Draft Environmental Impact Statement for the Elliott State Research Forest Habitat Conservation Plan

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Cover Photo Credits: Elliott State Forest (background; Ryan Singleton, Oregon Department of State Lands); northern spotted owl (top inset; Derek Acomb, California Department of Fish and Wildlife); coho salmon (middle inset; John and Karen Hollingsworth, U.S. Fish and Wildlife Service [FWS]); marbled murrelet (bottom inset; Rich MacIntosh, FWS)

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COVER SHEET

Title of Proposed Action:	Issuance of Incidental Take Permits for the Elliott State Research Forest Habitat Conservation Plan
Subject:	Draft Environmental Impact Statement
Lead Agency:	U.S. Fish and Wildlife Service
Cooperating Agencies:	National Marine Fisheries Service, Oregon Department of Fish and Wildlife, Oregon Department of Forestry
County/State:	Coos and Douglas Counties, Oregon
Public Comment:	November 18, 2022, through January 2, 2023

Abstract:
This environmental impact statement (EIS) evaluates the environmental consequences of the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) issuing incidental take permits (ITPs) associated with the Elliott State Research Forest Habitat Conservation Plan (HCP), in accordance with section 10(a)(1)(B) of the Endangered Species Act (ESA) of 1973, as amended. The Oregon Department of State Lands (DSL) prepared the HCP in support of its permit applications. DSL is seeking take authorization from FWS and NMFS for three species: northern spotted owl, marbled murrelet, and Oregon Coast coho. The permits, if issued, would authorize take of the covered species that may occur incidental to DSL's forest management and research activities on 83,458 acres of forest lands in Douglas and Coos Counties overseen by the State Land Board. The EIS presents effects of the proposed HCP and three alternatives on geology and soils, water resources, vegetation, fish and wildlife, air quality, climate change, recreation and visual resources, cultural resources, tribal resources, socioeconomics, and environmental justice. FWS, as the federal lead agency, prepared this EIS pursuant to the requirements of the National Environmental Policy Act and its implementing regulations, as modified by the Council on Environmental Quality in 2020, and revised in April of 2022, as well as internal agency guidance. FWS and NMFS will make separate decisions on whether to issue an ITP to the applicant, relying on the criteria for ITPs set forth in ESA and its implementing regulations.

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Acronyms and Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
CEQ	Council on Environmental Quality
CH_4	methane
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CRW	conservation research watersheds
CWA	Clean Water Act
EIS	environmental impact statement
ESA	Endangered Species Act
FR	Federal Register
FWS	U.S. Fish and Wildlife Service
GHG	greenhouse gas
H_2O	water vapor
IPCC	Intergovernmental Panel on Climate Change
ITP	incidental take permit
MRW	management research watersheds
MT	metric tons
N_2O	nitrous oxide
NAAQS	national ambient air quality standards
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NRHP	National Register of Historic Places
O_3	ozone
ODEQ	Oregon Department of Environmental Quality
ODF	Oregon Department of Forestry
OHV	off-highway vehicle
Oregon FPA	Oregon Forest Practices Act
SHPO	State Historic Preservation Officer
SWE	snow water equivalent
the Services	National Marine Fisheries Service and U.S. Fish and Wildlife Service
TMDL	total maximum daily load
USC	United States Code

Executive Summary

Introduction

The Oregon Department of State Lands (DSL) prepared the Elliott State Research Forest Habitat Conservation Plan (HCP) to support its applications for incidental take permits (ITPs) from the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) (collectively, the Services). The ITPs would authorize take of endangered and threatened species resulting from DSL's management activities (i.e., timber harvest and reforestation, thinning, and supporting management activities and infrastructure) in accordance with the requirements of the Endangered Species Act (ESA). Section 9 of the ESA and federal regulations prohibit the taking of a species listed as endangered or threatened. The ESA defines "take" to mean harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The Services may issue permits, under limited circumstances to take listed species incidental to, and not the purpose of, otherwise lawful activities. Section 10(a)(1)(B) of the ESA and implementing regulations provide for authorizing incidental take of listed species.

The proposed issuance of an ITP is considered a federal action under the National Environmental Policy Act (NEPA) (42 United States Code [USC] 4321 et seq.). This environmental impact statement (EIS) was prepared to meet the Services' NEPA requirements. FWS is the lead federal agency responsible for preparing the EIS, and NMFS is a cooperating agency.

