where ROWs present a barrier to movement between habitats used for breeding, dispersal, and hibernation. These adverse environmental impacts have been considered in the overall impact determination for wildlife barriers to movement.

Invertebrates

There is limited research on the barrier effects of transmission facilities on invertebrate populations. The creation of linear transmission facility corridors can resemble vegetation in managed semi-natural grasslands that are kept in an early successional stage, thus creating novel habitats. However, a study of the diversity of plants and insects along transmission facilities found that, although plant diversity increased, there was no increase in insect diversity along transmission facilities corridors (Dániel-Ferreira et al. 2020). However, other studies on insect diversity have identified higher diversity in transmission facility ROW than in surrounding habitats (Berg et al. 2016; Wagner et al. 2019; Twerd et al. 2021). This is likely dependent on the habitat type and the surrounding vegetation community.

[77] The act of drying up.

A potential barrier for insects is the effect of ELF EMF. Insects use EMF to orient themselves and move in the desired direction. Interference by ELF EMF may negatively impact the ability of insects to orient themselves, which could potentially impact migratory insect species (Balmori 2015).

The adverse environmental impact of barriers to movement on invertebrates during the operation and maintenance of overhead transmission facilities is expected to be similar to that described for new construction. It is expected that the impact would vary from nil in areas that have been highly modified to low in habitats that would be substantially modified along the ROW (e.g., forests). These adverse environmental impacts have been considered in the overall impact determination for wildlife barriers to movement.

Movement Corridors

Movement corridors are paths taken by wildlife to move between habitats or undertake long migrations and are typically used by generations of wildlife to move across the landscape. Changes to these routes can have a pronounced adverse environmental impact on the wildlife populations that use them. Wildlife’s response to linear corridors varies by species and by project type. For example, moose will generally cross transmission facilities but are more resistant to crossing roads (Bartzke et al. 2015). Columbian sharp-tailed and greater sage-grouse avoid linear features and tall structures on the landscape, so corridors for movement without these features are important to prevent genetic isolation of populations (Stinson and Schroeder 2012; Stinson 2017).

Migratory ungulates in Washington, such as mule deer and elk, can be affected by linear features such as roads, where busy roads can become movement barriers (Kauffman et al. 2022). If public recreational activities such as all-terrain vehicle riding, snowmobiling, and dirt biking, become common on transmission facility access roads, movement barriers for ungulate species could be created. Energy development has been known to affect ungulate movement by changing the amount of stopover time at migration sites, causing mismatches between optimal forage timing and migration timing (Kaufmann et al. 2022; Sawyer et al. 2013). However, the effects of linear features such as pipelines and transmission facilities on ungulate migration are still not well understood (Sawyer et al. 2013).

Wildlife corridors, such as those identified in the Washington Habitat Connectivity Action Plan, are key areas with high levels of habitat connectivity that provide important corridors for wildlife (Michalak et al. 2025). More than half of the Columbia

Plateau ecoregion has been converted to agricultural land or altered by other development, and the remaining habitat is fragmented by these practices and restricted to areas that are less suitable for agriculture (WHCWG 2012). This makes maintaining the remaining intact and interconnected shrubsteppe in the Columbia Plateau a priority for conservation, as several species that inhabit these areas require corridors to move among populations. The Washington Habitat Connectivity Action Plan was developed to guide future resource and urban development in Washington by identifying key areas of habitat connectivity (Michalak et al. 2025). One of the stated goals of the plan is to provide for effective planning for habitat connectivity in Washington, as well as identify strategies to support the conservation of connectivity.

The Pacific Flyway is an important migration route for migratory birds in western North America every spring and fall, when billions of birds move from their wintering to breeding grounds (Newcombe et al. 2019). Reducing barrier effects on migrants and maintaining quality habitat in the flyway, such as wetlands, mudflats, and other foraging areas, is important to support migratory populations and reduce continued declines of these populations. While many migratory birds, especially smaller guilds, are not expected to have substantial movement constraints associated with linear features, larger migrants that are susceptible to collisions with transmission lines, such as sandhill cranes, could experience movement changes from transmission lines.

The adverse environmental impact of barriers to movement during the operation and maintenance of overhead transmission facilities in movement corridors is expected to be similar to that described for new construction. It is expected that the impact would vary from nil for projects sited outside of migratory corridors, to medium for projects sited in modeled migratory routes for wildlife. These adverse environmental impacts have been considered in the overall impact determination for wildlife barriers to movement.

Impact Determination: Adverse environmental impacts on wildlife, including birds, mammals, amphibians, reptiles, invertebrates, and movement corridors, resulting from barriers to movement 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.

Fish

Barriers to habitat for fish and aquatic species during the operation and maintenance of transmission facilities are similar to those outlined for new construction.

Impact Determination: Adverse environmental impacts on fish resulting from barriers to movement 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 negligible to low.

Special Status Species

The adverse environmental impact of barriers to movement on special status species during the operation and maintenance of overhead transmission facilities is expected to be similar to that described for new construction. Transmission facility ROWs are expected to create barriers to the movement for special status species similar to those for other species within the same guilds. It is expected that the permeability of transmission facilities to special status species would vary by species and landscape and would need to be considered on a project-by-project basis. In general, cleared ROWs are expected to create more barriers in forested areas where the removal of canopy cover may limit wildlife movement. However, in open areas, transmission facility poles provide perch sites that can be used by raptors, which can change predator-prey dynamics and result in prey species avoiding crossing the lines. For example, greater sage-grouse and Columbian sharp-tailed grouse are both negatively affected by transmission facility development in their habitat due to their prey species' avoidance of tall structures, which could cause movement barriers (Stinson and Shroeder 2012).

It is expected that the adverse environmental impact would vary between areas that do not support these species and natural areas, such as forested habitats, where a linear overhead transmission facility may create an impassable barrier for smaller, less mobile species.

Impact Determination: Adverse environmental impacts from barriers to movement on special status species 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.

Fragmentation

Fragmentation of large tracts of habitat into smaller patches can result in indirect habitat loss through edge effect, create barriers to movement, reduce biodiversity, change nutrient cycling, and cause changes to gene flow (Haddad et al. 2015).

Habitat can be fragmented in several ways, the most obvious example being the clearing of land to accommodate a project. Fragmentation can also occur through widening existing clearing, as the increased distance between habitat patches can reduce wildlife movement and gene flow between the patches. Fragmentation can also occur through increasing the length of the edge of an ecosystem, resulting in increased indirect habitat loss (Haddad et al. 2015). In addition to physical changes in ecosystems, habitat can be fragmented through the creation of barriers to movement, as discussed above.

Approximately one-quarter of the remaining forested ecosystems in the western United States are critical to maintaining wildlife movement over the landscape (habitat outside of this area is critical to support living habitat); however, residential development, roads, and highways have resulted in a loss of 4.5 percent of these habitats, and another 1.2 percent are predicted to be lost by 2030 (Theobald et al. 2011). Fragmentation of ecosystems in Washington has occurred through several changes in the landscape, including urban development, energy development, and forestry. As of 1991, less than 20 percent of Washington's old-growth forest remained, and the remaining patches may have been degraded by fragmentation (Lehmkuhl and Ruggiero 1991). As a result, it is estimated that 80 percent of listed species that rely on late-succession stage Douglas-fir forest are vulnerable to the effects of fragmentation (e.g., increased competition between edge/generalist species and forest-dwelling species, increased nest predation, and microclimate changes) (Lehmkuhl and Ruggiero 1991).

Transmission facilities require clearing and maintaining of an ROW, which fragments habitat for the duration of project operation. Linear projects like transmission facilities, roads, and seismic lines[78] are more likely to fragment habitats as they can extend for hundreds of miles. However, unlike roads that require paved surfaces, some vegetation can be maintained under transmission lines. Therefore, transmission facilities are more likely to result in fragmentation of forested ecosystems than naturally open ecosystems (e.g., shrubsteppe), though transmission facilities can still create barriers to movement in these open habitats.

[78] A narrow corridor created by oil and gas exploration to try to locate oil and gas.

Wildlife

The following sections outline the adverse environmental impacts from habitat fragmentation on wildlife associated with the operation and maintenance of overhead transmission facilities. These impacts include considerations for:

- Birds
- Mammals
- Amphibians and Reptiles
- Invertebrates

Birds

Fragmentation of bird habitat from the development of transmission facilities would vary depending on whether the species are forest-dwelling and how much habitat can be maintained within the ROW. Birds that occur in habitats that cannot be maintained under an overhead transmission line, such as forests or tall shrubs, would be most impacted by habitat fragmentation, whereas limited habitat fragmentation is expected in naturally open landscapes that can be maintained along an ROW.

The adverse environmental impact of habitat fragmentation on birds during the operation and maintenance of overhead transmission facilities is expected to vary from nil in open habitats, where the ROW would not constitute an abrupt change in habitat type, to low in habitats such as mature forest, where the ROW may bisect suitable habitat for bird species that inhabit the forest interior. These adverse environmental impacts have been considered in the overall impact determination for habitat fragmentation on wildlife.

Mammals

The adverse environmental impacts of fragmentation on mammals would vary by species group, depending on biological factors such as body size, range size, behavior, and habitat specialization,[79] and landscape factors such as proximity to range boundary, patch size, patch isolation,[80] and habitat matrix contrast[81] (i.e., the difference in habitat between the patches and intervening areas) (Swihart et al. 2003; Ewers and Didham 2006; Crooks et al. 2017).

[79] The act of an organism adapting to a specific habitat.
[80] The extent to which a habitat patch is disconnected from other similar habitats.
[81] The contrast between different habitat types in matrix habitat.

Larger species tend to be more mobile and less susceptible to the negative effects of habitat fragmentation as long as either individual habitat patches are sufficiently large or the individuals can move between several habitat patches within their home range (Swihart et al. 2003). Small mammal species can be impacted by habitat fragmentation due to physical and behavioral barriers to crossing these linear features (Oxley et al. 1974; see Barriers to Movement, above). Species may become isolated on "island" patches of remnant habitat, resulting in reduced abundance in these areas (Bayne and Hobson 1998).

Habitat specialization and proximity to range boundary were identified as important factors influencing the persistence of mammalian species in fragmented landscapes (Swihart et al. 2003). Habitat specialization is related to a species' ability to use modified habitats to move between remaining habitat patches. The relationship between fragmentation and proximity to the range boundary is related to a species' lower abundance at the periphery of its geographic range, which can hamper dispersal, colonization, and population persistence in habitat patches.

On a landscape level, larger habitat patches typically contain more resources to support robust wildlife populations (Ewers and Didham 2006). The loss of wildlife species is generally greater at more isolated patches due to the reduced rates of dispersal and colonization, especially when there is high habitat matrix contrast (Ewers and Didham 2006). Fragmentation of mammal habitat by transmission facilities is expected to be more pronounced for species that have low dispersal or movement rates and occur in habitats that cannot be maintained under the overhead transmission line, resulting in high habitat matrix contrast.

The adverse environmental impact of habitat fragmentation on mammals during the operation and maintenance of overhead transmission facilities could vary based on species, habitat characteristics, patch size, and patch isolation. Fragmentation is expected to have less of an impact on wide-ranging large mammals that move between habitat patches within their home range, especially if the habitat matrix contrast is low; whereas fragmentation would have greater impacts on habitat specialists with low dispersal capabilities, especially if the habitat matrix contrast is high and the smaller habitat patches are able to support fewer individuals. These adverse environmental impacts have been considered in the overall impact determination for habitat fragmentation on wildlife.

Amphibians and Reptiles

The effects of fragmentation on reptile and amphibian communities are likely species-specific and depend on habitat preferences. Amphibians and reptiles that inhabit open habitats are expected to be less affected by fragmentation from transmission facilities than reptile and amphibian species that inhabit more structurally complex habitats. A study on California kingsnake (*Lampropeltis californiae*) in California found no effect of fragmented landscapes on movement or home range size (Anguiano and Diffendorfer 2015). However, side-blotched lizard (*Uta stansburiana*) in California was negatively affected in areas where the habitat was fragmented by anthropogenic disturbance from a wind farm (Keehn et al. 2018). This suggests that species may respond to fragmented habitat differently.

Amphibians that move short distances and require cool and forested areas can be affected by habitat fragmentation when “stepping stone” habitat is lost that connects breeding, living, and overwintering habitats. One study found that salamanders were 86 percent less likely to return to the stream where they were initially captured if required to cross an area with no canopy cover as short as 43 feet (13 meters), with decreasing likelihood as the gap distance increased (Cecala et al. 2014). This can isolate populations and create habitat “islands.”

The adverse environmental impact of habitat fragmentation on amphibians and reptiles during the operation and maintenance of overhead transmission facilities could vary based on species, habitat characteristics, patch size, and patch isolation. The adverse environmental impact could vary from nil in open habitats to medium in structurally complex habitats, especially if fragmentation disrupts connectivity between habitats required for different life requisites such as breeding, dispersal, and hibernation. These adverse environmental impacts have been considered in the overall impact determination for habitat fragmentation on wildlife.

Invertebrates

Fragmentation may not result in a substantial adverse environmental impact for many invertebrate species, as transmission facilities can create habitat for species that prefer open habitat and forage on flowers (Berg et al. 2016; Wagner et al. 2019). Some gastropods may also respond positively to the creation of grass-dominated habitats. However, forest-dwelling species require specific microhabitats that may not be supported by transmission facility ROWs and, therefore, are more susceptible to fragmentation (Biasotto and Kindel 2018).

The adverse environmental impact of habitat fragmentation on invertebrates during the operation and maintenance of overhead transmission facilities is expected to vary from nil for species that inhabit open habitats to low for species associated with forested habitats. These adverse environmental impacts have been considered in the overall impact determination for habitat fragmentation on wildlife.

Impact Determination: Adverse environmental impacts on wildlife, including birds, mammals, amphibians, reptiles, and invertebrates, resulting from 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.

Fish

Fragmentation of habitat for fish and aquatic species during the operation and maintenance of overhead transmission facilities is similar to that outlined for barriers to movement.

Impact Determination: Adverse environmental impacts on fish resulting from 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 negligible to low.

Special Status Species

Due to the sensitivity of special status species to population decline, the adverse environmental impact of habitat fragmentation could be higher than for other species in the same taxonomic guild. The effects of fragmentation on special status species have been reported as a threat to several species. For example, fragmentation of the remaining populations and the effects that would have on genetic structure and population resiliency is one of the greatest threats to Columbian sharp-tailed grouse recovery (Stinson 2017). The addition of more linear features to their habitat increases the chances of fragmentation being a contributing factor to continued population decline and reduced recovery success. This has also been identified as a key factor in the decline of greater sage-grouse, as their habitat exists in a landscape fragmented by agriculture, energy, and livestock (Schroeder et al. 2023).

Northern spotted owls are impacted by fragmentation of old forested habitat, as barred owls (*Strix varia*) are better able to exploit fragmented landscapes and outcompete spotted owls for resources (WDFW 2024r). Transmission facility development in old-growth habitat would fragment the landscape, not only by removing habitat but also by providing linear corridors for barred owls.

Habitat fragmentation is also listed as a threat for several special status reptile species identified in the SWAP, including California mountain kingsnake (*Lampropeltis zonata*), sagebrush lizard, pygmy horned lizard (*Phrynosoma douglasii*), and northwestern pond turtle. Similarly, the WDFW has identified Dunn's salamander (*Plethodon dunni*), Van Dyke's salamander, Cascade torrent salamander, Columbia torrent salamander (*R. kezeri*), and Rocky Mountain tailed frog (*Ascaphus montanus*) as vulnerable to fragmentation because these species inhabit cool forested streams with limited dispersal capabilities.

The adverse environmental impact could range from nil for wide-ranging species that move between habitat patches to high for habitat specialists with low dispersal capabilities, such as the special status salamander species.

Impact Determination: Adverse environmental impacts on special status wildlife and fish resulting from 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 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 any other linear industrial facility. Underground transmission facilities could have the following adverse environmental impacts during the operation and maintenance stage:

- Direct Habitat Loss
- Indirect Habitat Loss
- Mortality
- Barriers to Movement
- Fragmentation

Direct Habitat Loss

Direct habitat loss initiated during new construction would continue through the operation and maintenance stage of an underground transmission facility. Direct habitat loss during this stage would be generally consistent with the direct habitat loss for the operation and maintenance of an overhead transmission facility, except that vegetation on the ROW would be limited to grass and forbs. Trees and shrubs cannot be grown on top of underground transmission facilities, as the root systems can damage subterranean structures and can become electrified. Therefore, the suitability of modified habitat along the ROW would be limited to wildlife species that occur in grass- and forb-dominated habitats.

Wildlife

The following sections describe adverse environmental impacts on wildlife resulting from the operation and maintenance of underground transmission facilities and associated direct habitat loss. These impacts include considerations for:

- Birds
- Mammals
- Amphibians and Reptiles
- Invertebrates
- Movement Corridors

Birds

Habitat along the ROW of an underground facility is not expected to provide foraging or nesting habitat for species other than grassland and ground-nesting species, as deep-rooted shrubs and trees cannot be maintained on underground transmission facilities.

The adverse environmental impact of direct habitat loss on birds during the operation and maintenance of underground transmission facilities would be consistent with the impact during new construction, as habitat loss initiated during new construction would persist through operation and maintenance. As such, the impact of habitat loss could vary from negligible for facilities located in urbanized or modified habitats to medium for facilities located in mature forests. Species that are able to use the habitat in the ROW during the operation and maintenance stage could experience periodic habitat loss after vegetation maintenance activities, as the habitat would not be allowed to regenerate to its previous state, and therefore, the impact is considered low. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Mammals

Habitat along the ROW of an underground transmission facility could provide foraging opportunities for mammals that consume grasses and forbs, such as some rodents, ungulates, and bears. As the ROW would not be replanted with trees or shrubs, there would be limited shelter for smaller mammals. Bat species that forage in open areas could use the ROW during the operational stage.

The adverse environmental impact of direct habitat loss on mammals during the operation and maintenance of underground transmission facilities would be consistent with the impact during new construction, as habitat loss initiated during new construction would persist through operation and maintenance. As such, the impact is expected to range from negligible to medium, depending on the species and habitat characteristics. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Amphibians and Reptiles

As the ROW would not be replanted with shrubs or trees, it would likely provide limited suitable habitat for amphibians and reptiles, which require cover objects for shelter and thermoregulation. Therefore, habitat loss initiated during new construction would persist for amphibians and reptiles through operation and maintenance.

The adverse environmental impact of direct habitat loss on amphibians and reptiles during the operation and maintenance of underground transmission facilities would be consistent with the impact during new construction because habitat loss initiated during new construction would persist through operation and maintenance. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Invertebrates

The ROW would continue to support invertebrate species that forage on grasses and flowers. Invertebrate species that require shrubs, trees, or cover objects would be less likely to occur in the ROW.

The adverse environmental impact of direct habitat loss on invertebrates during the operation and maintenance of underground transmission facilities would be consistent with the impact during new construction, as habitat loss initiated during new construction would persist through operation and maintenance. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Movement Corridors

The adverse environmental impact of habitat loss on movement corridors from the operation and maintenance of an underground transmission facility is expected to be consistent with the descriptions for overhead transmission facilities.

The adverse environmental impact of habitat loss in movement corridors during the operation and maintenance of underground transmission facilities would be consistent with the impact during new construction, as habitat loss initiated during new construction would persist through operation and maintenance. As such, the impact is expected to range depending on the habitat type. These adverse environmental impacts have been considered in the overall impact determination for direct habitat loss on wildlife.

Impact Determination: Adverse environmental impacts on wildlife, including birds, mammals, amphibians, reptiles, invertebrates, and movement corridors, resulting from direct habitat loss 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.

Fish

Direct habitat losses for fish and aquatic species during operation and maintenance would be similar to those outlined above for overhead and underground transmission facilities for adverse environmental impacts during new construction.

Impact Determination: Adverse environmental impacts on fish resulting from direct habitat loss 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 negligible to medium.

Special Status Species

The adverse environmental impact of habitat loss on special status species from the operation and maintenance of an underground transmission facility is expected to be consistent with the descriptions for overhead transmission facilities.

Impact Determination: Adverse environmental impacts on special status species resulting from direct habitat loss 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 low to high.

Indirect Habitat Loss

Indirect habitat loss associated with the edge effect initiated during the new construction of underground transmission facilities would persist through operation and maintenance.

Wildlife

The adverse environmental impacts of edge effects on wildlife would be similar to those described for overhead transmission facilities.

Similarly, human disturbance along the ROW due to maintenance and recreational users would be similar for both overhead and underground transmission facilities.

The response of wildlife to EMFs produced by underground transmission facilities would be similar to that described above for overhead facilities. Although underground transmission facilities are constructed within casements and placed at least 6 feet belowground, burying the transmission line does not completely shield EMF (Grid North Partners 2021). Although this Programmatic EIS did not evaluate potential adverse environmental effects of EMFs from underground transmission facilities on human populations (see Section 3.8, Public Health and Safety for the analysis of EMF from overhead transmission on human populations), certain wildlife species may be exposed or more susceptible to EMFs.

As underground transmission facilities would not need poles or other overhead structures, it is expected that wildlife that perceive a risk of moving under overhead structures would not be similarly adversely affected by underground transmission facilities.

Underground transmission facilities are anticipated to have less indirect habitat loss on terrestrial wildlife than overhead transmission facilities.

Impact Determination: Adverse environmental impacts on wildlife, including birds, mammals, amphibians, invertebrates, and movement corridors, resulting from indirect habitat loss 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.

Fish

Indirect habitat losses for fish and aquatic species during operation and maintenance are not anticipated unless instream repairs are required. These adverse environmental impacts would be the same as those outlined for the new construction of underground transmission facilities.

Impact Determination: Adverse environmental impacts on fish resulting from indirect habitat 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 negligible to medium.

Special Status Species

The adverse environmental impact of indirect habitat loss on special status species from the operation and maintenance of an underground transmission facility is expected to be consistent with the descriptions for overhead transmission facilities.

Impact Determination: Adverse environmental impacts on special status species resulting from indirect habitat loss 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 low to high.

Mortality

Wildlife

The risk of wildlife mortality during the operation and maintenance stage of an underground transmission facility is expected to be limited to vehicle strikes and crushing during maintenance activities. Vehicles moving along access roads and vegetation clearings could crush nests and dens and collide with wildlife. Vehicles being operated through aquatic habitats could crush amphibian eggs, larvae, and adults. Risk of collision or electrocution of aerial species is not expected during the operation and maintenance of underground transmission facilities.

Impact Determination: Adverse environmental impacts on wildlife, including birds, mammals, amphibians, reptiles, and invertebrates, resulting from mortality 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 negligible.

Fish

Vehicles being operated through aquatic habitats could crush fish, including eggs and adults. Other adverse environmental impacts on fish are expected to be similar to those described for the operation and maintenance of overhead transmission facilities, including increase to access previously inaccessible fishing areas, which may affect fish populations, depending on the remoteness of the population and the number of fishers that may take advantage of the new access (Manitoba Hydro 2010; Cott et al. 2015).

Impact Determination: Adverse environmental impacts on fish resulting from mortality 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.

Special Status Species

Potential sources of mortality for special status species are maintenance activities and the use of herbicides. As these species are generally protected, hunting pressure is not expected to increase their mortality. These populations are typically small or are in decline and are unable to adapt to increased mortality. Therefore, populations may become vulnerable if they lose even a few individuals.

Impact Determination: Adverse environmental impacts on special status species resulting from mortality 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 negligible.

Barriers to Movement

Wildlife

Barriers to wildlife movement from underground transmission facilities would be limited to wildlife's perceived risk of crossing gaps created by ROWs. Underground transmission facilities would not have the same aboveground structures as overhead transmission facilities, which correspond to perceived barriers. Wildlife, particularly forest-dwelling species, that are resistant to crossing gaps in habitat due to a lack of shelter objects, would likely perceive an underground transmission facility ROW as a barrier to movement. Unlike ROW for overhead transmission facilities, ROW for underground transmission facilities cannot be planted with deep-rooted shrubs or small trees to provide shelter for smaller wildlife like small birds, rodents, and amphibians. The adverse environmental impact could range from negligible in open habitats, where the ROW would not constitute an abrupt change in habitat type, to low in habitats such as mature forest, where the ROW may constitute a perceived barrier to movement for some forest interior species or habitat specialists.

Impact Determination: Adverse environmental impacts on wildlife from barriers to movement 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 negligible to low.

Fish

Barriers to movement for fish during the operation and maintenance of underground transmission facilities are similar to those outlined for new construction. The adverse environmental impact on fish would range, depending on the location, size, and fish-bearing status of the stream.

Impact Determination: Adverse environmental impacts on fish resulting from barriers to movement 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 negligible to medium.

Special Status Species

Sources and impacts of barriers to movement on special status species during the operation and maintenance of underground facilities are expected to be similar to those described for above-ground facilities. Unlike overhead facilities, underground facilities would not include poles or lines that could create perceived barriers to movement. However, below-ground facilities cannot be restored with shrubs or small trees that could improve linkages for special status species across ROWs.

Impact Determination: Adverse environmental impacts on special status species resulting from barriers to wildlife movement 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.

Fragmentation

Wildlife

Operation and maintenance of an underground transmission facility is expected to result in the same adverse environmental impacts on habitat fragmentation as those described for overhead transmission facilities, except for facilities that are developed in naturally open ecosystems. Unlike overhead transmission facilities, underground facilities would require the removal of shrubs. As such, underground transmission facility ROWs would result in fragmentation of shrubsteppe and other open ecosystems.

The adverse environmental impact of habitat fragmentation during the operation and maintenance of underground transmission facilities is expected to vary based on species, habitat characteristics, patch size, and patch isolation. The adverse environmental impact could range from nil for highly mobile, wide-ranging species or facilities in open habitats, where the ROW would not constitute an abrupt change in habitat type, to medium in habitats such as mature forest, where the ROW may bisect suitable habitat for forest interior species or habitat specialists.

Impact Determination: Adverse environmental impacts on wildlife, including birds, mammals, amphibians, and invertebrates, 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.

Fish

Fragmentation of habitat for fish and aquatic species during the operation and maintenance of underground transmission facilities is similar to that outlined for barriers to movement. The impact on fish would range depending on the location, size, and fish-bearing status of the stream.

Impact Determination: Adverse environmental impacts on fish 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 negligible to medium.

