

Elwha Watershed Protection: A Call for State Stewardship

A Conservation
Assessment of DNR-
Managed Lands in the
Elwha Watershed

AUGUST 2026

Credit: Scott McGee/Forest2sea.com



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Thanks to the Harder Foundation for their support and to all the people who have fought for the health of the Elwha Watershed for decades and decades.

We acknowledge that the Elwha Watershed is in the traditional and ancestral homelands of Indigenous peoples, in particular the Lower Elwha Klallam Tribe (Nəxʷsáɣəm — the Strong People). We honor their enduring stewardship of the Elwha River, the Olympic Peninsula, and the surrounding waters and lands since time immemorial and commit to supporting their cultural heritage.

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Executive Summary

The Elwha Watershed is a national treasure that warrants careful stewardship. Given the significance of the federal investment in dam removal and restoration, and the importance of the watershed to the Lower Elwha Tribe and the people of Port Angeles, it is now the state's turn to take the next big step forward in returning this iconic place to its natural splendor.

At the direction of the Washington Legislature, the Washington Department of Natural Resources (DNR) is conducting an assessment of its lands in the Elwha Watershed to determine which may warrant special protection. DNR will be making its recommendations to the Legislature in December 2026. This report has been prepared to support DNR's identification of land that would be appropriate for Natural Area Preserve (NAP) or Natural Resources Conservation Area (NRCA) designation. This report is also a resource for the Washington State legislature and general public.

Evidence and Approach

This report brings together multiple lines of evidence relevant to DNR's evaluation, including Washington Natural Heritage Program data, new rare plant and lichen field surveys, spatial analyses of forest conditions, ecosystem service valuation, scientific literature, and information on recreation, cultural uses, water resources, habitat, and watershed restoration. The analysis was developed through contributions from scientists, economists, conservation practitioners, and subject matter experts to provide a comprehensive assessment of the conservation values present on DNR-managed lands in the Elwha Watershed.

Key Findings

The report identifies key considerations for DNR on rare species and ecological communities, structurally complex forests, significant scenic landscapes, recreation areas, and Tribal cultural uses across DNR-managed lands in the watershed. The report also contrasts the ecosystem services benefits of protecting these lands against those of the current harvest schedule. Compared to the status quo, protecting structurally complex forests would provide an additional \$367.5 million in ecosystem services benefits, supporting biodiversity, watershed health, climate resilience, and ongoing restoration efforts.

Recommendations

- Designate the Mt. Sutherland area as a Natural Area Preserve (NAP) due to its concentration of rare species, rare ecological communities, exceptional natural features, and high-quality habitat.
- Establish an Elwha Watershed Natural Resources Conservation Area (NRCA) in the Elwha Watershed encompassing the remaining priority study areas within the Dan Kelly Peak and Indian Creek, Dry Hill, Little River, and the Elwha River Mouth and Estuary zones.
- Utilize existing revenue replacement mechanisms, including Trust Land Transfer and Natural Climate Solutions funding, to address trust beneficiary needs while conserving high-value lands.
- Continue targeted data collection and field surveys in less-studied areas to support future boundary refinement and management decisions.

DNR-managed lands in the Elwha Watershed represent a rare opportunity to advance watershed-scale conservation while building upon decades of public investment in one of the nation's most important river restoration efforts.

Introduction

The Elwha Watershed is a Washington State, national, and international treasure-deserving of careful stewardship. People from around the world celebrate the Elwha River dam removal and restoration as a story of hope about the potential for a damaged ecosystem to recover.

The over \$300 million in federal dollars focused on riparian (in and near stream) restoration have had marked success in returning endangered salmon populations from the brink of extinction. Meanwhile, thousands of acres of forest lands in the Elwha Watershed continue to be managed by the Washington Department of Natural Resources (DNR) for industrial logging.

A broad array of stakeholders has shown a strong and growing interest in ways to protect and restore a larger portion of this critical watershed. In 2023, DNR set aside approximately 200 acres of forest lands in the Elwha Watershed for inclusion in a Natural Area or similar designation using Natural Climate Solutions funding provided by the legislature.

In 2025, the Washington State Legislature directed DNR to analyze the ecological and conservation values of state-owned lands managed by DNR in the Elwha Watershed.

The 2025–2026 DNR Conservation Area Study

The Legislature included a proviso in Capital Bill (SSB 5195) under Trust Land Transfer (Sec. 3120) that directs the Department of Natural Resources (DNR) to use \$250,000 to conduct an analysis of the ecological and conservation values of these lands.

DNR must provide the Legislature with a report in December 2026, that includes the following deliverables:

1. A Washington Natural Heritage Program site survey to identify rare flora, native ecological communities
2. Locations of structurally complex forests
3. Scenic or other natural features worthy of consideration for conservation
4. Current uses, including recreation and cultural practices
5. Identification of lands appropriate for conservation as a Natural Area Preserve or Natural Resources Conservation Area, and if applicable a proposed boundary.

DNR-Managed Natural Areas

DNR manages two different kinds of natural areas to conserve and restore special state-managed lands.

- Natural Area Preserves (NAPs) protect Washington's highest-quality ecological communities, rare species, and other exceptionally significant natural features. Nearly 41,500 acres are conserved in 58 Washington State NAPs.
- Natural Resources Conservation Areas (NRCAs) protect larger landscapes that provide important ecological, scenic, cultural, educational, and recreation values. Nearly 128,000 acres are conserved in 39 Washington State NRCAs.

For DNR-managed Elwha Watershed lands that are recommended for NAP or NRCA designation, revenue replacement tools are available to address trust beneficiary needs while transferring high-conservation-value lands into protected status. The Trust Land Transfer (TLT) Program allows qualifying trust lands to be transferred into conservation or public ownership while acquiring replacement lands of equal value for the affected trust, helping maintain long-term revenue potential for beneficiaries such as counties and schools. Recent TLT program updates also allow a portion of replacement value to be provided directly to counties as cash where near-term revenue needs exist.

Natural Climate Solutions funding generated by the Climate Commitment Act auctions may provide an additional pathway for revenue replacement where conservation of older, naturally regenerated forests advances carbon storage, sequestration, and related climate benefits.

About this Report

The purpose of this report is to provide supplementary information, context, and analysis to support and augment DNR's work in assessing the Elwha Watershed and identifying additional state-managed areas that should be included in a new Natural Area. The report provides DNR with data on the ecological and conservation values of DNR-managed lands in the Elwha Watershed, pursuant to the priorities and processes identified in chapters 79.70 and 79.71 RCW.

The report is intended to help DNR identify which lands warrant special protection and to support a thorough evaluation of the role these state lands play in the broader recovery of the Elwha Watershed. The report considers structurally complex forests, scenic and natural features, rare plants and native ecological communities, federally protected species, recreation and cultural uses, ecosystem service values, and other considerations.

Explanation of Appendices

The report contains several appendices.

Appendix I: Detailed information on relevant scientific literature.

Appendix II: A report on the value of the ecosystem services produced on DNR lands in the watershed. This valuation provides decision makers with a more complete picture of the value of these lands. It allows for a view that is more comprehensive, and that goes far beyond just the lens of timber value.

Appendix III: A report with the findings of the rare plant and lichen investigations.



Orientation to the Study Area

Throughout this report, areas with high potential to be Natural Area Preserves and/or Natural Resources Conservation Areas are identified in maps. They are intended to support DNR's evaluation of which state trust lands in the watershed should be included in a new Natural Area.

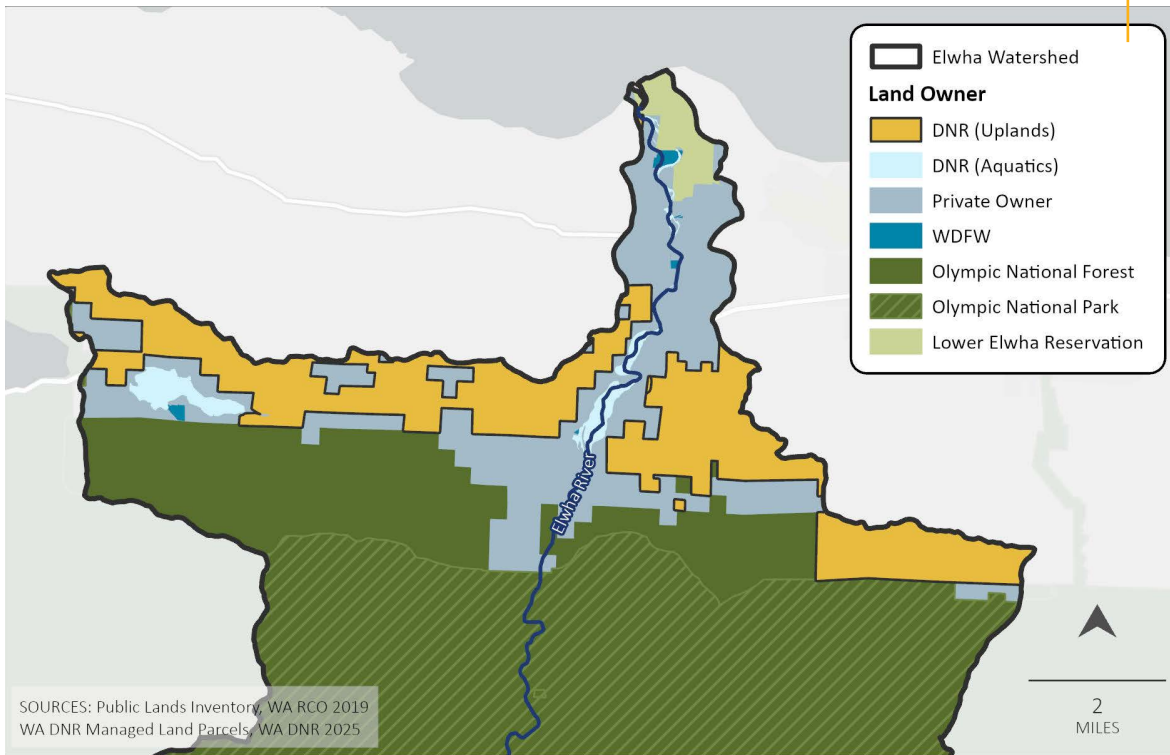
The context maps below show the extent of the Elwha Watershed, 90% of which is covered by the Olympic National Park and Olympic National Forest. The watershed consists of a diverse collection of landcover types, is heavily forested, and contains the Lower Elwha River. North of the Olympic National Forest, the majority of the land is either privately owned or managed by DNR.

Figure 1. Elwha River Watershed Study Area



The Lower Elwha Watershed includes multiple landowners. The yellow highlighted parcels are those owned by DNR and the focus of this report.

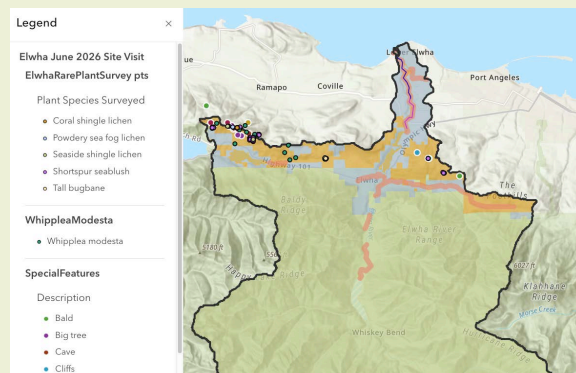
Figure 2. Land Ownership in the Lower Elwha Watershed



Explore the Web Map

In addition to the maps in the report, there is an interactive online map produced by Earth Economics that provides greater detail and depth on the areas of focus.

Its interactive layers and features provide a closer look at the features in the Elwha Watershed, including important plant and animal habitats, impaired streams, and information about drinking water sources.



OPEN THE MAP >

History and Context

Management of State-Owned Lands

DNR manages approximately 7,358 acres of land in the Elwha Watershed, including approximately 2,787 acres of structurally complex forest, representing about 38 percent of DNR-managed lands in the watershed. There are 1,627 acres of unprotected structurally complex forests on DNR-managed lands in the watershed.

The DNR-managed lands considered in this report include portions of the Elwha River, Little River, Indian Creek, associated floodplains, public trails, old-growth and structurally complex forests, wetlands, balds, and rare plant and habitat features. These lands also occur within the rain shadow climate of the north Olympic Peninsula, where dry Douglas fir forests, mesic cedar sites, madrone, and meadow species contribute to ecological diversity. Because these state lands are connected to key tributaries, floodplains, drinking water resources, recreation corridors, and recovering salmon habitat, they help maintain water quality, aquatic habitat, forest connectivity, biodiversity, recreation, and the long-term ecological function of the Elwha Watershed.

Community interest in the future of these lands has grown alongside the restoration effort. The City of Port Angeles has raised concerns about potential logging impacts on streamflow and watershed health, and over half of Lower Elwha Klallam Tribal citizens signed a petition opposing continued deforestation and calling for watershed protection. Citizen-led groups such as the Elwha Legacy Forests Coalition have raised concerns about how the continued commercial logging of mature forests undermines the over \$326 million in federal dollars spent on restoration.

The level of community interest reflects the importance of the remaining legacy forests and sensitive state lands to the broader effort to restore and sustain the Elwha Watershed.

Indigenous Leadership

The Lower Elwha Klallam Tribe (Nəxʷsłáyəm — the Strong People) is a sovereign, federally-recognized Indian Nation, with its own constitution and government. As such, we understand and expect that the DNR is engaging in government-to-government relations with the Tribe. We understand that there may be areas of particular importance to the Tribe that are not covered in this report.

The content below does not purport to speak for the Tribe or tribal citizens in any way but is meant to help situate the conservation area study process within the greater context encompassing the pre-colonial landscape through the present-day reality.

Dam Removal and Restoration

The Elwha River Watershed is one of the most significant river restoration landscapes in the United States as well as the world. Extending from the Olympic Mountains to the Strait of Juan de Fuca, the watershed supports cold-water salmonid habitat, diverse forest and riparian ecosystems, and the cultural lifeways of the Lower Elwha Klallam Tribe and S'Klallam people. Construction of the Elwha and Glines Canyon dams in the early twentieth century disrupted these connections by blocking salmon access to more than 70 miles of habitat, altering sediment and wood transport, and flooding lands and cultural sites important to the Lower Elwha Klallam Tribe.

After decades of advocacy, led in large part by the Lower Elwha Klallam Tribe, the removal of the Elwha and Glines Canyon dams (completed in 2014) marked, at that time, the largest dam removal project in U.S. history and launched a long-term effort to restore watershed function. Since dam removal, the Lower Elwha Klallam Tribe, public agencies, conservation organizations, and community partners have invested in revegetation, floodplain reconnection, fish passage, engineered log jams, and riparian restoration. These efforts are helping the river recover, but restoration is ongoing.

The watershed remains critical to salmon recovery, wildlife habitat, and cultural uses. The endangered Southern Resident Orcas depend upon these recovering salmon populations for their survival. According to the National Oceanic and Atmospheric Administration (NOAA), the Elwha River is a top restoration priority for the endangered Southern Resident Orcas. The state's Orca Task Force recommended significantly increasing investment in restoration and acquisition of habitat in areas where Chinook salmon stocks most benefit Southern Resident Orcas. Restoration and watershed health are also critical for downstream communities. The Elwha River is the sole water source for the City of Port Angeles and for 25% of Clallam County.

A holistic look at land use and ecological function across the landscape is important to watershed-scale recovery. The upper Elwha Watershed lies within Olympic National Park. The lower watershed contains lands managed by the U.S. Forest Service, the Lower Elwha Klallam Tribe, private landowners, and DNR. The Elwha River flows through the lower part of the watershed before reaching the Strait of Juan de Fuca. Unlike the conserved area within Olympic National Park, the lower watershed contains a mix of private and public lands, with 3,488 acres in commercial forestry and 1,321 acres in conservation. Of major concern is the fact that river temperatures in the lower watershed are high, exceeding Clean Water Act standards.

Climate Change

Climate change is a significant threat to watershed health. Scientists predict that climate change will dramatically alter hydrologic systems and lead to a water shortage crisis in the Pacific Northwest during the latter half of this century (Climate Impacts Group, 2015). This is especially relevant to the Elwha River Watershed where glacial meltwater and seasonal snowmelt substantially contribute to summer streamflow in the Elwha River and its tributaries. Glacial retreat and disappearance have been well-documented in the Olympic Mountain range (Fountain et al., 2022).

With the glacial melt component of the water budget decreasing and predicted to further decrease, summer low flows in the Elwha River Watershed are expected to decline in the future.

The timing of seasonal snowmelt runoff is being accelerated due to climate change as well, and this will also contribute to reduced summer low flows (Riedel et al., 2015).

"The potential for the Elwha River to lose its distinctive snowmelt-driven annual hydrology is a significant impact from climate change.

A changing Elwha River will have a cascading series of impacts to the many species that rely on the river, including Chinook salmon."

Lower Elwha Klallam Tribe, 2022

Impacts of Climate Change

The effects of climate change are having a real and immediate impact on community health and well-being. For the past several years, the City of Port Angeles has issued emergency water shortage declarations placing restrictions on water use.

Forests and watershed health are intertwined. Scientific studies demonstrate that forestry practices impact stream flows. As stated in the Lower Elwha Klallam Tribe's (LEKT) Climate Change Vulnerability Assessment (2022), p. 33 "[t]he Elwha River itself will adapt, provided that adequate space is provided, and healthy forests are established and maintained, but will represent a very different ecosystem than the one that supported the LEKT in the past."

The U.S. Forest Service Pacific Northwest Research Station synthesis surveys over 100 peer-reviewed scientific studies spanning the last five decades and identifies a direct correlation between industrial logging and increases in peak flows. Peak flows—a term to describe the maximum rate of water discharge in rivers and streams during rainstorms and snowmelt runoff—are associated with landslides, mass wasting, channelization, streambed scour, and other forms of erosion and sediment deposition that detrimentally affect fish. By causing water to move faster through the hydrologic system,

industrial logging practices not only can contribute to the degradation of salmonid habitat but also can endanger communities downstream by elevating the risks of floods and landslides.

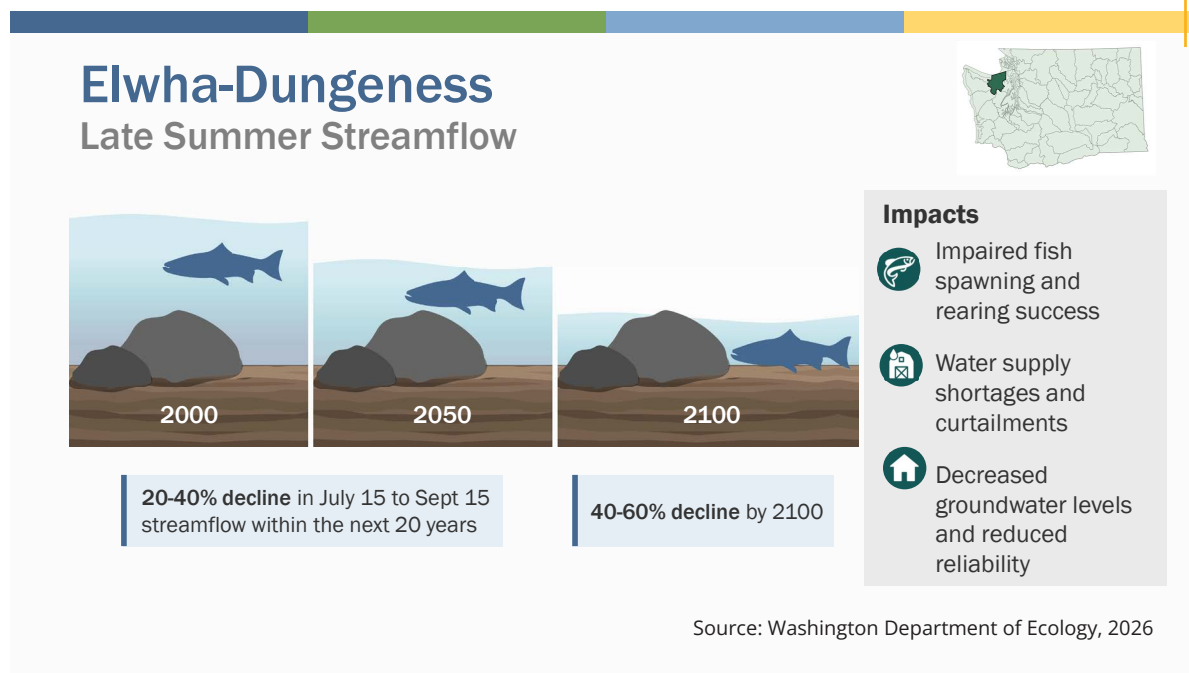
During the December 2025 floods, a landslide occurred at the site of an over 100 acre logged area in the Elwha Watershed (known as the “Aldwell” timber sale). The landslide temporarily blocked Olympic Hot Springs Road adjacent to Little River, a major tributary of the Elwha River.

While industrial logging increases winter peak flows, it also decreases summer stream flows. The results of a study called “Summer streamflow deficits from regenerating Douglas fir forests in the Pacific Northwest, USA” by Dr. Julia Jones and

Timothy Perry indicate that clearcutting today will produce diminished water levels well into the late-21st century. A study in the Nooksack River basin in Western Washington found similar results (Dickerson-Lange et al., 2022).