Proposed Federal Action and Decisions to be Made

The Services are reviewing the ITP applications, received on October 10, 2022. The Services will base their decisions on the statutory and regulatory criteria of the ESA. Their decisions will also be informed by the data, analyses, and findings in this EIS and public comments received on the EIS and HCP. The Services will independently document their determinations in an ESA Section 10 findings document, ESA Section 7 biological opinion, and NEPA Record of Decision developed at the conclusion of the ESA and NEPA compliance processes. If the Services find that all requirements for issuance of the ITPs are met, they will issue the requested permits, subject to terms and conditions deemed necessary or appropriate to carry out the purposes of ESA Section 10.

Purpose and Need for Federal Action

The purpose of the federal action considered in this EIS is to fulfill the Services' Section 10(a)(1)(B) conservation authorities and obligations under the ESA to address the applications requesting authorization of incidental take of three species listed as threatened under the ESA—the northern spotted owl, marbled murrelet, and Oregon Coast coho salmon. The applicant has determined that operation of the Elliott State Research Forest as proposed would likely result in take of these ESA-listed species and is looking for a long-term solution that assures compliance with the ESA.

The need for the federal action is to respond to the applicant's request for ITPs for the covered species and covered activities as described in the HCP. The Services will review the ITP applications to determine if they meet issuance criteria; those criteria include that the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of the incidental taking, that the applicant will ensure adequate funding for the HCP, and that such taking will not appreciably reduce the likelihood of survival and recovery of the species. The Services will also ensure that issuance of the ITPs complies with other applicable federal laws, regulations, treaties, and applicable executive orders, as appropriate.

Public Involvement

FWS initiated the public scoping process for this EIS by publishing the Notice of Intent (NOI) to prepare an EIS in the *Federal Register* (FR) on May 5, 2022 (87 FR 26778). The NOI can be accessed at https://www.fws.gov/project/elliott-state-research-forest-habitat-conservation-plan. The NOI announced NMFS' intent to prepare an EIS, provided information on the public scoping meeting, and requested comments from all interested parties on the scope of issues and alternatives to consider in preparing the EIS. The comment period was from May 5, 2022, to June 6, 2022. FWS hosted a virtual scoping meeting on May 16, 2022. Appendix 1-B, *Scoping,* and Chapter 5, *Summary of Submitted Alternatives, Information, and Analyses,* summarizes comments received during the scoping period, which FWS considered when developing this EIS.

The Draft EIS and HCP are being concurrently released for public review. Submitted comments will be considered and addressed in the Final EIS. A virtual public meeting will be held during the comment period.

Alternatives

FWS analyzed four alternatives in detail in the Draft EIS, including the no action alternative and the proposed action (Elliott State Research Forest HCP). Chapter 2, *Proposed Action and Alternatives*, describes additional alternatives that FWS considered but eliminated from detailed study.

Alternative 1: No Action Alternative

Under the no action alternative, the Services would not issue ITPs to DSL for the covered activities described in Chapter 2, Section 2.1.2.2, *Covered Activities*, and DSL would not implement the proposed HCP. The no action alternative assumes that DSL would manage the Elliott State Forest for timber harvest using a take avoidance approach to ESA compliance. DSL would manage the Elliott State Forest consistent with the Oregon Forest Practices Act (FPA) (Oregon Administrative Rules [OAR] Chapter 527). Updates to the Oregon FPA, consistent with the Private Forest Accord (PFA) report (Conservation Coalition and Working Forest Coalition 2022) are considered reasonably foreseeable, per the provisions of Oregon Senate Bill (SB) 1501.[1] These updates are considered in the analysis of the no action alternative where data and information are available.

[1] Per SB 1501, the riparian buffer provisions outlined in this report would go into effect on July 1, 2023, and would remain in effect pending an ITP related to an approved HCP consistent with the PFA report no later than December 31, 2027, when the remaining PFA provisions would go into effect. SB 1501 specifies that the HCP and associated changes to Oregon FPA must be consistent with the requirements outlined in the 2022 PFA report. Therefore, these protections were deemed reasonably foreseeable for purposes of the no action alternative.

For purposes of this analysis, the no action alternative assumes the following restrictions on forest management activities to avoid take of ESA-listed species in the absence of the proposed HCP.