Special Status Species

Sources and impacts of habitat fragmentation and the corresponding adverse impacts on special status species during the operation and maintenance of underground facilities are expected to be similar to those described for overhead transmission facilities. However, unlike overhead transmission facilities, the ROW for underground transmission facilities cannot be restored with shrubs or small trees that could minimize the impacts of fragmentation. For special status species, the impact could range from nil to high, because these species are more vulnerable to population declines due to changes in habitat.

Impact Determination: Adverse environmental impacts on special status species 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 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 habitat, wildlife, and fish, including:

- Direct habitat loss
- Indirect habitat loss
- Mortality
- Barriers to movement

The adverse environmental impacts of upgrading overhead transmission facilities are often comparable to those of overhead transmission facilities. These adverse environmental impacts are generally anticipated to be lower than those for modifying or constructing a new 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.

Direct Habitat Loss

Upgrades to existing overhead transmission facilities would not occur outside of the ROWs; therefore, there would be no new disturbance or direct habitat loss in areas that have not already been disturbed. However, if upgrades require vegetation clearing to replace aging components, there may be a temporary loss of early seral vegetation that occurs within the ROW, such as grasses and shrubs. No adverse environmental impacts would be expected for projects in urbanized or previously highly disturbed areas, as well as areas that support generalist species adapted to modified landscapes. Temporary loss of habitat that supports special status species, species with restricted ranges, and species with specialized habitat is predicted to have less of an impact on those populations compared to new construction, as the impacts would be of short duration. The impact on fish would depend on the location and size of the stream, the fish species present, and whether riparian vegetation would need to be removed.

Indirect Habitat Loss

Indirect habitat loss due to the upgrade of existing overhead transmission facilities is expected to be consistent with, but generally lower than, the adverse environmental impacts outlined for new construction, across all wildlife categories (birds, mammals, amphibians, reptiles, invertebrates, fish, and special status species).

The adverse environmental impact could vary based on the level of existing sensory disturbance and species tolerance, depending on existing human activity level, species tolerance of humans, and remoteness of the site.

Mortality

Sources of mortality of wildlife during the process of upgrading existing overhead transmission facilities would be consistent with sources described for the new construction of overhead transmission facilities. Risk of mortality associated with upgrading existing overhead transmission facilities could be less than the original facility, as the upgraded facility would be expected to meet current engineering standards to reduce collision and electrocution risk, such as installing deflectors on transmission lines.

The adverse environmental impact could vary based on habitat characteristics, species present, and seasonality of construction activities.

Barriers to Movement

Upgrading existing overhead transmission facilities would not create new barriers to movement, as the infrastructure is already present. Adverse environmental impacts from upgrades may result from perceived barriers and temporary barriers. These barriers could include sediment fencing or construction fencing. For fish, temporary barriers may include in-stream works for watercourse crossings; however, upgrading crossing structures, like culverts, is likely to reduce barriers to fish passage.

Fragmentation

Upgrading existing overhead transmission facilities would not further fragment the landscape, as the changes would occur in existing ROWs.

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 habitat, wildlife, and fish, including:

- Direct habitat loss
- Indirect habitat loss
- Mortality
- Barriers to movement

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.

Direct Habitat Loss

Upgrading existing underground transmission facilities would not require work outside of the ROWs, so there would be no direct habitat loss in areas that have not already been disturbed. However, if upgrades require excavation or vegetation clearing, there may be a loss of early seral stage vegetation growing within the ROW, such as grass and shrubs. While upgrading existing underground transmission facilities would

Upgrading overhead transmission facilities may involve minimal ground disturbance if existing access roads and towers are reused, whereas underground facility modifications typically require extensive excavation. The adverse environmental impact could vary based on habitat type, the extent of habitat affected, and the species present. For instance, impacts may differ between projects in urbanized or previously disturbed areas and those impacting generalist species adapted to modified landscapes, as opposed to projects impacting special status species or other species with specialized habitat requirements or restricted ranges. Overall, the adverse environmental impacts would be expected to have a shorter duration compared to the construction of a new underground transmission facility.

Indirect Habitat Loss

Indirect habitat loss due to the upgrade of existing underground transmission facilities is expected to be consistent with, but generally lower than, the adverse environmental impacts described for the new construction and operation and maintenance for all wildlife categories (birds, mammals, amphibians, reptiles, invertebrates, fish, and special status species). Indirect habitat loss during construction would be within the ROW. Indirect habitat loss would generally be consistent with pre-construction conditions.

The adverse environmental impact could vary based on the level of existing sensory disturbance (noise, light, and visual) and species tolerance, ranging between facilities in areas with high human activity or for species that are adapted to co-existing with humans, and facilities in remote areas or for special status species and other species that are sensitive to disturbance. The adverse environmental impact is expected to be generally lower than impacts estimated for the new construction of underground transmission facilities because disturbance is anticipated to be of shorter duration and limited to the existing ROWs.

Mortality

Sources of mortality of wildlife during the process of upgrading existing transmission facilities would be consistent with the sources described for the new construction of underground transmission facilities. Risk of mortality during upgrade could occur within the existing ROWs due to collisions with wildlife, destruction of nests and burrows, and entrapment in open features.

Barriers to Movement

In general, upgrading existing facilities would not create new barriers to movement, as the infrastructure is already present. Although temporary barriers to movement associated with upgrading an existing transmission facility could be created, these barriers would be temporary. Upgrades to existing underground facilities could create temporary fish barriers to movement if in-water works are required. These adverse environmental impacts would be similar to those of the new construction of underground facilities. However, upgrades to underground transmission facilities could require upgrades to access road watercourse crossings, such as culverts, that could improve fish passage for instream structures.

Fragmentation

Upgrades to existing underground transmission facilities would not further fragment the landscape, as the changes would occur in an existing ROW and disturbance footprint.

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 habitat, wildlife, and fish during the modification stage:

- Direct habitat loss
- Indirect habitat loss
- Mortality
- Barriers to movement
- Fragmentation

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.

Direct Habitat Loss

In general, direct habitat loss for wildlife during the modification of existing overhead transmission facilities would be consistent with the description provided for the new construction and operation and maintenance of overhead transmission facilities. Increasing the capacity of an existing transmission facility could require additional structures or widening the ROW for safety clearances. Accommodating a wider ROW or additional infrastructure components might require additional vegetation clearing, resulting in additional habitat loss. However, this loss would be less than what is required for the new construction of a transmission facility. The adverse environmental impact could vary based on habitat type, extent of habitat impacted, and species.

Indirect Habitat Loss

Indirect habitat loss due to the modification of existing transmission facilities is expected to be consistent with, but generally lower than, the adverse environmental impacts described for the new construction of overhead transmission facilities for all wildlife categories. The adverse environmental impact could vary based on the level of existing sensory disturbance and species tolerance.

In general, indirect disturbances would be similar to the conditions prior to modifying the transmission facility. However, increasing the capacity of a transmission facility would increase electromagnetic radiation, potentially increasing the indirect effects associated with EMF. Several groups of animals, including insects such as bees and cockroaches, ungulates such as caribou, amphibians, and some birds, can see this radiation and may avoid areas where these changes occur, resulting in indirect habitat loss (Balmori 2006, 2010; Zastrow 2014; Biasotto and Kindel 2018; Pálsdóttir et al. 2022; Froidevaux et al. 2023). Corona discharges could become more frequent because of increased capacity, which could attract more insects to transmission facilities, in turn affecting bats that feed on these insects.

Mortality

Sources of mortality of wildlife during the process of modifying existing transmission facilities would be consistent with sources described for new construction of overhead transmission facilities. Once the transmission facility is modified, the risk of mortality could increase if existing transmission facilities are modified to higher voltage with taller towers or additional conductors. However, modified facilities would be expected to meet newer engineering standards to reduce collision and electrocution risk. The adverse environmental impact could vary based on habitat characteristics, species present, and the seasonality of construction activities.

Barriers to Movement

In general, modifying existing transmission facilities would not create new barriers to movement, as most of the infrastructure is already present. Temporary barriers to movement could be created; however, these adverse environmental impacts would not persist beyond construction. If modifications require widening of the ROW, the additional width could reduce permeability for some wildlife species. How wildlife respond to widening a ROW would vary between wildlife guilds. For example, the widening of roads in North America has previously been documented to not affect large-mammal movement when traffic volume remained relatively constant after the upgrade (Boyle et al. 2020).

Fragmentation

Modifying an existing transmission facility would generally not create new fragmentation, as it would predominantly occur in an existing ROW. However, the modification could require widening the ROW to comply with safety standards. If modifications require widening the ROW, the additional width could further impact species as discussed under barriers to movement.

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. Differences in impacts to wildlife, fish, and special-status species from modifying an existing underground transmission facility versus constructing a new one are expected to be similar to those identified for modifying overhead transmission facilities.

Underground transmission facilities could have the following adverse environmental impacts on habitat, wildlife, and fish during the modification stage:

- Direct Habitat Loss
- Indirect Habitat Loss
- Mortality

- Barriers to Movement
- Fragmentation

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.

3.6.3.3 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 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.

3.6.4 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[82] that are relevant to this resource section are described below:

AVOID-1 – Hazardous Areas: Avoid having equipment or infrastructure within known hazardous areas, including, but not limited to, contaminated soils, geologically hazardous areas, landfills, and cutbanks.

Rationale: Avoiding hazardous areas provides safety for workers, the public, and infrastructure, as well as environmental protection. Disturbing sites of known contamination or other hazards may require the development of remediation plans.

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-3 –Sensitive Water Features: Avoid impacting areas sensitive to degradation, including adjusting the layout of new transmission facilities to steer clear of sensitive water features (wetlands, waterbodies, streams and channel migration zones).

Rationale: Avoiding sensitive water features that are susceptible to degradation from new construction activities, including changes to the water features'

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

physical characteristics (e.g., banks, bathymetry, and substrate[83]), as well as chemical properties. Avoiding these areas helps preserve their structure and function.

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-5 – Channel Migration Zones (CMZs): Avoid having equipment or infrastructure in Channel Migration Zones (CMZs), defined in WAC 222-16-010 as areas where the active channel of a stream is prone to move, resulting in a potential near-term loss of riparian function and associated habitat adjacent to the stream, except as modified by a permanent levee or dike. Avoidance of CMZs is recommended where feasible, but compliance with applicable shoreline, floodplain, and critical areas regulations will guide project-level decisions.

Rationale: This Avoidance Criterion would eliminate potential damage to infrastructure caused by erosion of soil or foundations for infrastructure, if a channel were to migrate. Additionally, placing equipment or personnel within CMZs poses safety risks due to unstable ground conditions, sudden changes in stream flow, and increased likelihood of flooding or debris movement. Avoidance reduces the risk of injury, equipment loss, and costly emergency responses, while supporting compliance with shoreline, floodplain, and critical area regulations.

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

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

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-9 – Movement Corridors: Avoid having equipment or infrastructure in modeled landscape connectivity areas that are characterized as having high connectivity value in the Washington Habitat Connectivity Action Plan, unless the project is sited within or adjacent to an existing right-of-way or linear feature (e.g., a roadway).

Rationale: This Avoidance Criterion aims to reduce wildlife barriers to movement.

AVOID-10 – Buffer Setbacks for Wildlife and Wildlife Features: Avoid having equipment or infrastructure within the setbacks identified for wildlife and wildlife features, as outlined in **Appendix 3.6-1**. Applicants would verify and update the setbacks as new buffers are recommended by Washington State (e.g., Washington Department of Fish and Wildlife [WDFW] and Washington State Department of Ecology). Buffers and setbacks would be reviewed with WDFW prior to the submittal of a project-specific application.

Rationale: This Avoidance Criterion reduces direct and indirect habitat loss and mortality of special status species.[84]

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 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.

[84] For this Programmatic EIS, special status fish and freshwater invertebrate species are defined as either listed under the federal Endangered Species Act or Bald and Golden Eagle Protection Act or listed by Washington State as endangered, threatened, sensitive, or candidate.

- Demonstrate that certain Mitigation Measures are not applicable due to the absence of relevant adverse environmental 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 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:

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.

Rationale: This Mitigation Measure aims to reduce the mortality of non-target species and contamination of wildlife features and aquatic waters.

Hab-2 – Minimize Transmission Line Crossings at Canyons and Riparian Habitat and Parallel to Rivers and Ridge Lines: Minimize transmission line crossings of canyons and draws, along ridge lines, parallel to rivers, and within riparian habitat.

Rationale: This Mitigation Measure reduces potential barriers to wildlife movement from transmission facility development and employs methods to reduce disturbance and conflicts between wildlife and transmission lines.

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

Rationale: This Mitigation Measure aims to restore affected habitat and reduce habitat loss, as well as reduce human access and barriers to movement.

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.

Rationale: This Mitigation Measure aims to reduce habitat loss and barriers to movement for small mammals, amphibians, and reptiles. During in-stream works, this Mitigation Measure aims to retain and provide habitat for juvenile salmonids.

Hab-5 – Vehicle and Equipment Use and Maintenance: Prohibit vehicles and other equipment from idling when not in use during construction. Vehicles and other equipment would be inspected daily for leaks and would be kept in good condition. Vehicles and equipment would only be stored with proper spill protection measures in place and in areas where contaminants would not enter the environment, watercourses, or riparian areas if spills were to occur.

Rationale: This Mitigation Measure aims to reduce the chances of contaminants entering the environment if spills or leaks were to occur and would reduce indirect habitat loss from light, noise, and odor pollution to nearby wildlife.

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.

Rationale: This Mitigation Measure aims to reduce incidental loss of wildlife habitat and features, as well as wildlife mortality.

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.

Rationale: This Mitigation Measure aims to reduce the direct habitat loss for wildlife species.

Wild-1 – Wildlife Timing Windows: Schedule vegetation clearing and grubbing and other activities that could destroy or disturb wildlife to occur outside of the sensitive timing windows in appropriate habitat as listed in **Appendix 3.6-1**. This list and timing periods would be verified with the Washington Department of Fish and Wildlife and updated as needed prior to implementation.

Rationale: This Mitigation Measure aims to reduce potential disturbance and mortality of wildlife. This measure is site-specific, and not all disturbance windows will apply to every project.

Wild-2 – Construction Occurs during Daylight Hours: Schedule construction activities during daylight hours, when feasible, to reduce the disturbance to nocturnal species and reduce the risk of wildlife-vehicle collisions.

Rationale: This Mitigation Measure aims to reduce wildlife disturbance and mortality.

Wild-3 – Incidental Take Permit: Apply for and obtain an Eagle Incidental Take Permit, in accordance with the Bald and Golden Eagle Protection Act, when constructing transmission facilities.

Rationale: This Mitigation Measure aims to reduce the potential mortality of eagles.

Wild-4 – Wildlife Entrapment in Open Trenches: Minimize areas where wildlife could be trapped during and following construction. These can include trenches, open containers, borrow pits, netting, damaged fencing, open pipes, and test pits. During the new construction of underground transmission facilities, applicants would develop a site-specific plan and mitigation to prevent wildlife from becoming trapped in open trenches. The plan would include measures for preventing wildlife from entering trenches, wildlife escape routes, and monitoring requirements of trenches.

Rationale: This Mitigation Measure aims to reduce potential wildlife injury and mortality during new transmission facility construction.

Wild-5 – Line Markers on Transmission Lines over Rivers: Install line markers on overhead transmission lines that cross rivers to improve their visibility to flying birds or site them on bridges or similar infrastructure.

Rationale: This Mitigation Measure aims to reduce bird collisions with transmission lines near rivers, which attract birds that are susceptible to collision such as waterbirds, pelicans, and wading birds.

Wild-6 – Wildlife-Resistant Waste Containers: Use only waste containers that are wildlife resistant.

Rationale: This Mitigation Measure aims to reduce the potential human-wildlife conflicts, therefore reducing the potential for wildlife mortality.

Wild-7 – Wildlife Monitoring: Document wildlife mortalities during work activities (e.g., from vehicle collisions, strikes, clearing) to the State Environmental Policy Act Lead Agency or an appropriate designee, along with adaptive management strategies to reduce mortality.

Rationale: This Mitigation Measure aims to reduce wildlife mortalities. Reporting wildlife mortalities related to transmission facility development would enable better management decisions.

Wild-8 – Road Rules during Critical Periods for Wildlife: During critical periods for wildlife (e.g., amphibian migration or ungulate calving season), implement mitigation strategies such as slower speed limits, no-stop areas, and potential road closures in or adjacent to suitable habitat.

Rationale: This Mitigation Measure aims to reduce adverse environmental impacts on wildlife during life stages when they are most vulnerable.

Wild-9 – No Hunting or Pets: Prohibit construction crews from hunting while on the work site. Do not allow pets at construction sites.

Rationale: This Mitigation Measure aims to reduce potential injury and mortality of wildlife during construction.

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

Rationale: This Mitigation Measure aims to reduce wildlife mortality and disturbance through controlling human and predator use of the ROW.

Wild-11 – Wildlife Crossing Opportunities Along Open Trenches: During new construction, operation and maintenance, upgrade, or modification of underground transmission facilities, maintain regularly spaced gaps in open trenches to provide crossing opportunities for wildlife.

Rationale: Providing wildlife crossing opportunities across open trenches aims to reduce potential barriers to movement and the risk of wildlife entrapment in trenches.

Wild-12 – Collision Monitoring: A post-construction operational collision monitoring plan would be developed in collaboration with the Washington Department of Fish and Wildlife and approved by the State Environmental Policy Act Lead Agency for portions of the transmission facility identified as high collision risk.

Rationale: This Mitigation Measure aims to reduce avian mortality by providing a collision monitoring plan that would include methods to survey bird mortalities, to confirm mitigation strategies are effective, and adaptive management strategies to be implemented if high mortality is recorded.

Wild-13 – Perching Deterrents. Design transmission facility towers or structures to include raptor perching deterrents where electrocution risk exists.

Rationale: Perching deterrents are expected to reduce raptor mortalities from electrocution.

Wild-14 – Wildlife-Specific Noise Mitigation: Implement noise control measures (e.g., temporary noise barriers, mufflers) or practices (e.g., restrictions to low-level helicopter flights) where project activities are expected near sensitive wildlife habitat.

Minimize the use of blasting, impact or vibratory driving or other construction methods near water or implement noise reduction strategies to reduce underwater noise.

Rationale: This Mitigation Measure aims to reduce indirect habitat loss for wildlife from sensory disturbance as well as reduce injury or mortality to fish.

Fish-1 – Least Risk Periods for Fish: Schedule construction and maintenance activities during the most up-to-date least risk periods and outside timing restrictions for salmonids or other sensitive fish species (e.g., Pacific lamprey [*Entosphenus tridentatus*]) that inhabit the watercourse.

Rationale: This Mitigation Measure aims to reduce adverse environmental impacts on salmon or other sensitive fish species during sensitive life history phases, such as when there are reeds. Applying least risk windows would time construction during periods when spawning or incubating salmonids or fish are least likely to be in Washington State freshwaters.

Fish-2 – Design Perpendicular Approaches: Construct transmission facility access road approaches and crossings perpendicular to streams or rivers and maintain the existing channel form and dimensions.

Rationale: This Mitigation Measure aims to reduce loss or disturbance to riparian vegetation, reduce instream habitat adverse environmental impacts, and maintain fish passage.

Fish-3 – Isolate Instream Works: Conduct in-water works in isolation from flowing water, if practicable.

Rationale: This Mitigation Measure aims to reduce the risk of potential injury to fish during in-water construction and isolation.

Fish-4 – Fords: Minimize low-water crossings (fords) by selecting the use of temporary bridges if temporary access is needed to cross waterways.

Rationale: This Mitigation Measure aims to minimize habitat loss and alteration, changes in water quality, or direct mortality to fish.

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

Rationale: This Mitigation Measure aims to maintain water quality and riparian function next to watercourses.

Fish-6 – Use Low-Impact Design for Roads: Use low-impact development techniques (e.g., pervious paving materials and narrow road widths) during the site planning and layout period of project-specific applications, particularly in areas of high aquatic species diversity or salmonid-bearing streams.

Rationale: This Mitigation Measure aims to protect salmonid habitat from adverse environmental impacts from roads.

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.

Rationale: This Mitigation Measure aims to reduce adverse environmental impacts on water quality (contaminants, sediment), water quantity, fish, and aquatic habitat.

Fish-8 – Reduce EMF on Magnet-Sensitive Species: Minimize the adverse environmental impact of electromagnetic fields (EMFs) on magnet-sensitive species.

Rationale: This Mitigation Measure aims to reduce adverse environmental impacts associated with EMF.

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.

Rationale: This Mitigation Measure aims to reduce the spread of invasive species into areas that are not infected.

Fish-10 – Maintain Fish Passage: Design necessary stream crossings to provide in-stream conditions that allow for and maintain uninterrupted movement and safe passage of fish and other aquatic species throughout new construction, operation and maintenance, upgrade, and modification.

Rationale: This Mitigation Measure aims to maintain fish passage and biodiversity.

Fish-11 – Regular Maintenance of Infrastructure: Regularly inspect and maintain infrastructure during operation to prevent leaks and spills into aquatic habitats.

Rationale: This Mitigation Measure aims to maintain water quality to prevent injury or death.

Fish-12 – Reduce Number of Stream Crossings: Design transmission facilities to reduce the number of stream crossings. Access roads and utilities would share common rights-of-way.

Rationale: This Mitigation Measure aims to reduce adverse environmental impacts on fish and fish habitat and maintain water quality.

Fish-13 – Use Bioengineering: Design stabilization structures to incorporate bioengineering[85] principles; for example, use living and nonliving plant materials in combination with natural and synthetic support material for slope stabilization, erosion reduction, and vegetation establishment.

Rationale: This Mitigation Measure aims to reduce changes to water quality and restore riparian functions.

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

Rationale: This Mitigation Measure aims to maintain riparian functions without full removal of riparian vegetation.

Fish-15 – In-Stream Sediment Disruption: If new transmission facility construction requires open-cut trenching or would generate in-stream sedimentation, then establish a dilution zone suitable to the location and flow.

Rationale: This Mitigation Measure aims to reduce adverse environmental impacts on fish and fish habitat from excessive sedimentation.

In addition to the above Mitigation Measures, the following Mitigation Measures[86] developed for other resources may be applicable:

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.

[85] The incorporation of biological materials and structures in engineering design.
[86] 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.

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

3.6.5 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 did occur (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 analysis and mitigation. Professional experience is used to supplement this baseline, providing additional insight to identify whether Mitigation Measures beyond those 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 habitat, wildlife, and fish that would 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 3.6-8** summarizes the adverse environmental impacts anticipated for the new construction, operation and maintenance, upgrade, and modification of transmission facilities.

The broad range in impact determinations reflects the diversity of Washington's habitats and the spectrum of project footprints. For example, projects sited in previously disturbed or urbanized areas may result in negligible habitat loss, while new corridors through mature forest or shrubsteppe can result in high, potentially irreversible impacts. SEPA requires agencies to evaluate the environmental impacts of proposed actions and determine whether those impacts are likely to be significant. One aspect of this evaluation is understanding that not all projects affect the environment equally, and this variability must be carefully considered.