The Washington Department of Ecology is currently undertaking studies of the impacts of climate change on Washington’s water supplies. Climate models show that stream flow in the Elwha Watershed will decline by 20–40% during the summer months (July 15–September 15). The Department of Ecology study underscores the importance of the opportunity to counteract low stream flows by retaining as many mature forests as possible (Hennessey, 2026).

Figure 3. Projected Late-Summer Streamflow Decline



Conservation Considerations for DNR Natural Areas

The following sections are intended to support DNR's work of assessing the Elwha Watershed to identify state-managed areas that should be included in a new Natural Area.

The following sections are organized to support DNR in providing its deliverables:

1. A site survey to identify rare flora and native ecological communities
2. Locations of structurally complex forests
3. Scenic or other natural features worthy of consideration for conservation
4. Current uses, including recreation and cultural practices
5. Identification of lands appropriate for conservation as NAPs or NRCAs

1. Rare Flora and Native Ecological Communities

Washington Natural Heritage Program Survey Enhancement

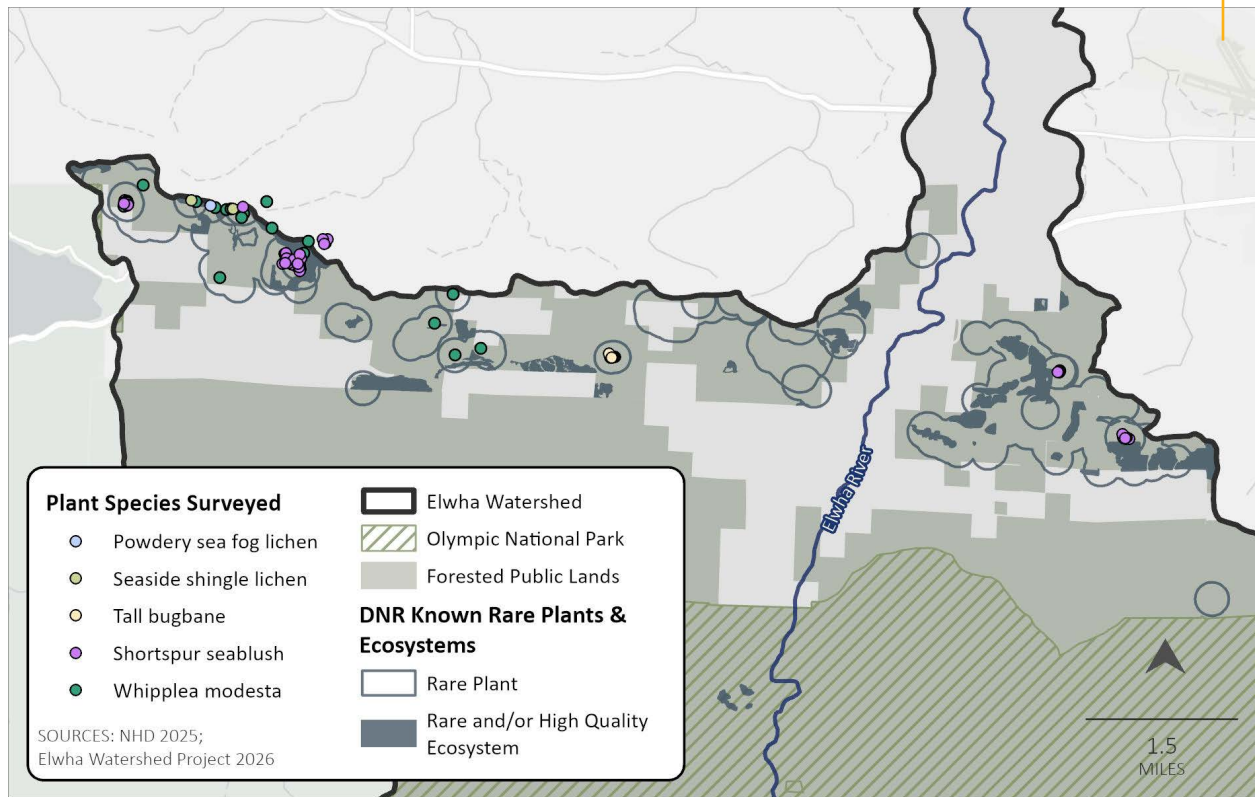
The Center for Responsible Forestry contracted with a team of botanists and lichenologists who conducted rare plant and lichen surveys on state lands in the Elwha River Watershed to expand the Washington Natural Heritage Program's survey area and support conservation planning pursuant to the DNR proviso (Figure 4). This work was meant to augment previous data collection and to supplement DNR's capacity to do plant surveys in this study area.

Field surveys completed in spring 2026 covered 607 acres at a good-to-high level of survey coverage and an additional 941 acres at a more limited level of coverage, for a total of 1,548 acres surveyed. The surveys documented several state-listed rare plant and lichen populations, including one previously unknown population of the Endangered coral shingle lichen (*Fuscopannaria coralloidea*), two populations of the Threatened seaside shingle lichen (*Fuscopannaria maritima*), and one previously unknown population of powdery sea fog lichen (*Niebla cephalota*) on the ridgeline and cliffs of Mount Sutherland. The surveys also documented five populations of the Sensitive vascular plant shortspur seablush (*Plectritis brachyptera*) in bald habitats west and east of the Elwha River, one population of the Sensitive vascular

plant tall bugbane (*Actaea elata* var. *elata*) in uplands adjacent to Indian Creek's riparian wetlands, and 21 previously unknown locations of the Sensitive vascular plant yerba de selva (*Whipplea modesta*) scattered across the survey area.

Following prior consultation with the Washington Natural Heritage Program (WNHP), the survey team did not complete individual sighting forms for each observation for *Whipplea modesta*, since it is scattered and widespread in this part of the state. Instead, the team recorded GPS waypoints when the species was encountered more than one-quarter mile from the last observation and has provided those locations to WNHP as a separate KML file. The team mapped and completed WNHP sighting forms for all other rare plant and lichen populations encountered during the survey and prepared spatial KML files for rare plant and lichen populations and other significant natural features, including caves, old-growth trees, cliffs, and balds. The surveys also documented a previously unknown population of the federally and state Endangered Taylor's checkerspot butterfly in the Mount Sutherland area, which has been verified by the Washington Department of Fish and Wildlife. The exact location is available only to WDFW and the U.S. Fish and Wildlife Service.

Figure 4. Rare Plant and Ecological Community Survey Areas



SEE ALSO

Appendix III: Rare Plant and Lichen Survey for the full report and the [web map](#) for detail on surveyed species.

Table 1. Rare Plant and Lichen Populations Documented in 2026 Surveys

Species scientific name	Species common name	State status	Rank	Date (s)	Pop #	Area (s)
<i>Fuscopannaria coralloidea</i>	Coral shingle lichen	Endangered	G2G4/S1	4/17/2026	1	Mt. Sutherland cliffs
<i>Fuscopannaria maritima</i>	Seaside shingle lichen	Threatened	G4?/S2	5/5/2026	4	Mt. Sutherland bald
<i>Fuscopannaria maritima</i>	Seaside shingle lichen	Threatened	G4?/S2	5/12/2026	5	Mt. Sutherland cliffs
<i>Niebla cephalota</i>	Powdery sea fog lichen	Sensitive	G4S2	4/17/2026	1	Mt. Sutherland cave
<i>Actaea elata</i> var. <i>elata</i>	Tall bugbane	Sensitive	G4T4/S3	5/17/2026	1	Indian Creek
<i>Plectritis brachystemon</i>	Shortspur seablush	Sensitive	G5?/S1	5/4/2026	1	Dry Hill bald
<i>Plectritis brachystemon</i>	Shortspur seablush	Sensitive	G5?/S2	5/6/2026	2	Mt. Sutherland balds
<i>Plectritis brachystemon</i>	Shortspur seablush	Sensitive	G5?/S3	5/7/2026	3	Parched Right of Way
<i>Plectritis brachystemon</i>	Shortspur seablush	Sensitive	G5?/S4	5/9/2026	4	SE Mt. Sutherland
<i>Plectritis brachystemon</i>	Shortspur seablush	Sensitive	G5?/S5	5/11/2026	5	Mt. Sutherland Ridge
<i>Whipplea modesta</i>	Yerba de selva	Sensitive	G4/S1	-	-	Widespread

Species of Importance: Animals and Insects

The most recent rare plant and lichen survey identified a previously unknown population of the federally and state endangered Taylor's Checkerspot Butterfly in the Mount Sutherland area, which has been verified by the Washington Department of Fish and Wildlife (WDFW).



Taylor's Checkerspot Butterfly

Table 2. Federal and State-Protected Species in the Study Area

Species	Protection Status	Description of Habitat
Marbled Murrelet	Federal Status Threatened; State Status Endangered	Nests occur in mature and old-growth forests, and sometimes younger forests with remnant older trees. Occupied habitat occurs on DNR lands in the Elwha Watershed (WDFW, 2026a). Approximately 2,027 of 2,067 acres of occupied and potential murrelet habitat on DNR is protected under the HCP[U1.1]. Conservation recommendations include protection of nesting habitat (WDFW, 2025).
Taylor's Checkerspot Butterfly	Federal Status Endangered; State Status Endangered	At least 2 populations inhabit DNR lands in the Elwha Watershed. A third population is known a few miles north of the watershed on DNR lands (WDFW, 2026a). The butterflies are using both native balds and meadow openings, as well as areas where trees and shrubs have been removed. Management that helps maintain suitable habitat (forest openings and food plants) is essential to long-term persistence of the species (USFWS, 2022).
Pacific Fisher	Federal Status None; State Status Endangered	Known to inhabit old-growth forest in the Elwha Watershed. Can utilize a diversity or mosaic of habitats in a matrix of old forest. Protection of den sites is a valuable conservation measure for the species (WDFW, 2025).
Western Toad	Federal Status None; State Status Species of Greatest Conservation Need (WDFW 2025) and State	Known locations on or adjacent to DNR lands in the Elwha Watershed (WDFW PHS, 2026). Breed in still water of lakes and ponds and utilizes adjacent upland habitat for dispersal. Conservation actions include protection of known sites from habitat alteration and degradation (WDFW, 2025).
Harlequin Duck	Federal Status None; State Status Species of Greatest Conservation Need	The mouth of the Elwha River is an important wintering area for Harlequin Ducks (WDFW PHS, 2026). Harlequin ducks likely breed in the Elwha Watershed. Conservation measures include protection of wintering areas (WDFW, 2025).
Little Brown Bat; Townsend's Big Eared Bat; Yuma myotis	Federal Status None; State Status Species of Greatest Conservation Need	Locations of these species are in the Elwha Watershed (WDFW, 2026a). Retention of large trees, decadent trees, snags, and hollow trees is important for conservation in forests (WDFW, 2025).

Additional Species of Greatest Conservation Need that may occur on DNR lands include, but are not limited to, Cascades Frog, Band-tailed Pigeon, American Goshawk, Olympic Torrent Salamander, Coastal Tailed Frog, Western Screech Owl, Johnson's Hairstreak, and Valley Silverspot Butterfly.

2. Structurally Complex Forests

Structurally Complex Forests on DNR-Managed Lands

Structurally complex forests are defined not only by age, but also by the physical features and ecological processes and functions that are on the verge of becoming old-growth.

These forests often include large live trees, snags, downed wood, multi-layered canopies, canopy gaps, large root systems, dense or varied understory conditions and variation in tree age and size. This vertical and horizontal complexity creates a more heterogeneous forest environment than is typically found in younger monocrop plantation stands.

Standing dead trees, downed logs, and decaying wood are also important components of these systems, contributing to habitat complexity, nutrient cycling, carbon storage, soil development, and water retention.

Since these structural features support functions that are less common or productive in younger or more uniform plantation stands, a growing body of literature has evaluated the benefits of protecting and maintaining structurally complex forests.

Figure 5. Structurally Complex and Old-Growth Forests on DNR Lands

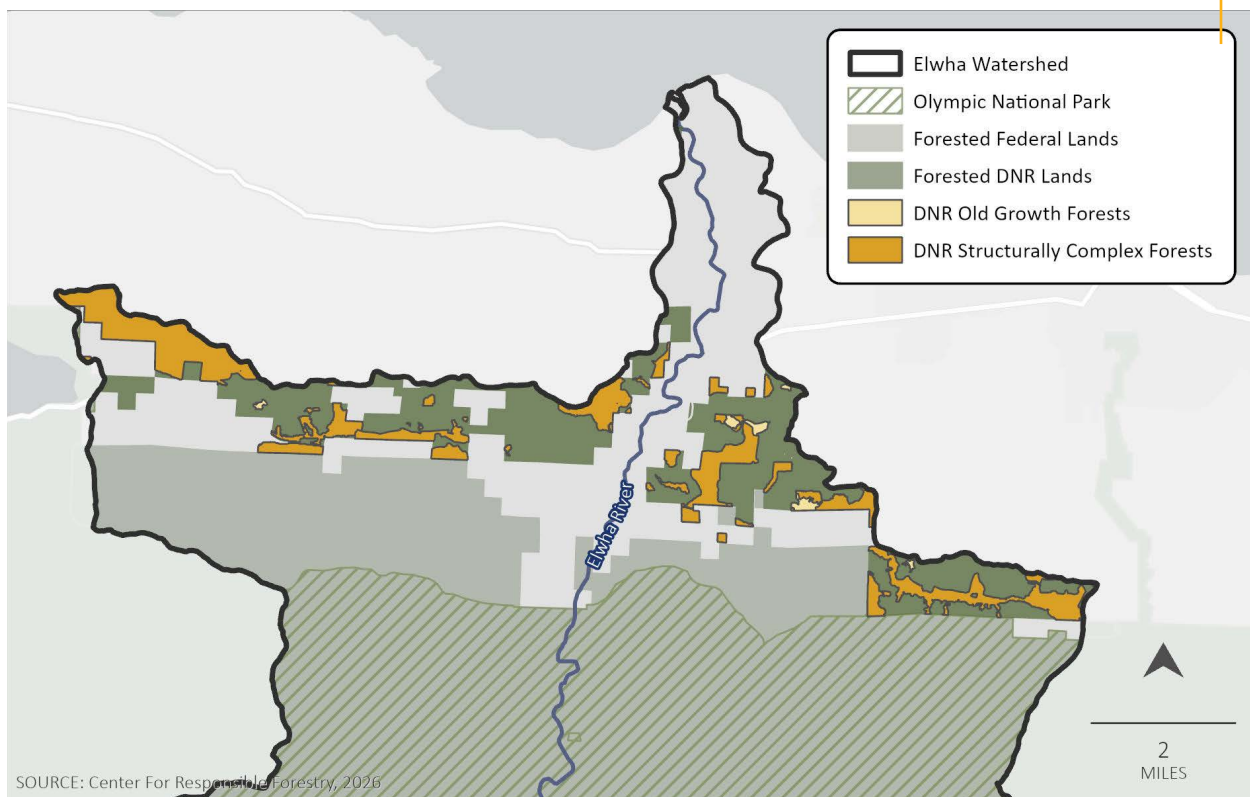


Table 3. Supporting Literature on Ecosystem Benefits of Structurally Complex and Old-Growth Forests

Ecosystem Services Benefit of old-growth, structurally complex and intact forests	Supporting literature
Carbon storage and sequestration	Birdsey et al. (2025); DellaSala et al. (2022); Farinacci et al. (2024); Gilhen Baker et al. (2022); Moomaw et al. (2019)
Water supply and summer streamflow	Perry and Jones (2016); Farinacci et al. (2024)
Water quality	Qiu et al. (2023); Warziniack et al. (2016); Gay et al. (2025); Kreye et al. (2014); DellaSala et al. (2022)
Flood mitigation	Herath et al. (2025), Belmar et al. (2018); Thomas and Nisbet (2016); Bond et al. (2022)
Drought resistance	Farinacci et al. (2024)
Wildfire severity and disturbance response	Zald and Dunn (2018); Bradley et al. (2016); Binkley et al. (2007)
Microclimate buffering and climate refugia	Frey et al. (2016); Betts et al. (2018)
Habitat, biodiversity and at-risk species	Gilhen-Baker et al. (2022); DellaSala et al. (2022); Betts et al. (2018)
Aquatic habitat	Cederholm and Reid (1987); Perry and Jones (2016); Qiu et al. (2023); Penaluna et al. (2026)
Soil stability and erosion control	Qiu et al. (2023); Kreye et al. (2014); Herath et al. (2025)

SEE ALSO

Appendix I: Old-Growth, Structurally Complex and Intact Forest Literature Review for more details.

Risk Reduction Benefits of Structurally Complex Forests

Forests can reduce disaster risk by moderating flooding, erosion, slope failure, and wildfire impacts. Intact, mature, old-growth, and structurally complex forests intercept rainfall, improve infiltration, stabilize soils, and reduce overland flow, helping lower peak flows and sediment delivery (Herath et al., 2025; Woznicki et al., 2020).

These benefits are often stronger in mature forests because developed canopies, root systems, organic soils, woody debris, and understory complexity provide greater hydrologic regulation than younger stands (Belmar et al., 2018; Thomas and Nisbet, 2016; Bond et al., 2022). Structurally complex forests may also reduce wildfire severity in some settings, with studies finding lower severity in older or more protected forests compared to more intensively managed forests, after accounting for weather, climate, and topography (Bradley et al., 2016; Zald and Dunn, 2018).

These benefits are particularly relevant in Clallam County, where DNR-managed forests in the Elwha Watershed overlap with mapped critical areas (see the [web map](#)). Clallam County identifies critical areas to help reduce risks to life and property from flooding, erosion, landslides, and other geologic hazards. County maps include frequently flooded areas and geologically hazardous areas, including landslide- and erosion-prone areas (Clallam County, n.d.). Where DNR-managed forests overlap with these mapped hazards, intact forest cover can provide an important protective function by helping retain soil, slow runoff, and reduce sediment delivery to streams and downstream infrastructure. Recent landslides in the watershed, including the Aldwell landslide on DNR-managed land, further illustrate this connection: photos show slope failure occurring near deforested areas, underscoring how forest removal can increase exposure to erosion and landslide-related impacts (Figure 6).

Figure 6. Aldwell Landslide Adjacent to Harvested Area



Credit: Scott McGee/Forest2sea.com

Planned Timber Sales

There are approximately 1,627 acres of unprotected structurally complex forests in the study area that, unless the state takes action to protect them, DNR will likely harvest within the next 10 years. Of these 1,627 acres, 764.4 acres are within riparian areas. Riparian buffers were classified as unprotected because logging can still occur in some of these areas depending on a stream classification, and areas modeled as a Riparian Management Zone (RMZ) can change when a timber sale is planned. As of August 2026, all are on at least temporary hold, with the exception of Parched and Tree Well.

The following table presents the status of these forests as of August 2026. If logged, these timber sales would industrially log 608.2 acres and be converted to tree plantations. This leaves only 254.4 acres of remaining unprotected structurally complex forests outside of riparian buffers and planned timber sales.

This highlights the importance of including these forests in Natural Area boundaries and reworking timber sales in DNR’s Olympic Region.

Table 4. Planned Timber Sales on Structurally Complex Forests

Sale Name	Acres	Status
Parched	171	Auctioned and some road building. Harvest scheduled to begin 10/26 but subject to lawsuit seeking to stop the sale. DNR modified sale to remove some rare plant communities, but 74 acres of rare plant communities would still be logged if sale proceeds
Tree Well	41.4	Auctioned and some road building. DNR modified sale to remove some rare plant communities. Harvest scheduled to begin 10/26 but subject to lawsuit seeking to stop the sale.
Kicker	67.9	Paused by commissioner's order
Bread & Butter	83.1	Paused by commissioner's order
Alley Cat	88.4	Paused by commissioner's order
By a Whisker	156.4	Paused by commissioner's order. WNHP found a rare plant community within the sale, and likely more would be found if adjacent areas that are connected to the stand were surveyed in the 400 acres just outside of the watershed boundary. A rare lichen was also identified within the sale.
Total	608.2	

Ecosystem Service Valuation of WA DNR Land in the Lower Elwha

A supplemental ecosystem service valuation of DNR lands within the Lower Elwha Watershed was conducted to complement the assessments presented in this report.

This analysis estimates the economic value of ecosystem services provided by the DNR lands under two management scenarios: (1) protection of the structurally complex forests in the area and (2) harvest of the structurally complex forests after 10 years followed by 50-year harvest rotations.

Ecosystem service valuation is the process of estimating the economic value of the benefits that natural ecosystems provide to people, including many services that are not bought and sold in traditional markets, such as habitat, water regulation, carbon storage, recreation, and disaster risk reduction. This assessment applies the benefit transfer method, which estimates these values using peer-reviewed economic studies conducted in ecologically and socially comparable settings, providing a practical and scientifically supported approach for evaluating ecosystem service benefits at the landscape scale.

The analysis found that, under the protection scenario, these lands (all landcovers) would provide an estimated **\$1.34 billion in undiscounted ecosystem service benefits over a 120-year period** (\$447.3 million discounted at 3%). Compared to the harvest scenario, protection of the structurally complex forests would **increase the value of ecosystem services by approximately \$367.5 million** (\$106.4 million discounted) compared with the business-as-usual harvest scenario. Pollination and seed dispersal, habitat conservation, outdoor recreation, carbon sequestration, water capture and supply, disaster risk reduction, and erosion regulation were identified as the largest contributors to these benefits.