- **Northern spotted owl:** DSL would avoid incidental take through habitat protections included in the *Revised Recovery Plan for Northern Spotted Owl* (FWS 2011), *FWS Protocol for Surveying Proposed Management Activities that May Impact Northern Spotted Owls* (FWS 2012), and *Biological Opinion on Northwest Oregon District, Bureau of Land Management Harvest and Routine Activities* (FWS 2020). DSL would avoid incidental take from habitat modification for northern spotted owl by protecting nest sites and suitable habitat[2] within home ranges (FWS 2011).[3] This includes maintaining a 70-acre no-harvest zone around the nest site, a minimum of 50% of suitable habitat within the core use area (0.5-mile radius around the nest site) and a minimum of 40% of suitable habitat within the provincial home range (in the Oregon Coast region, a 1.5-mile radius around the nest site) (FWS 2012).[4] DSL would also implement seasonal restrictions on certain maintenance activities and equipment use during the critical breeding period and the nesting season (FWS 2020).
- **Marbled murrelet:** DSL would avoid incidental take through compliance with OAR 635-100-0137, *Survival Guidelines for Marbled Murrelet.* The guidelines specify that "prior to implementing a project that removes trees and has the potential to take marbled murrelets, approved surveys of the project area shall be conducted for a minimum of two consecutive years to determine if it is occupied by murrelets." Timber harvest would not be permitted in sites determined through surveys to be occupied and in a 100-meter (328-foot) buffer surrounding occupied sites. For the purpose of analysis, occupied habitat is assumed to include the known occupied and modeled potential marbled murrelet habitat identified in the HCP (EIS Figure 2-1). The guidelines also include seasonal restrictions on certain activities (e.g., heavy equipment use, prescribed burns) with which DSL would be required to comply.
- **Oregon coast coho:** DSL would avoid incidental take through compliance with the Oregon FPA, including anticipated updates referenced in SB 1501. This policy would require riparian management areas (RMAs) to be applied to either side of streams (Table ES-1). Management in RMAs would be limited to restoration thinning.[5] Equipment limitation zones (ELZs) would be applied beyond the end of RMAs on certain stream types. Protections for Oregon coast coho would also include steep slope protections for designated debris flow traversal areas and slope retention areas, as defined in Chapter 3 of the PFA report. These protections are intended to deliver large wood and regulate sediment delivery to fish-bearing streams consistent with maintaining or improving aquatic habitat within large basins over long timeframes (Conservation Coalition and Working Forest Coalition 2022).

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[2] Suitable habitat includes marginal, suitable, and highly suitable habitat as defined in Davis et al. 2016.

[3] References for cited sources in this EIS are located in Appendix 2-A, *References.*

[4] Standards for maintaining suitable habitat in owl circles apply to the full circle, regardless of ownership.

[5] DSL would have no commitment to implement restoration treatments in RMAs, but they would be permitted per the anticipated updates to the Oregon FPA.

Table ES-1. Riparian Management Areas and Equipment Limitation Zones, No Action Alternative

Stream Type [a]	Prescribed Width (Slope Distance) [b]
Large or medium SSBT or other fish-bearing stream	110-foot RMA
Small SSBT or other fish-bearing stream	100-foot RMA
Large or medium perennial non-fish-bearing stream	75-foot RMA
Small, perennial non-fish-bearing stream, tributary to SSBT stream	75-foot RMA from the confluence with the SSBT stream for the first 500 feet 50-foot RMA on the next 650 feet (up to 1,150 feet from the confluence with the SSBT stream) 35-foot ELZ above RMA
Small, perennial non-fish-bearing stream, tributary to other (not SSBT) fish-bearing stream	75-foot RMA from the confluence with the fish-bearing stream for up to the first 600 feet 35-foot ELZ above RMA
Other non-fish-bearing stream (seasonal)	35-foot ELZ

[a] Stream types are defined in the Oregon FPA.

[b] RMA widths are measured using slope distance from the edge of the active channel, or channel migration zone if present, on each side of the stream. RMA lengths on non-fish-bearing streams are measured from the confluence with a fish-bearing stream. Due to the average slope of the landscape, measuring buffers along the slope results in a less-protective buffer than a horizontal buffer of the same width.

ELZ = equipment limitation zone; RMA = riparian management area; SSBT = salmon, steelhead, and bull trout

Further assumptions regarding forest management practices are identified as appropriate in Chapter 3, *Affected Environment and Environmental Consequences*.

In areas where harvest is not prohibited by take avoidance restrictions, as described above, the no action alternative assumes that DSL would harvest using clearcutting with one to two commercial thins prior to harvest.

Alternative 2: Proposed Action

The proposed action evaluated in this EIS is the issuance of ITPs with 80-year permit terms by the Services that would authorize incidental take of covered species from covered activities in the permit area, and implementation of the conservation strategy in the associated HCP. Below is a summary of the information in Chapter 2, Section 2.1.2, *Alternative 2: Proposed Action.*

Permit and Plan Area

The HCP permit area includes 83,458 acres of school lands[6] in Douglas and Coos Counties and is the location where all covered activities and conservation actions would occur. The HCP plan area includes the permit area and an additional 8,897 acres of Board of Forestry lands overseen by the

[6] Through the Oregon Admission Act in 1859, the federal government granted school lands to the state with the condition that these lands be used for schools. All revenue from school lands is distributed to school districts through the Common School Fund. DSL is in the process of decoupling the forest from the Common School Fund, compensating the school fund for the forest, and releasing the forest from its obligation to generate revenue for schools.