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Table 3.6-8: Summary of Adverse Environmental Impacts, Mitigation Strategies, and Significance Rating for Habitat, Wildlife, and Fish

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
Wildlife – Direct Habitat Loss	New Construction	Permanent or temporary loss of habitat and movement corridors from clearing and grubbing for structure placement, access roads, ROWs, and substations.	**Overhead:** nil to high **Underground:** nil to high	▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-3:** Sensitive Water Features ▪ **AVOID-4:** Floodplains ▪ **AVOID-6:** Old-growth and Mature Forests ▪ **AVOID-8:** Important Habitat ▪ **AVOID-9:** Movement Corridors ▪ **AVOID-10:** Buffer Setbacks for Wildlife and Wildlife Features ▪ **Hab-2:** Minimize Transmission Line Crossings at Canyons and Riparian Habitat and Parallel to Rivers and Ridge Lines ▪ **Hab-3:** Decommission Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-6:** Worker Education Program ▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas	Less than Significant	Throughout the life of a transmission facility, habitat on the ROW typically would be permanently lost, unless the vegetation and wildlife communities do not interfere with the transmission facility, and therefore can re-establish. Restoration of habitat to a low tree/shrub structure is possible under overhead facilities, while restoration of grass-dominated habitat is feasible over underground facilities. With the implementation of standard BMPs, Avoidance Criteria, and Mitigation Measures, the effects of direct habitat loss on wildlife can be reduced to a less than significant level.
	Operation and Maintenance	The adverse environmental impact of direct habitat loss on wildlife during the operation and maintenance stage would be consistent with the impact during new construction, as habitat loss initiated during construction would persist through operation and maintenance. Maintenance of an overhead transmission facility often includes clearing vegetation under the transmission line and within the ROW. Vegetation removal may continue to disturb early seral stage habitats that establish within the ROW and could continue to result in direct habitat loss. Depending on the habitat, some habitat types, such as naturally open habitats, may be able to partially recover under the transmission lines if they do not pose a risk to the transmission facility. Shrub or tree habitats cannot be established over underground transmission facilities.	**Overhead:** nil to high **Underground:** nil to high			
	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 from direct habitat loss to occur in comparison to new construction. 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. However, clearing early seral stage vegetation from the ROW may be required to facilitate upgrades.	**Overhead:** nil to high **Underground:** nil to high			
	Modification	Modifying existing transmission facilities and primarily utilizing existing ROWs reduces the need for extensive new development, thereby minimizing the potential for adverse environmental impacts from direct habitat loss to occur in comparison to new construction. However, should the existing ROW be expanded for safety clearances, permanent or temporary loss of vegetation from clearing	**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
		and grubbing would be similar to adverse environmental impacts occurring during new construction.				
Fish – Direct Habitat Loss	New Construction	Permanent loss of fish habitat, including riparian vegetation and instream fish habitat, could occur during the construction of access roads, overhead and underground transmission facilities, and substations. Construction activities and the use of equipment or machinery in the water could alter stream banks and disturb aquatic habitat.	**Overhead:** nil to low **Underground**: negligible to medium	▪ **AVOID-1:** Hazardous Areas ▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-3:** Sensitive Water Features ▪ **AVOID-4:** Floodplains ▪ **AVOID-8:** Important Habitat ▪ **AVOID-10:** Buffer Setbacks for Wildlife and Wildlife Features ▪ **Hab-2:** Minimize Transmission Line Crossings at Canyons and Riparian Habitat and Parallel to Rivers and Ridge Lines ▪ **Hab-3:** Decommission Nonpermanent Roads ▪ **Hab-4:** Wood Debris Salvage and Restoration ▪ **Fish-2:** Design Perpendicular Approaches ▪ **Fish-4:** Fords ▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-6:** Use Low-Impact Design for Roads ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-12:** Reduce Number of Stream Crossings ▪ **Fish-13:** Use Bioengineering ▪ **Fish-14:** Removal of Riparian Vegetation ▪ **Fish-15:** In-Stream Sediment Disruption ▪ **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	Less than Significant	Implementation of Avoidance Criteria and Mitigation Measures are expected to reduce fish habitat loss by reducing stream crossings, impacting riparian habitat, and changing instream habitat. The requirements of regulatory plans and permits generally prevent and/or minimize habitat loss from project-related activities. With the implementation of these Avoidance Criteria and Mitigation Measures, it is expected that the impact of a transmission facility on fish habitat loss would be less than significant.
	Operation and Maintenance	Clearing or conducting maintenance activities in riparian vegetation or habitat could alter the stream banks and cause direct habitat losses to fish and aquatic species, as described for new construction.	**Overhead:** nil to low **Underground:** negligible to medium			
	Upgrade	Although it is expected that no new direct habitat loss would occur during the upgrade of existing transmission facilities, construction activities could occur in re-established riparian zones. Direct habitat loss could occur if the re-established riparian vegetation and habitat are disturbed, altered, or destroyed.	**Overhead:** nil to low **Underground**: negligible to medium			
	Modification	Modifying overhead transmission facilities may involve minimal ground disturbance if existing access roads and towers are reused, whereas underground facility modifications typically require extensive excavation. Permanent loss of fish habitat, including riparian vegetation and instream fish habitat, could occur during the modification of existing overhead and underground transmission facilities. Construction activities and the use of equipment or machinery in the water could alter stream banks and disturb aquatic habitat.	**Overhead:** nil to low **Underground**: negligible 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
				▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas		
Special Status Species - Direct Habitat Loss	New Construction	Permanent or temporary loss of vegetation from clearing and grubbing for structure placement, access roads, ROWs, and substations could occur from the new construction of overhead and underground transmission facilities. Special status species may be disproportionately affected by direct habitat loss as they may rely on rare habitats, have restricted ranges, have small population numbers, and face increased risks of extirpation from the state or complete extinction.	**Overhead:** low to high **Underground:** low to high	▪ **AVOID-1:** Hazardous Areas ▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-3:** Sensitive Water Features ▪ **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-9:** Movement Corridors ▪ **AVOID-10:** Buffer Setbacks for Wildlife and Wildlife Features ▪ **Hab-2:** Minimize Transmission Line Crossings at Canyons and Riparian Habitat and Parallel to Rivers and Ridge Lines ▪ **Hab-3:** Decommission Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-6:** Worker Education Program ▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Fish-2:** Design Perpendicular Approaches ▪ **Fish-4:** Fords ▪ **Fish-5:** Delineate Riparian Management Zones	Less than Significant	Special status species are generally vulnerable to loss and degradation of habitat. For this reason, the identified Avoidance Criteria and Mitigation Measures, which include buffers and management plans are typically more conservative to minimize adverse environmental impacts on these species from direct habitat loss, which could impact populations beyond their natural carrying capacity if not managed. Assuming that sensitive and unique ecological features would be avoided and identified, Mitigation Measures implemented, the significance is expected to be less than significant
	Operation and Maintenance	Permanent loss of vegetation from the new construction of overhead and underground transmission facilities would continue through the operation and maintenance stage. Depending on the habitat, some habitat types may be able to partly recover if they do not pose a risk to overhead infrastructure. Maintenance of transmission facilities often includes clearing vegetation within the ROW. Vegetation removal may continue to disturb early seral stage habitats that establish within the ROW and could continue to result in direct habitat loss. Special status species may be disproportionately affected by these activities, as they may rely on the re-established vegetation or habitats.	**Overhead:** low to high **Underground:** low to high			
	Upgrade	There is no anticipated additional direct habitat loss outside of the ROWs; however, clearing early seral stage vegetation from the ROW may be required to facilitate upgrades. Vegetation would continue to be managed in the ROW, similar to the operation and maintenance stage.	**Overhead:** low to high **Underground:** low 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
	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 in comparison to new construction. However, modifications could still result in permanent or temporary loss of habitat from clearing and grubbing for structure placement or expanding the existing ROW to accommodate safety clearances. Similar to the adverse environmental impacts described for new construction, special status species may be disproportionately affected by direct habitat loss as they may rely on rare habitats, have restricted ranges, have small population numbers, and face increased risks of extirpation from the state or complete extinction.	**Overhead:** low to high **Underground:** low to high	▪ **Fish-6:** Use Low-Impact Design for Roads ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-12:** Reduce Number of Stream Crossings ▪ **Fish-13:** Use Bioengineering ▪ **Fish-14:** Removal of Riparian Vegetation ▪ **Fish-15:** In-Stream Sediment Disruption ▪ **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 ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas		
Wildlife – Indirect Habitat Loss	New Construction	The new construction of overhead and underground transmission facilities could create changes in habitat quality or access due to sensory disturbance (i.e., noise, light, and visual), human presence, avoidance behavior, and changes in water quality (i.e., temperature, pH, sediment, and contaminants).	**Overhead:** nil to high **Underground:** nil to high	▪ **AVOID-1:** Hazardous Areas ▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-3:** Sensitive Water Features ▪ **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-9:** Movement Corridors ▪ **AVOID-10:** Buffer Setbacks for Wildlife and Wildlife Features ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-2:** Minimize Transmission Line Crossings at Canyons and Riparian Habitat and Parallel to Rivers and Ridge Lines	Less than Significant	Change in disturbance during new construction can result in temporary shifts in wildlife habitat use and avoidance patterns. During operation, some species may continue to avoid ROWs and edge habitats due to reduced habitat quality or perceived predation risk. Other species may be attracted to or deterred from the ROW due to EMF and corona discharges from the transmission facilities. Disturbance due to noise and light that is expected during new construction would not persist in operation. Upgrades and modifications would result in short-term sensory disturbances to wildlife that would end during operation.
	Operation and Maintenance	Disturbance to wildlife from mechanical noise and light would occur periodically during maintenance activities, but would be less frequent and intense than during new construction. The operation and maintenance of overhead and underground transmission facilities could create changes in habitat quality or access due to sensory disturbance (i.e., noise, light, and visual), EMF, use of herbicides and other chemicals, human presence, avoidance behavior, and changes in water quality (i.e., temperature, pH, sediment, and contaminants). Overhead transmission lines may introduce new sources of noise, generally from the hum of electricity in the wire, corona discharge, and noise created by wind passing over wires and structures.	**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
	Upgrade	Indirect habitat loss due to the upgrade of existing overhead and underground transmission facilities is expected to be consistent with, but generally lower than, those described for new construction due to the use of existing ROWs and infrastructure.	**Overhead:** nil to high **Underground:** nil to high	▪ **Hab-3:** Decommission Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-5:** Vehicle and Equipment Use and Maintenance ▪ **Hab-6:** Worker Education Program ▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Wild-10:** Access Management Plan ▪ **Wild-14:** Wildlife-Specific Noise Mitigation ▪ **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 ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas		If all identified and applicable Avoidance Criteria and Mitigation Measures are implemented, impacts on wildlife from indirect habitat loss are expected to result in a less than significant adverse environmental impact.
	Modification	Modifying existing overhead or underground transmission facilities could result in indirect habitat loss, which could affect wildlife similarly to the adverse environmental impacts outlined for new construction.	**Overhead:** nil to high **Underground:** nil to high			
Fish – Indirect Habitat Loss	New Construction	Indirect habitat loss could result from changes in water quality, water quantity, and fish habitat due to the construction of access roads, transmission facilities, and substations. Changes to water quality include changes in water temperature, pH, nutrient concentrations, pollution, and sediment. These changes can lead to changes in fish habitat and aquatic resources over time, which ultimately can affect fish.	**Overhead:** negligible to medium **Underground:** negligible to high	▪ **AVOID-1:** Hazardous Areas ▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-3:** Sensitive Water Features ▪ **AVOID-4:** Floodplains ▪ **AVOID-8:** Important Habitat ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-6:** Worker Education Program ▪ **Fish-2:** Design Perpendicular Approaches ▪ **Fish-4:** Fords	Less than Significant	The requirement of regulatory plans and permits generally prevents and/or minimizes spills from project-related activities. However, uncontrolled spills or instream works could have short- to long-term effects on aquatic habitat. Standard BMPs, such as silt fences, sediment basins, and erosion control blankets, are commonly used. Standard BMPs along with the identified Avoidance Criteria and Mitigation Measures are generally effective at
	Operation and Maintenance	Conducting maintenance activities in riparian vegetation or habitat would increase human activity and could change the water quality, thereby altering the habitat quality or access due to sensory disturbance (i.e., noise, light, and visual). These impacts would cause indirect habitat losses to fish and aquatic species, similar to those described for new construction.	**Overhead:** negligible to medium **Underground:** negligible 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	Although no additional direct habitat loss outside of the ROWs is expected during the upgrade of overhead and underground transmission facilities, changes in water quality and fish habitat could occur if construction equipment or machinery is required near or in watercourses.	**Overhead:** negligible to medium **Underground:** negligible to medium	▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-6:** Use Low-Impact Design for Roads ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-9:** Decontaminate All Gear ▪ **Fish-11:** Regular Maintenance of Infrastructure ▪ **Fish-12:** Reduce Number of Stream Crossings ▪ **Fish-13:** Use Bioengineering ▪ **Fish-14:** Removal of Riparian Vegetation ▪ **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 ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas		managing erosion and sediment transport. Standard BMPs, Avoidance Criteria, and Mitigation Measures to preserve or minimize adverse environmental impacts on existing riparian vegetation are generally effective at managing changes to fish habitat, depending on size of stream and type of vegetation (grass versus trees).
	Modification	Modifying overhead transmission facilities may involve minimal ground disturbance if existing access roads and towers are reused, whereas underground facility modifications may result in accidental release to watercourses. Such modifications can alter water quality, nutrient levels, pollution, and sedimentation, potentially degrading aquatic habitat over time and affecting fish and other aquatic resources. These impacts are expected to be similar to those described for new construction.	**Overhead:** negligible to medium **Underground:** negligible to high			
Special Status Species - Indirect Habitat Loss	New Construction	The new construction of transmission facilities could result in changes to habitat quality or access due to sensory disturbance (i.e., noise, light, and visual), human presence, avoidance behavior, and changes in water quality (i.e., temperature, pH, sediment, and contaminants). The extent of indirect habitat loss would vary by species. Species that are sensitive to human activity would be the most affected, as they would maintain the largest distances from new construction activities. Beyond species-specific responses to construction disturbance, the extent of indirect habitat loss due to transmission facility construction varies depending on the type of machinery used, construction activities, and surrounding habitat.	**Overhead:** low to high **Underground:** low to high	▪ **AVOID-1:** Hazardous Areas ▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-3:** Sensitive Water Features ▪ **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-9:** Movement Corridors ▪ **AVOID-10:** Buffer Setbacks for Wildlife and Wildlife Features	Less than Significant	Special status species are expected to be more vulnerable to indirect habitat loss than other wildlife guilds, as these species have limited ranges or have small or declining populations. During operation, some wildlife species may continue to avoid ROWs and edge habitat due to reduced habitat quality, EMF, or perceived predation risk, and some fish species may avoid habitat due to increased human activity and other identified adverse environmental impacts. Disturbance due to noise and light

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 of transmission facilities could result in changes to habitat quality or access due to sensory disturbance (i.e., noise, light, and visual), EMF, use of herbicides and other chemicals, human presence, avoidance behavior, and changes in water quality (i.e., temperature, pH, sediment, and contaminants).	**Overhead:** low to high **Underground:** low to high	▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-2:** Minimize Transmission Line Crossings at Canyons and Riparian Habitat and Parallel to Rivers and Ridge Lines ▪ **Hab-3:** Decommission 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 ▪ **Wild-14:** Wildlife-Specific Noise Mitigation ▪ **Fish-2:** Design Perpendicular Approaches ▪ **Fish-4:** Fords ▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-6:** Use Low-Impact Design for Roads ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-8:** Reduce EMF on Magnet-Sensitive Species ▪ **Fish-9:** Decontaminate All Gear ▪ **Fish-11:** Regular Maintenance of Infrastructure ▪ **Fish-12:** Reduce Number of Stream Crossings ▪ **Fish-13:** Use Bioengineering ▪ **Fish-14:** Removal of Riparian Vegetation ▪ **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		that is expected during construction would not persist in operation. Following the identified Avoidance Criteria and Mitigation Measures is expected to reduce this impact to less than significant.
	Upgrade	Although no additional direct habitat loss outside of the ROWs is expected during the upgrade of overhead and underground transmission facilities, changes in habitat quality or access could still occur. Similar to the adverse environmental impacts described for new construction, species that are sensitive to human activity would be the most affected, as they would maintain the largest distances from upgrade activities.	**Overhead:** low to high **Underground:** low to high			
	Modification	Modifying existing overhead or underground transmission facilities could result in indirect habitat loss, which could affect special status species similarly to the adverse environmental impacts outlined for new construction.	**Overhead:** low to high **Underground:** low 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
				▪ **W-6:** Minimize Hydrology Changes ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas		
Wildlife – Mortality	New Construction	Sources of wildlife mortality related to the new construction of overhead and underground transmission facilities include nest and burrow destruction, wildlife-vehicle collisions, entrapment in trenching and other open features, and destruction of nuisance wildlife.	**Overhead:** nil to medium **Underground:** nil to medium	▪ **AVOID-8:** Important Habitat ▪ **AVOID-9:** Movement Corridors ▪ **AVOID-10:** Buffer Setbacks for Wildlife and Wildlife Features ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-2:** Minimize Transmission Line Crossings at Canyons and Riparian Habitat and Parallel to Rivers and Ridge Lines ▪ **Hab-3:** Decommission Nonpermanent Roads ▪ **Hab-6:** Worker Education Program ▪ **Wild-1:** Wildlife Timing Windows ▪ **Wild-2:** Construction Occurs during Daylight Hours ▪ **Wild-3:** Incidental Take Permit ▪ **Wild-4:** Wildlife Entrapment in Open Trenches ▪ **Wild-5:** Line Markers on Transmission Lines over Rivers ▪ **Wild-6:** Wildlife-Resistant Waste Containers ▪ **Wild-7:** Wildlife Monitoring	Less than Significant	With the application of Avoidance Criteria and Mitigation Measures, wildlife mortality during construction is expected to be mostly avoidable. Operation and maintenance of overhead transmission facilities could still pose risks for wildlife collisions and electrocutions. Maintenance activities, such as herbicide use and road collisions, may pose a risk to wildlife, although implementation of Mitigation Measures is expected to reduce these risks. Underground transmission facilities are not expected to pose a mortality risk to wildlife during operation and maintenance, except for wildlife-vehicle collisions during maintenance and required vegetation maintenance. Modifications or upgrades of existing transmission facilities can provide opportunities to apply mitigation to reduce mortality, such as adding line markers and
	Operation and Maintenance	Wildlife mortality during operation and maintenance could occur from collisions with overhead transmission lines, electrocutions, road mortality, destruction of nests and burrows during ROW maintenance, wildlife-vehicle collisions, and herbicide/pesticide use. The presence of linear features, such as transmission facility corridors, has been shown to change predator-prey dynamics. These corridors may increase access for predator species while decreasing hiding areas for prey species.	**Overhead:** nil to low **Underground:** nil to negligible			
	Upgrade	Sources of wildlife mortality due to upgrading existing transmission facilities would be similar to those described for the new construction and operation and maintenance stages. These sources could include wildlife-vehicle collisions, destruction of nests and burrows, and entrapment in trenching and other open features. However, the adverse environmental impacts on wildlife are expected to be lower than those described for new construction because they may avoid accessing or using the existing transmission facility corridor. Therefore, it would be less likely for the species to be impacted by upgrade activities.	**Overhead:** nil to low **Underground:** nil to negligible			

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	Although modifying existing transmission facilities would utilize existing transmission facility ROWs, they may need to be expanded to accommodate safety clearances. Expanding the ROW could result in similar sources of wildlife mortality as those described for new construction.	**Overhead:** nil to medium **Underground:** nil to medium	▪ **Wild-8:** Road Rules during Critical Periods for Wildlife ▪ **Wild-9:** No Hunting or Pets ▪ **Wild-10:** Access Management Plan ▪ **Wild-11:** Wildlife Crossing Opportunities along Open Trenches ▪ **Wild-12:** Collision Monitoring ▪ **Wild-13:** Perching Deterrents ▪ **Wild-14:** Wildlife-Specific Noise Mitigation		perching deterrents to reduce risks of collision and electrocution.
Fish – Mortality	New Construction	Fish mortality during the new construction of overhead and underground transmission facilities could result from in-stream works that change water flow or erosion and sedimentation. Fish mortality could also occur due to physical injury or death from equipment, debris, noise, or the physical presence of transmission facility infrastructure. Underground transmission facilities may emit EMF, depending on the strength of the electric current, cable shielding, and other factors that may cause changes in fish behavior. Fish mortality from EMF has not been documented, but exposure to EMF may change embryonic development of some salmonids.	**Overhead:** negligible to low **Underground:** negligible to medium	▪ **AVOID-9:** Important Habitat ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-6:** Worker Education Program ▪ **Wild-14:** Wildlife-Specific Noise Mitigation ▪ **Fish-1:** Least Risk Periods for Fish ▪ **Fish-3:** Isolate Instream Works ▪ **Fish-4:** Fords ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-8:** Reduce EMF on Magnet-Sensitive Species ▪ **Fish-11:** Regular Maintenance of Infrastructure ▪ **Fish-15:** In-stream Sediment Disruption ▪ **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 ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas	Less than Significant	The application of standard BMPs, engineering design considerations, Avoidance Criteria, and Mitigation Measures is expected to reduce potential fish mortality. These Mitigation Measures include using least risk periods for fish, working in isolation, and implementing sediment and erosion control measures. The requirement of regulatory plans and permits generally prevent and/or minimize changes to water quality impacts related to fish mortality from project-related activities.
	Operation and Maintenance	Fish mortality during the operation and maintenance of overhead and underground transmission facilities could occur due to water quality changes from the use of machinery in or near waterbodies. Additionally, there is the potential to create or increase access to previously inaccessible fishing areas, which may affect fish populations, depending on the remoteness of the population and the number of fishers that may take advantage of the new access.	**Overhead:** nil to medium **Underground:** nil to medium			
	Upgrade	Fish mortality during the upgrade of existing transmission facilities could occur during in-stream works, changes in water quality, or machinery/infrastructure impacts.	**Overhead:** nil to medium **Underground:** nil to medium			
	Modification	Fish mortality during the modification of existing transmission facilities could occur during in-stream works, changes in water quality, or machinery impacts.	**Overhead:** negligible to low **Underground:** negligible 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
Special Status Species - Mortality	New Construction	Sources of wildlife mortality due to the new construction of transmission facilities include nest and burrow destruction, collisions with wildlife, entrapment in trenching and other open features, and destruction of nuisance wildlife. Due to the sensitivity of special status species to population decline, mortality would have an increased adverse environmental impact, possibly resulting in changes at a population level.	**Overhead:** nil to high **Underground:** nil to high	▪ **AVOID-7:** Rare, Endangered, or Threatened Plant Species and Sensitive Ecosystems ▪ **AVOID-8:** Important Habitat ▪ **AVOID-9:** Movement Corridors ▪ **AVOID-10:** Buffer Setbacks for Wildlife and Wildlife Features ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-2:** Minimize Transmission Line Crossings at Canyons and Riparian Habitat and Parallel to Rivers and Ridge Lines ▪ **Hab-3:** Decommission Nonpermanent Roads ▪ **Hab-6:** Worker Education Program ▪ **Wild-1:** Wildlife Timing Windows ▪ **Wild-2:** Construction Occurs during Daylight Hours ▪ **Wild-3:** Incidental Take Permit ▪ **Wild-4:** Wildlife Entrapment in Open Trenches ▪ **Wild-5:** Line Markers on Transmission Lines over Rivers ▪ **Wild-6:** Wildlife-Resistant Waste Containers ▪ **Wild-7:** Wildlife Monitoring ▪ **Wild-8:** Road Rules during Critical Periods for Wildlife ▪ **Wild-9:** No Hunting or Pets ▪ **Wild-10:** Access Management Plan ▪ **Wild-11:** Wildlife Crossing Opportunities Along Open Trenches ▪ **Wild-12:** Collision Monitoring ▪ **Wild-13:** Perching Deterrents	Less than Significant	Populations of special status species can be more vulnerable to loss of individuals than other wildlife species. They may be more susceptible to a variety of the listed adverse environmental impacts, such as collision and electrocution, road mortality, and herbicide exposure, in-stream works, water quality changes, and effects of heavy machinery. However, with application of Avoidance Criteria and Mitigation Measures, mortalities are expected to be uncommon for special status species.
	Operation and Maintenance	Special status species mortality during the operation and maintenance of overhead and underground transmission facilities could occur from road mortality, destruction of nests and burrows during ROW maintenance, wildlife-vehicle collisions, and herbicide/pesticide use. As these species are generally protected, hunting pressure is not expected to increase their mortality. Operation and maintenance of overhead transmission facilities may result in special status species mortality from collisions with overhead transmission lines and electrocutions. Additionally, mortality of special status species could occur from changes in predator/prey dynamics. For example, overhead transmission facility infrastructure can create perches for raptors, resulting in increased predation risk for species such as the greater sage-grouse. Special status species populations are typically small or are in decline and are unable to adapt to increased mortality. As such, populations may become vulnerable if they lose even a few individuals.	**Overhead:** nil to medium **Underground:** nil to negligible			
	Upgrade	Wildlife mortality during the upgrade of existing overhead or underground transmission facilities could occur from collisions with wildlife, entrapment in trenching and other open features, and nest and burrow destruction. These impacts are similar to those described for the operation and maintenance stage.	**Overhead:** nil to medium **Underground:** nil to negligible			

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	Sources of special status species mortality during the modification of existing overhead or underground transmission facilities could occur from nest and burrow destruction, destruction of nuisance wildlife, collisions with lines, electrocutions, road mortality, destruction of nests and burrows during ROW maintenance, and herbicide/pesticide use. These impacts are expected to be similar to those described for the new construction phase.	**Overhead:** nil to high **Underground:** nil to high	▪ **Wild-14:** Wildlife-Specific Noise Mitigation ▪ **Fish-1:** Least Risk Periods for Fish ▪ **Fish-3:** Isolate Instream Works ▪ **Fish-4:** Fords ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-8:** Reduce EMF on Magnet-Sensitive Species ▪ **Fish-11:** Regular Maintenance of Infrastructure ▪ **Fish-15:** In-stream Sediment Disruption ▪ **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 ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas		
Wildlife – Barriers to Movement	New Construction	Barriers to movement during the new construction of overhead or underground transmission facilities could occur from physical or perceived barriers to wildlife movement. Physical barriers could include construction fencing, sediment and erosion control measures, and material laydown, while perceived barriers could include human presence, noise, anthropogenic structures, and light.	**Overhead:** nil to medium **Underground:** nil to high	▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-3:** Sensitive Water Features ▪ **AVOID-6:** Old-Growth and Mature Forests ▪ **AVOID-8:** Important Habitat ▪ **AVOID-9:** Movement Corridors ▪ **AVOID-10:** Buffer Setbacks for Wildlife and Wildlife Features ▪ **Hab-2:** Minimize Transmission Line Crossings at Canyons and Riparian	Less than Significant	Creation of new linear features on the landscape is expected to create barriers to movement, though the magnitude of these effects are expected to be reduced through careful project siting, access management planning, and restoration. Upgrades or modification to existing systems are not expected to substantially change barriers to movement during operations.
	Operation and Maintenance	Barriers to movement during operation and maintenance could occur from physical and perceived barriers, changes to predator-prey dynamics, and restricted animal movement across a landscape.	**Overhead:** nil to medium **Underground:** negligible 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	Upgrades are not expected to substantially change existing barriers to movement. However, activities associated with the upgrade could create temporary barriers, such as construction fencing, erosion control measures, or perceived barriers to wildlife movement.	**Overhead:** nil to medium **Underground:** negligible to low	Habitat and Parallel to Rivers and Ridge Lines ▪ **Hab-3:** Decommission Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-6:** Worker Education Program ▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Wild-1:** Wildlife Timing Windows ▪ **Wild-2:** Construction Occurs during Daylight Hours ▪ **Wild-10:** Access Management Plan ▪ **Wild-11:** Wildlife Crossing Opportunities Along Open Trenches ▪ **Wild-14:** Wildlife-Specific Noise Mitigation ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **W-6:** Minimize Hydrology Changes ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas		
	Modification	Modifications are not expected to substantially change existing barriers to movement. However, widening the ROW could exacerbate existing barriers, but it is not expected to add new barriers.	**Overhead:** nil to medium **Underground:** nil to high			
Fish – Barriers to Movement	New Construction	In-stream works, such as the construction of culverts and bridges, associated with the new construction of overhead and underground transmission facilities, can cause barriers to fish passage. These construction activities can cause velocity barriers, bank erosion, slumping, noise, and debris jams, which may cause migration blockage to fish. The new construction of underground transmission facilities may emit EMF, thereby creating a barrier to movement for aquatic species. EMF sensitivity varies by aquatic species, and some aquatic species have been reported to be sensitive to EMF, including salmonids and sturgeon. However, research has not yet determined whether EMF from transmission facilities has an adverse environmental impact on fish species.	**Overhead:** nil to low **Underground:** negligible to medium	▪ **AVOID-1:** Hazardous Areas ▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-3:** Sensitive Water Features ▪ **AVOID-4:** Floodplains ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-2:** Minimize Transmission Line Crossings at Canyons and Riparian Habitat and Parallel to Rivers and Ridge Lines ▪ **Hab-4:** Woody Debris Salvage and Restoration	Less than Significant	Barriers to fish passage are expected be avoidable if all BMPs, regulatory plans or permits, Avoidance Criteria, and Mitigation Measures are properly implemented, including those from Section 3.4, Water Resources (use trenchless construction rather than open-cut or laying on bottom of water).