Since this assessment evaluates only the DNR lands in the Lower Elwha, representing less than five percent of the Elwha Watershed, the estimated values represent only a portion of the ecosystem services provided across the broader watershed.

SEE ALSO

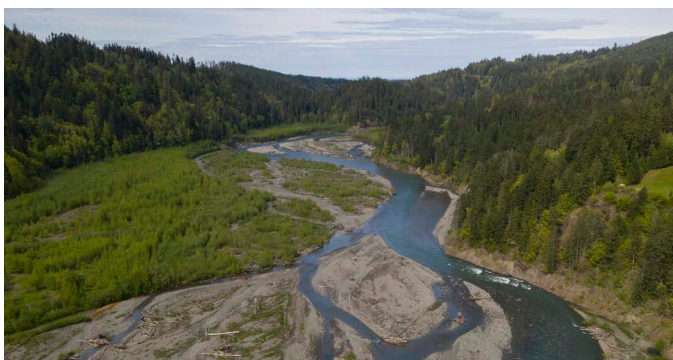
Appendix II: Ecosystem Services Valuation of the DNR Lands in the Elwha Watershed

3. Scenic and Other Natural Features

One purpose of an NRCA is to protect scenic features. The Natural Resources Conservation Area Act does not define “scenic features.” The Lower Elwha Watershed has several features that can be described as scenic. Scientists from around the world visit the Elwha Watershed to observe the effects of dam removal and progress with restoration efforts. DNR conducted a public survey to help identify scenic and other natural features. That survey could have yielded identification of considerably more scenic areas, but some scenic features of note are below.

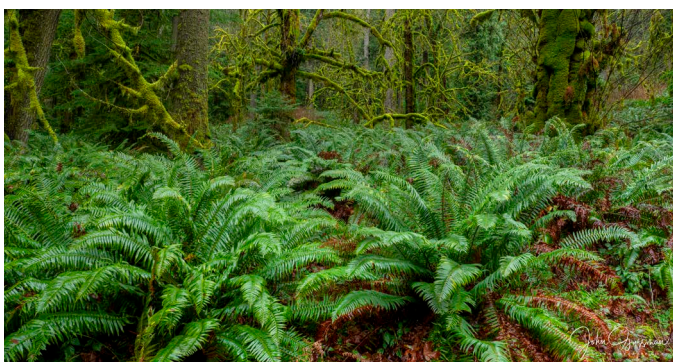
Former Aldwell Lake Bed

Credit: John Gussman



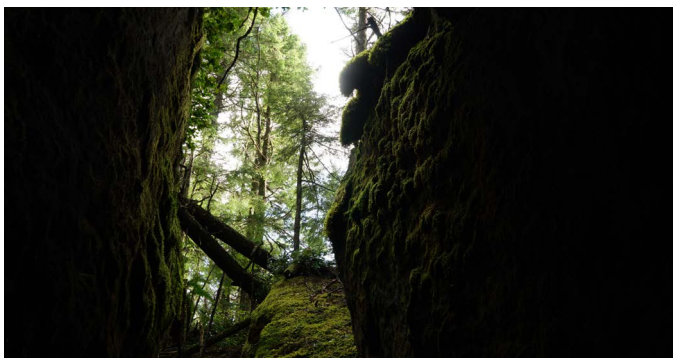
Forested Wetlands

Credit: John Gussman



Caves

Credit: Joshua Wright



Old Elwha Dam Site

Credit: John Gussman



Mouth of the Elwha River

Credit: John Gussman



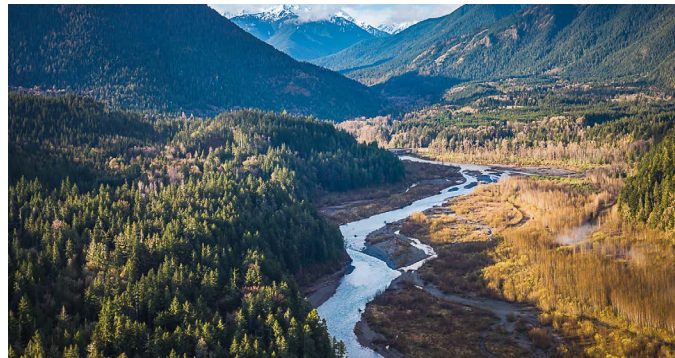
Balds

Credit: Florence Caplow



Viewplanes

Credit: Scott McGee/Forest2sea.com



The Elwha Watershed is also ecologically unique in a number of ways, including, but not limited to:

1. It is affected by the rain shadow of the Olympics, with a gradient across the watershed from wetter to the west to dryer to the east.
2. It is one of only a small number of areas in the state that have globally rare “bald habitat” which is also habitat for the federally Endangered Taylor’s checkerspot as well as the state Sensitive *Plectritis brachystemon*, which the Taylor’s checkerspot butterfly partially depends on as a post-diapause food plant (WDFW, 2026).
3. The rocky ridgeline of Mount Sutherland at the western end of the watershed supports a very unusual assemblage of rare lichens, all of which are usually found at sea level and sometimes even within the saltwater “splash zone.” This ridgeline also has caves and scattered old-growth trees with burn scars. One of the rare lichens, *Niebla cephalota*, was found in a cave.

In some cases, GPS points were taken for significant natural features encountered in the course of fieldwork (caves, old-growth trees, cliffs, balds) and that information has been provided to the DNR.



4. Current Uses: Recreation and Cultural Practices

Recreational Uses

Some parts of the Lower Elwha Watershed host low impact recreation activities, including hiking, mountain biking, and educational opportunities. These parcels feature public trails including the well-known Olympic Adventure Route of the Olympic Discovery Trail. There are other community and mountain biking trails. In some parts of the lower watershed, DNR has approved a network of responsibly designed and world-class mountain biking trails. These trails enhance access to recreation—a secondary objective of NRCAs. Other NRCAs, such as Blanchard Mountain and West Tiger Mountain, include management of mountain biking trails in their management plans.

The value of recreating in intact forest ecosystems or ecosystems that are being restored is much higher than recreating in impaired and clearcut landscapes. Conserved ecosystems or ecosystems in process of restoration also provide greater opportunities for wildlife viewing. There are several popular birding trails in the lower watershed dependent upon healthy ecosystems. Recreation is a significant economic benefit to the community. Across the North Olympic Peninsula, visitor spending alone brings approximately \$369 million annually (The Trust for Public Land, 2021).

In October 2023, the Lower Elwha Klallam Tribe celebrated the return of ceremonial and subsistence fishing and for the first time in decades were able to exercise their treaty right to harvest salmon. While fish populations rebuild, recreational fishing is still not allowed. However, based on the current restoration trajectory, we can anticipate that recreational fishing will have future economic value.

Tribal Cultural Practices

The Lower Elwha Klallam Tribe resides in the Lower Elwha River Valley and adjacent bluffs on the north coast of the Olympic Peninsula just west of Port Angeles, Washington. As recognized by the United States in the 1855 Treaty of Point No Point, the Lower Elwha Klallam Tribe has lived in this area since time immemorial.

The Tribe's current landbase was initially acquired by the United States in trust for the Tribe in 1935-36 and these lands were proclaimed as the Lower Elwha Reservation in 1968. Today tribal lands include about a thousand acres of land on and near the Elwha River.

For thousands of years, the Elwha River and Indigenous peoples existed in a state of reciprocity, with the river serving as the lifeblood of the people.

When settlers built the Elwha and Glines Canyon dams without fish passage in the early 1900s, it decimated the ecosystem and severed a foundational piece of Klallam culture. The Lower Elwha Klallam Tribe worked tirelessly to bring down the dams and begin the process of healing a place and people. To the Lower Elwha Klallam Tribe, the Elwha River Watershed is their home, their life source, and the physical anchor of their cultural identity. The watershed has inherent worth and intrinsic value, unable to be fully measured in economic terms.

Important cultural practices in the watershed include hunting, gathering native and medicinal plants, and harvesting cedar bark as well as ceremonial and subsistence fishing. The few remaining mature cedar groves are in structurally complex forests.

Structurally complex forests are likewise home to important native and medicinal plants. The valley provided cedar trees for canoes, longhouses, and woven baskets. It yielded wildlife like elk and deer, alongside a vast array of edible and medicinal plants like huckleberries, salal, and devils club. Specialized knowledge regarding the watershed's plants is passed down through generations. The pre-colonial landscape looked much different than the watershed of today. Towering trees and abundant wildlife have been replaced by intensive logging and degraded landscapes. But restoration efforts under the Tribe's leadership and in partnership with other groups and governmental entities hold promise that a way of life rooted in reciprocity, rather than extraction, will return.

5. Identification of Conservation Areas

Within the investigation area, there are different sub-areas or zones that each deserve careful consideration for inclusion in a new NRCA or in a new NAP. NAPs provide the highest level of protection.

This section highlights each of the sub-areas and contains a summary of their special features that make the zone worthy of protection and, where warranted, focused restoration.

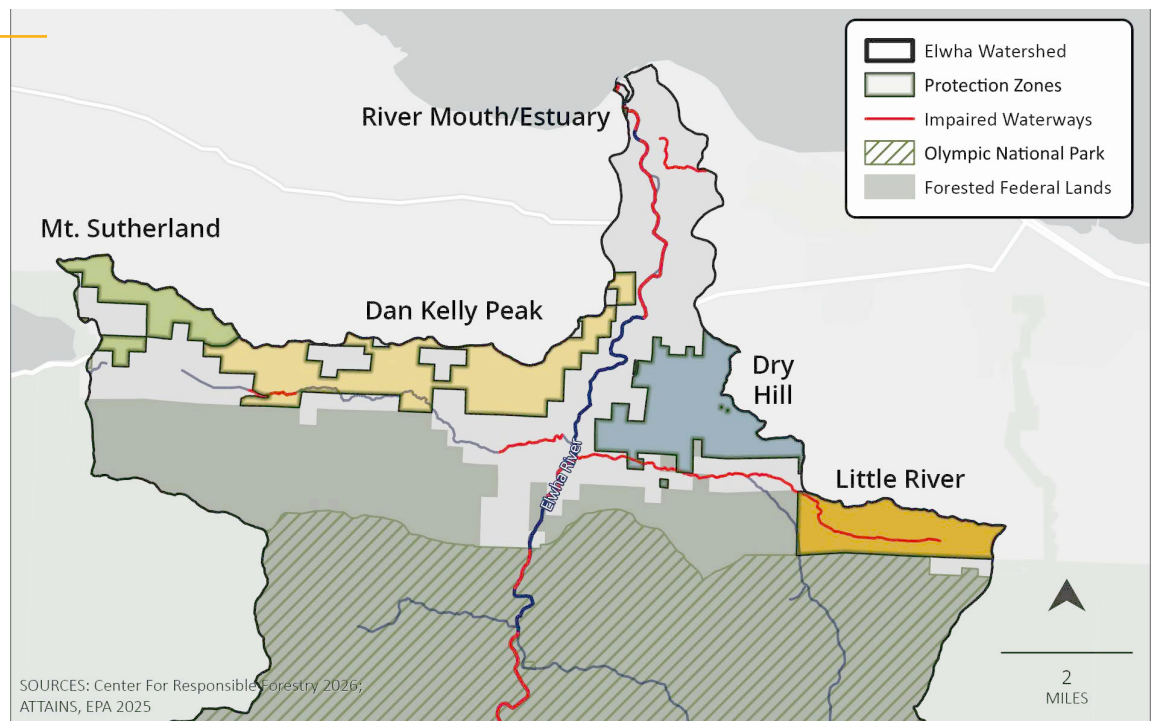
The Elwha Study looks at characteristics of the Elwha Watershed worthy of conservation. Under the Natural Resources Conservation Area Act - RCW 79.71.030, "conservation purposes" include but aren't limited to:

1. Maintaining, enhancing, or restoring ecological systems, including but not limited to aquatic, coastal, riparian, montane, and geological systems, whether such systems be unique or typical to the state of Washington
2. Maintaining exceptional scenic landscapes
3. Maintaining habitat for threatened, endangered, and sensitive species
4. Enhancing sites for primitive recreational purposes
5. Outdoor environmental education

To evaluate these conservation purposes, the watershed was divided into five geographic assessment zones: Mt. Sutherland, Dan Kelly Peak and Indian Creek, Dry Hill, Little River, and the Elwha River mouth and estuary (Figure 7). Each zone was assessed for a range of conservation values, including:

- Acreage of DNR-managed lands;
- Extent of structurally complex forests;
- Rare plants, lichens, and native ecological communities;
- Existing protected and conserved lands;
- Water quality conditions and impaired waterways;
- Habitat for threatened, endangered, and sensitive species;
- Landscape connectivity with other protected areas and habitat networks;
- Scenic, geological, and natural features;
- Recreation, education, and cultural resource values; and
- Contributions to watershed-scale ecological integrity and restoration.

Figure 7.
Conservation
Assessment Zones
on DNR Lands



Mt. Sutherland

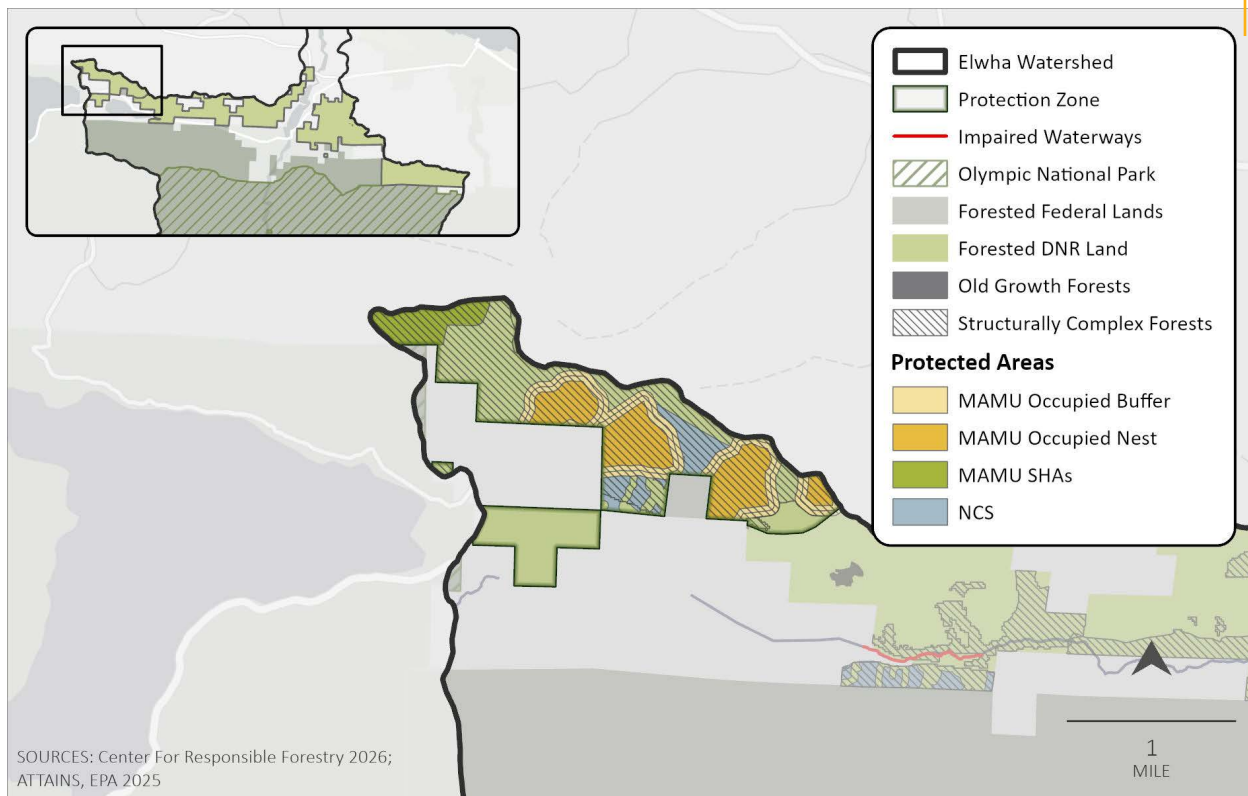
Mt. Sutherland is one of the most ecologically significant areas within the study area, containing over 980 acres of DNR-managed land, including 790 acres of structurally complex forest, of which approximately 283 acres remain unprotected. The area also provides landscape-scale ecological connectivity through more than 400 additional acres of structurally complex forest on the mountain's north slope. Although these forests occur outside the Elwha Watershed boundary, they are part of the same ecological system, and several rare ecological community occurrences extend beyond the mapped study area. Significant portions of Mt. Sutherland remain undeveloped and roadless, contributing to ecological integrity and habitat security. Notably, the area contains virtually no trails, except for a small trail entering the adjacent Shore Thing parcel, a characteristic that helps maintain ecological integrity and minimizes disturbance.

A defining characteristic of Mt. Sutherland is the presence of multiple Washington Natural Heritage Program (WNHP) Element Occurrences of rare native plant communities, including some of the highest-quality examples documented anywhere in Washington.

These include:

- A-ranked occurrence of the Douglas fir / Salal - Oceanspray Forest (G3/S2) encompassing approximately 150 acres. These stands are located primarily within the watershed, although a portion extends beyond the watershed boundary on Mt. Sutherland. This is the highest-quality documented occurrence of this community in Washington State and the only occurrence identified within the Northwest Coast Ecoregion, where it has been designated a priority for inclusion in the 2025 Natural Heritage Plan.
- A-ranked occurrence of the Western Hemlock - (Douglas fir, Western Red-cedar) / Western Swordfern - Common Ladyfern Forest (G3G4/S3) across approximately 20 acres. This occurrence is located just outside the watershed boundary in a structurally complex forest stand that is continuous with the forests of Mt. Sutherland. It is the highest-quality known occurrence of this community in Washington.

Figure 8. Mt. Sutherland Conservation Assessment Zone



- B-ranked occurrence of the same Western Hemlock - (Douglas fir, Western Red-cedar) / Western Swordfern - Common Ladyfern Forest (G3G4/S3), occupying approximately a dozen acres on Mt. Sutherland and extending into the “Shore Thing” forest along Indian Creek, which was protected through Natural Climate Solutions funding in 2024.
- B-ranked occurrence of the Common Camas - White Brodiaea Wet Bald (GNR/S1S2) community. This rare wet bald occupies approximately 0.2 acres on the south slope of Mt. Sutherland at the base of a grassland supporting a newly documented Taylor’s checkerspot butterfly population. This community is not currently protected within any Washington state natural area, is identified by WNHP as a priority for conservation, and represents the only documented occurrence of this plant community in the state.
- C-ranked occurrence of the Roemer’s Fescue - Field Chickweed - Prairie Junegrass Grassland (G1/S1), covering approximately 4 acres on the south slope of Mt. Sutherland. This rare grassland supports the newly documented Taylor’s checkerspot butterfly population and is identified by WNHP as a priority for inclusion within the state natural area system in the Northwest Coast Ecoregion.
- A likely high-ranked occurrence of Douglas fir - Western Hemlock / Salal - Oceanspray Forest (G2/S2) extending across several hundred acres. This community has not yet been formally designated as an Element Occurrence because less than 250 acres occur within the watershed boundary, which is insufficient to meet WNHP criteria for this large-patch forest type. However, if adjacent forests on the north slope and west side of Mt. Sutherland were surveyed, the area would likely qualify as a high-quality Element Occurrence with exceptional ecological integrity.

Together, these occurrences represent some of the most significant concentrations of rare native ecological communities found anywhere in the Elwha Watershed and include several communities identified by WNHP as priorities for conservation and natural area representation.

These rare ecological communities are complemented by five documented occurrences of rare plants and lichens. Rare plant species include *Whipplea modesta*, which occurs on dry slopes throughout the area, and *Plectritis brachystemon*, which has been documented both within the bald supporting the Taylor’s checkerspot butterfly population and within an additional bald to the west. Rare lichen occurrences include *Fuscopannaria coralloidea* on cliff faces, *Niebla cephalota* within a cave environment on the cliffs, and *Fuscopannaria maritima* on exposed ridge-top rock outcrops overlooking the Taylor’s checkerspot habitat, including an additional occurrence overlapping with the proposed By A Whisker timber sale area.

Approximately 513 acres of Mt. Sutherland are already protected through a combination of marbled murrelet conservation areas, Natural Climate Solutions acquisitions, and old-growth forest patches.

Mt. Sutherland provides habitat for multiple species of conservation concern, including the Taylor’s checkerspot butterfly, which occupies the area’s rare bald and grassland habitats, and at least four documented marbled murrelet nest sites. The area also contains significant non-delineated old-growth forest stands, extensive talus slopes, and at least four documented boulder cave systems. These caves are believed to provide excellent habitat for wildlife, including mountain lions, and are the only documented non-coastal cave systems in Clallam County. Some extend more than 50 feet in depth, making them an uncommon geological feature within the region.

In addition to its ecological significance, Mt. Sutherland possesses exceptional scenic value. Its prominent peak and cliff systems are highly visible from Highway 101 and form one of the defining visual landmarks of the Lower Elwha landscape. The area is directly connected to the adjacent Natural Climate Solutions property known as “Shore Thing,” further enhancing its role in a larger network of protected lands and contributing to landscape-scale habitat connectivity throughout the watershed.