State Board of Forestry and managed by ODF. Board of Forestry lands are included in the plan area to accommodate any future land exchanges between DSL and ODF within the Elliott State Forest.[7]

Covered Activities

The covered activities are the forest management activities, as well as the activities needed to carry out the conservation strategy, for which DSL is requesting take authorization and include the following.

- S**tand-level research treatments:** Stand-level research treatments would be implemented according to the research design outlined in the HCP. This research design subdivides the permit area into two general areas—the conservation research watersheds (CRW) and management research watersheds (MRW). The CRW would be managed as a contiguous reserve with limited management activity allowed. The MRW would be managed based on a triad design, with reserve, extensive, and intensive management practices applied in varying proportions by subwatershed. Riparian conservation areas (RCAs) would be applied to streams throughout the permit area, with varying widths based on stream type and location (Table ES-1). Allowable treatment types vary by allocation.
    - **Reserve areas:** In reserve areas, treatments would be limited to restoration thinning in stands younger than 65 years old as of 2020, which would include thinning intended to enhance forest complexity and habitat by transitioning young, dense plantations in reserves toward greater compositional, successional, and structural diversity that would remove between 20 and 80% of basal area. In the CRW, restoration thinning would occur primarily in the first 20 years of the permit term, with the potential for subsequent entries with concurrence from the Services if it is determined additional thinning would further benefit the covered species. Restoration thinning in the MRW reserves would be focused in the first 20 years of the permit term but may occur later in the permit term as needed to support research objectives.
    - **Extensive areas:** In extensive areas, treatments would include a continuum of management options, between the extremes of reserves and intensive management, with the intent of balancing biodiversity objectives and timber demand at the stand level. Extensive treatments would include thinning and variable density harvest, retaining 20 to 80% of preharvest relative density.
    - **Intensive areas:** In intensive areas, forest management would include management for clearcut timber harvest, which removes nearly all trees in a stand. Management in these areas would prioritize commercial timber harvest at rotations of 60 years or longer. Up to two commercial thins would occur between 30 and 50 years and these treatments would remove no more than 80 square feet of conifer basal area per acre.
    - **Riparian conservation areas:** In RCAs, forest management would be limited to restoration thinning. Management permitted in RCAs in the CRW and MRW reserves would include one entry for restoration thinning in areas less than 65 years of age as of 2020. Management permitted in RCAs in intensive and extensive areas not located in reserves would include

[7] For example, DSL may exchange a limited amount of school lands with Board of Forestry lands to consolidate land ownership and improve management consistency across contiguous parcels. Per HCP Chapter 7, *Implementation and Assurances*, changes to the permit area would require an amendment to the HCP and approval by the Services.

restoration thinning as needed in areas less than 65 years of age as of 2020. Table ES-2 shows RCA widths.

Table ES-2. Riparian Conservation Areas, Proposed Action

Stream Type [a]	Area	Buffer Distance [b] (Horizontal Distance)
Fish-bearing streams	CRW	200 feet
	MRW, Lower Millicoma [c]	120 or 200 feet [f]
	MRW, other (full watersheds) [d]	100 feet
	MRW, other (partial watersheds) [e]	120 feet
Non-fish-bearing, perennial (PNFB) and high landslide delivery potential (HLDP) [g] streams	CRW	200 feet [f]
	MRW, Lower Millicoma [c]	50 feet (non-fish-bearing perennial) or 120 feet (HLDP)
	MRW, other (all watersheds)	50 feet
Non-fish-bearing, non-HLDP seasonal streams	All	0 feet

[a] Stream types are those defined in the OSU Modeled Stream Network (2020).

[b] RCAs are measured as the horizontal distance from each side of the channel migration zone.

[c] Along the West Fork Millicoma River mainstem, buffers would be 200 feet measured as the horizontal distance from each side of the channel migration zone. Buffers would be 120 feet measured as horizontal distance along any non-fish-bearing stream that has a high potential to deliver wood to the adjacent fish-bearing stream and fish-bearing tributaries to the mainstem.

[d] Full watersheds are contained entirely within the permit area. Buffers on these streams would be a minimum of 100 feet. Where a 100-foot buffer is applied, increased buffering would be allocated to the HLDP portions of the stream network to attain the target level of wood delivery and associated resources.