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	Barriers to movement for fish during the operation and maintenance of transmission facilities are similar to those outlined for new construction. The adverse environmental impact on fish would range, depending on the location, size, and fish-bearing status of the stream. Although not conclusive, underground transmission facilities may emit EMF, thereby creating a barrier to movement for fish species.	**Overhead:** negligible to low **Underground:** negligible to medium	▪ **Wild-14:** Wildlife-Specific Noise Mitigation ▪ **Fish-1:** Least Risk Periods for Fish ▪ **Fish-2:** Design Perpendicular Approaches ▪ **Fish-3:** Isolate Instream Works ▪ **Fish-4:** Fords ▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-6:** Use Low-Impact Design for Roads ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-8:** Reduce EMF on Magnet-Sensitive Species ▪ **Fish-10:** Maintain Fish Passage ▪ **Fish-12:** Reduce Number of Stream Crossings ▪ **Fish-14:** Removal of Riparian Vegetation ▪ **Fish-15:** In-stream Sediment Disruption ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **W-4:** Store Chemicals, Operate Equipment, and Conduct Maintenance Away from Water ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas		
	Upgrade	In-stream works associated with the upgrade of existing overhead or underground transmission facilities could cause temporary barriers to fish passage from velocity barriers, bank erosion, slumping, noise, and debris jams from upgrades of stream crossings. Although not conclusive, upgrading underground transmission facilities may emit EMF, thereby creating a barrier to movement for fish species.	**Overhead:** negligible to low **Underground:** negligible to medium			
	Modification	In-stream works could cause barriers to fish passage from velocity barriers, bank erosion, slumping, noise, and debris jams from the construction of stream crossings. Although not conclusive, underground transmission facilities may emit EMF, thereby creating a barrier to movement for fish species.	**Overhead:** nil to low **Underground:** negligible to medium			
Special Status species – Barriers to Movement	New Construction	Barriers to movement during new construction could occur from physical or perceived barriers to wildlife movement. Due to the sensitivity of special status species to changes in habitat connectivity, barriers to movement are expected to result in increased adverse environmental impacts on these populations.	**Overhead:** nil to high **Underground:** nil to high	▪ **AVOID-1:** Hazardous Areas ▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-3:** Sensitive Water Features ▪ **AVOID-6:** Old-Growth and Mature Forests	Less than Significant	Special status species may be more sensitive to changes in their habitat, resulting in smaller habitat changes causing barriers to movement and perceived barriers to movement compared to other species. For this reason,

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	Barriers to movement during operation and maintenance could occur from physical and perceived barriers, changes to predator-prey dynamics, and restricted animal movement across a landscape.	**Overhead:** nil to high **Underground:** nil to high	▪ **AVOID-7:** Rare, Endangered, or Threatened Plant Species and Sensitive Ecosystems ▪ **AVOID-8:** Important Habitat ▪ **AVOID-9:** Movement Corridors **AVOID-10:** Buffer Setbacks for Wildlife and Wildlife Features ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-2:** Minimize Transmission Line Crossings at Canyons and Riparian Habitat and Parallel to Rivers and Ridge Lines ▪ **Hab-3:** Decommission Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-6:** Worker Education Program ▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Wild-1:** Wildlife Timing Windows ▪ **Wild-2:** Construction Occurs during Daylight Hours ▪ **Wild-10:** Access Management Plan ▪ **Wild-11:** Wildlife Crossing Opportunities along Open Trenches ▪ **Wild-14:** Wildlife-Specific Noise Mitigation ▪ **Fish-1:** Least Risk Periods for Fish ▪ **Fish-2:** Design Perpendicular Approaches ▪ **Fish-3:** Isolate Instream Works ▪ **Fish-4:** Fords ▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-6:** Use Low-Impact Design for Roads ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-8:** Reduce EMF on Magnet-Sensitive Species ▪ **Fish-10:** Maintain Fish Passage		Avoidance Criteria, species-specific management plans, mitigation strategies, and BMPs typically contain actions that are stricter, resulting in reduced adverse environmental impacts on these species. By carefully planning and implementing BMPs and Mitigation Measures, the impact is expected to be less than significant.
	Upgrade	Upgrades are not expected to substantially change existing barriers to movement. However, activities associated with the upgrade could create temporary barriers, such as construction fencing, erosion control measures, or perceived barriers.	**Overhead:** nil to high **Underground:** nil to high			
	Modification	Modifications are not expected to substantially change existing barriers to movement. Widening the ROW could exacerbate existing barriers, but it is not expected to add new barriers.	**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-12:** Reduce Number of Stream Crossings ▪ **Fish-14:** Removal of Riparian Vegetation ▪ **Fish-15:** In-stream Sediment Disruption ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **W-4:** Store Chemicals, Operate Equipment, and Conduct Maintenance Away from Water ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas		
Wildlife - Fragmentation	New Construction	The new construction of overhead and underground transmission facilities can fragment habitat, particularly forested habitats that cannot be maintained on ROWs. Habitat fragmentation results in a patchwork of isolated fragments of habitat with increased edge effects and movement barriers.	**Overhead:** nil to medium **Underground:** nil to medium	▪ **AVOID-1:** Hazardous Areas ▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-3:** Sensitive Water Features ▪ **AVOID-6:** Old-Growth and Mature Forests ▪ **AVOID-8:** Important Habitat ▪ **AVOID-9:** Movement Corridors ▪ **AVOID-10:** Buffer Setbacks for Wildlife and Wildlife Features ▪ **Hab-2:** Minimize Transmission Line Crossings at Canyons and Riparian Habitat and Parallel to Rivers and Ridge Lines ▪ **Hab-3:** Decommission Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-6:** Worker Education Program	Less than Significant	Fragmentation can cause long-term changes to wildlife habitat. Application of BMPs, Avoidance Criteria, and Mitigation Measures are expected to reduce the extent of fragmentation so that this adverse environmental impact does not result in a significant impact on wildlife.
	Operation and Maintenance	Fragmentation initiated during new construction would continue through operation and maintenance.	**Overhead:** nil to medium **Underground:** nil to medium			
	Upgrade	Upgrading existing overhead and underground transmission facilities are not expected to result in a change to habitat fragmentation due to utilizing existing infrastructure and ROWs.	**Overhead:** N/A **Underground:** N/A			

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 existing overhead and underground transmission facilities is not expected to further fragment habitat, as these projects would be primarily, if not completely, within existing ROWs. However, if modifications require widening the ROW, the additional width could further impact species, as discussed under barriers to movement.	**Overhead:** nil to medium **Underground:** nil to medium	▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Wild-1**: Wildlife Timing Windows ▪ **Wild-2:** Construction Occurs during Daylight Hours ▪ **Wild-10:** Access Management Plan ▪ **Wild-11:** Wildlife Crossing Opportunities along Open Trenches ▪ **Wild-14:** Wildlife-Specific Noise Mitigation ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **W-6:** Minimize Hydrology Changes ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas		
Fish - Fragmentation	New Construction	Earthwork in or near waterbodies can cause barriers to fish passage, preventing fish from migrating, which could fragment fish populations. New construction associated with overhead transmission facilities typically requires less earthwork, but access roads, pole foundations, or temporary crossings may still disrupt fish passage depending on location and method. Impacts would depend on stream size, timing, and species present.	**Overhead:** nil to medium **Underground**: negligible to medium	▪ **AVOID-1:** Hazardous Areas ▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-3:** Sensitive Water Features ▪ **AVOID-4:** Floodplains ▪ **AVOID-8:** Important Habitat ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides ▪ **Hab-2:** Minimize Transmission Line Crossings at Canyons and Riparian Habitat and Parallel to Rivers and Ridge Lines ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Wild-14:** Wildlife-Specific Noise Mitigation	Less than Significant	Fragmentation of fish habitat is expected to be avoidable if Avoidance Criteria and Mitigation Measures are properly implemented, including those from Section 3.4 Water (use trenchless construction rather than open-cut or laying on bottom of water).
	Operation and Maintenance	Bridges and culverts may cause velocity barriers, slumping, or debris jams that hinder fish migration. EMF sensitivity varies by aquatic species, but it may cause behavioral changes to fish.	**Overhead:** negligible to low **Underground**: negligible 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	Upgrades to overhead transmission facilities are assumed to avoid in-stream work; however, access improvements or pole replacements near waterways could cause temporary fragmentation. Upgrades to underground transmission often require excavation or conduit replacement, increasing the likelihood of in-stream disruption and fragmentation if earthworks occur near waterbodies. Upgrades of underground transmission facilities may involve re-entry into stream environments for equipment replacement. These temporary earthworks can cause barriers to fish passage, preventing fish from migrating, which could fragment fish populations.	**Overhead:** negligible to low **Underground**: negligible to medium	▪ **Fish-1:** Least Risk Periods for Fish ▪ **Fish-2:** Design Perpendicular Approaches ▪ **Fish-3:** Isolate Instream Works ▪ **Fish-4:** Fords ▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-6:** Use Low-Impact Design for Roads ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-8:** Reduce EMF on Magnet-Sensitive Species ▪ **Fish-10:** Maintain Fish Passage ▪ **Fish-12:** Reduce Number of Stream Crossings ▪ **Fish-14:** Removal of Riparian Vegetation ▪ **Fish-15:** In-stream Sediment Disruption ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings ▪ **W-4:** Store Chemicals, Operate Equipment, and Conduct Maintenance Away from Water ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas		
	Modification	In-stream works can cause barriers to fish passage, preventing fish migration, which could fragment fish populations. Impacts are anticipated to be similar to those described for new construction.	**Overhead:** nil to medium **Underground**: negligible to medium			
Special Status Species – Fragmentation	New Construction	New construction of overhead and underground transmission facilities can fragment habitat, particularly forested habitats that cannot be maintained within ROWs. Habitat fragmentation results in a patchwork of isolated fragments of habitat with increased edge effects and movement barriers.	**Overhead:** nil to high **Underground:** nil to high	▪ **AVOID-1:** Hazardous Areas ▪ **AVOID-2:** Wetland Disturbance ▪ **AVOID-3:** Sensitive Water Features ▪ **AVOID-6:** Old-Growth and Mature Forests ▪ **AVOID-7:** Rare, Endangered, or Threatened Plant Species and Sensitive Ecosystems ▪ **AVOID-8:** Important Habitat ▪ **AVOID-9:** Movement Corridors **AVOID-10:** Buffer Setbacks for Wildlife and Wildlife Features ▪ **Hab-1:** Use of Pesticides, Herbicides, and Fungicides	Less than Significant	Special status species may be more sensitive to fragmentation, but with the application of identified Avoidance Criteria and Mitigation Measures, fragmentation is not expected to be a significant adverse environmental impact on special status species.

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 initiated during new construction would continue through operation and maintenance.	**Overhead:** nil to high **Underground:** nil to high	▪ **Hab-2:** Minimize Transmission Line Crossings at Canyons and Riparian Habitat and Parallel to Rivers and Ridge Lines ▪ **Hab-3:** Decommission Nonpermanent Roads ▪ **Hab-4:** Woody Debris Salvage and Restoration ▪ **Hab-6:** Worker Education Program ▪ **Hab-7:** Retain Wildlife Trees where Practicable ▪ **Wild-1:** Wildlife Timing Windows ▪ **Wild-2:** Construction Occurs during Daylight Hours ▪ **Wild-10:** Access Management Plan ▪ **Wild-11:** Wildlife Crossing Opportunities along Open Trenches ▪ **Wild-14:** Wildlife-Specific Noise Mitigation ▪ **Fish-1:** Least Risk Periods for Fish ▪ **Fish-2:** Design Perpendicular Approaches ▪ **Fish-3:** Isolate Instream Works ▪ **Fish-4:** Fords ▪ **Fish-5:** Delineate Riparian Management Zones ▪ **Fish-6:** Use Low-Impact Design for Roads ▪ **Fish-7:** Work in Dry Conditions ▪ **Fish-8:** Reduce EMF on Magnet-Sensitive Species ▪ **Fish-10:** Maintain Fish Passage ▪ **Fish-12:** Reduce Number of Stream Crossings ▪ **Fish-14:** Removal of Riparian Vegetation ▪ **Fish-15:** In-stream Sediment Disruption ▪ **W-2:** Clear Spanning or Trenchless Methods for Water Crossings		
	Upgrade	There are no anticipated upgrades outside of the ROWs; therefore, there is no change to habitat fragmentation from upgrading existing overhead or underground transmission facilities.	**Overhead:** N/A **Underground:** N/A			
	Modification	Modification of existing overhead and underground transmission facilities is not expected to further fragment habitat, as these projects would be primarily within, if not completely within, existing ROWs.	**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
				▪ **W-4:** Store Chemicals, Operate Equipment, and Conduct Maintenance Away from Water ▪ **Veg-1:** Site Transmission Facilities in Existing ROW or Disturbed Areas		

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.

BMP = best management practice; **EMF** = electromagnetic frequency; **ROW** = right-of-way

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3.6.6 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 3.6-6 through **Figure 3.6-8** presents the environmental sensitivity map for habitat, wildlife and fish resources, identifying areas of varying sensitivity based on the siting criteria described in the following sections.

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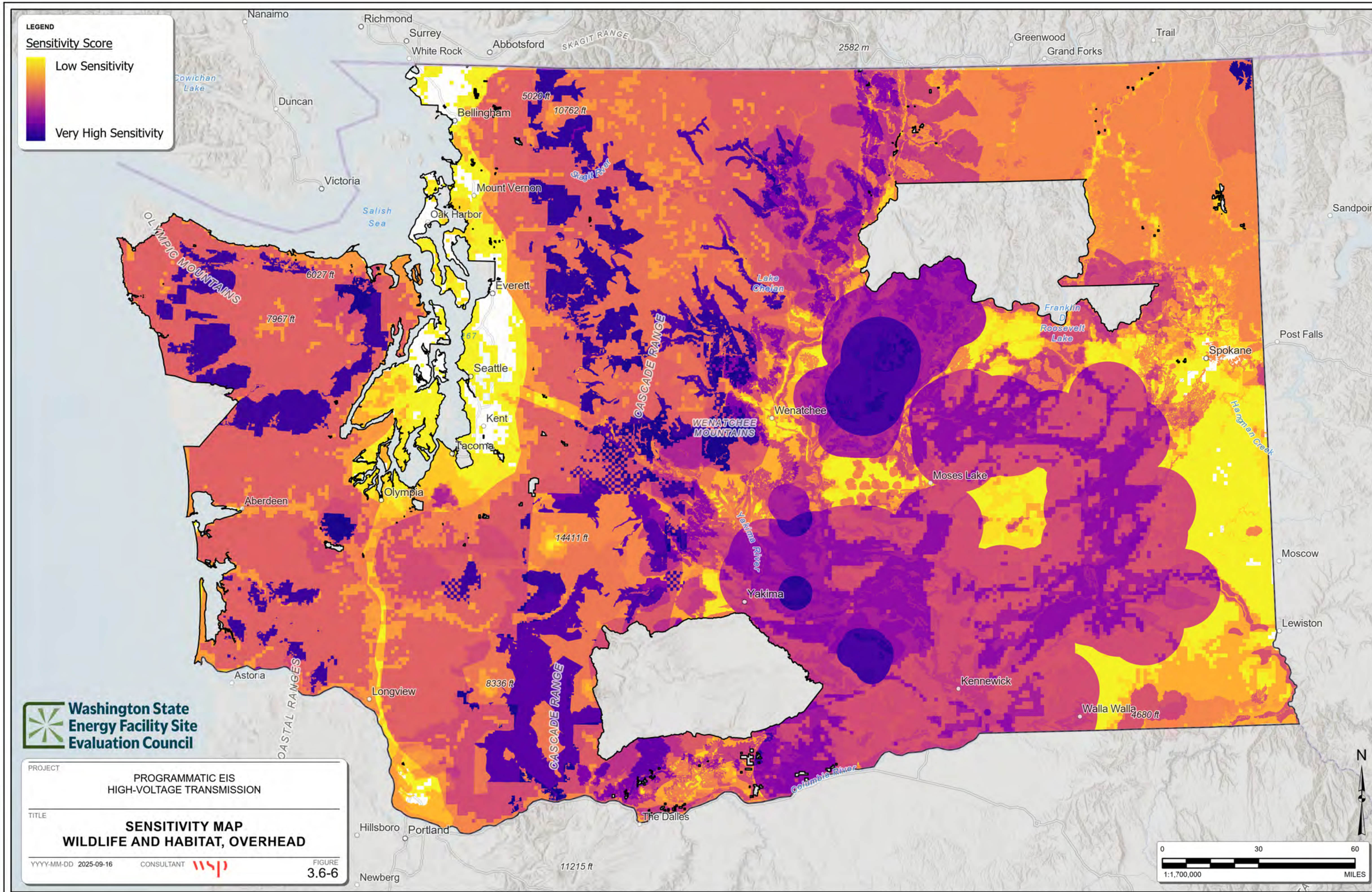

PROJECT
PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION

TITLE
SENSITIVITY MAP
WILDLIFE AND HABITAT, OVERHEAD

YYYY-MM-DD 2025-09-16 CONSULTANT wsp FIGURE 3.6-6

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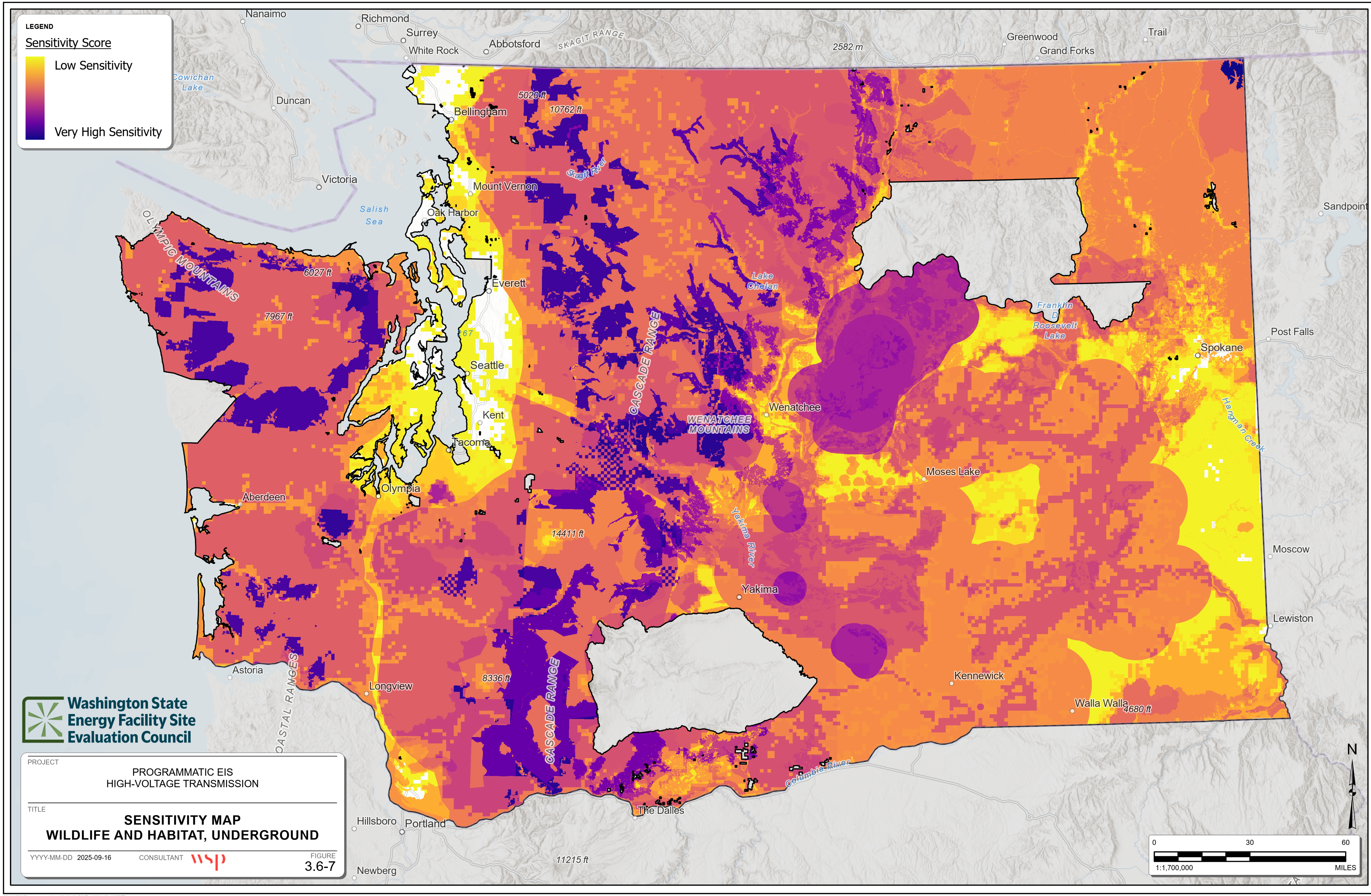

LEGEND
Sensitivity Score
Low Sensitivity
Very High Sensitivity
Nanaimo
Richmond
Surrey
White Rock
Abbotsford
SKAGIT RANGE
2582 m
Greenwood
Grand Forks
Trail
Duncan
Cowichan Lake
Bellingham
5020 ft
10762 ft
Victoria
Skagit River
Mount Vernon
Salish Sea
Oak Harbor
OLYMPIC MOUNTAINS
6027 ft
Everett
Lake Chelan
7967 ft
CASCADE RANGE
Franklin D Roosevelt Lake
Sandpoint
Post Falls
Spokane
Seattle
Wenatchee
WENATCHEE MOUNTAINS
Kent
Hangman Creek
Tacoma
Moses Lake
Olympia
Aberdeen
Yakima River
14411 ft
Moscow
Yakima
Lewiston
Astoria
8336 ft
Kennewick
Longview
Walla Walla
4680 ft
COASTAL RANGES
Columbia River
The Dalles
Hillsboro
Portland
11215 ft
Newberg
Washington State Energy Facility Site Evaluation Council
PROJECT
PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION
TITLE
SENSITIVITY MAP
WILDLIFE AND HABITAT, UNDERGROUND
YYYY-MM-DD 2025-09-16
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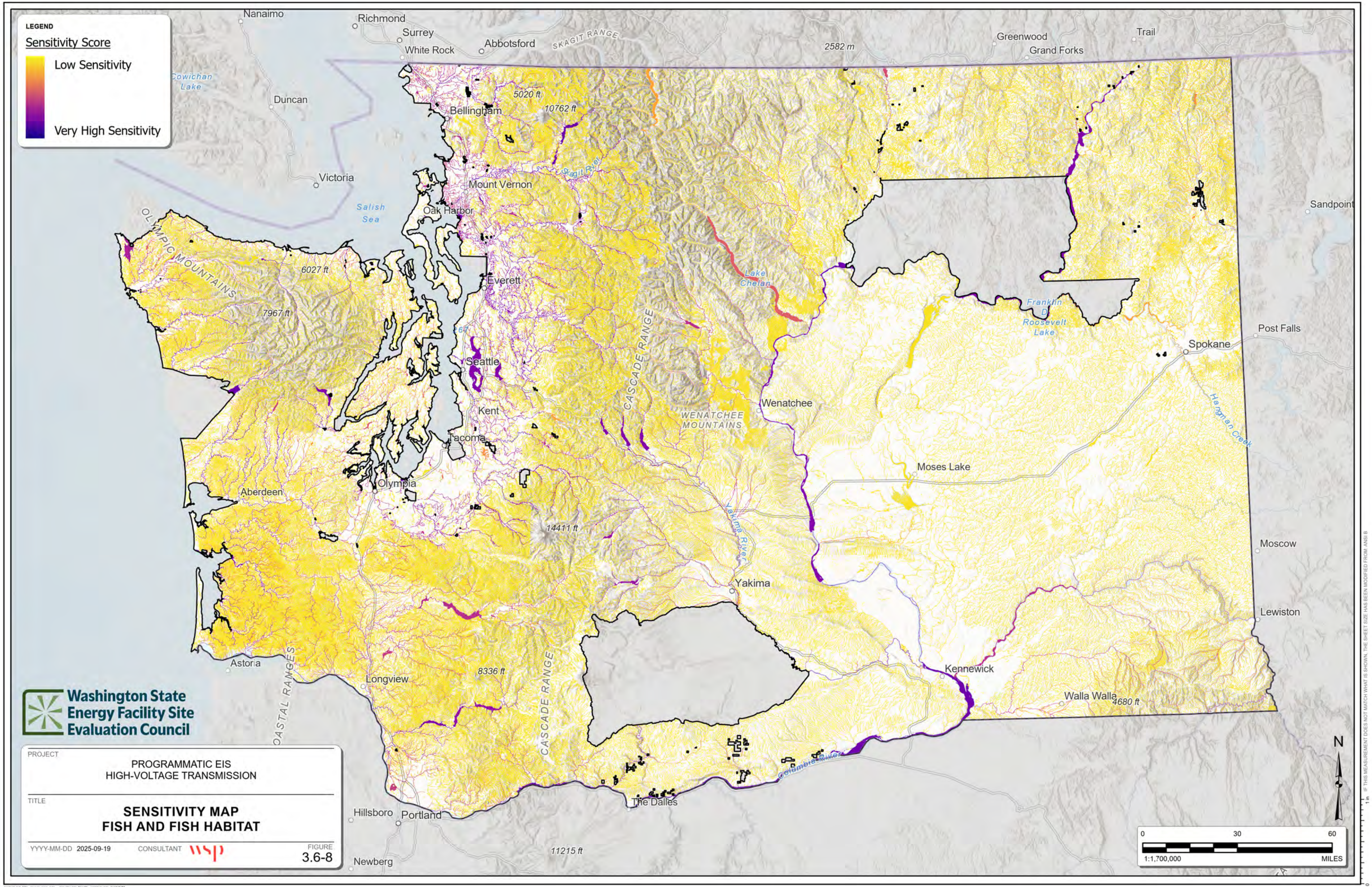
LEGEND
Sensitivity Score
Low Sensitivity
Very High Sensitivity
Washington State Energy Facility Site Evaluation Council
PROJECT
PROGRAMMATIC EIS
HIGH-VOLTAGE TRANSMISSION
TITLE
SENSITIVITY MAP
FISH AND FISH HABITAT
YYYY-MM-DD 2025-09-19
CONSULTANT wsp
FIGURE
3.6-8
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MILES
N
Nanaimo
Richmond
Surrey
White Rock
Abbotsford
SKAGIT RANGE
2582 m
Greenwood
Grand Forks
Trail
Cowichan Lake
Duncan
Bellingham
5020 ft
10762 ft
Skagit River
Victoria
Mount Vernon
Salish Sea
Oak Harbor
OLYMPIC MOUNTAINS
6027 ft
7967 ft
Everett
Lake Chelan
Franklin D. Roosevelt Lake
Spokane
Sandpoint
Post Falls
Seattle
Kent
Tacoma
CASCADE RANGE
WENATCHEE MOUNTAINS
Wenatchee
Hangman Creek
Moses Lake
Olympia
Aberdeen
14411 ft
Yakima River
Yakima
Moscow
Lewiston
Kennewick
Walla Walla
4680 ft
Astoria
Longview
8336 ft
COASTAL RANGES
Columbia River
The Dalles
Hillsboro
Portland
11215 ft
Newberg

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3.6.6.1 Environmental Sensitivity Map Criteria Cards

The environmental sensitivity maps evaluate various siting criteria and assign 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 3.1-1 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.