Dan Kelly Peak (including Indian Creek)

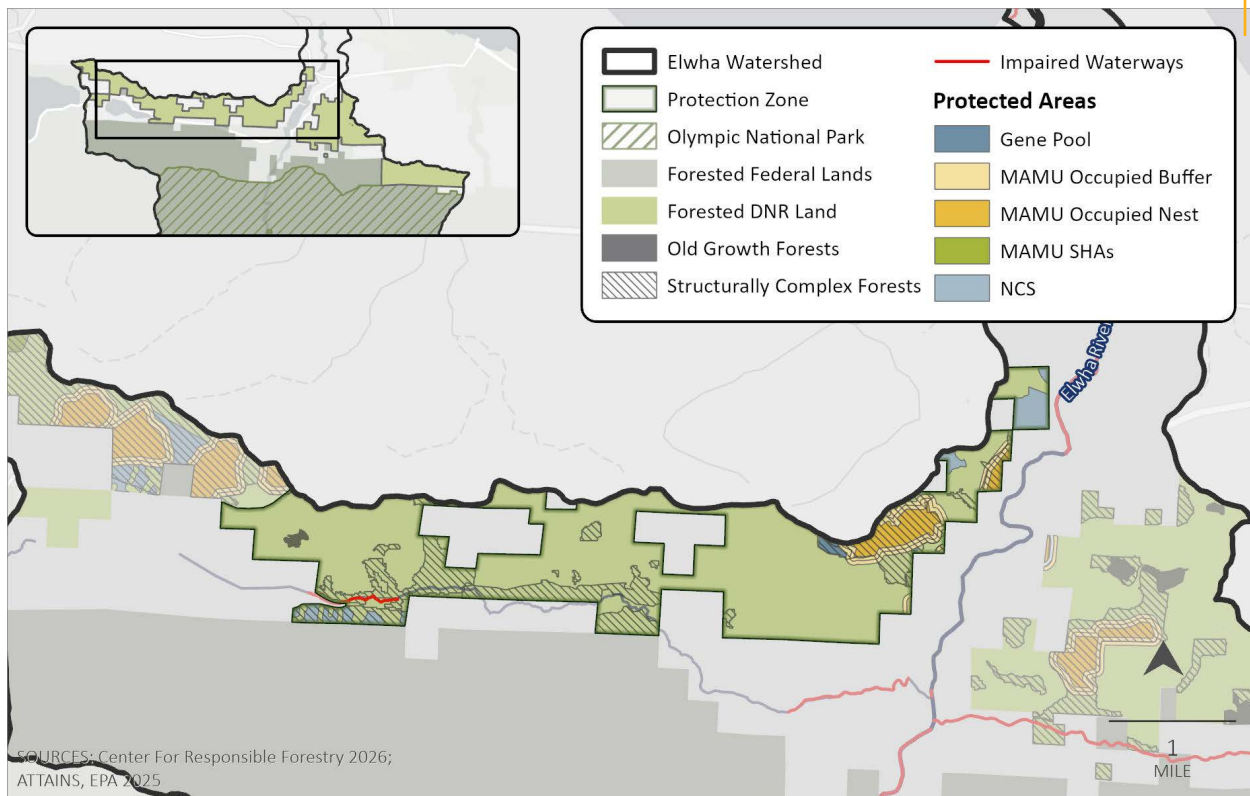
The Dan Kelly Peak and Indian Creek area encompasses approximately 2,880 acres of DNR-managed land, making it the largest assessment zone within the study area. The area contains 686 acres of structurally complex forest, of which approximately 454 acres remain unprotected. The landscape includes a diverse mixture of upland forests, riparian corridors, wetlands, and open bluff habitats that support an exceptional concentration of rare ecological communities and species. Its location between Mount Sutherland, Dry Hill, and existing conservation lands makes it one of the most important landscape connectivity areas in the watershed.

A defining characteristic of Dan Kelly Peak and Indian Creek is its concentration of Washington Natural Heritage Program (WNHP) Element Occurrence of rare native plant communities.

These include:

- B-ranked occurrence of Red-osier Dogwood - Willow spp. - Douglas' Spirea Wet Shrubland (GNR/S2) located around a small wetland at the base of Dan Kelly Ridge. This ecological community is identified by WNHP as a priority for inclusion in the state's natural area system and is not currently represented within any state natural area.
- B-ranked occurrence of Sitka Spruce - Western Hemlock - (Red Alder) / Devil's-club / Swordfern Swamp Forest (GNR/S2S3) occupying approximately 60 acres along Indian Creek. This community is also identified as a priority for protection and is not currently represented within Washington's natural area system.
- B-ranked occurrence of Sitka Spruce / Salmonberry / Slough Sedge - Yellow Skunk-cabbage Swamp (G2G3/G2) co-occurring with the swamp forest communities of Indian Creek and occupying approximately 60 acres.

Figure 9. Dan Kelly Peak and Indian Creek Assessment Zone



- B-ranked occurrence of Western Hemlock - (Douglas fir, Western Red-cedar) / Western Swordfern - Common Ladyfern Forest (G3G4/S3) across approximately 80 acres along Indian Creek. This occurrence connects ecologically with the same community found on Mt. Sutherland and within the adjacent Shore Thing conservation property.
- B-ranked occurrence of Douglas fir / Oceanspray - Baldhip Rose / Western Fescue Forest (G2G3/S2) located on Dan Kelly Ridge and extending into Dry Hill.
- C-ranked occurrence of Douglas fir / Salal - Oceanspray Forest (G3/S2) occupying approximately 12 acres.
- C-ranked occurrence of Western Redcedar - (Grand Fir) / Swordfern Forest (G1/S1) occupying approximately 80 acres within Dan Kelly Ridge and Indian Creek.
- C-ranked occurrence of Western Hemlock - (Western Red-cedar, Red Alder) / Skunk-cabbage - Common Ladyfern Swamp (GNR/S2S3) occupying approximately two acres.

Collectively, these communities represent a diverse assemblage of rare forested wetland, swamp forest, riparian, and upland ecological communities, several of which are poorly represented or absent from Washington's existing natural area system.

Rare plant observations documented by CRF-contracted botanists include *Whipplea modesta*, which occurs throughout dry slopes in the area, and *Actaea elata* var. *elata*, which was documented in upland bigleaf maple stands near Indian Creek.

Approximately 295 acres are already protected through marbled murrelet conservation areas, Natural Climate Solutions acquisitions near the Power Plant property, and scattered old-growth forest patches. One impaired waterway has been documented within the area.

Dan Kelly Peak and Indian Creek provide habitat for the Taylor's checkerspot butterfly, particularly within the bluff and bald habitats of Dan Kelly Ridge, as well as at least one documented marbled murrelet nest site. The area serves as a critical landscape linkage connecting marbled murrelet habitat, the Power Plant Natural Climate Solutions property, and the adjacent Dan Kelly Ridge Preserve, a 152-acre property managed by the Center for Natural Lands Management. The preserve protects one of the last remaining wild populations of Taylor's checkerspot butterfly and supports numerous larval host plants and nectar sources.

The area also supports significant cultural, recreational, and public-resource values. It includes the City of Port Angeles wellhead protection area, provides opportunities for gathering native and medicinal plants, and accommodates low-impact recreation through the Olympic Discovery Trail and approved mountain bike trail systems. These combined values make Dan Kelly Peak and Indian Creek among the most significant opportunities for landscape-scale conservation within the Elwha Watershed.

Dry Hill

The Dry Hill area encompasses approximately 2,160 acres of DNR-managed land, including 687 acres of structurally complex forest, of which approximately 392 acres remain unprotected. Positioned near the mainstem Elwha River, Dry Hill serves as an important ecological connection between upland forests and lower watershed habitats while supporting some of the largest concentrations of rare ecological communities documented during this assessment.

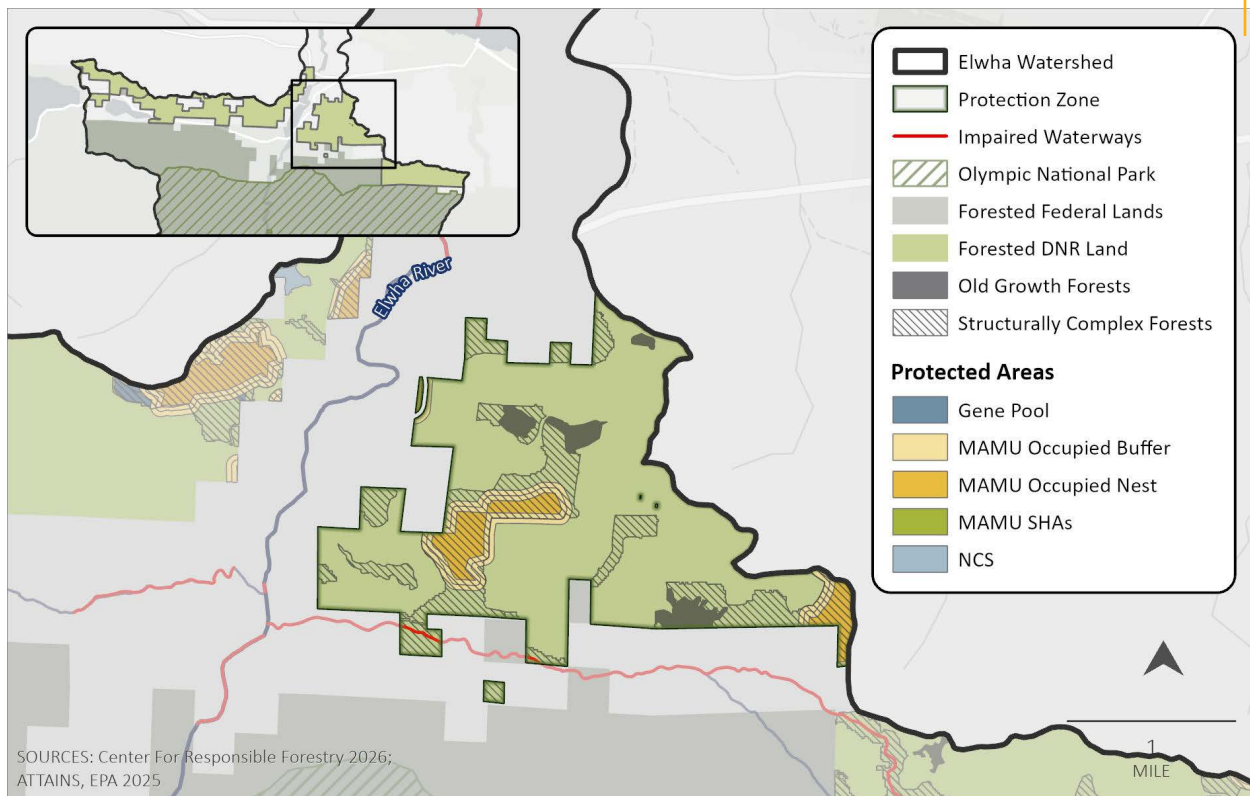
Dry Hill contains approximately 321 acres of documented WNHP Element Occurrences of rare native plant communities, including:

- B-ranked occurrence of Douglas fir / Oceanspray - Baldhip Rose / Western Fescue Forest (G2G3/S2) occupying approximately 60 acres and extending into Dan Kelly Ridge.
- B/C-ranked occurrence of the Sierran-North Pacific Bald, Bluff & Prairie (G3?/S1S3) community, representing one of the area's rare open-habitat ecosystems.

- C-ranked occurrence of Western Redcedar - (Grand Fir) / Swordfern Forest (G1/S1) occupying approximately 23 acres.
- C-ranked occurrence of Western Redcedar - Douglas fir - Grand Fir / Dwarf Oregongrape / Western Swordfern Forest (G1/S1) occupying approximately 23 acres.
- C-ranked occurrence of Douglas fir - Western Hemlock / Salal - Oceanspray Forest (G2/S2) occupying approximately 262 acres on the south slope of Dry Hill.

Particularly noteworthy is the 262-acre Douglas fir - Western Hemlock / Salal - Oceanspray Forest occurrence, which may be degraded or removed from DNR's inventory if future logging activities associated with the proposed Parched timber sale proceed. As a result, Dry Hill contains one of the most substantial concentrations of conservation-priority ecological communities identified during this assessment.

Figure 10. Dry Hill Conservation Assessment Zone



Rare plant observations include *Whipplea modesta* and *Plectritis brachystemon*, the latter documented in three locations including sites near or within the Parched timber sale area.

Approximately 315 acres are already protected within marbled murrelet conservation areas and old-growth forest patches. One impaired waterway has been documented.

Dry Hill supports habitat for at least two documented marbled murrelet nest sites and provides important connectivity between protected forests and the lower watershed. The area also supports low-impact

mountain biking opportunities and contains a known culturally significant cedar-bark harvesting area. Its proximity to the mainstem Elwha River further increases its importance for watershed-scale ecological function and restoration.

The area's ecological and cultural importance was highlighted in November 2024 when the Lower Elwha Klallam Tribe opposed the proposed Alley Cat timber sale, which remains paused. This opposition underscores the broader significance of Dry Hill for cultural resources, forest integrity, and long-term watershed conservation.

Little River

The Little River area contains approximately 1,455 acres of DNR-managed land, including 515 acres of structurally complex forest, of which approximately 498 acres remain unprotected. Although fewer biological inventories have been conducted in this area than elsewhere in the watershed, Little River remains an important component of the broader conservation landscape and contains substantial opportunities for future conservation and restoration.

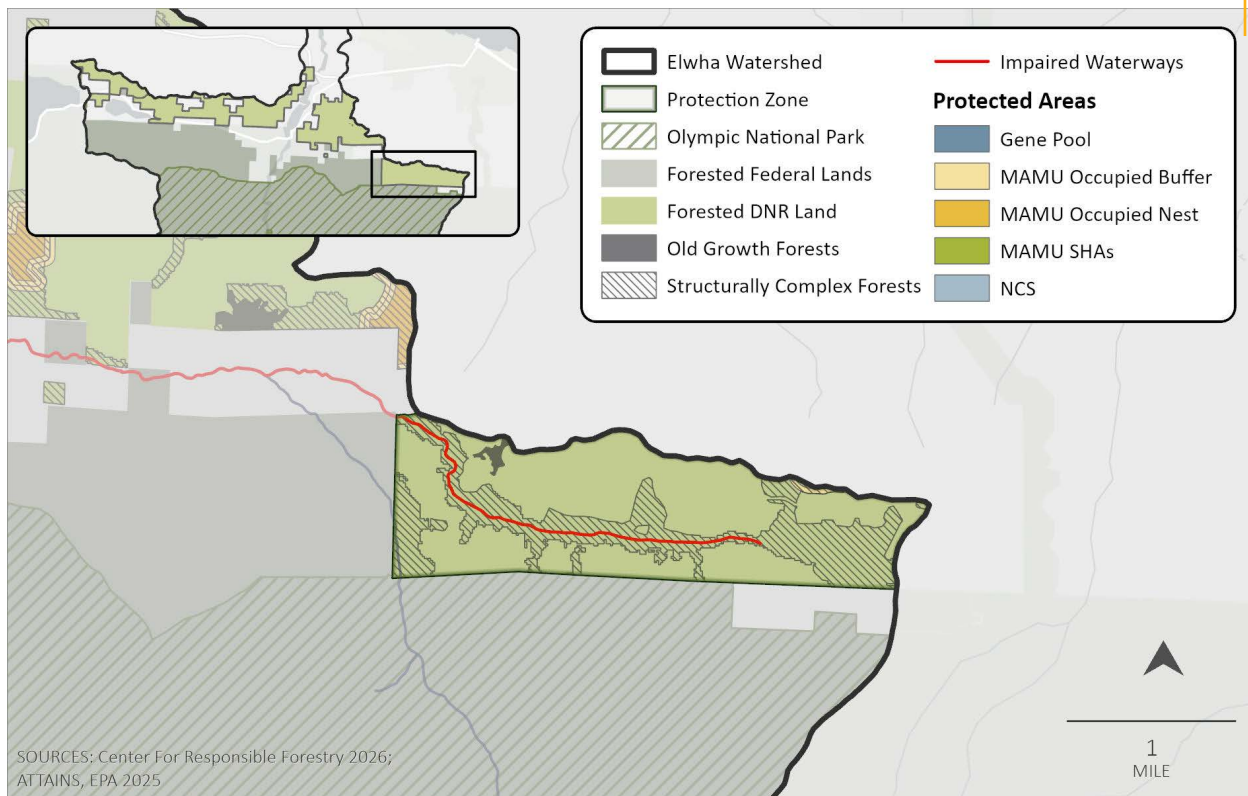
Unlike the other assessment zones, there are currently no documented Washington Natural Heritage Program Element Occurrences of rare ecological communities within Little River. However, the absence of documented occurrences should be interpreted cautiously. The area was not surveyed by CRF-contracted botanists for rare plants or lichens, and additional inventories may identify conservation values that have not yet been documented.

Approximately 17 acres are already protected through two old-growth forest patches. One impaired waterway has been identified within the area.

Little River's significance lies primarily in its restoration, connectivity, and resilience values. The area contains a large extent of unprotected structurally complex forest and contributes to habitat connectivity across the lower watershed. It has also been identified by the Lower Elwha Klallam Tribe as an important restoration area, making it an important landscape for future ecosystem recovery efforts.

Given its relatively limited survey history, substantial forest resources, and restoration potential, Little River should be considered a conservation opportunity area whose full ecological significance may not yet be fully understood.

Figure 11. Little River Conservation Assessment Zone



Elwha River Mouth and Estuary

Although comprising only 7 acres of DNR-managed forest land, the Elwha River Mouth and Estuary occupy one of the most ecologically significant locations in the watershed. As the transition zone between the Elwha River and the Strait of Juan de Fuca, the estuary plays a critical role in salmon recovery, sediment transport, estuarine habitat development, and broader ecosystem restoration following dam removal.

One impaired waterway has been identified within the area. Despite its small size, the estuary is among the watershed's most important scenic landscapes and serves as a critical link between freshwater and marine ecosystems.

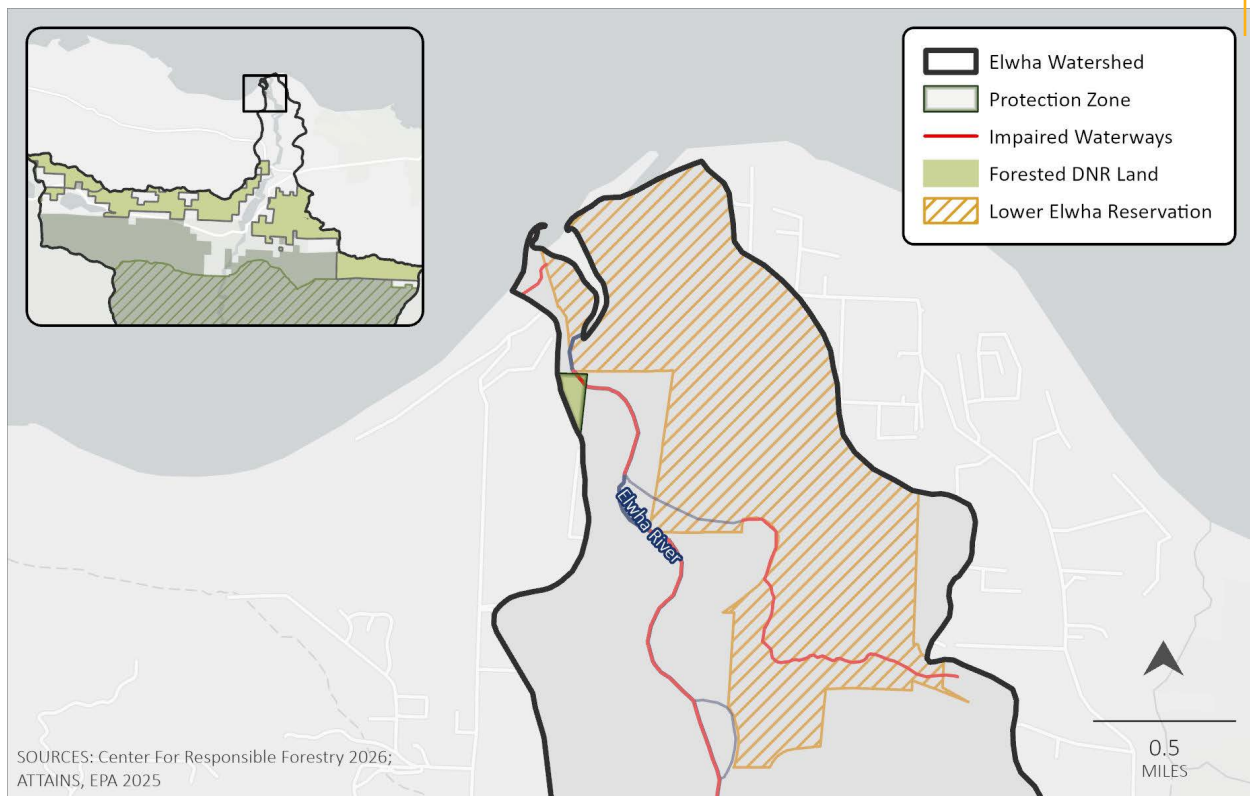
The estuary is particularly important for marine species recovery. It provides feeding habitat that supports the endangered Southern Resident killer whale population, which relies heavily on Chinook salmon originating from watersheds such as the Elwha. NOAA has identified restoration of the Elwha River as a priority for Southern Resident recovery,

and Washington's Orca Task Force has recommended increased investment in restoration and habitat acquisition in watersheds that contribute significantly to Chinook salmon production.