[e] Partial watersheds overlap with the permit area but extend into adjacent land ownership.

[f] In 200-foot-wide RCAs, log volume from restoration thinning may be removed and sold from the area between 120 and 200 feet from the channel migration zone (HCP Section 5.3.1.1, *Riparian Vegetation Management in RCAs*).

[g] HLDP streams are defined as non-fish-bearing streams with the potential to deliver wood to fish-bearing streams.

CRW = conservation research watersheds; MRW = management research watersheds; RCAs = riparian conservation zones; HLDP = high landslide delivery potential

- **Supporting management activities:** Supporting management activities include activities required to manage stands in support of the research platform. Specific activities include those conducted as a part of harvest regimes (e.g., tree planting, landing construction, precommercial thinning and pruning, slash removal), those required for infrastructure construction and maintenance (e.g., mechanical vegetation control, heavy equipment use, hazard tree removal) and those necessary for implementation of research or restoration projects (e.g., small fixed-wing aircraft or helicopter use, tree climbing, tree felling). Prescribed fire, including single or multiple controlled burns that incorporate traditional ecological knowledge, may be used to manage fuels and increase or maintain suitable conditions for species of cultural value to local tribal communities.
- **Supporting infrastructure:** Supporting infrastructure is needed to facilitate the research platform and programs and includes roads and related facilities, quarries, and communication sites/lookouts.
    - **Road system management:** The construction, use, maintenance, daylighting, abandonment, and decommissioning of roads and related facilities are covered activities. All road system management will be performed in accordance with restrictions in the Oregon

FPA (OAR 629) and other applicable statutes. The HCP allows the construction of up to 40 miles of new permanent roads and two new quarries in the permit area during the permit term. Any road not decommissioned within 5 years of construction would count toward the limit on permanent road construction.

    - **Quarries:** The HCP allows the construction of up to two new quarries, located only in the MRW and outside of reserves and RCAs.
    - **Communication site/lookout maintenance:** The HCP covers the maintenance of three existing communication sites/lookouts in the plan area.

- **Covered activities related to conservation measures and implementation:** Covered activities related to conservation measures and implementation include the following:
    - Riparian restoration and stream enhancement
    - Road restoration and network reduction
    - Habitat enhancement for northern spotted owl and marbled murrelet
    - Research on the covered species
    - Survey and monitoring requirements

Covered Species

The covered species include the Oregon coast coho, northern spotted owl, and marbled murrelet Table ES-3 lists the covered species and their state and federal listing statuses.

Table ES-3. Covered Species

Species	Status [a]		Federal Jurisdiction
	State	Federal	
Fish			
Oregon Coast coho (*Oncorhynchus kisutch*)	--	FT	NMFS
Birds			
Northern spotted owl (*Strix occidentalis*)	ST	FT	FWS
Marbled murrelet (*Brachyramphus marmoratus*)	SE	FT	FWS

[a] SE = state-listed as endangered; ST = state-listed as threatened; FT = federally listed as threatened.
NMFS = National Marine Fisheries Service; FWS = U.S. Fish and Wildlife Service

Conservation Strategy

The HCP conservation strategy includes biological goals and objectives for each covered species, which broadly describe desired future conditions and how they will be achieved. It also includes conservation measures, actions that DSL would implement to avoid, minimize, and mitigate (or offset) impacts on covered species from covered activities such that the impact of the taking is minimized and mitigated to the maximum extent practicable, as required under ESA Section 10(a)(2)(A) and the Services' implementing regulations. DSL would also apply conditions on covered activities. Conditions are rules or standards that would be used when covered activities are implemented to further minimize and sometimes avoid potential effects on covered species.

Conservation Measures

- **Conservation Measure 1, Targeted Restoration and Stream Enhancement:** This conservation measure includes restoration and stream enhancement projects that would occur based on need and opportunities to take advantage of existing equipment onsite during harvest operations. Instream wood placement and gravel augmentation projects would be targeted at fish-bearing streams within or adjacent to all harvest operations when the stream is below the desired level of wood and the operation contains wood meeting size requirements for the intended stream.