Direct Wildlife Habitat Loss – Sensitivity Level 3

Figure 3.6-9 illustrates the spatial extent of critical habitat and other areas designated as “Level 3 Sensitivity” when considering direct risk of habitat loss from overhead or underground transmission facility development. Wildlife and habitat in this category include the following:

- American white pelican breeding occurrences (plus 1,600-meter buffer) (WDFW 2024s)
- Marbled murrelet critical habitat (USFWS 2024d, 2024e; WDFW 2024s)
- Mountain caribou critical habitat (USFWS 2024d)
- Sage-grouse lek breeding occurrences (plus 5-mile buffer) (USFWS 2024f; WDFW 2024s)
- Spotted owl critical habitat (USFWS 2024d, 2024g; WDFW 2024s)
- Western grey squirrel critical habitat (WDFW 2024s)

Areas were classified as having a Level 3 sensitivity to direct wildlife habitat loss if they exhibited overlap with endangered species and species with highly limited habitat. Wildlife species with highly specialized habitat requirements (e.g., specific breeding colony locations) or species that require contiguous mature forest (e.g., spotted owl) and are highly sensitive to loss of habitat are included in this category. To further refine the analysis, spatial setbacks of approximately 1 mile (1.6 km) from known American white pelican breeding occurrences and 5 miles (8 km) from sage-grouse lek breeding occurrences.

Direct Wildlife Habitat Loss – Sensitivity Level 2

Figure 3.6-10 illustrates the spatial extent of critical habitat and other areas designated as "Level 2 Sensitivity" when considering direct risk of habitat loss from overhead or underground transmission facility development. Wildlife and habitat in this category include the following:

- Canadian lynx critical habitat (USFWS 2024d, 2024h; WDFW 2024s)
- Common loon breeding areas (plus 150-meter buffer) (WDFW 2024s)
- Ferruginous hawk breeding habitat core area (plus 20-kilometer buffer) (WDFW 2024s)
- Fisher core habitat (USFWS 2024d)
- Grey wolf habitat (USFWS 2024d, 2024i)
- Grizzly bear habitat (USFWS 2024j)
- Habitat concentration areas designated as high and very high (WHCG 2013)
- Important bird areas (Audubon 2013)
- Larch Mountain salamander core habitat (WDFW 2024s)
- Oregon spotted frog critical habitat (USFWS 2024d, 2024k; WDFW 2024s)
- Pygmy rabbit habitat area (USFWS 2024l; WDFW 2024s)
- Streaked horned lark critical habitat and breeding areas (plus 30-meter buffer) (USFWS 2024d; WDFW 2024s)
- Wolverine current range (USFWS 2024m)

Areas were classified as having a Level 2 sensitivity to direct habitat loss if they exhibited overlap with species with limited ranges or heightened sensitivity to habitat loss that may be significantly impacted by new transmission ROW construction. This category also includes areas that support unique, limiting, or high-value habitats, areas that support federal and state listed species, and forests and important wildlife areas identified through habitat concentration areas and IBAs. To further refine the analysis, spatial setbacks of approximately 100 feet (30 meters) from known streaked horned lark breeding areas and 500 feet (150 meters) from common loon breeding areas were applied to exclude high-risk zones. Ferruginous hawk breeding habitat core areas include a 12.5-mile (20 km) buffer.

Direct Wildlife Habitat Loss – Sensitivity Level 1

Figure 3.6-11 illustrates the spatial extent of critical habitat and other areas designated as Sensitivity Level 1 when considering direct risk of habitat loss from overhead or underground transmission facility development. Wildlife and habitat in this category include the following:

- Golden eagle breeding areas (plus 300-meter buffer) (WDFW 2024s)
- Habitat concentration areas designated as moderate (WHCWG 2013)
- Mardon skipper critical habitat (WDFW 2024s)
- Mazama pocket gopher critical habitat (USFWS 2024d; WDFW 2024s)
- Oregon silverspot butterfly critical habitat (USFWS 2024d; WDFW 2024s)
- Western snowy plover critical habitat (USFWS 2024d; WDFW 2024s)
- Taylor's checkerspot critical habitat (USFWS 2024d; WDFW 2024s)
- Western pond turtle habitat area (plus 500-meter buffer) (WDFW 2024s)

Areas were classified as having Sensitivity Level 1 for direct wildlife habitat loss if they exhibited minimal overlap with critical wildlife features and could be feasibly spanned or restored post-construction, such as open habitats and wetlands.

Wildlife Habitat Fragmentation – Sensitivity Level 3

Figure 3.6-12 illustrates the spatial extent of critical habitat and other areas designated as "Level 3 Sensitivity" when considering risk of habitat fragmentation from overhead or underground transmission facility development. Wildlife and habitat in this category include the following:

- Marbled murrelet critical habitat (USFWS 2024d, 2024e; WDFW 2024s)
- Mountain caribou critical habitat (USFWS 2024d)
- Spotted owl critical habitat (USFWS 2024d, 2024g; WDFW 2024s)

Areas were classified as having a Level 3 sensitivity to habitat fragmentation that support federally and state-listed threatened or endangered species highly sensitive to habitat fragmentation, including species that are dependent on contiguous mature forest.

Wildlife Habitat Fragmentation – Sensitivity Level 2

Figure 3.6-13 illustrates the spatial extent of critical habitat and other areas designated as "Level 2 Sensitivity" when considering risk of habitat fragmentation from overhead or underground transmission facility development. Wildlife and habitat in this category include the following:

- Canadian lynx critical habitat (USFWS 2024d, 2024h; WDFW 2024s)
- Ferruginous hawk breeding habitat core area (plus 20-kilometer buffer) (WDFW 2024s)
- Fisher core habitat (USFWS 2024d)
- Grizzly bear habitat (USFWS 2024j)
- Habitat concentration areas designated as high and very high (WHCWG 2013)
- Sage-grouse lek breeding occurrences (plus 5-mile buffer) (USFWS 2024f; WDFW 2024s)

Areas were classified as having a Level 2 risk from habitat fragmentation include areas identified to support species that are moderately vulnerable to fragmentation. To further refine the analysis, the following spatial setbacks were applied: a 12.5-mile (20 km) buffer around ferruginous hawk breeding habitat core areas, and a 5-mile (8 km) buffer around sage-grouse lek breeding occurrences.

Wildlife Habitat Fragmentation – Sensitivity Level 1

Figure 3.6-14 illustrates the spatial extent of critical habitat and other areas designated as Sensitivity Level 1 when considering risk of habitat fragmentation from overhead or underground transmission facility development. Wildlife and habitat in this category include the following:

- American white pelican breeding occurrences (plus 1,600-meter buffer) (WDFW 2024s)
- Common loon breeding areas (plus 150-meter buffer) (WDFW 2024s)

- Habitat concentration areas designated as moderate (WHCWG 2013)
- Larch Mountain salamander core habitat (WDFW 2024s)
- Mazama pocket gopher critical habitat (USFWS 2024d; WDFW 2024s)
- Oregon silverspot butterfly critical habitat (USFWS 2024d; WDFW 2024s)
- Oregon spotted frog critical habitat (USFWS 2024d, 2024k; WDFW 2024s)
- Pygmy rabbit habitat area (USFWS 2024l; WDFW 2024s)
- Streaked horned lark critical habitat and breeding areas (plus 30-meter buffer) (USFWS 2024d; WDFW 2024s)
- Taylor's checkerspot critical habitat (USFWS 2024d; WDFW 2024s)
- Western grey squirrel critical habitat (WDFW 2024s)
- Western pond turtle habitat area (plus 500-meter buffer) (WDFW 2024s)
- Western snowy plover critical habitat (WDFW 2024s)

Areas classified as having a Level 1 risk from habitat fragmentation include naturally open areas, habitats that can be avoided, and areas that can be restored during operation. To further refine the analysis, the following spatial setbacks were applied: 500-foot (150-meter) buffer around common loon breeding areas, a 1-mile (1,600-meter) buffer around American white pelican breeding sites, and a 1,640-foot (500-meter) buffer around western pond turtle habitat.

Barriers to Wildlife Movement – Sensitivity Level 3

Figure 3.6-15 illustrates the spatial extent of critical habitat and other areas designated as “Level 3 Sensitivity” when considering barriers to wildlife movement from overhead or underground transmission facility development. Wildlife and habitat in this category include the following:

- Mountain caribou critical habitat (USFWS 2024d)
- Sage-grouse lek breeding occurrences (plus 5-mile buffer) (USFWS 2024f; WDFW 2024s)
- Spotted owl critical habitat (USFWS 2024d, 2024g; WDFW 2024s)
- Landscape connectivity values characterized by WDFW as high to very high statewide and very high regionally (WDFW 2025)

Areas that were classified as having a Level 3 sensitivity to the creation of barriers to movement include areas that could have species federally or state listed as endangered and threatened, with limited ability to cross ROWs. To further refine the analysis, the following spatial setbacks were applied: a 5-mile buffer around sage-grouse lek breeding occurrences.

Barriers to Wildlife Movement – Sensitivity Level 2

Figure 3.6-16 illustrates the spatial extent of critical habitat and other areas designated as "Level 2 Sensitivity" when considering barriers to wildlife movement from overhead or underground transmission facility development. Wildlife and habitat in this category include the following:

- Canadian lynx critical habitat (USFWS 2024d, 2024h; WDFW 2024s)
- Ferruginous hawk breeding habitat core area (plus 20-kilometer buffer) (WDFW 2024s)
- Fisher core habitat (USFWS 2024d)
- Habitat concentration areas designated as high and very high (WHCWG 2013)
- Marbled murrelet critical habitat (USFWS 2024d, 2024e; WDFW 2024s)
- Landscape connectivity values characterized by WDFW as moderate value statewide and high regionally (WDFW 2025)

Areas that were classified as having a Level 2 sensitivity to the creation of barriers to movement include areas that could support movement patterns of federally or state-listed endangered and threatened species with some ability to cross ROWs. To further refine the analysis, the following spatial setbacks were applied: 12.5-mile (20 km) buffer around ferruginous hawk nests.

Barriers to Wildlife Movement – Sensitivity Level 1

Figure 3.6-17 illustrates the spatial extent of critical habitat and other areas designated as Sensitivity Level 1 when considering barriers to wildlife movement from overhead or underground transmission facility development. Wildlife and habitat in this category include the following:

- American white pelican breeding occurrences (plus 1,600-meter buffer) (WDFW 2024s)
- Common loon breeding areas (plus 150-meter buffer) (WDFW 2024s)

- Grey wolf habitat (USFWS 2024d, 2024i)
- Grizzly bear habitat (USFWS 2024j)
- Habitat concentration areas designated as moderate (WHCWG 2013)
- Larch Mountain salamander core habitat (WDFW 2024s)
- Mazama pocket gopher critical habitat (USFWS 2024d; WDFW 2024s)
- Oregon silverspot butterfly critical habitat (USFWS 2024d; WDFW 2024s)
- Pygmy rabbit habitat area (USFWS 2024l; WDFW 2024s)
- Western snowy plover critical habitat (USFWS 2024d; WDFW 2024s)
- Streaked horned lark critical habitat and breeding areas (plus 30-meter buffer) (USFWS 2024d; WDFW 2024s)
- Taylor's checkerspot critical habitat (USFWS 2024d; WDFW 2024s)
- Western grey squirrel critical habitat (WDFW 2024s)
- Western pond turtle habitat area (plus 500-meter buffer) (WDFW 2024s)
- Landscape connectivity values between 1 and 5 (WDFW 2025)

Areas classified as having Sensitivity Level 1 for barriers to wildlife movement include habitats allocated for species that occur in naturally open areas, habitats that can be spanned by a transmission line, and species that can continue to cross transmission ROWs. To further refine the analysis, the following spatial setbacks were applied: a 1,640-foot (500-meter) buffer around western pond turtle habitat, a 100-foot (30-meter) buffer around streaked horned lark critical habitat and breeding areas, a 500-foot (150-meter) buffer around common loon breeding areas, and a 1-mile (1,600-meter) buffer around American white pelican breeding sites were provided in the dataset.

Indirect Wildlife Habitat Loss (Overhead) – Sensitivity Level 2

Figure 3.6-18 illustrates the spatial extent of critical habitat and other areas designated as "Level 2 Sensitivity" when considering indirect risk of habitat loss from overhead transmission facility development. Wildlife and habitat in this category include:

- Common loon breeding areas (plus 150-meter buffer) (WDFW 2024s)

- Ferruginous hawk breeding habitat core area (plus 20-km buffer) (WDFW 2024s)
- Habitat concentration areas designated as high and very high (WHCWG 2013)
- Marbled murrelet critical habitat (USFWS 2024c, 2024d; WDFW 2024s)
- Mountain caribou critical habitat (USFWS 2024c)
- Sage-grouse lek breeding occurrences (plus 5-mile buffer) (USFWS 2024e; WDFW 2024s)
- Spotted owl critical habitat (USFWS 2024e; WDFW 2024s)

Areas were classified as having a Level 2 sensitivity to indirect habitat loss for state or federally listed endangered and threatened species, as well as non-listed species sensitive to disturbance. To further refine the analysis, spatial setbacks of 12-mile (20-km) buffer around ferruginous hawk nests, a 500-foot (150-meter) buffer around common loon breeding areas, and a 5-mile (8-km) buffer around sage-grouse lek breeding occurrences.

Indirect Wildlife Habitat Loss (Overhead) – Sensitivity Level 1

Figure 3.6-19 illustrates the spatial extent of critical habitat and other areas designated as Sensitivity Level 1 when considering indirect risk of habitat loss from overhead transmission facility development. Wildlife and habitat in this category include:

- American white pelican breeding occurrences (plus 1,600-meter buffer) (WDFW 2024s)
- Fisher core habitat (USFWS 2024c)
- Golden eagle breeding areas (plus 300-meter grizzly bear habitat) (WDFW 2024s)
- Larch Mountain salamander core habitat (WDFW 2024s)
- Mazama pocket gopher critical habitat (WDFW 2024s)
- Oregon silverspot butterfly critical habitat (WDFW 2024s)
- Oregon spotted frog critical habitat (USFWS 2024c, 2024j; WDFW 2024s)
- Pygmy rabbit habitat area (USFWS 2024k; WDFW 2024s)
- Streaked horned lark critical habitat and breeding areas (plus 30-meter buffer) (USFWS 2024c; WDFW 2024s)

- Taylor's checkerspot critical habitat (USFWS 2024c; WDFW 2024s)
- Western grey squirrel critical habitat (WDFW 2024s)
- Western pond turtle habitat area (plus 500-meter buffer) (WDFW 2024s)
- Western snowy plover critical habitat (WDFW 2024s)
- Wolverine current range (WDFW 2024s)

Areas were classified as having Sensitivity Level 1 for indirect habitat loss for species less sensitive to disturbance or state or federally listed species that inhabit areas which can be spanned or avoided. This category also includes species that are less affected by disturbance or may experience reduced vulnerability to indirect habitat loss from overhead transmission lines. To further refine the analysis, spatial setbacks of approximately 100 feet (30 meters) from known streaked horned lark breeding areas, 1 mile (1.6 km) from known American white pelican breeding occurrences, approximately 1,640 feet (500 meters) from western pond turtle habitat, and 1,000 feet (300 meters) from golden eagle nests.

Sensitive Wildlife at Risk of Mortality (Overhead) – Sensitivity Level 3

Figure 3.6-20 illustrates the spatial extent of critical habitat and other areas designated as "Level 3 Sensitivity" when considering risk of wildlife mortality from overhead transmission facility development. Wildlife and habitat in this category include the following:

- American white pelican breeding occurrences (plus 1,600-meter buffer) (WDFW 2024s)
- Ferruginous hawk breeding habitat core area (plus 20-kilometer buffer) (WDFW 2024s)
- Mountain caribou critical habitat (USFWS 2024f)

Areas were classified as having a Level 3 risk of mortality include those that support federally and state listed species that are vulnerable to mortality from the new construction and operation of overhead transmission lines and are vulnerable to further loss of individuals. To further refine the analysis, the following spatial setbacks were applied: 1 mile (1.6 km) from known American white pelican breeding occurrences and a 12.5-mile (20-km) buffer around ferruginous hawk nests.

Sensitive Wildlife at Risk of Mortality (Overhead) – Sensitivity Level 2

Figure 3.6-21 illustrates the spatial extent of critical habitat and other areas designated as "Level 2 Sensitivity" when considering risk of wildlife mortality from overhead transmission facility development. Wildlife and habitat in this category include the following:

- Golden eagle breeding areas (plus 300-meter buffer) (WDFW 2024s)
- Habitat concentration areas designated as high and very high (WHCWG 2013)
- Marbled murrelet critical habitat (USFWS 2024d, 2024e; WDFW 2024s)
- Pygmy rabbit habitat area (USFWS 2024l; WDFW 2024s)
- Sage-grouse lek breeding occurrences (plus 5-mile buffer) (USFWS 2024f; WDFW 2024s)
- Spotted owl critical habitat (USFWS 2024d, 2024g; WDFW 2024s)

Areas that were classified as having a Level 2 risk of mortality include habitats that identified or documented as supporting species with populations vulnerable to individual losses and vulnerable to mortality from transmission lines (e.g., large-bodied birds), including those at risk due to collisions, electrocutions, and changes in predator/prey dynamics. To further refine the analysis, the following spatial setbacks were applied: a 12-mile (20-km) buffer around ferruginous hawk nests and a 5-mile (8-km) buffer around golden eagle breeding areas.

Sensitive Wildlife at Risk of Mortality (Overhead)– Sensitivity Level 1

Figure 3.6-22 illustrates the spatial extent of critical habitat and other areas designated as Sensitivity Level 1 when considering risk of wildlife mortality from overhead transmission facility development. Wildlife and habitat in this category include the following:

- Common loon breeding areas (plus 150-meter buffer) (WDFW 2024s)
- Mazama pocket gopher critical habitat (USFWS 2024d; WDFW 2024s)
- Oregon spotted frog critical habitat (USFWS 2024d, 2024k; WDFW 2024s)
- Streaked horned lark critical habitat and breeding areas (plus 30-meter buffer) (USFWS 2024d; WDFW 2024s)
- Western grey squirrel critical habitat (WDFW 2024s)

- Western snowy plover critical habitat (USFWS 2024d; WDFW 2024s)

Areas were classified as having a Level 1 risk of mortality include those that can be spanned by transmission lines (e.g., wetlands), habitats identified for non-aerial species, or habitats identified for species that do not fly at the height of transmission lines are less likely to interact with overhead transmission facilities. To further refine the analysis, spatial setbacks of 500 feet (150 meters) were implemented around common loon breeding areas and a 100-foot (30-meter) buffer around streaked horned lark critical habitat and breeding areas.

Indirect Wildlife Habitat Loss (Underground) – Sensitivity Level 2

Figure 3.6-23 illustrates the spatial extent of critical habitat and other areas designated as "Level 2 Sensitivity" when considering indirect risk of habitat loss from underground transmission facility development. Wildlife and habitat in this category include:

- Spotted owl critical habitat (USFWS 2024c, 2024f; WDFW 2024s)
- Marbled murrelet critical habitat (USFWS 2024c, 2024d; WDFW 2024s)
- Mountain caribou critical habitat (USFWS 2024c)
- Western grey squirrel critical habitat (WDFW 2024s)

Areas were classified as having a Level 2 sensitivity to indirect habitat loss for state or federally listed endangered and threatened species, as well as non-listed species sensitive to disturbance. Federally and state listed species may be particularly vulnerable to behavioral disruptions and other forms of indirect habitat loss caused by underground transmission lines.

Indirect Wildlife Habitat Loss (Underground) – Sensitivity Level 1

Figure 3.6-24 illustrates the spatial extent of critical habitat and other areas designated as Sensitivity Level 1 when considering indirect risk of habitat loss from underground transmission facility development. Wildlife and habitat in this category include:

- American white pelican breeding occurrences (plus 1,600-meter buffer) (WDFW 2024s)
- Common loon breeding areas (plus 150-meter buffer)

- Ferruginous hawk breeding habitat core area (plus 20-kilometer buffer) (WDFW 2024s)
- Fisher core habitat (USFWS 2024c)
- Golden eagle breeding areas (plus 300-meter buffer) (WDFW 2024s)
- Grey wolf habitat (USFWS 2024c, 2024h)
- Grizzly bear habitat (USFWS 2024i)
- Habitat concentration areas designated from low to very high (WHCWG 2013)
- Larch Mountain salamander core habitat (WDFW 2024s)
- Canadian lynx critical habitat (USFWS 2024c, 2024g; WDFW 2024s)
- Mazama pocket gopher critical habitat (USFWS 2024c; WDFW 2024s)
- Oregon spotted frog critical habitat (USFWS 2024c, 2024j; WDFW 2024s)
- Pygmy rabbit habitat area (USFWS 2024k; WDFW 2024s)
- Sage-grouse lek breeding occurrences (plus 5-mile buffer) (USFWS 2024e; WDFW 2024s)
- Western snowy plover critical habitat (USFWS 2024c; WDFW 2024s)
- Streaked horned lark critical habitat and breeding areas (plus 30-meter buffer) (USFWS 2024c; WDFW 2024s)
- Taylor's checkerspot critical habitat (USFWS 2024c; WDFW 2024s)
- Western pond turtle habitat area (plus 500-meter buffer) (WDFW 2024s)
- Wolverine current range (USFWS 2024l)

Areas were classified as having Sensitivity Level 1 for indirect wildlife habitat loss if they overlap with species less sensitive to disturbance or state or federally listed species that inhabit areas which can be spanned or avoided. Species in such habitats, or those less affected by disturbance, may experience reduced vulnerability to indirect habitat loss from underground transmission lines. To further refine the analysis, spatial setbacks of 12-mile (20-km) buffer around ferruginous hawk nests, a 5-mile (8-km) buffer around sage-grouse lek breeding occurrence, a 1-mile (1,600-meter) buffer around American white pelican breeding sites, 492-foot (150-meter) buffer common loon breeding areas, and a 0.3-mile (500-meter) buffer around western pond turtle critical habitat were provided in the dataset, 100-foot (30-meter) buffer around streaked horned lark critical habitat and breeding areas.

Sensitive Wildlife at Risk of Mortality (Underground) - Sensitivity Level 3

Figure 3.6-25 illustrates the spatial extent of critical habitat and other areas designated as "Level 3 Sensitivity" when considering risk of wildlife mortality from underground transmission facility development. Wildlife and habitat in this category include mountain caribou critical habitat.

Areas were classified as having a Level 3 risk of mortality include those habitats of federally and state listed species with populations vulnerable to loss of individuals, and changes in predator/prey dynamics. With populations of federally and state listed species already in decline, these species are particularly vulnerable to further losses.

Sensitive Wildlife at Risk of Mortality (Underground) – Sensitivity Level 1

Figure 3.6-26 illustrates the spatial extent of critical habitat and other areas designated as Sensitivity Level 1 when considering risk of wildlife mortality from underground transmission facility development. Wildlife and habitat in this category include:

- American white pelican breeding occurrences (plus 1,600-meter buffer) (WDFW 2024s)
- Common loon breeding areas (plus 150-meter buffer) (WDFW 2024s)
- Ferruginous hawk breeding habitat core area (plus 20-kilometer buffer) (WDFW 2024s)
- Golden eagle breeding areas (plus 300-meter buffer) (WDFW 2024s)
- Habitat concentration areas designated from low to very high (WHCWG 2013)
- Larch Mountain salamander core habitat (WDFW 2024s)
- Marbled murrelet critical habitat (USFWS 2024c, 2024d; WDFW 2024s)
- Mazama pocket gopher critical habitat (USFWS 2024c; WDFW 2024s)
- Oregon spotted frog critical habitat (USFWS 2024c, 2024j; WDFW 2024s)
- Pygmy rabbit habitat area (USFWS 2024k; WDFW 2024s)

- Sage-grouse lek breeding occurrences (plus 5-mile buffer) (USFWS 2024e; WDFW 2024s)
- Western snowy plover critical habitat (USFWS 2024c; WDFW 2024s)
- Spotted owl critical habitat (USFWS 2024c, 2024f; WDFW 2024s)
- Streaked horned lark critical habitat and breeding areas (plus 30-meter buffer) (USFWS 2024c; WDFW 2024s)
- Western grey squirrel critical habitat (WDFW 2024s)

Areas were classified as having a Level 1 risk of mortality including those habitat for species and populations that are less vulnerable to loss of individuals from a population and species that occur in habitats that can be spanned by transmission lines (e.g., wetlands).

Fish Habitat Loss – Sensitivity Level 2

Figure 3.6-27 illustrates the spatial extent of bull trout, Chinook, coho, and steelhead habitat plus a 240-foot buffer (Ecology, USFS, and BLM 2025; USFWS 2025;WDFW 2024t). Areas were classified as having a Level 2 sensitivity from habitat loss where habitat extent of federally listed (endangered or threatened) fish species that would be directly impacted by new transmission line construction and operations. This includes species that are highly sensitive to habitat disturbance, have low population abundance, limited range, or are located in watercourses where new overhead transmission construction and operations will impact habitat. Watercourses or waterbodies that have been compensated or adopted by local governments are also vulnerable to impacts from new transmission line construction and operations.

A 240-foot riparian buffer on either side of watercourses was provided in the dataset. Riparian buffers are based on the riparian widths recommended in Riparian Ecosystems, Volume 2 Management Recommendations (Rentz et al. 2020). A 240-foot riparian buffer was added based on the mean height of riparian old-growth forest in Washington, as described in Rentz et al. (2020). Although recommended riparian buffers may vary throughout Washington, and different counties may have different recommended buffer widths, a buffer width of 240 feet was used to be conservative.

Fish Habitat Loss – Sensitivity Level 1

Figure 3.6-28 illustrates the spatial extent of Olympic mudminnow, chum, sockeye, and pygmy whitefish habitat distribution plus a 240-foot buffer (Ecology, USFS, and

BLM; WDFW 2024s, 2024t). Areas were classified as Sensitivity Level 1 for fish habitat loss where habitat supports candidate species at risk of direct impacts, as well as federally listed endangered, threatened, and candidate species at risk of indirect impacts. This included species that are federally listed as endangered or threatened, are more tolerant to short-term changes in habitat, or are less likely to be impacted by transmission line construction or operations due to habitat location or the types of waterbodies that they inhabit.