The area also provides critical ecosystem services for human communities. The Elwha River serves as the sole drinking water source for the City of Port Angeles and supplies water to approximately 25 percent of Clallam County residents. The City's water intake facility is located within this area, linking watershed protection directly to regional water security.

The estuary's role in salmon recovery, marine ecosystem health, scenic values, public drinking water supply, and ongoing restoration efforts makes it one of the most strategically important conservation areas in the entire Elwha Watershed despite its relatively small acreage.

Figure 12. Elwha River Mouth and Estuary Assessment Zone



Watershed-Scale Significance

Taken together, these areas demonstrate that DNR-managed lands in the Elwha Watershed support multiple conservation purposes identified under RCW 79.71.030. They contain extensive structurally complex forests; documented rare plants, lichens, and ecological communities; habitat for threatened and sensitive species; exceptional geological and scenic features; opportunities for primitive and low-impact recreation; and landscapes that support cultural practices, education, and ongoing ecological restoration.

Perhaps most importantly, these lands function as interconnected components of the broader Elwha ecosystem. Their conservation value extends beyond individual sites to include their role in maintaining habitat connectivity, protecting watershed processes, supporting the recovery of the Elwha River ecosystem, and complementing existing federal, tribal, state, and local conservation investments throughout one of Washington's most important and celebrated watersheds.



6. Additional Considerations

Salmon Recovery and Stream Health

One of the major goals of the dam removal and the watershed restoration is salmon recovery. Given the enormous impacts that forests and riparian areas have on stream flows and stream temperature, it is essential that the assessment consider stream health.

Forest conditions are closely linked to aquatic habitat. Forest harvest and riparian disturbance can increase sediment, warm stream temperatures, reduce large wood recruitment, simplify channel structure, and limit seasonal refuge habitat. In the Clearwater River basin, Cederholm and Reid (1987) found that forestry-related impacts affected coho salmon through increased sediment loads, altered riparian conditions, reduced winter and summer habitat, and lower streambed stability where large wood had been removed. On the western Olympic Peninsula, harvested basins had higher maximum daily stream temperatures and greater daily temperature swings than unharvested basins, with higher harvest levels increasing the likelihood of exceeding Washington's core salmon and trout habitat temperature criterion (Pollock et al., 2009). Recent DNR monitoring of the Clearwater River further highlights the importance

of large wood and mature riparian processes. Large trout were concentrated in pools with the most large wood, and juvenile coho salmon and trout densities were strongly associated with habitat complexity and key-piece wood density (Martens, 2025). These findings suggest that legacy logging has reduced instream wood and habitat quality, and that restoration may be needed until surrounding forests can naturally restore large wood recruitment and stream processes.

These benefits are directly relevant to DNR-managed lands in the Elwha Watershed. The Elwha Chapter Update to the Puget Sound Chinook Recovery Plan identifies riparian forest and forest restoration, monitoring, and protection as important recovery actions, including enhanced protection for mature forests, tributaries, and forested water-retention areas (North Olympic Peninsula, 2024). The Elwha River, Little River, and Indian Creek are also listed by Washington Department of Ecology as Category 5 impaired waters under the 303(d) list, primarily due to temperature, with additional pH and dissolved oxygen concerns (Washington Department of Ecology, 2026). These waterways support aquatic life uses, such as summer salmonid habitat, and spawning grounds.



Credit: John Gussman

Protecting Water Provisions

The [web map](#) includes water intake, well protection, and critical aquifer recharge areas.

Forests support water quality and supply by filtering pollutants, retaining sediment, moderating runoff, and protecting surface and groundwater sources. Research generally finds that higher forest cover is associated with lower turbidity, sediment, nutrients, and drinking water treatment needs (Warziniack et al., 2016; Ernst et al., 2004; Kreye et al., 2004). Recent modeling also shows that forest conversion and development can increase sediment and nitrogen at drinking water intakes, while forest cover can improve water quality outcomes (Gay et al., 2025). These benefits are influenced by watershed conditions, forest type, and fragmentation, with mixed, natural, and less fragmented forests often providing stronger water quality benefits (Qiu et al., 2023).

These benefits are directly relevant to DNR-managed lands in the Elwha Watershed. EnviroAtlas data indicate that DNR forested lands retain significant sediment, reducing sediment and nutrient delivery to nearby waterways. The lands fall across three HUC12 sub-watersheds—Lake Aldwell-Elwha, Little River, and Indian Creek—that include wellhead and source

water protection areas. More than 50% of Indian Creek is within groundwater protection areas, while more than 50% of Lake Aldwell-Elwha and Little River include source water protection areas. Clallam County also maps Lake Sutherland, Little River, and the Elwha River corridor through the study area as critical aquifer recharge areas (Clallam County, n.d.).

The greater Elwha Watershed and these sub-watersheds provide surface water and groundwater supply to local public water systems (Table 5), including the City of Port Angeles, Black Diamond Water District, Dry Creek Water Association, Elwha Place Homeowners Association, Elwha Dam RV Park, and Maple Grove (Environmental Protection Agency, 2026). The ecosystem service values for water quality and supply therefore reflect the role of DNR forests in maintaining clean and reliable water sources, reducing sediment and treatment burdens, and supporting the residents, businesses, and public services that depend on these systems. This includes the City of Port Angeles, which has 13 major employers with more than 100 jobs each, representing at least 1,300 jobs that depend on a consistent supply of clean water (West, 2023).

Table 5. Community Water Systems and Populations Served

Community Water System	Population Served
Port Angeles City	28,946
Black Diamond Water District	452
Dry Creek Water Association	3,030
Elwha Place Homeowners Association	61
Elwha Dam RV Park	106
Maple Grove	132

Source: *The Drinking Water Mapping Application to Protect Source Waters (DWMAPS)* from the U.S. Environmental Protection Agency (2026)

Strategies for Revenue Replacement

Historically, DNR has managed the state's forested trust lands primarily to generate revenue for a variety of trust beneficiaries such as public schools, counties, and their junior taxing districts, prisons, and the State Capitol among others. When forests are harvested, the beneficiaries receive a portion of the revenue from DNR. When forested trust lands are determined to be prime candidates for conservation, DNR has the ability to compensate the underlying trust by acquiring replacement lands of equal value that will produce revenue for the trusts over time. This is important because revenue replacement tools ensure that the beneficiaries are compensated when forests are conserved. Trust lands that may be designated for inclusion in a new Elwha NRCA or NAP would be candidates for replacement lands that can replace the foregone revenue.

The primary revenue replacement program is called the Trust Land Transfer Program (TLT). It has existed since the late 1980s and hundreds of thousands of acres of ecologically valuable land have been conserved using TLT and replacement lands have been acquired providing long-term benefits to the underlying trusts. Every legislative session a ranked list of projects is recommended by the Board of Natural Resources for funding through the Capital Budget. In 2023, the program was codified by the Washington Legislature, and a feature was added that allows counties to receive some of the replacement value upfront in cash rather than getting all the value in replacement forest land. This new feature is known as "Cash for Counties." This is a great new benefit because it can help in situations where a particular trust beneficiary has a near-term revenue need. If an NRCA and/or NAP is created in the Elwha Watershed, the state-owned forested areas within the boundary can be transferred out of trust status and into conservation status and replacement lands of equal value can be acquired using the Trust Land Transfer program.

Another revenue replacement mechanism that could be used in the Elwha Watershed is known as Natural Climate Solutions. The year 2023 was the first year the Legislature appropriated funds generated by Washington's Climate Commitment Act's (CCA) Cap and Invest system. By law, a portion of the funds generated by selling pollution allowances must be spent on strategies that advance carbon storage and sequestration or that help the climate using other natural biologic processes. In 2023, the legislature invested \$70 million of CCA-derived Natural Climate Solutions funding in older forest conservation. In subsequent years there have been additional appropriations. Going forward, the legislature could again use Climate Commitment Act funds to buy replacement lands of equal value replacing the revenue that would have been garnered for the trusts if the remaining older, naturally regenerated Elwha forests were logged. The legislature can also include the "Cash for Counties" feature that is contained in the Trust Land Transfer program.

Conclusion

Washington State DNR has a tremendous opportunity to take action to protect and restore its lands within the Elwha Watershed. Structurally complex forests are particularly important to protect. Their large trees, layered canopies, standing and downed wood, extensive root systems and varied understory conditions support ecological functions that are not readily replicated by younger, more uniform forests. These characteristics sustain habitat and biodiversity while supporting carbon storage, water regulations, soil formation, and other ecosystem services that contribute to the long-term health and resilience of the Elwha Watershed. The ecosystem service valuation demonstrated the magnitude of these benefits: protecting structurally complex forests rather than continuing current harvest practices would generate **an additional \$367.5 million in ecosystem service benefits**, underscoring the substantial ecological and economic value of maintaining these forests over the long term.

As this report demonstrates, there are numerous areas that warrant Natural Area protection. The extraordinary Mt. Sutherland area clearly meets the criteria for designation as a Natural Area Preserve (NAP), the highest level of protection available under Washington's natural area system. The Mt. Sutherland NAP should also include DNR forestlands immediately north of the watershed boundary because they support similar ecological conditions, contain additional structurally complex forest, and contribute significantly to landscape-scale habitat connectivity. Mt. Sutherland contains some of the highest-quality rare ecological communities documented in Washington State, habitat for Taylor's checkerspot butterfly and marbled murrelets, significant old-growth characteristics, unique cave and talus systems, and one of the most prominent scenic landmarks in the Lower Elwha Watershed.

The other DNR lands evaluated in this study, including Dan Kelly Peak and Indian Creek, Dry Hill, Little River, and the Elwha River Mouth and Estuary, meet the criteria for a newly established Elwha Watershed Natural Resources Conservation Area (NRCA).

The Dan Kelly Peak and Indian Creek area is notable because of its proximity to the Elwha River, connectivity to parcels previously protected through Natural Climate Solutions funding, the presence of numerous rare ecological communities, connectivity to the Dan Kelly Ridge Preserve, which protects one of the last remaining wild populations of Taylor's checkerspot butterfly, and its scenic and historical significance as the location of the former Elwha Dam. The area also includes important wetland and riparian habitats, the City of Port Angeles' wellhead protection area, opportunities for cultural plant gathering, and extensive low-impact recreation opportunities.

Dry Hill warrants protection because it contains more than 300 acres of documented Washington Natural Heritage Program Element Occurrences, including several rare ecological communities that may be threatened by future timber harvest activities. The area supports marbled murrelet habitat, substantial structurally complex forest and old-growth characteristics, important connectivity to the Lower Elwha River corridor, and culturally significant cedar-bark harvesting areas.

Little River represents an important restoration and conservation opportunity within the lower watershed. Although less thoroughly surveyed than other areas, it contains more than 500 acres of structurally complex forest, most of which remains unprotected. The area contributes to habitat connectivity and watershed resilience and has been identified by the Lower Elwha Klallam Tribe as a priority landscape for restoration.

The Elwha River Mouth and Estuary occupy a relatively small area of DNR ownership but represent one of the most strategically important conservation locations in the watershed. The estuary supports salmon recovery, Southern Resident orca recovery, and nearshore ecosystem restoration, while also protecting the sole drinking water source for the City of Port Angeles and approximately one-quarter of Clallam County's population.

Collectively, these areas form an interconnected conservation landscape supporting rare ecological communities, structurally complex forests, threatened and sensitive species, cultural resources, climate resilience, recreation, water quality, and ecosystem restoration. **Protecting these lands would build upon decades of investment in Elwha restoration and help ensure that one of the nation's most celebrated river recovery efforts continues to deliver ecological, cultural, and economic benefits for future generations.**

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APPENDIX I

Old-Growth, Structurally Complex, and Intact Forest Literature Review

Benefit provided	Description	Supporting literature
Carbon storage and sequestration	Old-growth and mature forests store large amounts of carbon in live trees, dead wood, litter, and soils. Older forests can continue accumulating carbon over long periods when not logged or severely disturbed, and large trees often hold a substantial share of above-ground carbon.	Birdsey et al. (2025); De-IlaSala et al. (2022); Fari-nacci et al. (2024); Gilhen Baker et al. (2022); Moo-maw et al. (2019)
Water supply and summer streamflow	Older conifer forests can help sustain summer stream-flow and water availability relative to young Douglas-fir plantations. PNW research found lower summer streamflow in regenerating plantation basins than in reference basins with mature and old-growth forests. More recent research also found that mature and old-growth watersheds better sustained water availability compared with young, planted forests.	Perry and Jones (2016); Farinacci et al. (2024)
Water quality	Forest cover supports water quality by stabilizing soils, reducing erosion, retaining sediment, nutrient absorption and reducing overland flow. Higher forest cover is generally associated with improved water quality, while deforestation, fragmentation, development and other forest conversion can increase sediment, turbidity and nutrient loading.	Qiu et al. (2023); Warzi-niack et al. (2016); Gay et al. (2025); Kreye et al. (2014); DellaSala et al. (2022)
Flood mitigation	Mature and intact forests help reduce peak flows by intercepting rainfall, increasing infiltration, reducing overland flow and slowing water movement through a watershed. Research found that deforestation consistently increases peak flows, while flood reduction from added forest cover develops more gradually and depends on forest maturity and other ecological and geographic characteristics.	Herath et al. (2025), Belmar et al. (2018); Thomas and Nisbet, (2016); Bond et al. (2022)
Drought resistance	Mature and old-growth forests may be more resistant to drought than young, planted forests, because their growth is less sensitive to summer drought conditions. Research in Oregon found that young forests had lower water-use efficiency, reduced streamflow and declining tree growth during drought, while mature and old-growth forests continued accumulating carbon and maintaining higher summer streamflow.	Farinacci et al. (2024)
Wildfire severity and disturbance response	Older and more structurally complex forests can be associated with lower fire severity in western U.S. landscapes compared with younger, intensively man-aged plantation forests. Studies found that forests with higher protection, which included a greater proportion of older trees, had lower fire severity. However, fire severity is also strongly influenced by other factors, such as fire weather, topography, stand age, and forest structure.	Zald and Dunn (2018); Bradley et al. (2016); Bin-kley et al. (2007)
Microclimate buffering and climate refugia	Old-growth forest structure can moderate understory temperatures and provide cooler, more stable micro-climates. Complex canopy structure, high biomass, taller canopies, and vertical layering can reduce maximum temperatures compared with more simplified stands. In the Pacific Northwest, old-growth forest cover has also been shown to buffer some climate-sensitive bird populations from the effects of warming.	Frey et al. (2016); Betts et al. (2018)
Habitat, biodiversity and at-risk species	Older forests provide habitat features such as large live trees, snags, cavities, downed wood, canopy layering, fungi, epiphytes, and varied microclimates. These conditions support species associated with older forest structure, contribute to biodiversity, and provide conservation value for at-risk ecosystems and species.	Gilhen-Baker et al. (2022); DellaSala et al. (2022); Betts et al. (2018)
Aquatic habitat	Forested watersheds and riparian areas support aquatic habitat by regulating sediment, stream temperature, nutrients, large woody debris, channel structure and refuge habitat. Forest age and condition can influence freshwater biodiversity, with recent research finding greater taxonomic and functional richness in older forested watersheds.	Cederholm and Reid (1987.); Perry and Jones (2016); Qiu et al. (2023); Penaluna et al. (2026)
Soil stability and erosion control	Forest cover and intact forest structure reduce erosion by stabilizing soils, increasing infiltration, reducing overland flow, and retaining sediment. These processes support water quality, aquatic habitat, and down-stream watershed function	Qiu et al. (2023); Kreye et al. (2014); Herath et al. (2025)

Ecosystem Services Valuation of the DNR Lands in the Elwha Watershed

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Executive Summary

This report estimates the economic value of ecosystem services provided by Washington Department of Natural Resources (DNR) lands in the Elwha Watershed and evaluates the long-term benefits of protecting the structurally complex forests in that watershed. Two management scenarios were analyzed over a 120-year period: **Scenario 1 (Business-as-Usual)**, in which currently unprotected structurally complex forests are harvested in 10 years and then on 50-year rotations, and **Scenario 2 (Protection)**, in which these forests remain protected, providing increased levels of ecosystem services as these ecosystems remain diverse and mature.

Under Scenario 2, DNR lands in the watershed would provide an estimated **\$1.34 billion** in undiscounted ecosystem service benefits over 120 years (**\$447.3 million, discounted 3 percent per year**). Currently unprotected, the structurally complex forests alone would provide **\$523.1 million** in undiscounted benefits (**\$172.6 million discounted**) in perpetuity, were they protected. Compared to Scenario 1, protecting these forests would increase the asset value of ecosystem services across the study area by approximately **\$367.5 million (\$106.4 million discounted)**.

Pollination and seed dispersal provide the highest valued benefits, reflecting the role of forests in supporting habitat and forage for wild and managed pollinators that sustain agricultural production, biodiversity, and food security. Habitat conservation follows, reflecting the value Washington residents place on protecting old-growth and structurally complex forests and habitat for species such as the northern spotted owl. These benefits represent the intrinsic value residents place on the natural landscape in Washington. Outdoor recreation, carbon sequestration, water capture and supply, disaster risk reduction, and erosion regulation also contribute substantial value. Note that carbon benefits reported here are not valued for their potential in carbon credit markets, but based on the Social Cost of Carbon.

This analysis values only those DNR lands that have been proposed for protection (Figure 1), which cover less than five percent of the Elwha Watershed. This includes approximately 8,485 acres of forests, wetlands, shrublands, and 6.6 lineal miles of river; comparable landcover across the watershed exceeds 188,000 acres. Thus, the ecosystem services estimates presented in this report represent a fraction of the total value provided across the Elwha Watershed, and should not be interpreted as the total value produced by Elwha Watershed ecosystems.

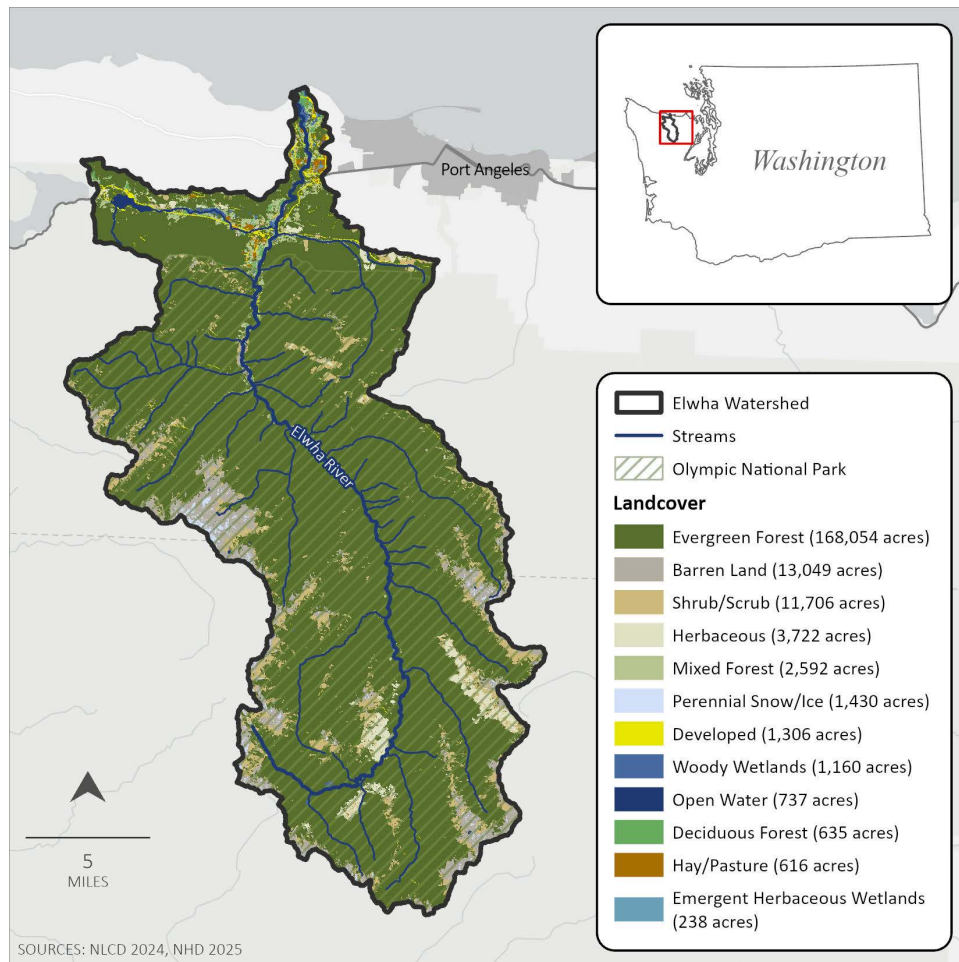
Introduction

The Elwha River Watershed is one of the most successful river restorations in the United States. Following removal of the Elwha and Glines Canyon dams, the watershed has been the focus of long-term restoration efforts led by the Lower Elwha Klallam Tribe, public agencies, conservation organizations, and community partners. Their efforts are helping to restore watershed function, floodplain processes, riparian vegetation, ecological connectivity, and salmonid habitat. Much of the upper watershed falls within Olympic National Park boundaries and is thus already managed for conservation. The lower watershed lands managed by the Washington Department of Natural Resources (DNR) are important to watershed-scale recovery because they connect recovering aquatic habitat in tributaries with floodplains, drinking water resources, and recreational corridors.