  This conservation action specifies that restoration thinning in RCAs would only occur in overstocked former plantation stands that are 65 years or less in age as of 2020. Restoration thinning may occur throughout the entire width of the RCA with the objective of improving ecological conditions.[8] Of the conifers harvested from RCAs, 15 to 20% of the total volume thinned would be devoted to channel placement and would come from the first 120 feet adjacent to subject streams, provided there is sufficient volume in this area to do so. Where RCA width is 200 feet and there is enough wood in the first 120 feet of the RCA to meet the channel placement requirement, timber may be removed from 120 to 200 feet within the RCA. Potential actions within RCAs include silvicultural treatments such as reducing the density of conifers, conversion of hardwood stands to conifer species, selective removal of hardwoods from mixed-species stands and establishment of shade-tolerant conifer seedlings, creation of gaps in hardwood stands to establish conifer seedlings (shade-intolerant and shade-tolerant), opening riparian areas to an early-seral stage, or other similar practices designed to improve aquatic and riparian conditions.

  This conservation measure may also include beaver restoration projects (e.g., installation of a beaver dam analog, beaver habitat enhancement). DSL would coordinate this work with regional partners, the Oregon Department of Fish and Wildlife (ODFW), FWS, and NMFS to ensure beaver management actions fit into the larger context of salmonid recovery and statewide beaver management principles.

- **Conservation Measure 2, Expand RCAs on Lower Millicoma River**: This conservation measure includes expanded RCAs along the Lower Millicoma River from its entry into the southwest portion of the permit area through the confluence with Elk Creek. RCAs in this area would be a distance equal to the site's potential tree height (200 feet measured as the horizontal distance from each side of the channel migration zone) on either side of the river mainstem and 120 feet measured as horizontal distance along any non-fish-bearing stream that has a high potential to deliver wood to the adjacent fish-bearing stream and fish-bearing tributaries to the mainstem (HLDP streams) (Carlson in prep.).

- **Conservation Measure 3, Reduce Forest Road Network in CRW**: This conservation measure includes a commitment to no net increase in permanent new road miles in the CRW. Roads not necessary to facilitate the research program, recreation activities, or emergency management would be abandoned or decommissioned to meet these commitments. This measure also includes guidance on locations of new roads; standards for road construction, maintenance, and vacating; and a commitment to study hydrologic connectivity. DSL may also pursue upgrades or removal of existing fish passage barriers in the permit area.

[8] HCP Appendix A, *Thinning in Riparian Conservation Areas*, provides detail on the intended benefits of thinning treatments in RCAs.

- **Conservation Measure 4, Research on Coho Salmon and their Habitat:** This conservation measure includes research to better understand the effects of different forest treatments on Oregon Coast coho evolutionarily significant unit health, its populations, and habitat parameters important to the species.
- **Conservation Measure 5, Research on Northern Spotted Owl, Marbled Murrelet, and their Habitat:** This conservation measure includes research led by an interagency stakeholder advisory committee to determine the best methods and treatments for increasing old forest structure that would benefit northern spotted owl and marbled murrelet.
- **Conservation Measure 6, Barred Owl Research**: This conservation measure includes collaboration with FWS and other federal and state management agencies to design and implement appropriate barred owl removal protocols in support of federal management strategies for northern spotted owl recovery. Related research initiatives, including on the effects of generalist predators such as the barred owl on ecosystem processes, would be integrated into monitoring and data collection in the Elliott State Forest.

Conditions on Covered Activities

- **Condition 1, Seasonal Restrictions around Northern Spotted Owl Nest Sites:** This condition includes seasonal restrictions on forest management activities within specified distances of northern spotted owl nest sites.
- **Condition 2, Retention of Northern Spotted Owl Nesting Core Areas:** This condition specifies that, for the 23 protected owl sites, there would be no harvest (i.e., no modification or treatment) in a 100-acre nesting core area surrounding the nest tree and made up of the best contiguous habitat. The distance between the nest tree and the edge of the nesting core will be no less than 300 feet.
- **Condition 3, Retention of Northern Spotted Owl Core Use Areas:** This condition requires that, per the guidance in the revised Recovery Plan (FWS 2011) for northern spotted owl, at least 50% (more than 251 acres) of the 502-acre northern spotted owl core use areas will be retained as nesting, roosting, and foraging habitat[9] at all times. The 502 acres do not need to be in a circle but will consist of the best contiguous habitat, and the edge of the core use area will be no less than 300 feet from the nest location. The location of nesting, roosting, and foraging habitat within the core use areas may change, as long as the target continues to be met. The HCP uses the definitions of highly suitable, suitable, and marginal habitat in Davis et al. (2016), but the definition of nesting, roosting, and foraging habitat will be based on the most up-to-date scientific information and regulatory standards throughout the permit term. This standard will be applied to the 23 northern spotted owl core use areas. If new owl nest locations are discovered in the future, DSL, in coordination with FWS, could choose to remove protections from an inactive core use area from the 23 existing owl sites in favor of the newly discovered (active) nest site.
- **Condition 4, Retention of Habitat in Northern Spotted Owl Home Ranges:** This condition requires that, per the guidance in the revised Recovery Plan for northern spotted owl (FWS 2011), at least 40% of the northern spotted owl home range (a 1.5-mile buffer around the nest

[9] In the HCP, this is assumed to mean habitat that contains all of the elements of nesting, roosting, and foraging habitat (per Davis et al. 2016, highly suitable and suitable habitat), not habitat that only supports foraging (per Davis et al. 2016, marginally suitable habitat).

site) is maintained as nesting, roosting, and foraging habitat around the active nest core areas. This is equivalent to 1,809 acres of nesting, roosting, and foraging habitat.