A 240-foot riparian buffer on either side of watercourses was provided in the dataset. Riparian buffers are based on the riparian widths recommended in Riparian Ecosystems, Volume 2 Management Recommendations (Rentz et al. 2020). A 240-foot riparian buffer was added based on the mean height of riparian old-growth forest in Washington, as described in Rentz et al. (2020). Although recommended riparian buffers may vary throughout Washington, and different counties may have different recommended buffer widths, a buffer width of 240 feet was used to be conservative.

Watercourses and Waterbodies – Sensitivity Level 1

Figure 3.6-29 illustrates the spatial extent of NHD Watercourses plus a 240-foot buffer and NHD waterbodies (Ecology, USFS, and BLM 2025). Instream impacts may still occur in all watercourses and waterbodies, which includes changes downstream to fish-bearing habitat, or possible fish presence.

A 240-foot riparian buffer on either side of watercourses was provided in the dataset. Riparian buffers are based on the riparian widths recommended in Riparian Ecosystems, Volume 2 Management Recommendations (Rentz et al. 2020). A 240-foot riparian buffer was added based on the mean height of riparian old-growth forest in Washington, as described in Rentz et al. (2020). Although recommended riparian buffers may vary throughout Washington, and different counties may have different recommended buffer widths, a buffer width of 240 feet was used to be conservative.

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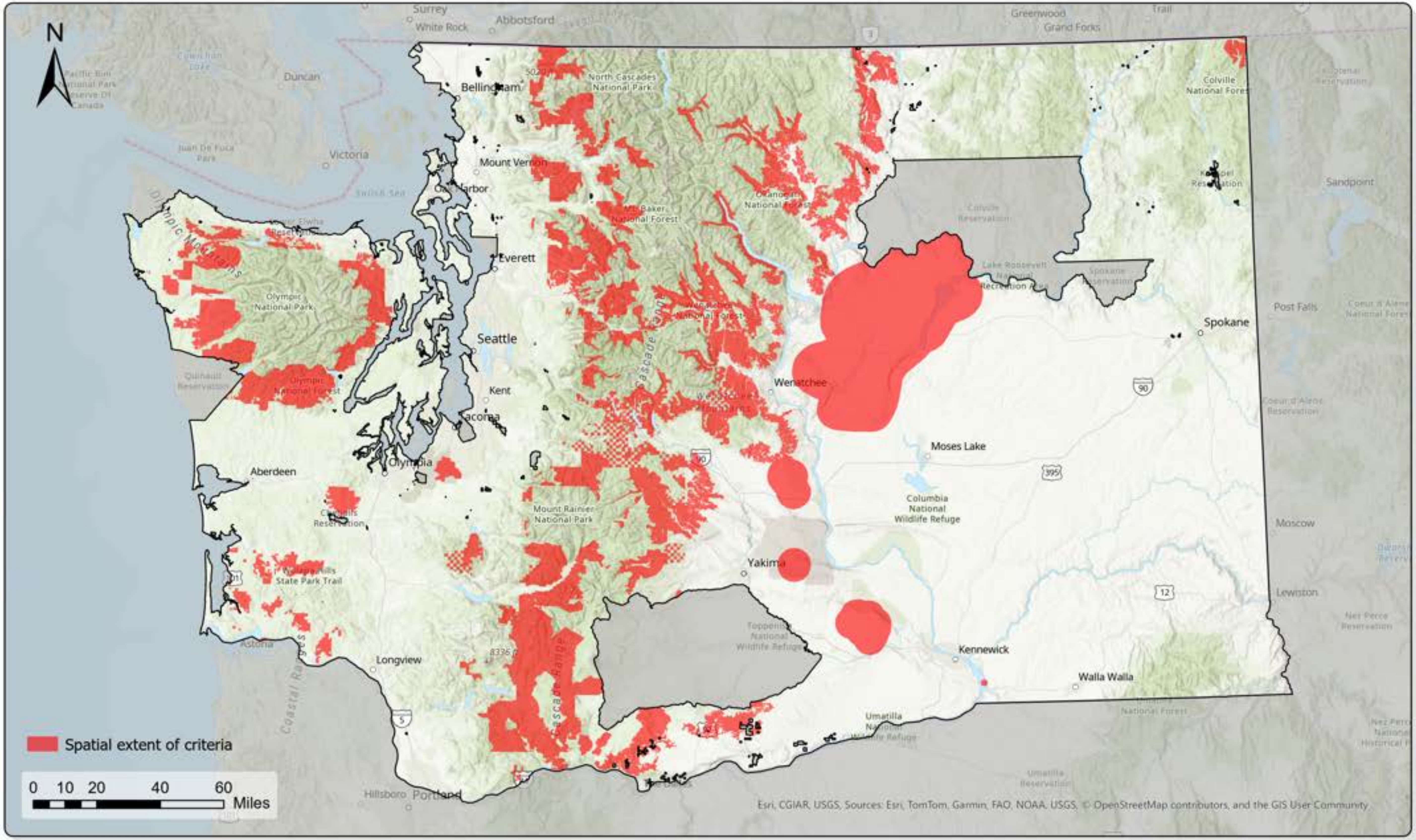
Direct Wildlife Habitat Loss – Sensitivity Level 3

Washington State Energy Facility Site Evaluation Council



HABITAT, WILDLIFE AND FISH

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Figure 3.6-9

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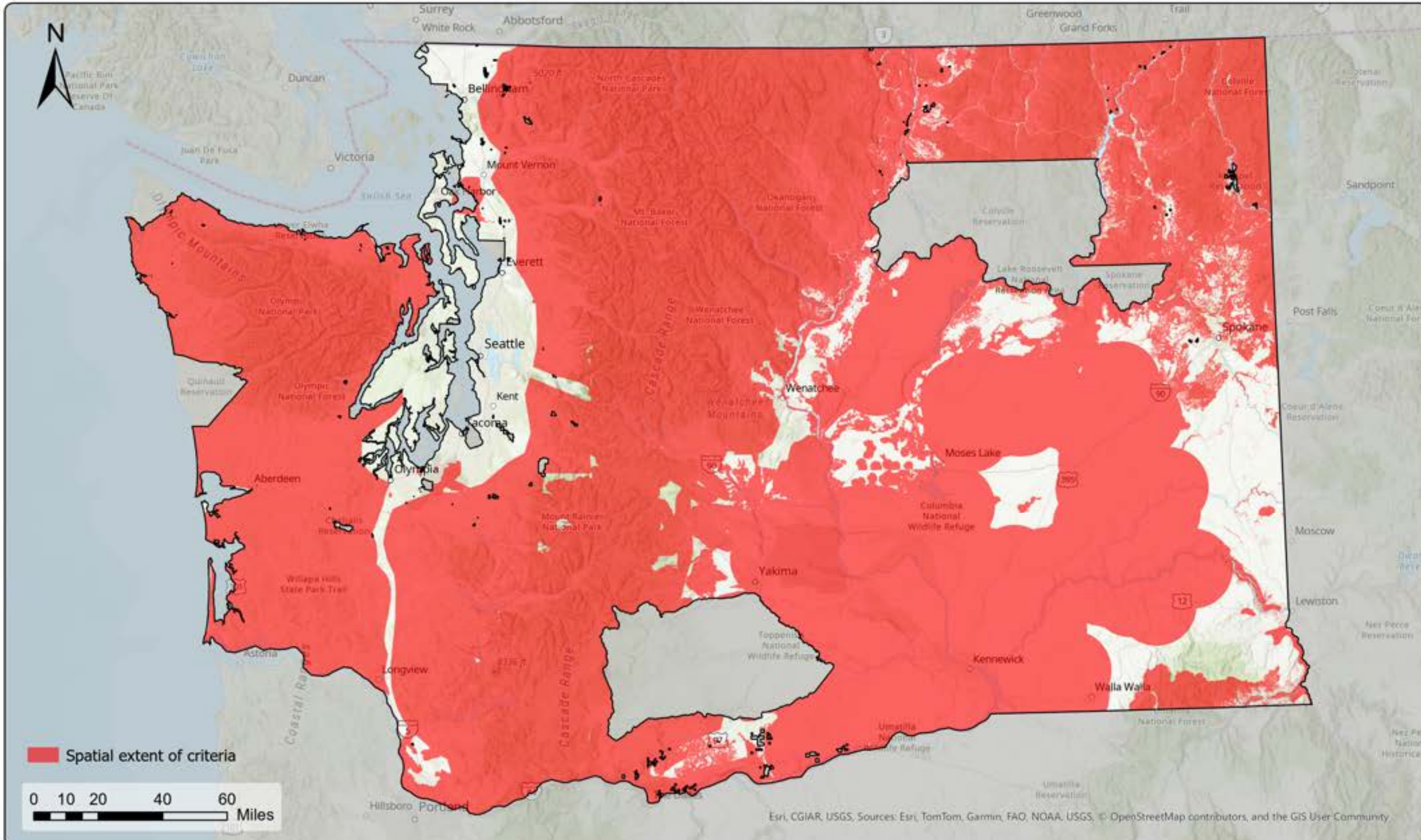
Direct Wildlife Habitat Loss – Sensitivity Level 2

Washington State Energy Facility Site Evaluation Council



HABITAT, WILDLIFE AND FISH

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Figure 3.6-10

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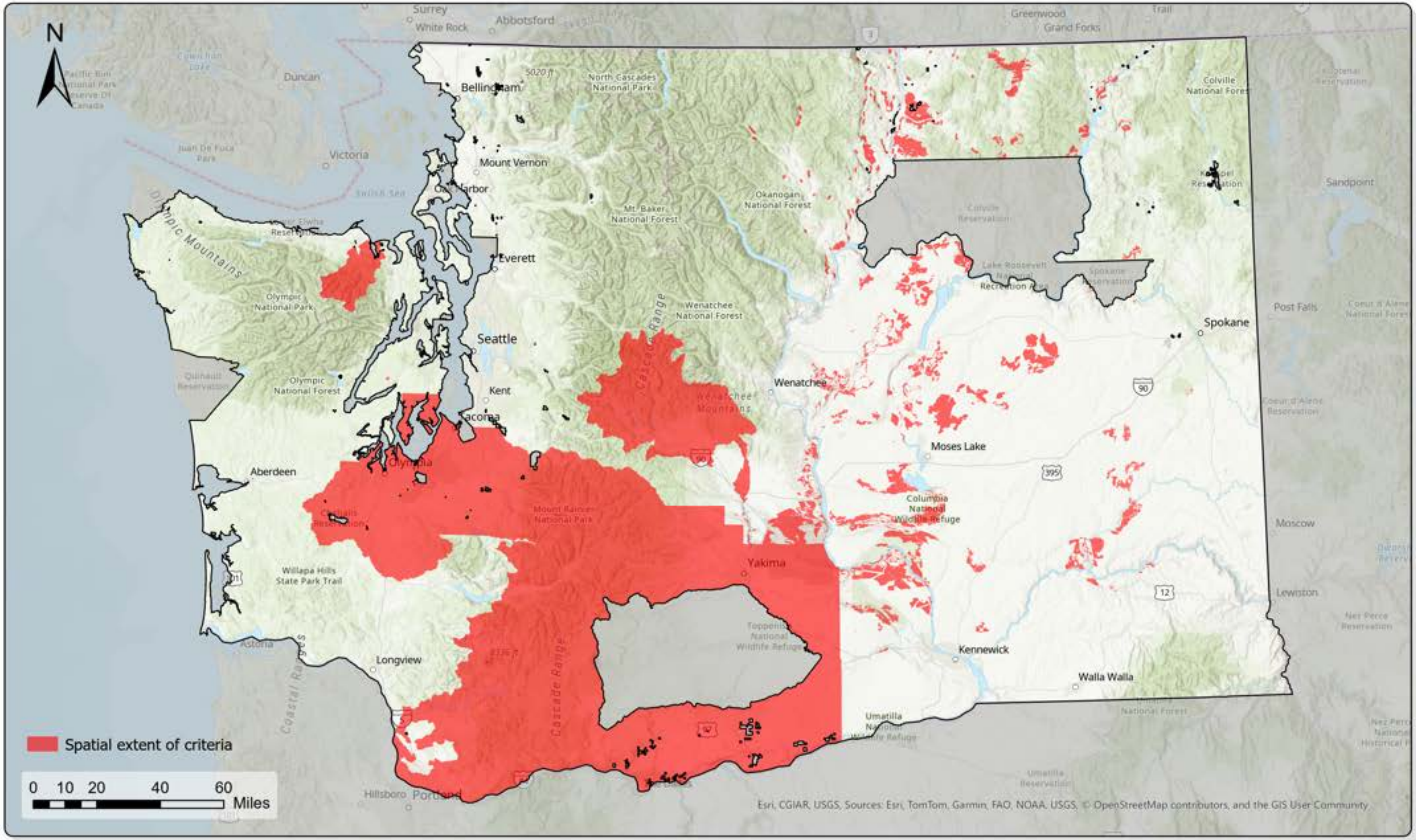
Direct Wildlife Habitat Loss – Sensitivity Level 1

Washington State Energy Facility Site Evaluation Council



HABITAT, WILDLIFE AND FISH

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Figure 3.6-11

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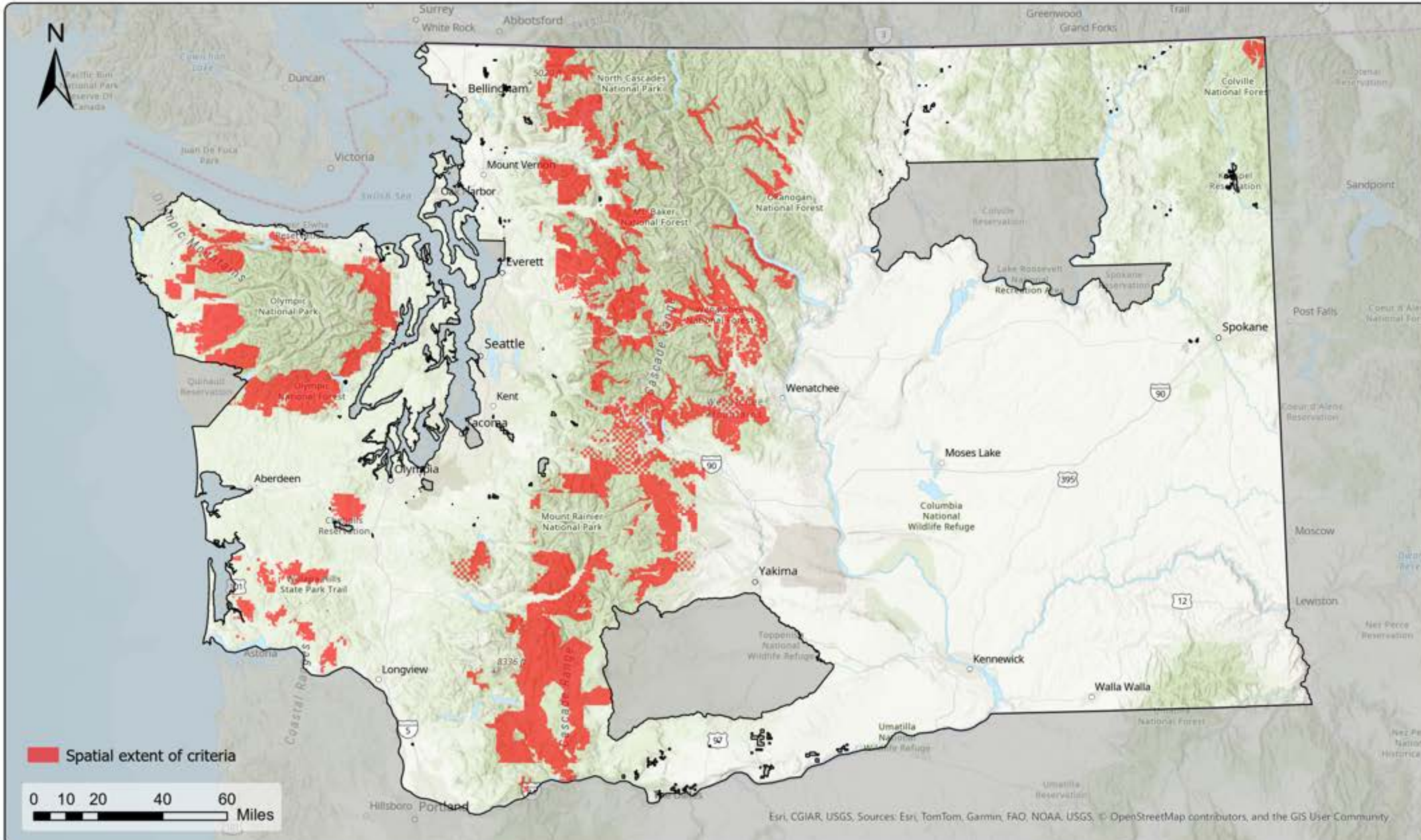
Wildlife Habitat Fragmentation – Sensitivity Level 3

Washington State Energy Facility Site Evaluation Council



HABITAT, WILDLIFE AND FISH

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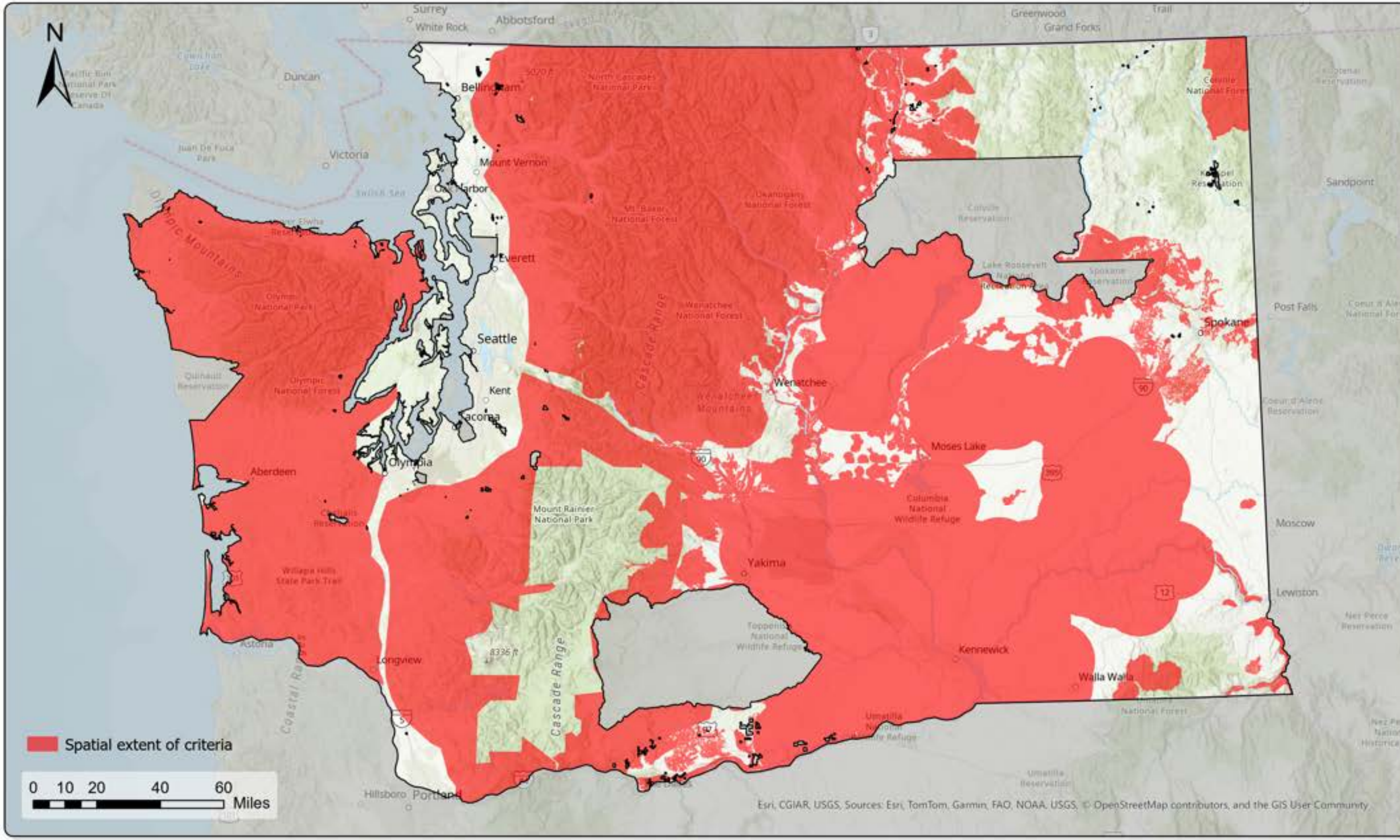
Wildlife Habitat Fragmentation – Sensitivity Level 2

Washington State Energy Facility Site Evaluation Council

HABITAT, WILDLIFE AND FISH



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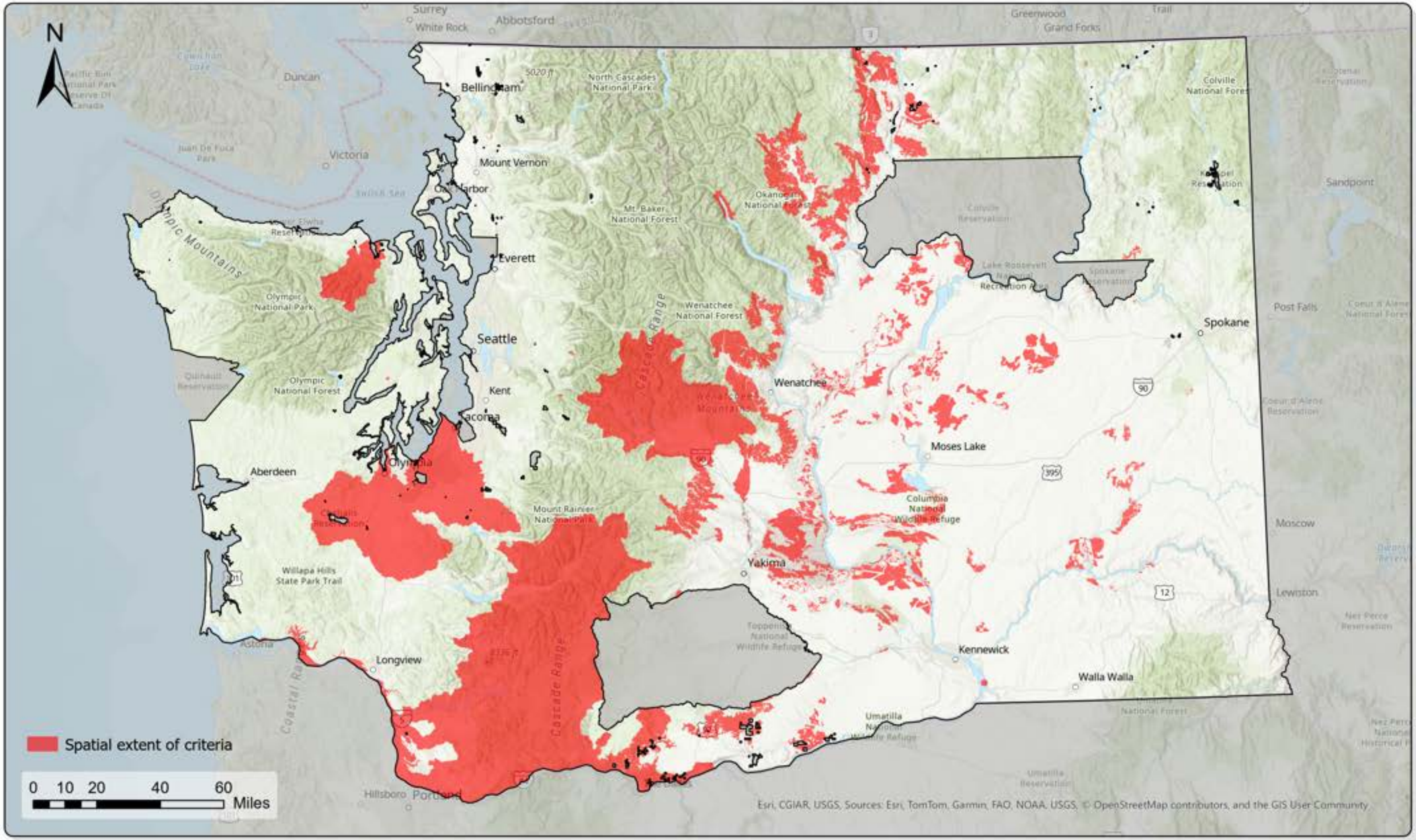
Wildlife Habitat Fragmentation – Sensitivity Level 1