The Center for Responsible Forestry and partners have proposed additional protection mechanisms for high conservation value DNR lands in the Elwha lower watershed, with a particular focus on structurally complex forests. These forests provide mature-forest functions, supporting water quality, carbon storage and sequestration, habitat, biodiversity, flood and erosion regulation, outdoor recreation, and other ecosystem services. Some of the old-growth and structurally complex DNR forest patches are already protected from harvest, preserving their ecological functions and associated benefits. Yet more than half of the structurally complex forests in the study area remain unprotected and are thus at risk of future harvest. Protection pathways such as Natural Area Preserve or Natural Resources Conservation Area designation, or Trust Land Transfer could help to conserve these forests while also addressing trust land management and beneficiary considerations.

This supplemental report provides the methods and results of an ecosystem service valuation developed to estimate the economic value of benefits provided by forests and other landcovers of DNR lands in the Lower Elwha Watershed. This analysis is intended to complement a broader ecological and conservation assessment (Elwha Watershed Protection - A Call for State Stewardship) by estimating, where possible, the economic value of the benefits these lands provide to nearby communities and the local economy.

Figure 1. DNR lands in the Elwha Watershed.



Source: Earth Economics, 2026

Ecosystem Service Valuation Methods

Natural Capital and Ecosystem Services

The analysis evaluates two scenarios to illustrate the ecosystem service value associated with protecting structurally complex forests that are not currently protected. Again, in Scenario 1 (business-as-usual), unprotected structurally complex forests remain available for harvest. In Scenario 2 (protection), unprotected structurally complex forests, protected from harvest, continue providing the ecosystem service benefits associated with old-growth and structurally complex forest conditions.

This report offers a preliminary analysis of the economic value of co-benefits provided by forests and other landcover across the Washington Department of Natural Resources (DNR) lands in the Elwha Watershed. As it was not possible in this report to estimate the value of all benefits provided by the forests and other ecosystems of the

Lower Elwha, the results should be interpreted as high-level underestimates which demonstrate the magnitude of ecosystem service benefits safeguarded by the proposed protections.

The following sections include a brief primer on ecosystem services and valuation techniques to familiarize readers with key ecological economics concepts. The report then describes the methods, assumptions, and sources used to estimate ecosystem service values for DNR lands in the Lower Elwha. Results are reported by ecosystem service, landcover type, and scenario to highlight how the proposed protection could support multiple watershed functions and benefits over time.

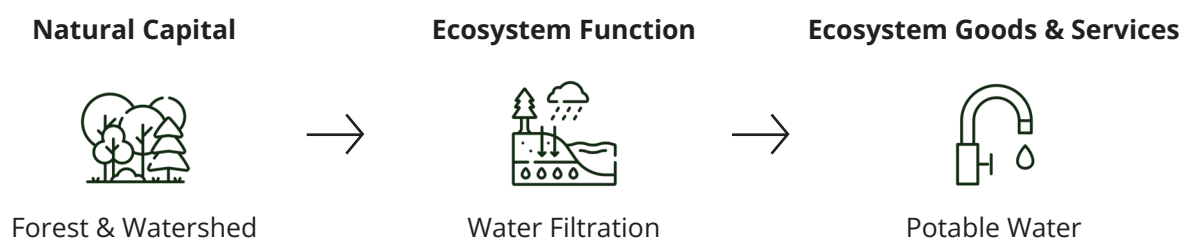
AN ECOSYSTEM SERVICES PRIMER: WHY VALUE ECOSYSTEM SERVICES

Including the non-market value of ecosystem services in decision making leads to more informed decisions. These benefits have often been excluded from economic decision making—effectively valued at \$0—which has led to incomplete assessments of the full worth of environmental assets and nature-based solutions. Ignoring these benefits can lead to inefficient investments and higher long-term costs. As natural systems are degraded, communities can become more vulnerable, and replacing lost ecosystem services (e.g., water filtration) with built infrastructure often leads to greater lifetime costs that must be borne by taxpayers, ratepayers, and consumers. In many cases, the loss of natural capital means the loss of irreplaceable ecosystem services for which equivalent substitutes are not available at any price. Recognizing and quantifying ecosystem services benefits has become a common approach for evaluating the value of conservation and restoration, ensuring that decision makers account for the full range of benefits supported by these alternatives.

NATURAL CAPITAL, ECOSYSTEM FUNCTION, AND ECOSYSTEM SERVICES

Natural capital consists of any “minerals, energy, plants, animals, ecosystems, climatic processes, nutrient cycles, and other natural structures and systems ... that provide a flow of natural goods and services” (Daly and Farley, 2004). As forests, wetlands, and rivers intercept rainfall and filter water, natural storage and filtration processes support clean water supplies (see Figure 2). Though these and other ecosystem functions provide a foundation for all human societies, such value is frequently overlooked.

Figure 2. Natural Capital, Ecosystem Function, and Ecosystem Goods and Services.



Healthy landscapes support thriving communities and economies, with ecosystem services providing the resources and critical ecosystem processes to support industry and quality of life. There are multiple approaches to categorizing ecosystem services. The commonly cited include the Millennium Ecosystem Assessment framework (MEA) (Alcamo et al., 2003), The Economics of Ecosystems and Biodiversity framework [TEEB] (De Groot et al., 2010), the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services framework (IPBES, 2017), and the Common International Classification of Ecosystem Services [CICES] (Haines-Young & Potschin, 2018). The number of distinct services varies widely—CICES lists over 100 services, while the MEA and TEEB frameworks name just 21.

Generally, ecosystem services are organized into four broad categories:

- Provisioning services are tangible resources used directly by humans (e.g., food, water storage, fuels, forage, fibers, and minerals).
- Regulating services help to maintain natural processes (e.g., long-term terrestrial storage of carbon, local and regional climate regulation, water capture, water quality, soil creation and retention, flood risk reduction, pollination).
- Supporting services provide critical habitat and refugia for plants, animals, and other species at each stage of their lifecycles.
- Informational services support social, cultural, or spiritual needs (e.g., education, aesthetic beauty, spiritual and cultural heritage, recreational and touristic experiences).

ESTIMATING THE ECONOMIC VALUE OF ECOSYSTEM SERVICES

Ecosystem service valuation is the process of quantifying the monetary value of these benefits. Some ecosystem goods and services are traded in markets (e.g., food, natural fibers, wetland credits), and for these, there are mechanisms to assign or impute monetary values using market prices. However, many other valuable ecosystem benefits are not—these are known as “non-market” goods and services. To understand the economic value of these, economists use other means by which to estimate their value.

Most non-market valuation methods are derived from either stated preferences or revealed preferences. Stated preference methods estimate value by directly asking people what they would be willing to pay for a particular resource (or accept for its loss). Revealed preference methods infer values by observing spending behavior in related markets, such as variations in property values associated with specific amenities, or costs incurred to visit a particular place.

It is also possible to use secondary methods to estimate the value of ecosystem services. In these instances, researchers applied published estimates to “transfer” sites with ecological and social characteristics similar to the original research sites. This is known as Benefit Transfer Method (BTM), broadly defined as “...the use of existing data or information in settings other than for what it was originally collected” (Richardson et al., 2015). BTM is frequently used to estimate the value of nonmarket goods or services, as it is often the most pragmatic option available for quickly generating reasonable estimates at-scale and at a fraction of the cost of conducting multiple primary studies. A commonplace application of BTM is the property appraisal, in which the value and features of comparable nearby properties that have recently sold (e.g., two bedrooms, garage, adjacent to a park area) are used to estimate the value of off-market properties. Such results can be somewhat imprecise; their value comes from the ability to generate reasonable results (appropriate to support initial decision making) in a timely and cost-effective manner.

Benefit Transfer Methods

Two common categories of BTM are point-value transfers and value function transfers. Point-value transfers convert estimates reported in the primary research into unit values (e.g., \$/acre/year), which are then scaled by the number of equivalent units at a transfer site. Value function transfers reapply statistical models reported in the valuation literature, substituting transfer site attributes for explanatory variable values (e.g., median income, distance to surface waters) to generate semi-tailored estimates.

This analysis uses point-value transfers and erosion reduction benefits associated with the sediment retained by vegetation to estimate the non-market value of ecosystem services. Unit-based point transfer estimates were selected from the Earth Economics database based on the compatibility of the primary sites with DNR lands in the Elwha Watershed (e.g., studies from Washington or the Pacific Northwest). Sediment reduction estimates by Woznicki et al. (2020) were valued using erosion reduction benefits reported by Hansen and Ribaud (2008) and the U.S. Environmental Protection Agency (2025).

Table 1. Ecosystem services included in this report and methodologies used.

Ecosystem Service	Point Transfer	Erosion Reduction
Aesthetic Beauty	•	
Air Quality	•	
Biological Control	•	
Carbon Sequestration and Storage	•	
Commercial Fisheries		•
Cultural Value	•	
Disaster Risk Reduction	•	•
Food	•	
Habitat	•	
Pollination, Genetic Transfer	•	
Recreation and Tourism	•	•
Science and Education	•	
Soil Retention	•	
Soil Quality	•	
Water Capture, Conveyance, and Supply	•	
Water Quality	•	•

POINT VALUE TRANSFER ESTIMATES

For more than two decades, Earth Economics has curated a database of published valuation estimates to support the rapid valuation of ecosystem services. The database currently includes over 10,000 estimates, each tagged with over 100 attributes, including study site location and characteristics (e.g., proximity to urban areas, climate), methodology, and valuation type (e.g., revealed preferences). Where feasible, each estimate has been “regularized” into a unit value (e.g., \$/acre/year, \$/household/year). This facilitates selection of datasets that closely match transfer sites. All transcriptions undergo a rigorous internal peer review to ensure that estimates have been properly transcribed and that the underlying methodology conforms with contemporary best practices.

This analysis includes valuation studies for old-growth and structurally complex forests, other forests, shrublands, and wetlands. Table 2 reports the acres and lineal miles of each landcover type in the study site. Forest acres have been reported by protected status, as these are valued differently across the two scenarios. The following section describes the valuation methods for erosion reduction, and how point values and erosion reduction benefits were scaled and projected.

Table 2. Landcover in DNR-land in the Elwha Watershed.

Landcover	Value	Riparian	Units
Old-Growth (OG)			
<i>Protected</i>	101	—	Acres
Structurally Complex Forest (SCF)			
<i>Protected</i>	1,032	128	Acres
<i>Unprotected</i>	1,627	—	Acres
Other Forest			
<i>Protected</i>	132	60	Acres
<i>Unprotected</i>	4,718	—	Acres
Wetland	166	—	Acres
Shrubland	521	—	Acres
River	6.6	—	Lineal Miles

EROSION REDUCTION CO-BENEFITS

This analysis estimated the annual value of sediment retained by old-growth and structurally complex forests, as well as other forest areas, on DNR lands in the Lower Elwha Watershed. Sediment retention estimates were derived from EnviroAtlas data on the sediment transport to nearby and downstream waterways avoided by restoring vegetation. These data are available for the conterminous United States and represent the annual quantity of sediment retained by forests and other vegetation.

The EnviroAtlas avoided sediment yields are based on Woznicki et al. (2020), which mapped erosion and sediment transport across the coterminous United States. The study used the Revised Universal Soil Loss Equation (RUSLE), physiographic data, remote sensing datasets, and estimates of sediment delivery ratios to model sheet and rill erosion and the portion of eroded sediment likely to reach waterbodies at a 30-meter spatial resolution, nationwide. The study also estimated the magnitude of sediment retention provided by natural landcover by comparing erosion and sediment delivery under existing natural vegetation conditions to a scenario in which natural vegetation is removed. This provides a spatially explicit basis for estimating the ability of forests and other vegetation to reduce erosion and sediment loading in adjacent and downstream waterways.

For this analysis, avoided sediment yield values were extracted for DNR forest areas in the Lower Elwha Watershed. Sediment retention was estimated at approximately 30 tons per hectare per year for old-growth and structurally complex forest areas, and approximately 15 tons per hectare per year for other forested areas. These were converted to tons per acre and applied to the erosion reduction benefits.

To derive the economic value of these sediment retention benefits, avoided sediment estimates were multiplied by erosion reduction estimates from Hansen and Ribaudo (2008). These were characterized as \$/(short) ton across 14 benefit categories, capturing relationships between reduced soil erosion and environmental and economic outcomes. The authors use multiple methods to estimate public and private willingness-to-pay for such benefits, and their models link physical processes of erosion and sedimentation to economic effects on industries, households, and municipalities.

This analysis applied erosion reduction benefits (\$/ton) values for Clallam County to estimate the value of benefits related to water quality, avoided flood damages, marine fisheries, marine recreation, and water-based recreation (Table 3). For each forest type, the tons of sediment retained per acre, per year were multiplied by the relevant Hansen and Ribaudo estimates to generate annual dollar-per-acre, per-year estimates. These annual values represent the estimated economic benefits associated with reduced sediment delivery from forest retention in the Lower Elwha Watershed.

Table 3. Categories of benefits affected by water erosion (Hansen & Ribaudo, 2008)

Service	Benefit	Description	Used
Navigation	Reservoir services	Less sediment in reservoirs	
	Navigation	Shipping industry avoidance of damages from groundings	
Recreation	Water-based recreation	Cleaner fresh water for recreation	•
	Marine recreational fishing	Increased catch rates for marine recreational fishing	•
Agricultural Productivity	Irrigation ditches and canals	Reduced cost of removing sediment and aquatic plants from irrigation channels	
	Soil productivity	Reduced losses in soil productivity	
Flood Control	Flood damages	Reduced flooding and damage from flooding	•
	Road drainage ditches	Less damage to and flooding of roads	
Commercial Fisheries	Marine fisheries	Improved catch rates for marine commercial fisheries	•
	Freshwater fisheries	Improved catch rates for freshwater commercial fisheries	
Water Quality	Municipal and industrial water use	Reduced damages from salt and mineral dissolved in sediment	•
	Municipal water treatment	Lower sediment removal costs for water-treatment plants	•
	Steam power plants	Reduced plant growth on heat exchangers	

Benefit-Scaling Methods

Existing old-growth forest patches on DNR lands are currently protected from harvest, preserving their ecological functions and associated ecosystem service benefits. However, more than half of the structurally complex forests in the study area remain unprotected and at risk of future harvest. To evaluate the value of protecting these areas, the analysis considers two scenarios: one in which unprotected structurally complex forests remain available for harvest and lose their unique ecological functions once harvested, and one in which they are protected through mechanisms such as Natural Area Preserve or Natural Resources Conservation Area designation and continue providing ecosystem service benefits over time.

All ecosystem service unit values were scaled to the corresponding spatial extent of each landcover type (Table 2). Benefits specific to landcovers in riparian areas were applied only to the extent of each landcover type (e.g., old-growth, structurally complex, and other forest areas) in riparian zones. Benefits not specific to riparian conditions were applied to the non-riparian acres of each landcover type. Annual benefits were projected out 120 years to capture the long-term value these lands may provide to future generations. These were then discounted at 3 percent per year and reported as 2024 USD.

SCENARIO ANALYSIS

The analysis uses two datasets of forest benefits. The old-growth and structurally complex forest dataset includes benefits specific to old-growth and structurally complex forest conditions, as well as general forest benefits. The other dataset includes general forest benefits for forests not classified as old-growth or structurally complex. Wetland, shrubland, and river benefits were valued using separate datasets specific to those landcover types.

Several assumptions are held constant across both scenarios. All currently protected old-growth and structurally complex forests are assumed to remain protected over the full 120-year period of analysis. Again, the approximately 101 acres of old-growth forest and 1,032 acres of structurally complex forest were valued using the old-growth and structurally complex forest benefit dataset throughout the analysis (see Figure 4). The total benefits for these protected acres include both current carbon storage and carbon sequestered over the 120-year period.

Forests not classified as old-growth or structurally complex are assumed to be harvestable. Again, these forests were valued using the other forest benefit dataset, and follow a cycle where they are harvested in 15 years and then every 50 years, followed by three years of replanting, and the subsequent regrowth. Total benefits for these other forest acres include both current carbon storage and carbon sequestered over the 120-year analysis period. Wetlands, shrublands, and rivers are valued consistently across scenarios and are not affected by the forest protection scenarios.

Two scenarios were developed to illustrate the value of protecting structurally complex forests that are not currently protected. Under Scenario 1 (Business-As-Usual), all structurally complex forests not currently protected are valued using the old-growth and structurally complex forest benefit dataset for the first 10 years of the analysis, prior to a presumed harvest after. After year 60, these acres are assumed to be harvested, followed by a three-year replanting period. For the remainder of the 120-year analysis period, these acres are assumed to be harvested on 50-year rotations, regrow as other forest and valued using the other forest benefit dataset. This scenario assumes that, following harvest, the characteristics and ecological functions associated with structurally complex forest conditions are no longer present and that the forest provides the benefits of a typical regenerating forest instead. Because these acres are assumed to be harvested every 50 years, current carbon stock is not included for these unprotected structurally complex forest acres.

Under Scenario 2 (Protection), all structurally complex forest acres that are not currently protected are protected (via NRCA or NAP) and assumed to remain unharvested for the full 120-year analysis period. These acres are valued using the old-growth and structurally complex forest benefit dataset throughout the analysis. This scenario represents the long-term value of protecting structurally complex forests and allowing them to continue providing mature-forest ecosystem services over time. Total benefits for these acres include both current carbon storage and carbon sequestered over the 120-year period.

Figure 3. Forested DNR lands in the Lower Elwha Watershed

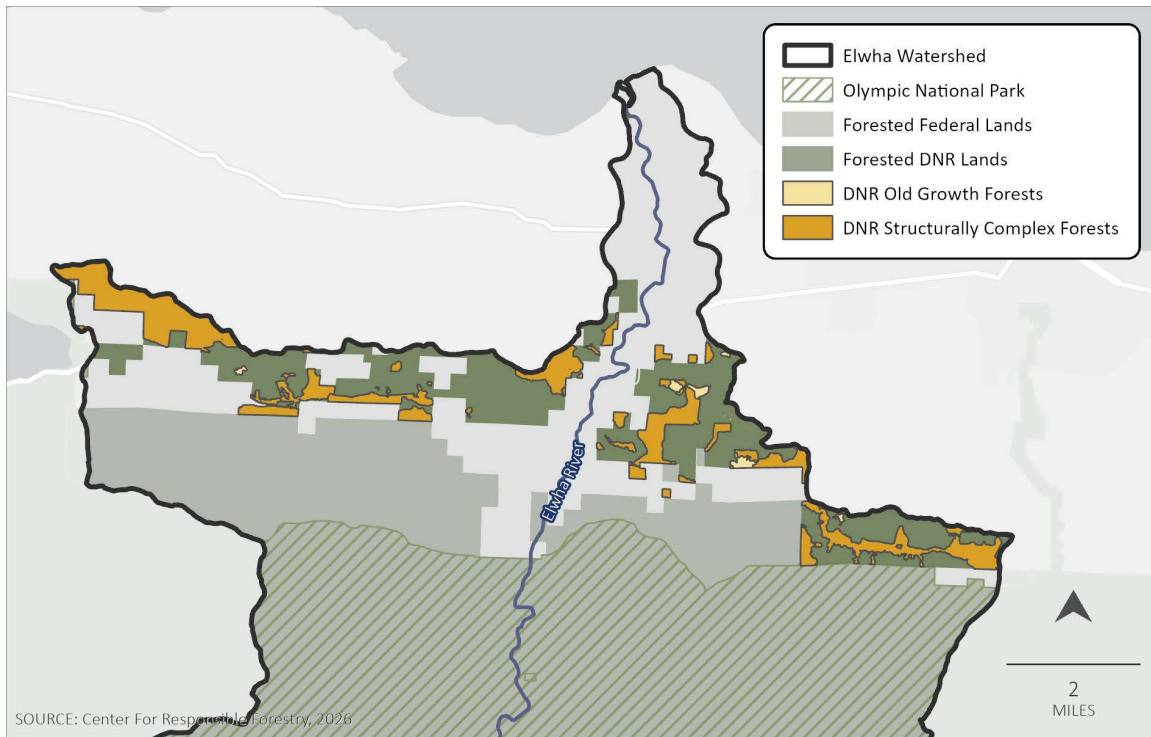
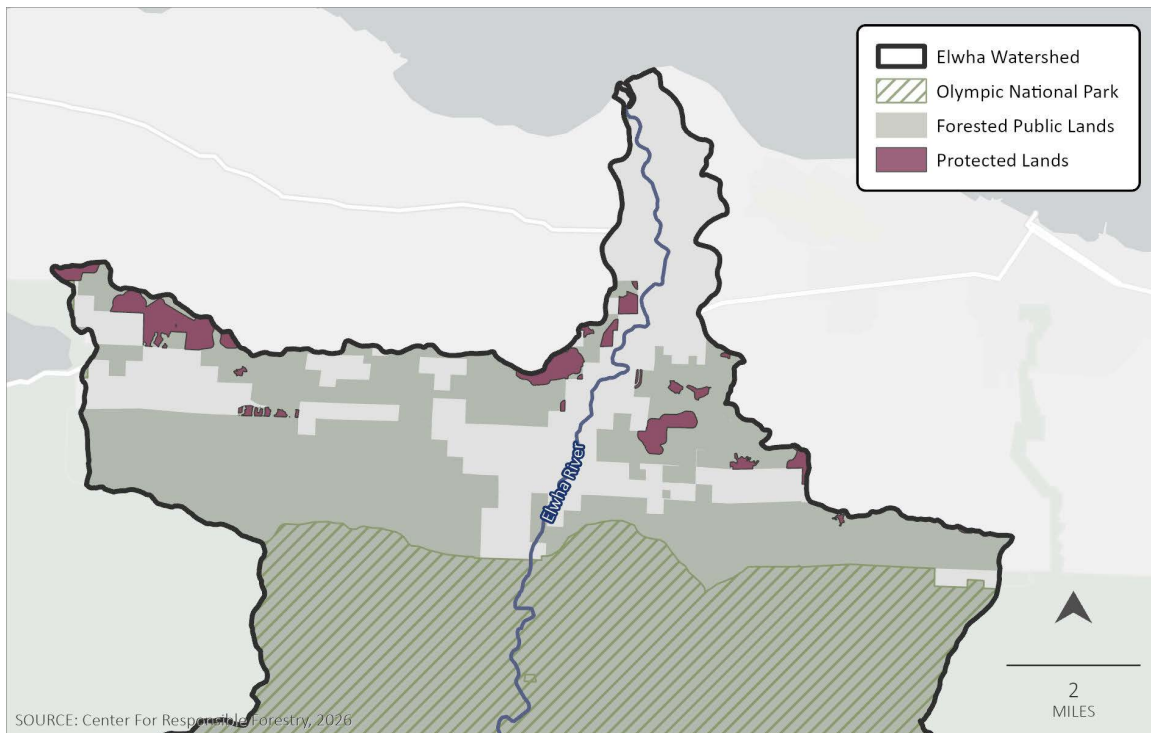