- **Condition 5, Maintenance of Northern Spotted Owl Dispersal Landscape:** This condition requires that at least 40% of the MRW is retained as dispersal habitat, per the standards set forth in Thomas et al. (1990), which are met when at least 50% of trees are at least 11 inches in diameter at breast height with at least 40% canopy cover.
- **Condition 6, Seasonal Restrictions in Marbled Murrelet Occupied Habitat:** This condition includes seasonal restrictions on forest management activities in and near designated occupied marbled murrelet habitat.
- **Condition 7, Survey Requirements for Designated Occupied and Modeled Potential Marbled Murrelet Habitat:** This condition lays out a process for surveying all designated occupied and modeled potential marbled murrelet stands (HCP Chapter 2, Figure 2-11) for marbled murrelet presence. Based on the findings of these surveys, DSL will determine if areas with murrelet presence need to be added to reserves or extensive treatment areas and intensive areas reallocated.
- **Condition 8, Limits on Harvest in Designated Occupied and Modeled Potential Marbled Murrelet Habitat:** This condition sets a limit on the area of designated occupied and modeled potential marbled murrelet habitat that can be subject to extensive treatments. There is a total limit of 1,400 acres over the permit term and an initial limit of no more than 500 acres in the first 10 years of the permit term with a minimum of 80% retention of pre-harvest relative density, at which time DSL could proceed with treatments in the remaining 900 acres following FWS' review of the initial research outcomes.
- **Condition 9, Maintaining Aggregate Amount of Marbled Murrelet Occupied Habitat Over Time:** This condition requires no temporal loss of the aggregate number of acres of designated occupied or modeled potential marbled murrelet habitat as a result of harvest treatments in the permit area. DSL must demonstrate that at least as many acres of designated occupied or modeled potential habitat proposed for extensive harvest have been replaced by habitat in the CRW or MRW reserves that is first determined to be occupied during the term of the permit.
- **Condition 10, Retention Standards for Intensive Treatments:** This condition specifies that live tree retention in intensively managed areas must meet or exceed the requirements of the Oregon FPA.
- **Condition 11, Management on Steep Slopes:** This condition specifies that harvest plans in areas with slopes with an average gradient greater than 65% will be reviewed by a geotechnical specialist to advise on how to modify management activities where necessary to minimize the risk of sediment transfer or increased risk of landslides in ways that may have a negative effect on coho salmon. This condition also states that management under the HCP would comply with updated Oregon FPA requirements for management on steep slopes.
- **Condition 12, Road Construction and Maintenance:** This condition includes road design standards to ensure hydrologic disconnection from streams and operational standards to reduce erosion and stream sedimentation from construction and maintenance. This condition also specifies that culvert removal and replacement would meet NMFS and ODFW fish passage criteria.

Monitoring and Adaptive Management

The proposed action would include implementation of a monitoring and adaptive management program (HCP Chapter 6, *Monitoring and Adaptive Management*). The program is intended to ensure compliance with the HCP, assess the status of covered species habitat, and evaluate the effects of management actions such that the conservation strategy, including the biological goals and objectives, is achieved.

Alternative 3: Increased Conservation

Under Alternative 3, the HCP would include the same permit area, covered species, permit term, and monitoring and adaptive management program as the proposed action. The HCP's covered activities and conservation strategy would be modified in the following ways.

All known occupied and modeled potential existing marbled murrelet habitat, northern spotted owl core use areas, and extensive stands over 80 years as of 2020 would be allocated to reserves. Northern spotted owl habitat requirements and the conservation strategy's conditions for northern spotted owls (Conditions 1 through 5) would apply to any future northern spotted owl activity centers.