Washington State Energy Facility Site Evaluation Council

HABITAT, WILDLIFE AND FISH



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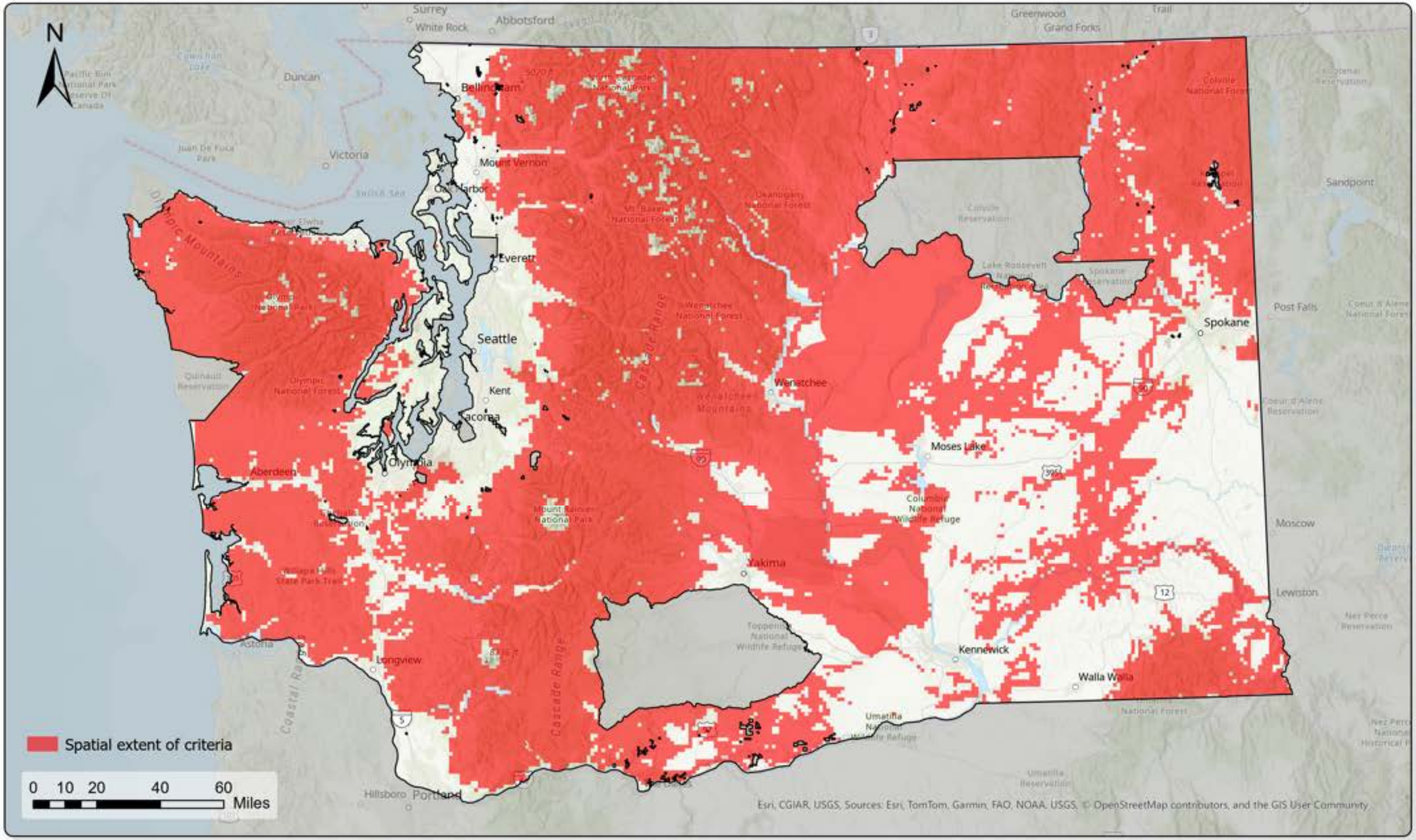
Barriers to Wildlife Movement - Sensitivity Level 3



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HABITAT, WILDLIFE AND FISH

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Figure 3.6-15

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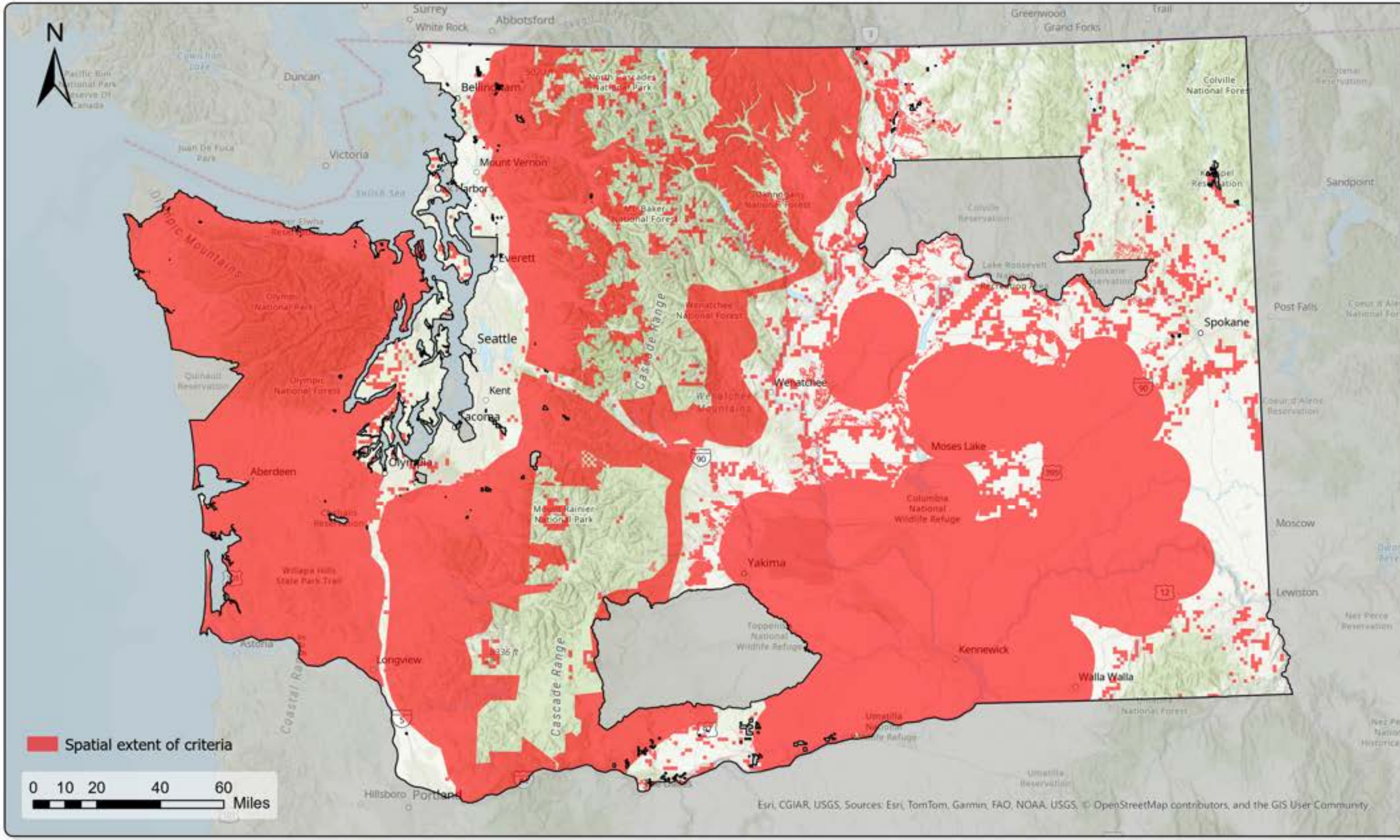
Barriers to Wildlife Movement - Sensitivity Level 2

Washington State Energy Facility Site Evaluation Council



HABITAT, WILDLIFE AND FISH

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Figure 3.6-16

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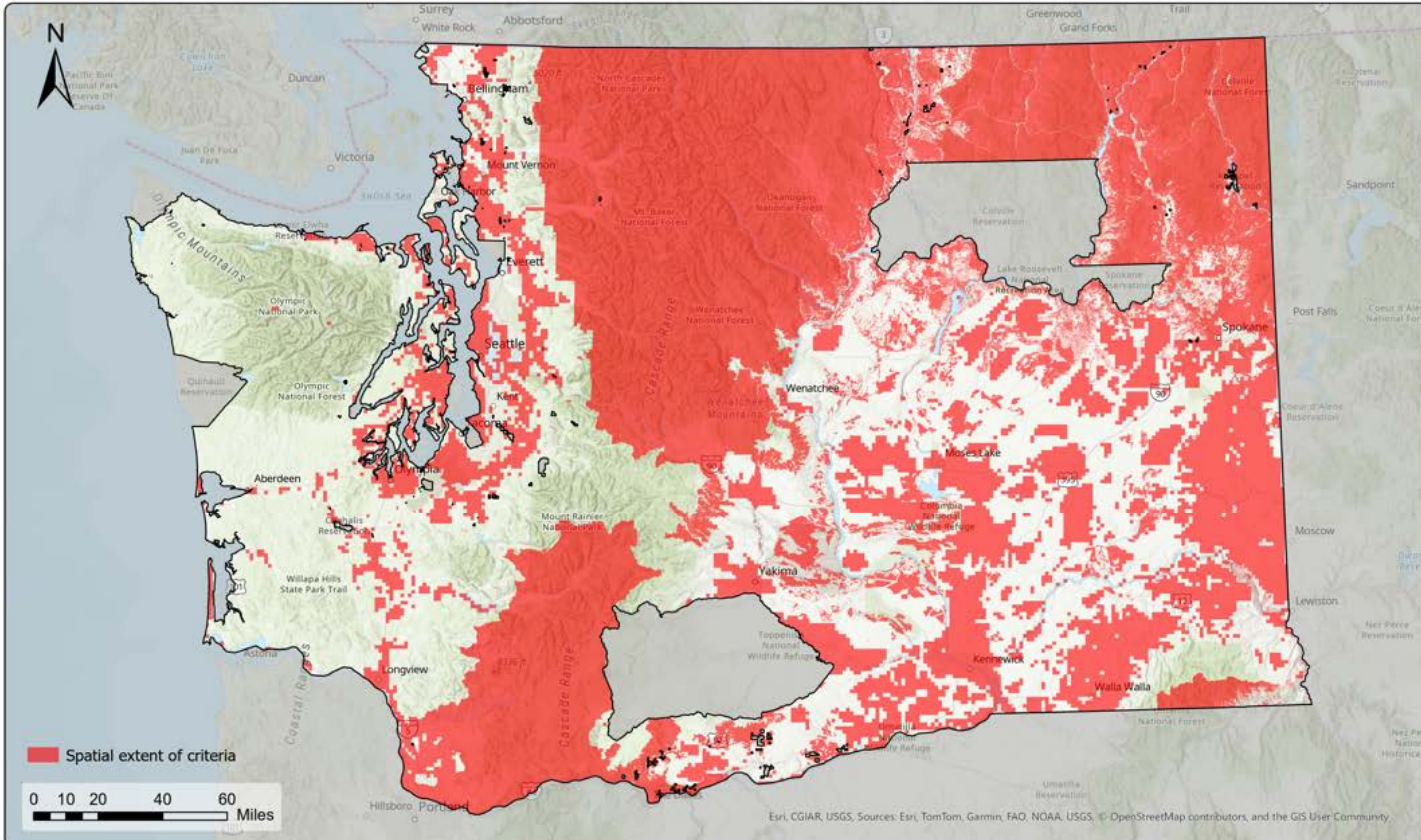
Barriers to Wildlife Movement - Sensitivity Level 1

Washington State Energy Facility Site Evaluation Council



HABITAT, WILDLIFE AND FISH

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Figure 3.6-17

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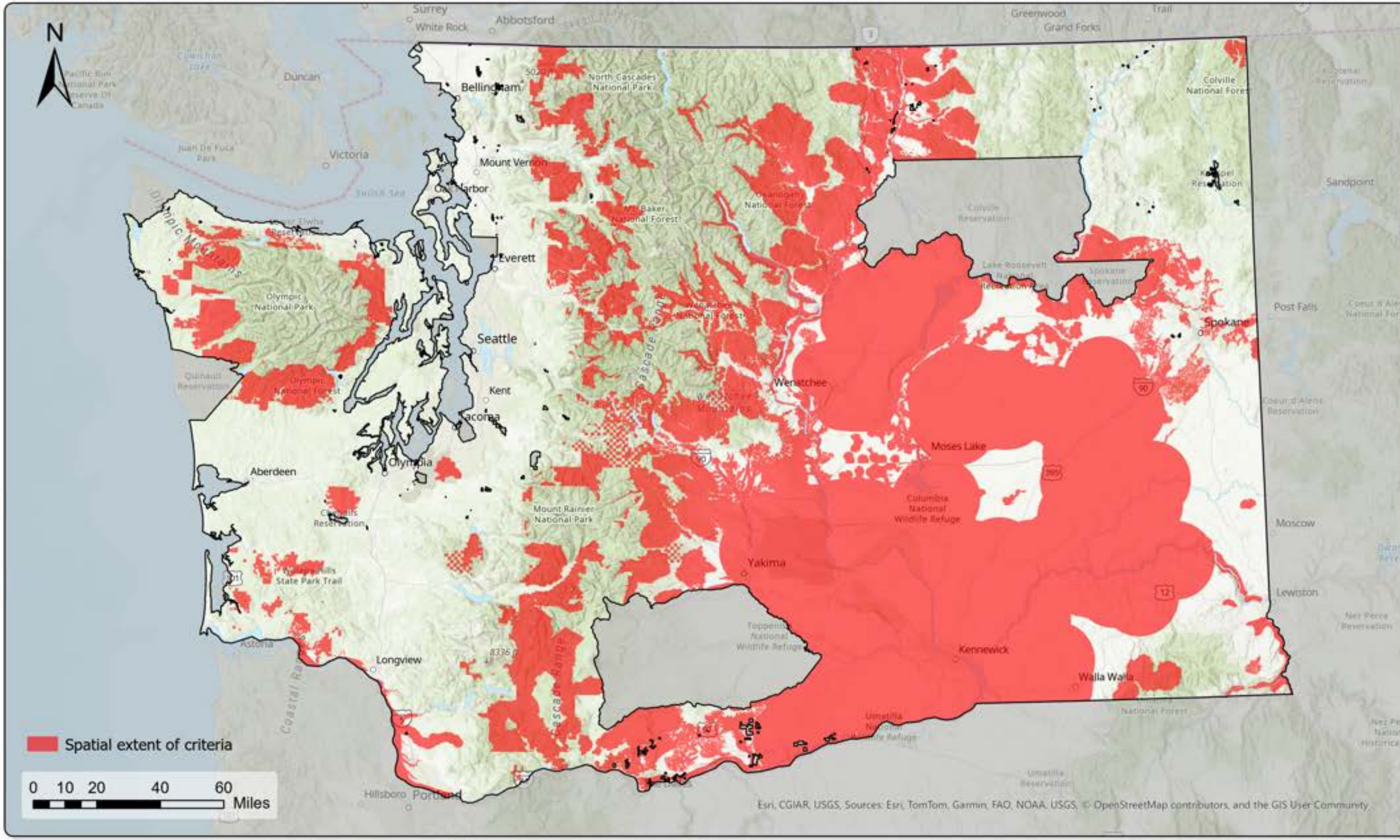
Indirect Wildlife Habitat Loss (Overhead) – Sensitivity Level 2

Washington State Energy Facility Site Evaluation Council



HABITAT, WILDLIFE AND FISH

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Figure 3.6-18

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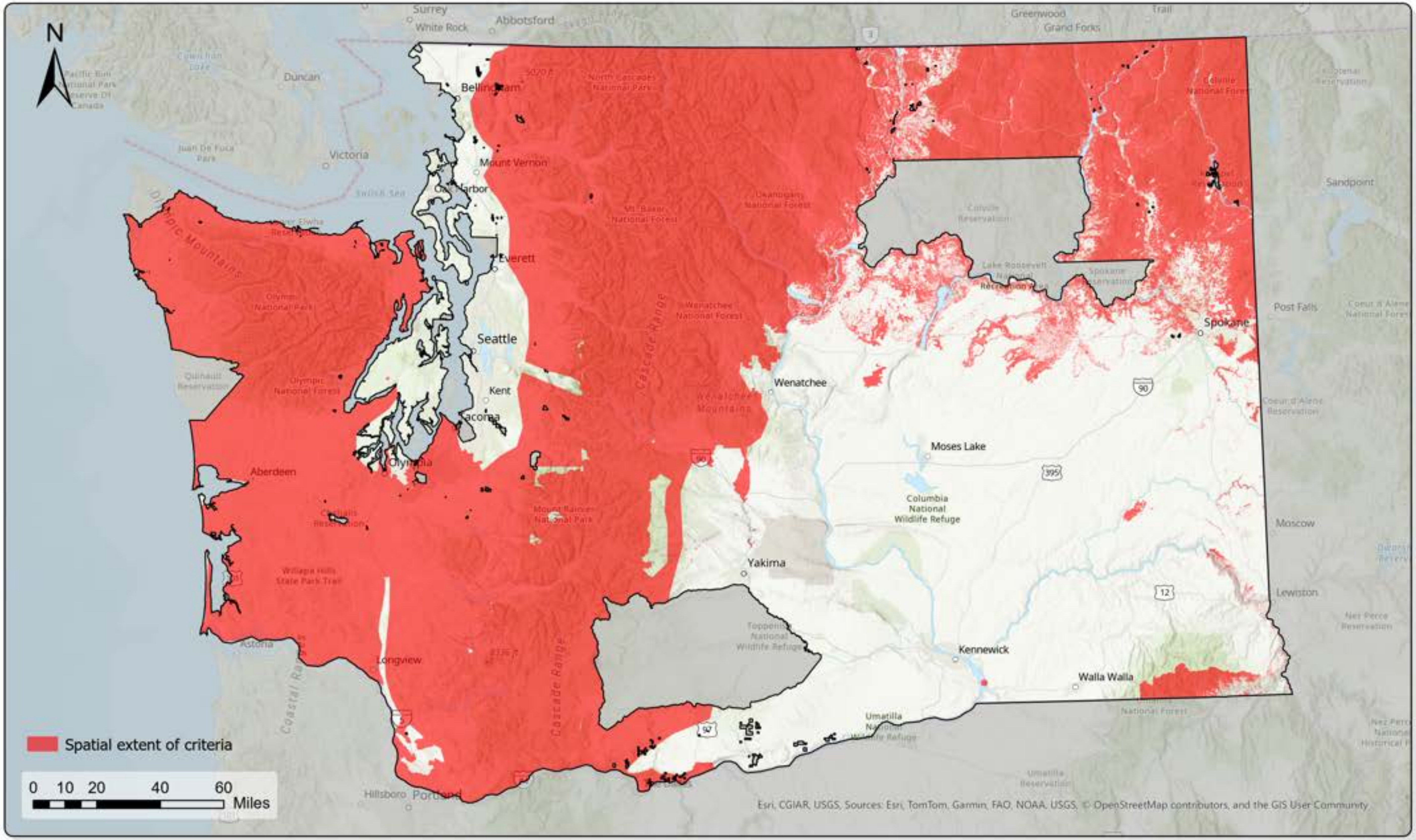
Indirect Wildlife Habitat Loss (Overhead) – Sensitivity Level 1

Washington State Energy Facility Site Evaluation Council



HABITAT, WILDLIFE AND FISH

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Figure 3.6-19

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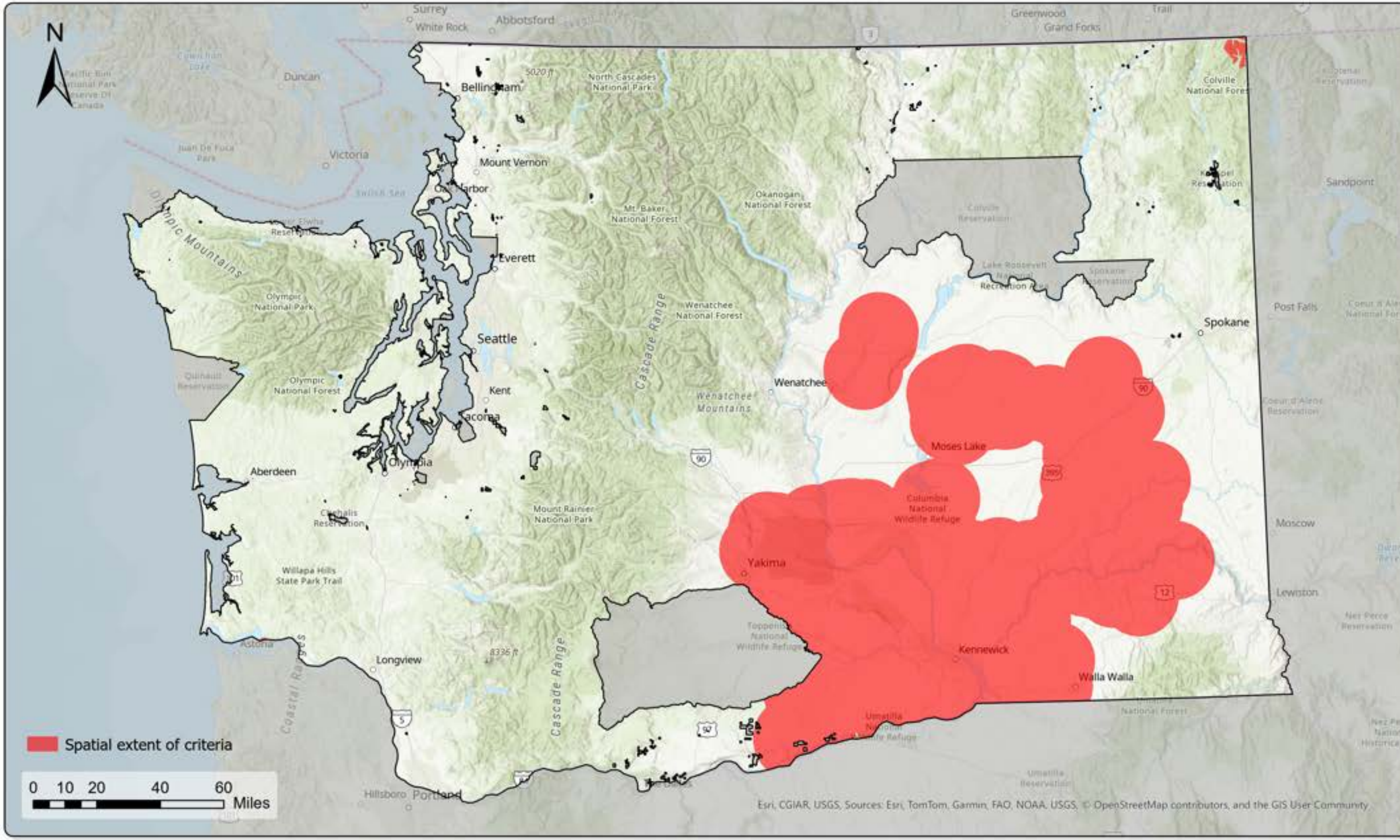
Sensitive Wildlife at Risk of Mortality (Overhead) - Sensitivity Level 3

Washington State Energy Facility Site Evaluation Council



HABITAT, WILDLIFE AND FISH

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Figure 3.6-20

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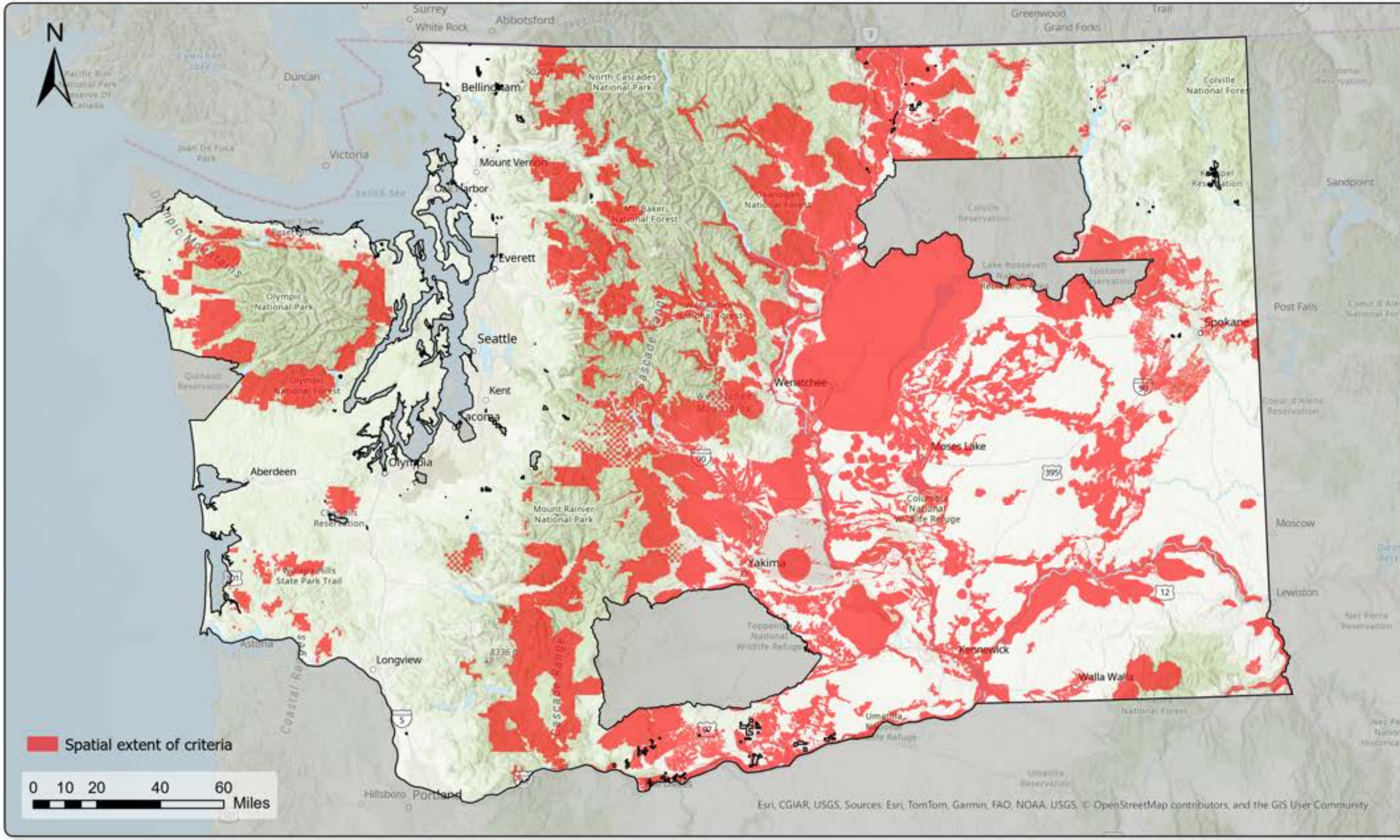
Sensitive Wildlife at Risk of Mortality (Overhead) - Sensitivity Level 2