Figure 4. Protected DNR lands in the Lower Elwha Watershed



Asset Value

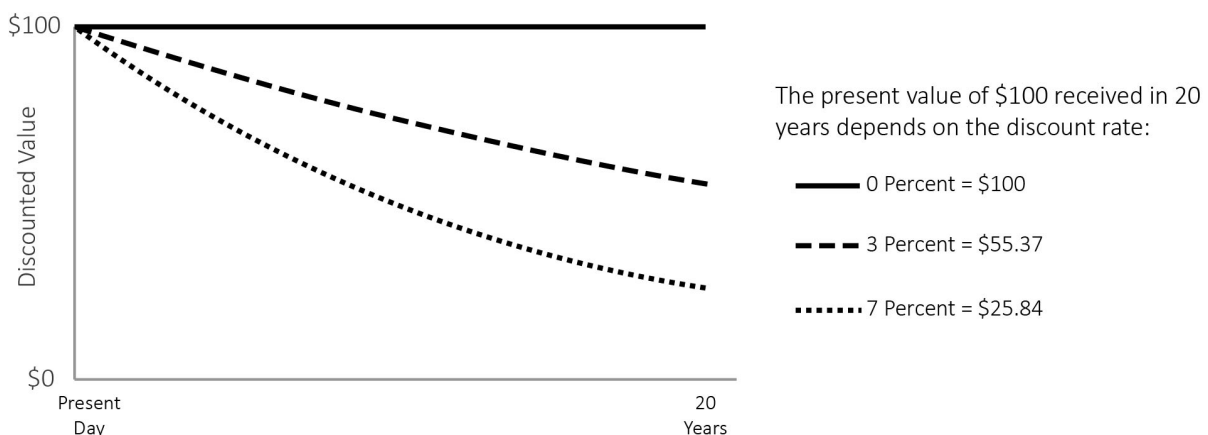
Asset values provide a measure of the benefits expected to flow from natural capital over time, helping policy makers understand the lifetime benefits provided by natural capital to support investment planning and stewardship at appropriate scales. Asset value can be calculated as Net Present Value (NPV) to facilitate comparison of benefits and costs produced over various time periods. Discount rates allow future value to be expressed in present day terms, accounting for two factors:

- Time preference: People tend to prefer immediate benefits over those deferred into the future
- Opportunity costs: Investments made today can provide positive returns into the future

This analysis reports both the undiscounted and discounted (3 percent) value of ecosystem services. While discount rates are often based on market interest rates, experts disagree on the appropriate discount rate for natural capital benefits (Arrow et al., 2004; Sterner and Peterson, 2008). The Office of Management and Budget (OMB, 2023) recommends separate discount rates for regulatory analyses (three percent) and public investment (seven percent). Other federal agencies, such as the National Oceanic and Atmospheric Administration (NOAA) and the United States Army Corps of Engineers (USACE) use discount rates of around three percent (U.S. Department of Treasury, 2020; Dunford, 2018). Some economists argue for even lower discount rates (Weitzman, 2001).

Although discounting is useful for comparing projects of varying duration, it may not fully reflect the value of natural capital, which can produce benefits in perpetuity, absent major disturbances. Unlike built assets that depreciate in value, well-managed natural capital may maintain or increase its value over time as ecosystems mature, their functions improve, and benefits continue to accrue. For this reason, the undiscounted value may better represent the long-term value of natural capital that does not lose value over time. Reporting both the three-percent discounted value and the undiscounted value is transparent and avoids favoring short-term, unsustainable benefits. For example, \$100 received in 20 years under a 0 percent discount rate, or the undiscounted value, is still \$100, but under a 3 percent discount rate, the same amount falls to \$55.37 in year 20, and even farther to \$25.84 using a 7 percent rate (see Figure 5). In 120 years, \$1 is worth just \$0.03, after discounting by 3 percent.

Figure 5. A stylized comparison of discount rates' effect on present values.



Results

Table 4 presents the present value of lifetime ecosystem service benefits for Scenario 2, in which all structurally complex forests are protected from harvest over the 120-year period of analysis. Under this scenario, the currently unprotected structurally complex forests provide an estimated \$523.1 million in undiscounted ecosystem service benefits (\$172.6 million discounted). Compared with the business-as-usual scenario (Scenario 1), protecting these forests results in an additional \$367.5 million in undiscounted benefits and \$106.4 million in discounted benefits over 120 years. Under Scenario 1, these forests are harvested after 10 years, and then on 50-year rotations subsequently providing the ecosystem services of regenerating forest rather than structurally complex forest.

Table 4. Benefits by landcover under Scenario 2 (Protection)

Landcover	0% discount	3% discount
Protected Old-Growth and Structurally Complex Forest*	\$312,330,000	\$105,730,000
Structurally Complex Forest*	\$523,110,000	\$172,570,000
Other Forest	\$408,860,000	\$143,460,000
Wetland	\$54,330,000	\$15,100,000
Shrubland	\$34,690,000	\$9,640,000
River	\$3,040,000	\$850,000
Total	\$1,336,357,000	\$447,341,000

Totals may vary due to rounding. *Ecosystem service benefits include the value of carbon stock currently in the standing forest, forest floor and soil.

Table 5 summarizes ecosystem service values by benefit category. Pollination and seed dispersal provide the largest share of total value. These forests support habitat, forage, and nesting resources for wild and managed pollinators, contributing to agricultural productivity while sustaining plant reproduction, biodiversity, and food security. Habitat represents the second largest benefit, based on Washington residents' willingness-to-pay to protect natural areas, including old-growth and structurally complex forests and habitat for species such as the northern spotted owl, which are found within the study area. These estimates reflect the non-market value residents place on conserving high-quality forest habitat.

Outdoor recreation also offers substantial contributions. DNR lands provide access to the Olympic Adventure Route of the Olympic Discovery Trail, as well as other community trails for mountain biking, wildlife viewing, and other forms of recreation. Forest protection supports downstream marine fisheries by reducing sediment delivery to inland and coastal habitats. Erosion regulation also helps to prevent damages to roads, infrastructure, and property, while lowering downstream water treatment and maintenance costs.

Other major ecosystem services include carbon storage and sequestration, which reduce the social, environmental, and economic damages associated with greenhouse gas emissions. Water supply benefits support downstream communities that include Port Angeles. Again, the economic value of carbon sequestration was priced using the Social Cost of Carbon (SCC), which represents the total global costs associated with each additional ton of carbon emissions, including losses to agriculture, impacts on human health, and increased disaster risk. This value does not represent the potential carbon market value.

Table 5. Benefits by service for all landcover under Scenario 2 (Protection)

Ecosystem Service Benefit	0% discount	3% discount
Aesthetic Information	\$2,142,000	\$595,000
Air Quality	\$4,611,000	\$1,313,000
Biological Control	\$1,278,000	\$364,000
Carbon Sequestration	\$183,223,000	\$52,420,000
Carbon Storage	\$97,057,000	\$97,057,000
Cultural Value	\$23,373,000	\$6,495,000
Disaster Risk Reduction (Flooding)	\$47,736,000	\$13,286,000
Fisheries (Marine)	\$4,055,000	\$1,144,000
Food	\$17,004,000	\$4,734,000
Habitat	\$232,015,000	\$64,478,000
Pollination, Seed Dispersal	\$541,412,000	\$154,143,000
Recreation, Tourism	\$111,437,000	\$31,164,000
Science, Education	\$1,955,000	\$543,000
Soil Retention	\$2,230,000	\$620,000
Soil Quality*	\$4,000	\$1,000
Water Capture, Conveyance, & Supply	\$59,252,000	\$16,861,000
Water Quality	\$4,534,000	\$1,280,000
Total	\$1,336,357,000	\$447,341,000

Totals may vary due to rounding. *Nutrients transferred by salmon.

Table 6 summarizes the difference in ecosystem service values across all landcover between Scenario 1 (business-as-usual) and Scenario 2 (protection). Protecting the currently unprotected structurally complex forests increases total ecosystem service benefits across the study area by approximately \$367.5 million undiscounted and \$106.4 million using a 3 percent discount rate. These results demonstrate the additional ecosystem service benefits generated by protecting structurally complex forests.

Table 6. Net Differences between Scenario 1 (Business-as-usual) and Scenario 2 (Protection).

Ecosystem Service Benefit	0% discount	3% discount
Aesthetic Information	\$1,157,000	\$258,000
Air Quality	\$857,000	\$211,000
Biological Control	\$238,000	\$58,000
Carbon Sequestration	\$1,352,000	\$1,213,000
Carbon Storage	\$26,703,000	\$26,703,000
Cultural Value	\$11,687,000	\$2,610,000
Disaster Risk Reduction (Flooding)	\$1,584,000	\$367,000
Fisheries (Marine)	\$1,275,000	\$295,000
Food	\$8,726,000	\$1,954,000

continues on next page

Table 6 continued

Ecosystem Service Benefit	0% discount	3% discount
Habitat	\$148,463,000	\$33,177,000
Pollination, Seed Dispersal	\$100,998,000	\$24,785,000
Recreation, Tourism	\$49,921,000	\$11,265,000
Science, Education	\$1,056,000	\$236,000
Soil Retention	\$1,205,000	\$269,000
Soil Quality*	\$0	\$0
Water Capture, Conveyance, & Supply	\$10,822,000	\$2,656,000
Water Quality	\$1,426,000	\$331,000
Total	\$367,471,000	\$106,384,000

Totals may vary due to rounding. *Nutrients transferred by salmon.

Table 7 summarizes the estimated carbon stock value of protected old-growth and structurally complex forests under Scenario 2 (Protection). Carbon stock values include carbon stored in standing forest biomass, the forest floor, and soil. Under Scenario 2, protected old-growth and structurally complex forests store an estimated 1.16 million tons of non-soil carbon, with an associated value of approximately \$101.3 million. Carbon stock is only fully valued under Scenario 2 because these forests remain protected over the 120-year analysis period. Under Scenario 1 (Business-as-Usual), aboveground forest biomass and forest floor carbon are assumed to be lost following harvest and are therefore not valued, while 75 percent of soil carbon is retained based on findings from James et al. (2021), which reported that most soil carbon persists following conventional forest harvest. This provides a conservative estimate of the impacts of logging on soil carbon, as there is potential for further reductions in soil carbon following certain variable retention practices.

Table 7. Carbon stock and value by landcover for Scenario 2 (protection).

Landcover	Carbon Stock (Non-soil CO₂)	Benefit
Protected Old-Growth and Structurally Complex Forest*	477,200	\$63,608,000
Structurally Complex Forest*	685,200	\$37,682,000

*Forest carbon stock is only valued in Scenario 2 (protection), since the forest is never harvested.

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Rare Plant and Lichen Surveys on State Lands in the Elwha Watershed

May 30, 2026, revised June 29, 2026

Authors: Florence Caplow, Callie Zender, Adrienne Alms, and members of the Northwest Lichenologists

Background

In the spring legislative session of 2025, the Washington Legislature passed a proviso providing guidance and funding to the Washington Department of Natural Resources to undertake a study to support a conservation planning process on state lands in the Elwha River Watershed, to be largely completed by the Washington Natural Heritage Program (WNHP). Approximately four thousand acres in the watershed were [identified as priorities](#) for study and surveys by the WNHP.

The presence of state-listed rare plant and lichen species listed in the [2025 Washington Natural Heritage Plan](#) is a primary factor in DNR conservation planning, per statute and policy, but due to budget and staffing constraints, the WNHP planned to survey only a very small portion of the priority areas for rare plants, and the survey could not include the numerous state-listed potential lichen species due to a lack of specialized lichenology expertise by their current staff.

Through the generous support of the Harder Foundation, which made a grant to the Center for Responsible Forestry to support this work, it has been possible to expand the area surveyed for rare plants and lichens, the time allotted for surveys, and the expertise of the field teams, beyond the capacity of the WNHP, in order to provide the WNHP with higher quality data in the development of conservation plans.

This report summarizes the results of the rare plant and lichen surveys on state lands in the Elwha Watershed, completed in the spring of 2026.

Summary of Findings

Over the course of approximately one month of field work we covered 607 acres at a “good to high” level of survey coverage, and 941 additional acres at a more limited level of coverage, for a total of 1,548 acres surveyed (Figures 2 and 3).

In terms of state-listed rare non-vascular and vascular plants, we found one previously unknown population of the Endangered lichen *Fuscopannaria coralloidea* (coral shingle lichen); two populations of the Threatened lichen *Fuscopannaria maritima* (seaside shingle lichen); and one previously unknown population of the Sensitive lichen *Niebla cephalota* (powdery sea fog lichen) all on the ridgeline and cliffs of Mount Sutherland; five populations of the Sensitive vascular plant species *Plectritis brachyptera* (shortspur seablush), both east and west of the Elwha River in bald habitats; one population of the Sensitive vascular plant species *Actaea elata* var. *elata* (tall bugbane) in adjacent uplands of Indian Creek’s riparian wetlands area, and 21 previously unknown locations of the Sensitive vascular plant species *Whipplea modesta* (yerba de selva) scattered across the survey area.

ITS sequencing also suggests there is an undescribed rare lichen species in the *Fuscopannaria* genus, collected on the cliffs of Mount Sutherland, and the first Washington collection of *Vahliella californica* (sun shingle lichen), from the same area.

Due to the scattered/widespread nature of the *Whipplea modesta* in this area of the state, and with prior consultation with the WNHP, we did not complete sighting forms when we encountered the species, instead we took a GPS waypoint every time it was encountered more than ¼ mile from the last observation, and these waypoints will be shared with the WNHP as a separate KML file (see table 2 for names of all KML files associated with this study). We mapped and completed WNHP sighting forms for all other rare plant and lichen populations we encountered in the course of the survey (Appendix A), as well as a spatial KML file for all rare plant and lichen populations (Table 2).

We also discovered a previously unknown population of the federally and state Endangered Taylor's Checkerspot Butterfly in the Mount Sutherland area, which has been verified by the Washington Department of Fish and Wildlife (WDFW). The exact location is only available to the WDFW and the US Fish and Wildlife Service.

In some cases, GPS points were taken for significant natural features encountered in the course of fieldwork (caves, old-growth trees, cliffs, balds) and that information is in a KML file under "special features" (Table 2).

See table 1 for a summary in tabular form, Appendix A for WNHP sighting forms, and Appendix E for narrative descriptions of each survey area.

Methods

We began by developing a list of the highest potential rare plants, lichens, and mosses in the watershed (Appendix B). This guided the timing and focus of the fieldwork. In order to narrow the spatial focus of fieldwork, given our limited time frame, we used the map of priority areas for surveys in the watershed developed by the WNHP (Figure 1), shapefiles of potential timber sales in the watershed, and the expertise of Joshua Wright, who has performed reconnaissance level plant community work in the watershed. Based on a request from the Center for Responsible Forestry, we also included surveys just outside the watershed in older legacy forest and bald habitats on the north side of the Mount Sutherland ridgeline, since protecting the ecological integrity of the ridgeline and its associated habitats is not limited to the south side of the ridge.

"Bald habitats" (steep, rocky areas dominated by grasses, forbs, and mosses in otherwise forested areas) were high priorities for fieldwork given the likelihood for rare plants or lichens in those areas, but we were specifically asked by staff from the WDFW to avoid working in the balds just west of the Elwha River, since these are known Taylor's checkerspot butterfly habitat and there were concerns about possible damage to individuals of this very rare species. It is our understanding that staff from the WNHP were able to survey those areas for rare vascular plants (though not lichens), accompanied by staff from the WDFW to minimize harm.

We began work on April 16 with a three day "foray" of lichenologists from the organization Northwest Lichenologists, including Daphne Stone, a certified lichenologist known for 50 years of work on the taxonomy and ecology of lichens of the Pacific Northwest; Katherine Glew, curator of the Burke Museum lichen herbarium at the University of Washington; Scot Loring, an Ashland based botanist, certified lichenologist, and mycologist; Kathryn Beck, a consulting rare plant botanist and lichenologist with more than 30 years of experience conducting rare plant surveys in the Pacific Northwest; Callie Zender, a rare plant botanist and certified lichenologist, as well as lichenology students and others with lichenology experience.

The twelve participants in the foray focused on the most likely habitats in the watershed for rare lichens: the summit ridgeline and cliffs of the western end of Mount Sutherland; the bald at Dry Hill on the east side of the Elwha River, and the wetlands along Indian Creek. Members of the foray also did some surveys on imperiled DNR land at Salt Creek Recreation Area, outside the watershed (not covered in this report). The foray produced a number of significant finds on Mount Sutherland, including previously unknown populations of *Niebla cephalota*, *Fuscopannaria coralloidea* and *F. maritima*.

All potentially rare lichen collections were identified using both dissecting and compound microscopes during the foray and verified by the most senior lichenologists present. Collections will be deposited at the Burke Museum herbarium lichen collection. Problematic members of the *Fuscopannaria* genus found during and after the foray

were also sent to Bruce McCune, Professor Emeritus at Oregon State University and author of *Macrolichens of the Pacific Northwest* and *Microlichens of the Pacific Northwest*. He confirmed identification of *F. maritima* and *F. coralloidea* based on morphology (physical characteristics of the species) and will complete DNA sequencing of the collections as part of an ongoing research project on the genus.

From May 4 to May 15, we (Callie Zender and Adrienne Alms, rare plant botanists and lichenologists, who conducted most of the fieldwork, and Florence Caplow, former lead rare plant botanist for the Washington Natural Heritage Program, who directed the project) conducted eleven days of rare plant and rare lichen fieldwork in the watershed.

Fieldwork consisted of 1) walking transects across the landscape (a total of 314 miles), 2) identification and collections of any rare or potentially rare vascular and non-vascular species found during the course of the survey, 3) GPS mapping of all occurrences of all rare vascular and non-vascular species found during the course of the survey (KML file name is in Table 2), and field notes taken on habitat and associated species, for later data entry into WNHP sighting forms (Appendix A). In addition, GPS tracks were taken for later mapping of areas surveyed. KML file names for areas surveyed are in Table 2. Photos were also taken, generally both close-up and of the general habitat, and these can be found in the sighting forms in Appendix A and at this [Google Drive folder link](#).

At the end of each field day, collections were examined with dissecting and compound microscopes to verify identification. In addition, we compiled a full list of lichens encountered during the survey, totaling 116 species (Appendix C). All lichen fieldwork and identification in this period was by Callie Zender and Adrienne Alms, with verification of *Fuscopannaria* collections by Bruce McCune from Oregon State University.

After the completion of the surveys, Bruce McCune at Oregon State University performed DNA (ITS) sequencing on 13 collections of *Fuscopannaria* from the Mount Sutherland and Dry Hill areas. This shifted some of his original identifications, which this revised report reflects, and included a collection of *Fuscopannaria* that may be an undescribed rare regional endemic and the first Washington collection of *Vahliella californica* (Appendix D).

All rare plant collections will be deposited in the Burke Museum lichen collection at the University of Washington and/or the herbarium at Oregon State University (for lichens verified by Bruce McCune or Scot Loring).