Washington State
Energy Facility Site
Evaluation Council



HABITAT, WILDLIFE AND FISH

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Figure 3.6-21

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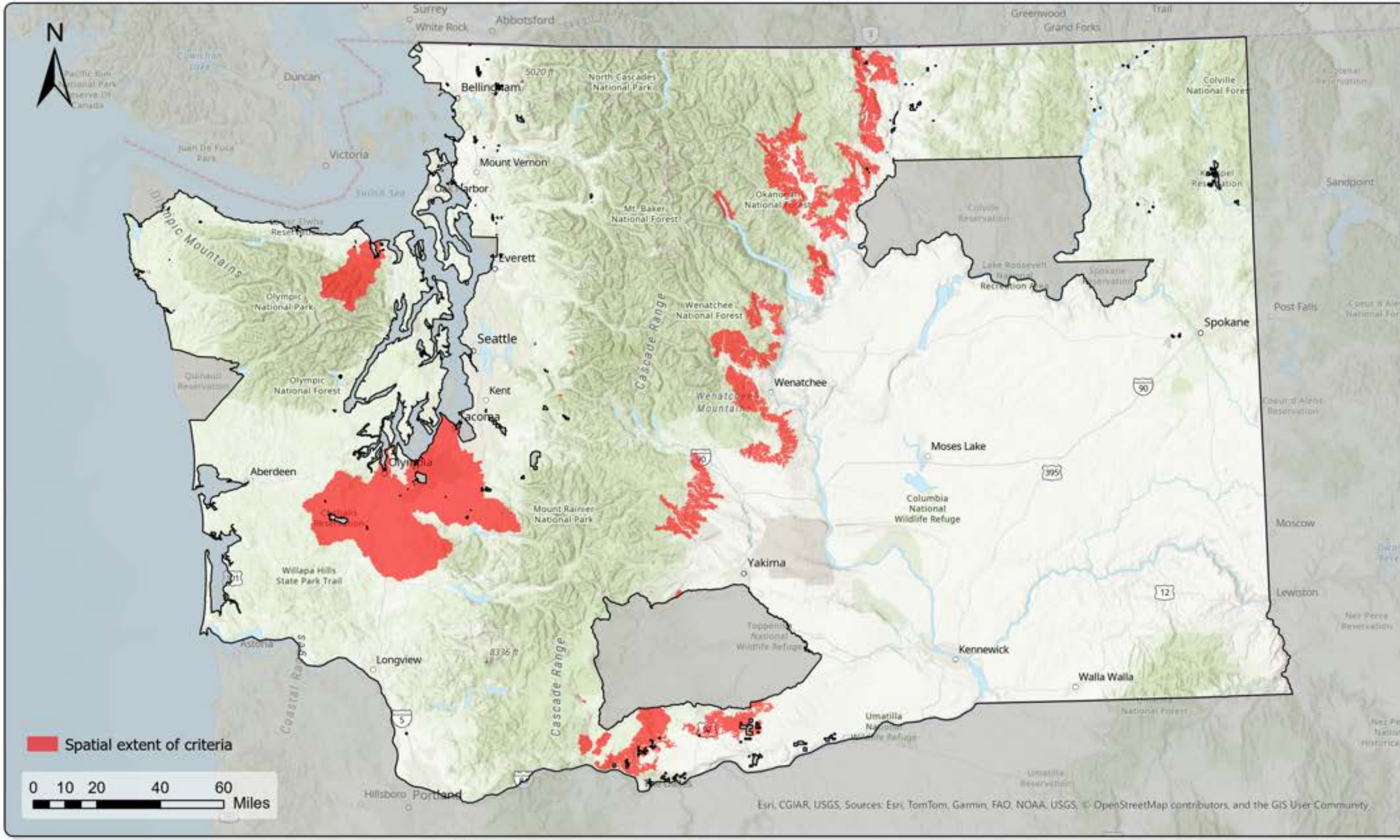
Sensitive Wildlife at Risk of Mortality (Overhead) - Sensitivity Level 1

Washington State Energy Facility Site Evaluation Council



HABITAT, WILDLIFE AND FISH

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Figure 3.6-22

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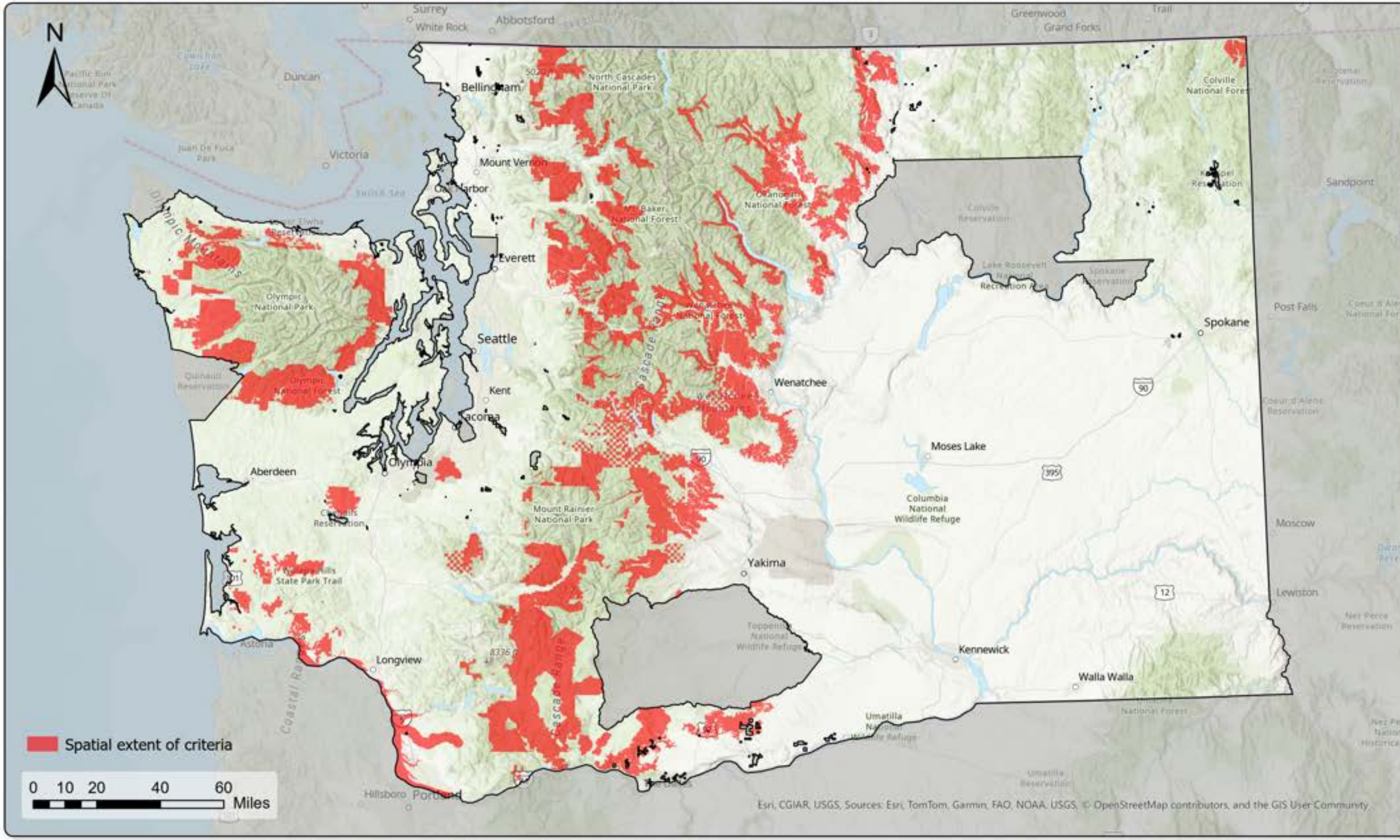
Indirect Wildlife Habitat Loss (Underground) - Sensitivity Level 2

Washington State Energy Facility Site Evaluation Council



HABITAT, WILDLIFE AND FISH

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Figure 3.6-23

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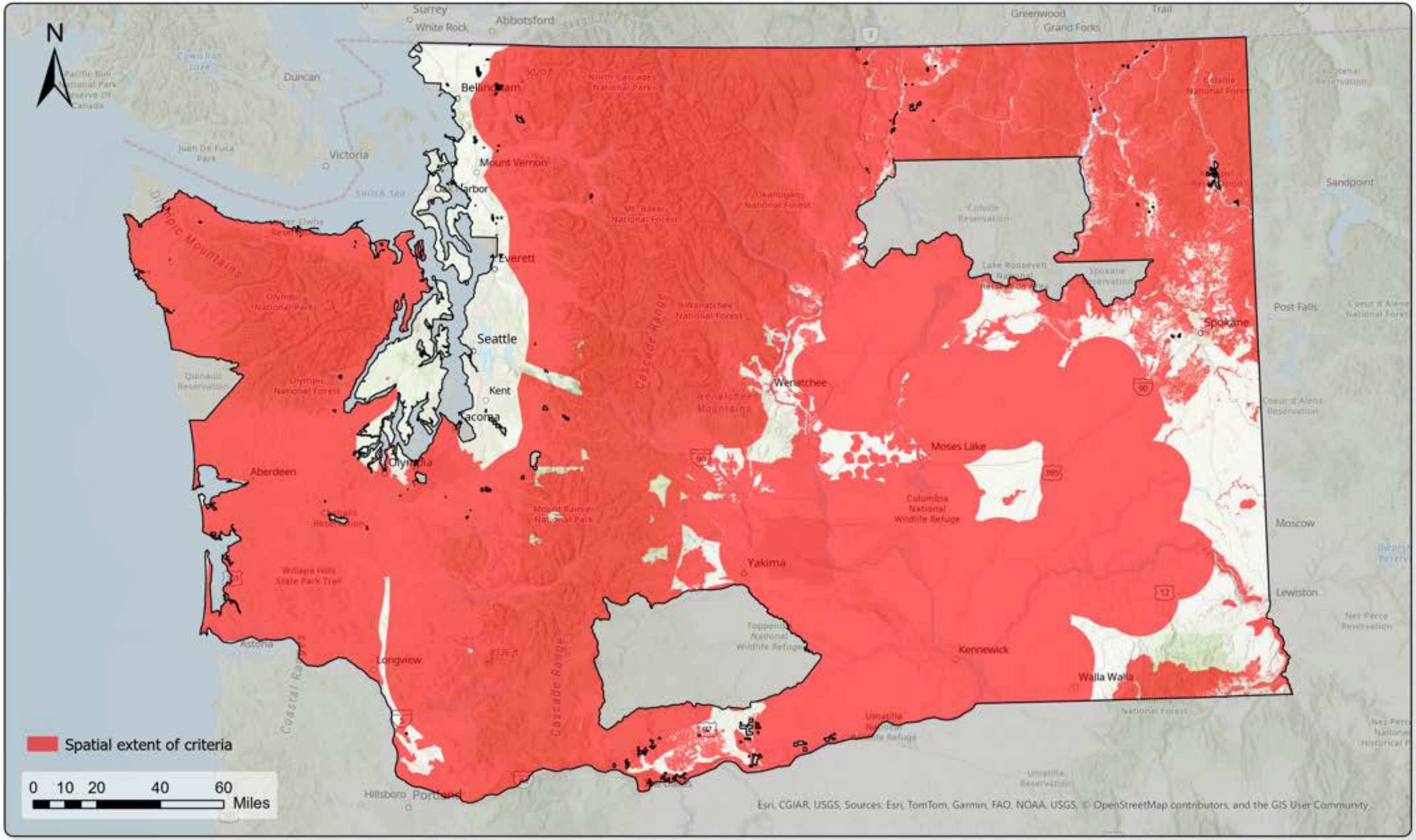
Indirect Wildlife Habitat Loss (Underground) - Sensitivity Level 1

Washington State Energy Facility Site Evaluation Council



HABITAT, WILDLIFE AND FISH

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Figure 3.6-24

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Sensitive Wildlife at Risk of Mortality (Underground) - Sensitivity Level 3

Washington State Energy Facility Site Evaluation Council

HABITAT, WILDLIFE AND FISH

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Figure 3.6-25

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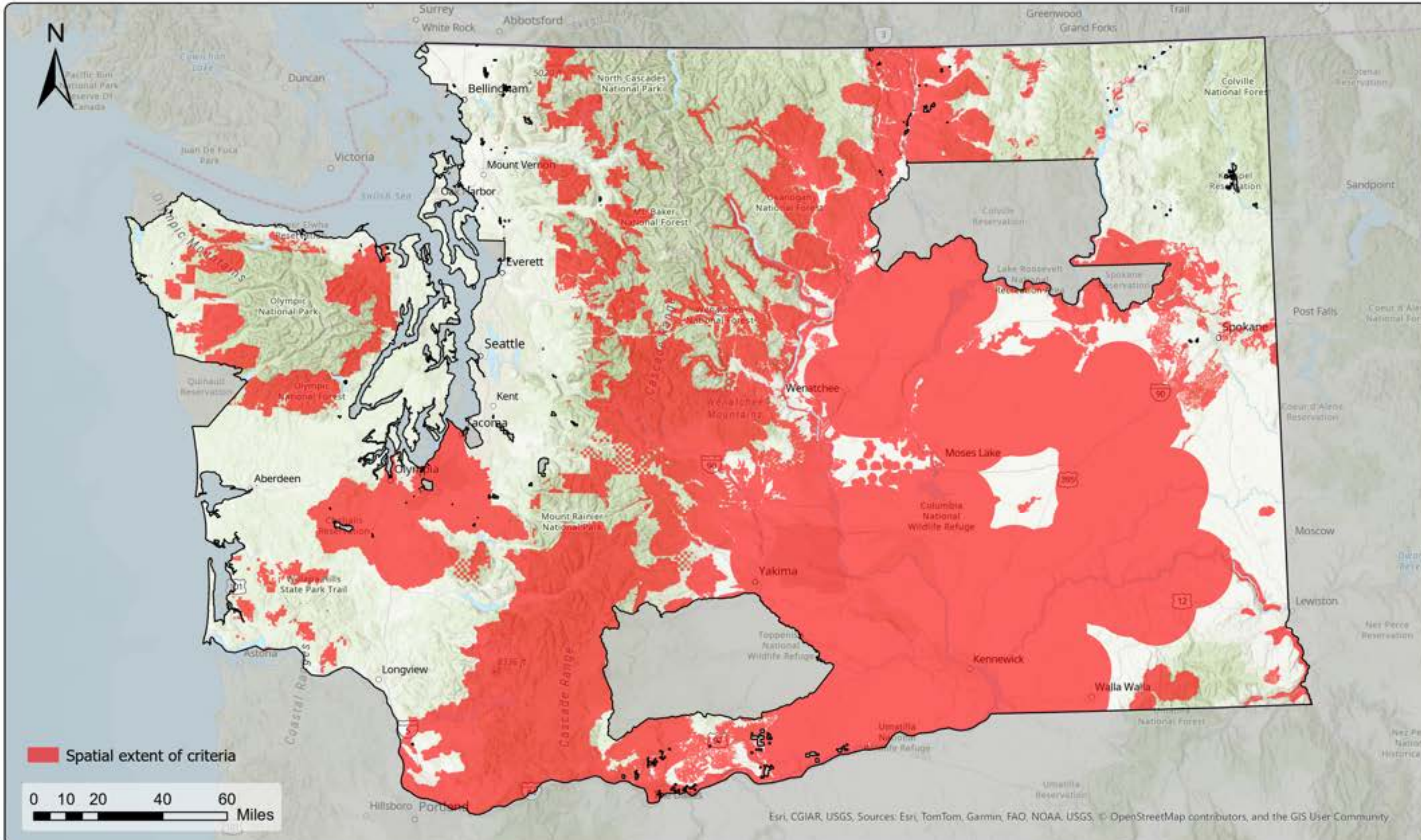
Sensitive Wildlife at Risk of Mortality (Underground) - Sensitivity Level 1

Washington State Energy Facility Site Evaluation Council



HABITAT, WILDLIFE AND FISH

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Figure 3.6-26

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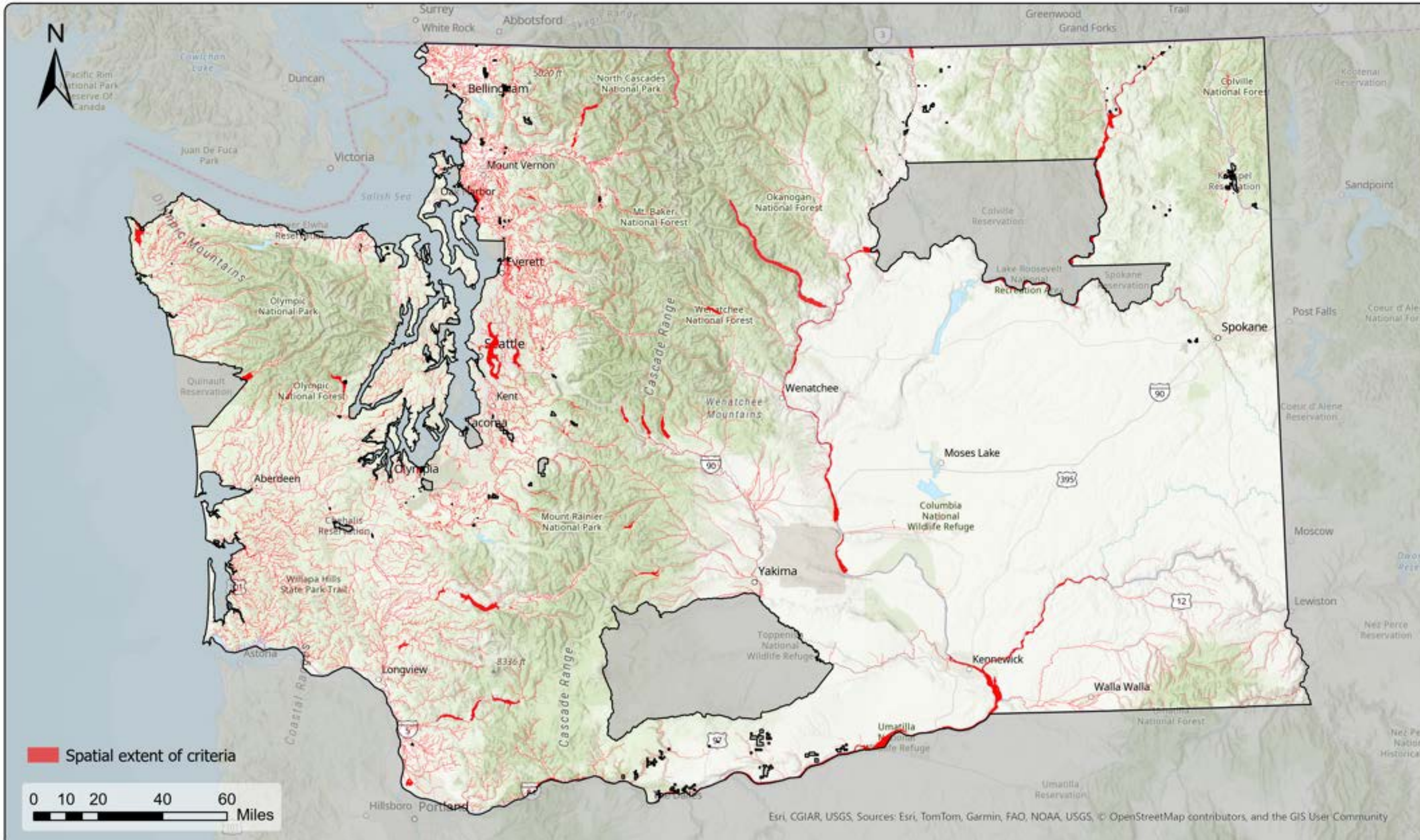
Fish Habitat Loss - Sensitivity Level 2

Washington State Energy Facility Site Evaluation Council



WILDLIFE, HABITAT AND FISH

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Figure 3.6-27

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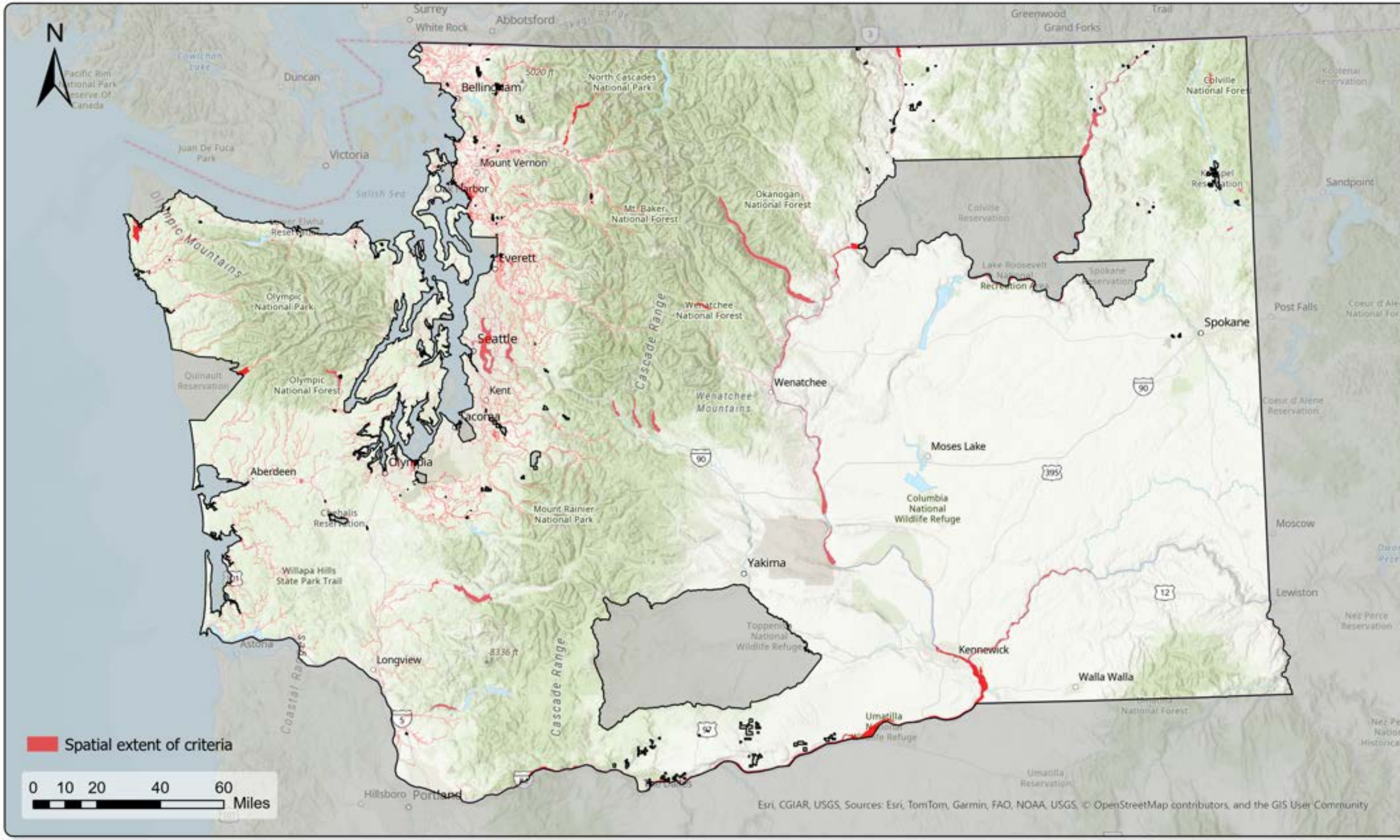
Fish Habitat Loss - Sensitivity Level 1

Washington State Energy Facility Site Evaluation Council



WILDLIFE, HABITAT AND FISH

wsp

Figure 3.6-28

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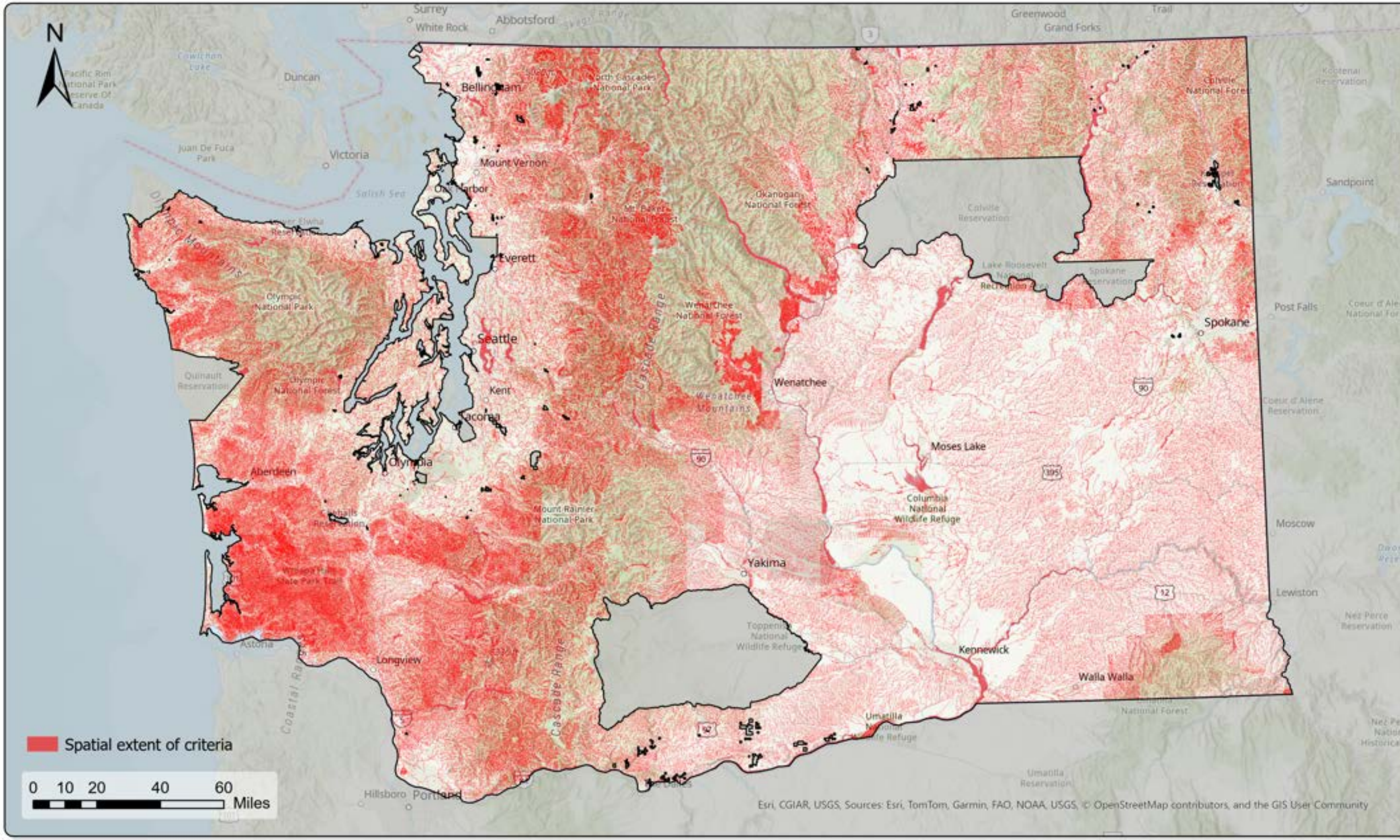
Watercourses and Waterbodies – Sensitivity Level 1

Washington State Energy Facility Site Evaluation Council



WILDLIFE, HABITAT AND FISH

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Figure 3.6-29

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