Survey limitations

The findings of this survey are a significant contribution to our knowledge of rare plants and lichens on state lands in the Elwha Watershed, as well as to the known range of a federally listed endangered butterfly, but the survey was still strongly limited by budget and timing constraints. We focused on the areas most likely to support rare plants or lichens: bald habitats (although we were not able to survey the extensive balds with known Taylor's checkerspot populations, see above), cliffs, ridgelines, areas of large contiguous uncut older forest, and wetlands. There are, however, large areas within the approximately 7,000 acres of state lands in the watershed that were not surveyed, and which could support still unknown populations of rare plants or rare lichens. There are significant cliffs and balds immediately to the west of the river on "Dan Kelly Ridge", but we were not allowed to survey in that area, per the WDFW, to protect Taylor's checkerspot butterflies and their habitat.

There was one potential moss species from the area (Appendix B) and although we were aware of the field characteristics of these mosses, only two people who participated in the surveys (Scot Loring and Daphne Stone who were present during the Northwest Lichenologists foray) have a sufficiently deep knowledge of mosses to be likely to identify either of these species in the field. No rare mosses were identified. Future surveys would ideally have someone who could identify these or other rare mosses.

Unfortunately, due to the deadlines for reporting our data to the WNHP, we had to complete the fieldwork earlier than would have been ideal for some of the potential rare vascular plants for the watershed, particularly *Actaea elata* var. *elata* and *Montia diffusa*, which would be more likely to be visible and in flower in June, based on historical sightings. Nonetheless, this was a warm and dry spring, and we did find one population of *Actaea elata* var. *elata* during the course of the surveys. *Lobelia dortmanna* is known from near the Elwha Watershed, but only from fully aquatic sites, which do not occur on state lands in the watershed. *Polemonium carneum* is a showy plant that was not found during these surveys.

Survey discussion and implications for conservation

Given the presence of several state-listed rare plants and lichens known or found in or near the state lands in the watershed, we recommend that before any timber sales or other habitat-disturbing activities are planned for these lands, there will be rare plant and lichen surveys at the appropriate time of year, by a person with expertise in both rare plants and rare lichens, preferably a [certified lichenologist](#).

The Elwha Watershed is unique ecologically in a number of ways, not limited to: 1) it is affected by the rain shadow of the Olympics, with a gradient across the watershed from wetter to the west to drier to the east, 2) it is one of only a small number of areas in the state that have globally rare “bald habitat” which is also habitat for the federally Endangered Taylor’s checkerspot as well as the state Sensitive *Plectritis brachystemon*, which the Taylor’s checkerspot butterfly partially depends on as a post-diapause food plant ([WDFW 2026](#)), and 3) the rocky ridgeline of Mount Sutherland at the western end of the watershed supports a very unusual assemblage of rare lichens, all of which are usually found at sea level and sometimes even within the saltwater “splash zone.” This ridgeline also has caves and scattered old-growth trees with burn scars. One of the rare lichens, *Niebla cephalota*, was found in a cave.

Six of the seven species of rare plants and lichens found during this survey were found on the mid-slopes to the ridgeline of Mount Sutherland, as well as to the north of the ridgeline outside of but near the watershed boundary. One species, *Actaea elata* var. *elata*, was found along Indian Creek to the east of Mount Sutherland. Conservation of the Mount Sutherland area, already somewhat protected by HCP designation, would preserve multiple populations of all six species, as well as the newly discovered population of Taylor’s checkerspot butterfly.

Both the federally Endangered Taylor’s checkerspot butterfly and the state Sensitive vascular plant *Plectritis brachystemon* are grassland species found in the balds in the watershed. One population of the state Threatened lichen *Fuscopannaria maritima* was also found in a bald on Mount Sutherland. The balds on Mount Sutherland are in excellent condition compared to any other balds we saw in the course of the study (Appendix D) or elsewhere in Clallam County, and they are unique in that they are completely surrounded by large areas of contiguous, naturally regenerated, older forest habitat. One of the balds that supports a population of *Plectritis brachystemon* is within the boundary of the proposed “By a Whisker” timber sale.

In the past, balds were used as staging areas for timber harvest activities (David Hayes, retired WDFW biologist, pers. comm.). There has been extensive research on the effect of weed invasion in grassland communities from nearby disturbance such as timber harvest or roads, even if there is not direct disturbance to the grassland. For a preliminary list of recent studies on the deleterious effects of weeds on grassland natural areas and the effects when nearby areas are disturbed, see [Familo & Moxham](#) (2023) in Ecological Engineering.

In addition, many lichens are highly susceptible to subtle environmental changes, and two of the rare lichen populations found during the survey are also within the boundaries of the “By a Whisker” proposed timber sale, the state Endangered *Fuscopannaria coralloidea* and the state Threatened *Fuscopannaria maritima*. Although these locations, both on rock, would not be directly affected by harvest activities, the changes in light and humidity from harvest could extirpate these individuals. Populations of the state Sensitive vascular species *Plectritis brachystemon* (found in a bald in the proposed sale area) and *Whipplea modesta* were also in “By a Whisker.” For these reasons – the vulnerability to weed invasion of the bald habitats currently in excellent condition, the uniqueness of the ridgeline cliffs and the lichens found there, and the significance of a large area of contiguous naturally regenerated older forest functioning as a buffer for the rare plant and lichen habitat—we urge that the area of the proposed “By a Whisker” timber sale be protected from future timber harvest.

From the perspective of this study, we also urge the protection of the greater Mount Sutherland area both within and north of the watershed boundary, including the area now proposed as the “By a Whisker” timber sale, to protect the highly unusual and vulnerable rare plant and lichen species that occur there. Other areas in the Elwha Watershed may be important to protect for other conservation priorities, not addressed in this study.

Table 1. Rare plant and lichen populations found in the Elwha Watershed during the 2026 survey

Species scientific name	Species common name	State status	Rank	Date (s)	Pop #	Area (s)
<i>Fuscopannaria coralloidea</i>	Coral shingle lichen	Endangered	G2G4/S1	4/17/2026	1	Mt. Sutherland cliffs
<i>Fuscopannaria maritima</i>	Seaside shingle lichen	Threatened	G4?/S2	5/5/2026	4	Mt. Sutherland bald
<i>Fuscopannaria maritima</i>	Seaside shingle lichen	Threatened	G4?/S2	5/12/2026	5	Mt. Sutherland cliffs
<i>Niebla cephalota</i>	Powdery sea fog lichen	Sensitive	G4S2	4/17/2026	1	Mt. Sutherland cave
<i>Actaea elata</i> var. <i>elata</i>	Tall bugbane	Sensitive	G4T4/S3	5/17/2026	1	Indian Creek
<i>Plectritis brachystemon</i>	Shortspur seablush	Sensitive	G5?/S1	5/4/2026	1	Dry Hill bald
<i>Plectritis brachystemon</i>	Shortspur seablush	Sensitive	G5?/S2	5/6/2026	2	Mt. Sutherland balds
<i>Plectritis brachystemon</i>	Shortspur seablush	Sensitive	G5?/S3	5/7/2026	3	Parched Right of Way
<i>Plectritis brachystemon</i>	Shortspur seablush	Sensitive	G5?/S4	5/9/2026	4	SE Mt. Sutherland
<i>Plectritis brachystemon</i>	Shortspur seablush	Sensitive	G5?/S5	5/11/2026	5	Mt. Sutherland Ridge
<i>Whipplea modesta</i>	Yerba de selva	Sensitive	G4/S1	–	–	Widespread

Species marked with an asterisk are in the “special features” KML file and do not have an associated sighting form.

Table 2. KML files included with this report, under separate cover

File name	Description
elwha-rare-plant-surveys.kml	All waypoints and polygons for rare plant & lichen populations
Whipplea-modesta.kml	All waypoints taken for Whipplea modesta
surveyed-areas.kml	Polygons of surveyed areas
special-features.kml	Features worthy of note

APPENDIX III.A

Washington Natural Heritage Program Rare Plant Sighting Form. [View online.](#)

Photos of all rare plant and lichen occurrences. [View online.](#)

APPENDIX III.B

List of potential rare plants and non-vascular rare plants for the Elwha Watershed, developed April 2026.

Scientific Name	State Status	Hist	Habitat
LICHENS (See: WA Lichen Species List)			
<i>Acroscyphus sphaerophoroides</i>	E		wood or rock, low elevation to subalpine, open rocky areas or forests
<i>Bryoria bicolor</i>	S		near coast, on rocks and bark and wood
<i>Bryoria furcellata</i>	S		on bark and wood, occasionally on rock or soil, boreal forest and on the coast
<i>Bunodophoron melanocarpum</i>	T		bark or wood of conifers, near ocean
<i>Erioderma sorediatum</i>	T		Ericaceous stems, conifer branch, near ocean
<i>Fuscopannaria coralloidea</i>	E		on mossy soil, soil over rock, and rock
<i>Fuscopannaria (Steineropsis) laceratula</i>	E		conifer branches, bases, wood, near ocean
<i>Fuscopannaria maritima</i>	T		on coastal rocks, often coalescing into extensive mats **Daphne told Adrienne during foray that Bruce thinks not just only coastal rocks anymore
<i>Kaernefeltia californica</i>	T	H	Conifer twigs, shrubs, near ocean
<i>Leioderma sorediatum</i>	E		Ericaceous stems, conifer branches, near ocean
<i>Leptogium cyanescens</i>	S		on hardwood and conifer bark, rotten logs, and rocks, in moist forests usually near water source
<i>Niebla cephalota</i>	S		Trees, shrubs, rock near ocean
<i>Pertusaria coccodes</i>	E		bark or wood of pisi, pico, near ocean
<i>Pseudocyphellaria rainierensis</i>	S		bark or wood of conifers, low to mid elev
<i>Ramalina labiosorediata</i>	T		bark or wood, Picea, low elev swamps
<i>Stereocaulon spathuliform</i>	S		on rock (noncalcareous), sheltered microsites in cool moist habitats, especially talus slopes and cliffs
<i>Sulcaria badia</i>	X	H	bark or wood, mostly hardwoods, low elevs
<i>Sulcaria spiralifera</i>	E		exposed coastal trees
<i>Tholurna dissimilis</i>	S		on conifer twigs, on exposed subalpine ridges and peaks, occasionally at low to mid elevations in cool, moist sites
<i>Usnea cavernosa</i>	S		on bark and wood of conifers, hardwoods, and shrubs in forests
<i>Usnea rubicunda</i>	E		on bark and wood, coastal forests and shrublands including headlands, estuaries, and deflation plains
<i>Usnea subgracilis</i>	S		conifer bark and wood near coast
MOSESSES (See: WA Mosses List)			
<i>Iwatsukiella leucotricha</i>	E		conifer trunks, twigs, branches, along coastal ridges
<i>Orthotrichum praemorsum</i>	E		rock
VASCULARS (See: WA Vascular Plant Species List)			
<i>Actaea elata</i> var. <i>elata</i>	S		moist shady woods at low elevations
<i>Lobelia dortmanna</i>	S		in shallow water at the margins of ponds and lakes
<i>Montia diffusa</i>	S		moist woods at low elevations
<i>Plectritis brachystemon</i>	S		coastal bluffs, lowland prairies, balds at low elevation
<i>Polemonium carneum</i>	T		thickets, woodlands and forest openings, from near sea level to moderate elevations in the mountains
<i>Whipplea modesta</i>	S		dry, rocky, open to lightly forested areas

APPENDIX III.C

Lichens found during the 2026 Elwha Watershed rare plant and lichen survey.

- Northwest Lichenologists Foray | April 17-18, 2026
- Adrienne Alms and Callie Zender | May 4-15, 2026

<i>Alectoria imshaugii</i>	<i>Hypogymnia physodes</i>	<i>Peltigera venosa</i>
<i>Alectoria sarmentosa</i>	<i>Hypogymnia rugosa</i>	<i>Pertusaria subambigens</i>
<i>Baeomyces rufus</i>	<i>Hypogymnia tubulosa</i>	<i>Pilophorus acicularis</i>
<i>Bryoria fremontii</i>	<i>Immadophila ericetorum</i>	<i>Placopsis lambii</i>
<i>Bryoria fuscescens</i>	<i>Leptra amara</i>	<i>Platismatia glauca</i>
<i>Bryoria glabra</i>	<i>Leptochidium albociliatum</i>	<i>Platismatia herrei</i>
<i>Bryoria nadvornikiana</i>	<i>Letharia vulpina</i>	<i>Platismatia lacunosa</i>
<i>Bryoria pseudofuscescens</i> var. <i>friabilis</i>	<i>Lobaria anomala</i>	<i>Platismatia norvegica</i>
<i>Bryoria pseudofuscescens</i> var. <i>pikei</i>	<i>Lobaria hallii</i>	<i>Platismatia stenophylla</i>
<i>Bryoria pseudofuscescens</i> var. <i>pseudofuscescens</i>	<i>Lobaria linita</i>	<i>Physcia alnophila</i>
<i>Caloplaca pyracea</i>	<i>Lobaria oregana</i>	<i>Physcia tenella</i>
<i>Cetraria chlorophylla</i>	<i>Lobaria pulmonaria</i>	<i>Polychidium muscicola</i>
<i>Cetraria orbata</i>	<i>Lobaria scrobiculata</i>	<i>Pseudocyphellaria citrina</i>
<i>Cetraria pallidula</i>	<i>Loxosporopsis corallifera</i>	<i>Ramalina dilacerata</i>
<i>Cetraria platyphylla</i>	<i>Massalongia carnosa</i>	<i>Ramalina farinacea</i>
<i>Cetrelia cetrarioides</i>	<i>Melanelixia glabrata</i>	<i>Ramalina labiosorediata</i>
<i>Chaenotheca furfuracea</i>	<i>Melanohalea multispora</i>	<i>Ricasolia amplissima</i>
<i>Chrysothrix candelaris</i>	<i>Montanelia panniformis</i>	<i>Scytinium californicum</i>
<i>Cladonia bellidiflora</i>	<i>Mycoblastus caesius</i>	<i>Scytinium palmatum</i>
<i>Cladonia coniocraea</i>	<i>Mycoblastus sanguinarius</i>	<i>Sphaerophorus tuckermanii</i>
<i>Cladonia ecmocyna</i>	<i>Nephroma laevigatum</i>	<i>Sphaerophorus venerabilis</i>
<i>Cladonia furcata</i>	<i>Nephroma resupinatum</i>	<i>Stenocybe clavata</i>
<i>Cladonia pyxidata</i>	<i>Nephroma tropicum</i>	<i>Stereocaulon sterile</i>
<i>Cladonia squamosa</i>	<i>*Niebla cephalota (state Sensitive)</i>	<i>Sticta fuliginosa</i>
<i>Cladonia transcendens</i>	<i>Nodobryoria oregana</i>	<i>Sticta limbata</i>
<i>Cladonia verruculosa</i>	<i>Normandina pulchella</i>	<i>Sticta rhizinata</i>
<i>Esslingeriana idahoensis</i>	<i>Ochrolechia oregonensis</i>	<i>Thelotrema lepadinum</i>
<i>Evernia prunastri</i>	<i>Ochrolechia upsaliensis</i>	<i>Umbilicaria polyrrhiza</i>
<i>Fuscopannaria aurita</i>	<i>Parmelia hygrophila</i>	<i>*Usnea cavernosa (state Sensitive)</i>
<i>*Fuscopannaria coralloidea (state Endangered)</i>	<i>Parmelia saxatilis</i>	<i>Usnea dasipoga</i>
<i>Fuscopannaria leucostictoides</i>	<i>Parmelia sulcata</i>	<i>Usnea glabrata</i>
<i>*Fuscopannaria maritima (state Threatened)</i>	<i>Parmeliella tryptophylla</i>	<i>Usnea longissima</i>
<i>Fuscopannaria pacifica</i>	<i>Parmeliopsis hyperopta</i>	<i>Usnea pacificana</i>
<i>Graphis scripta</i>	<i>Peltigera britannica</i>	<i>Usnea scabrata</i>
<i>Hypogymnia apinnata</i>	<i>Peltigera collina</i>	<i>Usnea silesiaca</i>
<i>Hypogymnia duplicata</i>	<i>Peltigera didactyla</i>	<i>Vahliella californica (first WA collection)</i>
<i>Hypogymnia enteromorpha</i>	<i>Peltigera membranacea</i>	<i>Xanthomendoza hasseana</i>
<i>Hypogymnia hultenii</i>	<i>Peltigera neopolydactyla</i>	
<i>Hypogymnia imshaugii</i>	<i>Peltigera pacifica</i>	<i>*Species is listed as rare by the WNHP.</i>
<i>Hypogymnia inactiva</i>	<i>Peltigera praetextata</i>	

APPENDIX III.D

Results of ITS sequencing on *Fuscopannaria* spp. collected on Mt. Sutherland (under separate cover). [View online.](#)

APPENDIX III.E

Narrative descriptions of each survey area compiled by Callie Zender and Adrienne Alms (the “survey areas” KML file corresponds to these areas).

Mt. Sutherland

Ridge: Old-growth Douglas fir, western hemlock, and red cedar dominated forest. No logged stumps encountered, just some old burn scarring. High lichen biomass and diversity on trees as well as rocky cliffs just below the south side of the ridge. *Fuscopannaria maritima* was located here on these cliffs, as well as *Fuscopannaria coralloidea*. We encountered a few caves both up on the ridge, as well as down on the cliffsides. *Niebla cephalota* was located during the NWL Foray in one such cave down on the cliffside. Mountain lion scat encountered.

North side of mountain: One logged area was found. Douglas fir, western red cedar dominated forest with low to no understory in places. In some spots the understory was dominated by mosses. Relatively high lichen biomass and some diversity, but no WNHP listed species found. Deer and black bear activity encountered. Creek area very densely vegetated especially down by road and dominated by salmonberry, devil's club, nettles, *Actaea rubra*. Trickle of water running through at time of survey, so it appeared to be a seasonal drainage.

South side of mountain: Some large old-growth Douglas fir and western red cedar trees throughout. Very steep rocky slope with dense salal and oregon grape understory in most places, as well as high amount of downed woody debris. The areas between 1000 and 1200 feet are dominated by large boulders. Steep exposed cliffs begin around 1700-1800 feet in elevation. This is the bottom of the cliffs that continue up to the ridge. Creek running down eastern side was a swale (no rock cobble in it). Some sections were saturated with water, and the further south we went it became more like a wetland rather than a running creek.

South-facing balds: New population of Taylor's Checkerspot Butterfly found in western side of steep rocky bald. A very large population of *Plectritis brachystemon* was found just northeast of the bald in forest openings and throughout most of the bald itself. A population of *Fuscopannaria maritima* was also located on top of exposed rocks on the ridge overlooking the steep bald area. The forest around the bald is dominated by Douglas fir, western red cedar, and western hemlock with oceanspray understory. Mountain lion scat encountered.

Southwest areas (By a Whisker proposed timber sale): Some large old-growth Douglas fir and western hemlock trees throughout this forest, especially in the northern and northwestern areas of U2. A creek runs down through U1, along which red alder and bigleaf maple dominated. At the southern end of proposed timber sale there is an opening in the forest where a large healthy population of *Plectritis brachystemon* was located. The population of *Niebla cephalota* on the ridge is also within the boundary of the timber sale, as well as one population of *Fuscopannaria maritima*.

Indian Creek:

The north side of Indian Creek is a flat, riparian area dominated by towering Sitka spruces, skunk cabbage, water parsley, and a high diversity of obligate wetland species. Adjacent upland areas transition to dense shrub patches of vine maple and salmonberry, while other upland areas consist of big leaf maple, sword fern, candy flower, Pacific waterleaf and Solomon's seal. State sensitive tall bugbane (*Actaea elata* var. *elata*) was located in the big leaf maple dominated upland area. Lichen abundance and diversity is low in this area, while bryophyte abundance is high.

Dry Hill bald:

The Dry Hill bald is a medium-sized south-facing bald below radio towers on the top of Dry Hill. The top has a rock ledge, then slopes down steeply approximately 100 ft to the treeline, with signs of tree encroachment by Douglas fir at the bottom of the bald. This bald is relatively weedy, given its proximity to the road and towers, with a number of non-native grasses, but also supports paintbrush (associated with Taylor's checkerspot) and two small patches of *Plectritis brachystemon* at the lower edge of the bald.

Bread and Butter proposed timber sale U1 and U7:

U1 is a second growth forest. The ridge and southern facing slopes are drier and consist of Douglas fir, ocean spray, Oregon grape, sword fern, and snowberry. The vegetation is mostly sparse in this area. A few, small rock outcrops were encountered. The north side of the ridge consists of the same vegetation composition but is more dense and has lots of downed woody debris.

The northwestern part of U7 is burned. Almost all trees here have burn scars, and there were very few lichens and little understory. A lot of downed woody debris. The rest of this unit is a second growth forest dominated by Douglas fir, western red cedar, western hemlock and bigleaf maple. Parts of the understory are very dense with salal. Some small rocky outcrops throughout. Low lichen biomass and diversity.

North of Little River Road (Parched Timber Sale):

Plectritis brachystemon population was encountered along Parched proposed timber sale right of way. Forest dominated by Douglas fir and western red cedar, with oceanspray and flowering dogwood understory. A couple of different clearcuts already around here that we walked through and past to get to a rocky bald-ish outcrop. This bald area had high lichen biomass and diversity on the rocks, but no WNHP listed species were found. There was Castilleja, but no other Taylor's checkerspot plants or butterflies seen.