RCAs would be expanded on certain stream types (Table ES-4). Minimum RCAs on fish-bearing streams in full watersheds in the MRW would be expanded from 100 to 120 feet. RCAs on perennial non-fish-bearing streams in watersheds in the MRW would be expanded from 50 to 120 feet. RCAs on HLDP streams in the MRW outside of the Lower Millicoma region would be expanded from 50 to 120 feet. RCAs on non-fish-bearing, non-HLDP nonperennial streams that are second order or greater would expand from 0 to 35 feet. In addition to the proposed action limitation of conducting restoration thinning in RCAs only in stands less than 65 years old as of 2020, restoration thinning in RCAs would also be prohibited on slopes greater than 65% and would be limited to removing a maximum of 5% of existing shading.[10]

Table ES-4. Riparian Conservation Areas, Alternative 3

Stream Type [a]	Area	Buffer Distance (Horizontal Distance) [b]
Fish-bearing streams	CRW	200 feet
	MRW, Lower Millicoma mainstem	200 feet
	MRW, other	120 feet
Non-fish-bearing, perennial (PNFB) streams	CRW	200 feet
	MRW	120 feet
High landslide delivery potential (HLDP) streams	CRW	200 feet
	MRW	120 feet
Non-fish-bearing, non-HLDP streams	CRW and MRW, 2nd order streams and higher	35 feet
	CRW and MRW, 1st order streams	0 feet

[a] Stream types are those defined in the OSU Modeled Stream Network (2020).
[b] Riparian conservation areas are measured as the horizontal distance from each side of the channel migration zone.

[10] The amount of trees removed from a particular stream segment would depend on site conditions contributing to shade, such as aspect, topography, density and tree height.

CRW = conservation research watershed; PNFB = perennial, non-fish-bearing; HLDP = high landslide delivery potential; MRW = management research watershed

Conservation Measure 3 would be modified to apply the requirement for no net increase in permanent new road miles to the entire permit area rather than just the CRW. To count as a road removed from the permanent road network, roads must be decommissioned, rather than abandoned or decommissioned. Decommissioning would include additional measures, to those defined in the HCP (Chapter 2, Section 2.1.3, *Alternative 3: Increased Conservation*).

Alternative 4: Increased Harvest

Under Alternative 4, the HCP would include the same permit area, covered activities, covered species, permit term, and monitoring and adaptive management program as the proposed action. The layout of the HCP's research design would be modified in the following ways.

The CRW and MRW reserve areas located outside of occupied and modeled potential marbled murrelet habitat would be eliminated. In these areas, intensive prescriptions would be applied to stands under 65 years of age as of 2020, and extensive prescriptions would be applied to stands over 65 years of age as of 2020.

RCAs in the CRW would be modified to be the same width as RCAs in the MRW (Table ES-5). Additionally, the conservation strategy would be modified to remove Conservation Measure 2, Expand RCAs on Lower Millicoma River. RCAs in these areas would be the same width as RCAs in the rest of the MRW.

The requirement for there to be no net increase in permanent road miles in the CRW would not apply under Alternative 4.

Table ES-5. Riparian Conservation Areas, Alternative 4

Stream Type [a]	Area	Buffer Distance [b] (Horizontal Distance)
Fish-bearing streams	CRW	100 feet
	MRW, Lower Millicoma	100 feet
	MRW, other (full watersheds) [c]	100 feet
	MRW, other (partial watersheds) [d]	100 feet
Non-fish-bearing, perennial (PNFB) and HLDP seasonal streams	CRW	50 feet
	MRW, Lower Millicoma [c]	50 feet
	MRW, other (all watersheds)	50 feet
Non-fish-bearing, non- HLDP seasonal streams	All	0 feet

[a] Stream types are those defined in the OSU Modeled Stream Network (2020).

[b] Riparian conservation areas are measured as the horizontal distance from each side of the channel migration zone.

[c] Full watersheds are contained entirely within the plan area.

[d] Partial watersheds overlap with the plan area but extend into adjacent land ownership.

CRW = conservation research watershed; PNFB = perennial, non-fish-bearing; HLDP = high landslide delivery potential; MRW = management research watershed

Summary of Impact Analysis

Table ES-6 summarizes the impacts that could occur under the proposed action and alternatives for all environmental issues analyzed in the EIS. Chapter 3, *Affected Environment and Environmental Consequences*, provides a detailed analysis of potential effects. Cumulative impacts are analyzed in Chapter 4, *Cumulative Effects*, of the EIS, and are not included in the table.

Table ES-6. Summary of Potential Impacts

Alternative 1: No Action	Alternative 2: Proposed Action	Alternatives 3 and 4
Geology and Soils		
More intensive harvest treatments, especially clearcut harvest, and road construction and use would increase erosion. Riparian protections and compliance with Oregon FPA requirements for reforestation and road management would reduce sedimentation to streams from these activities. Timber harvest, particularly clearcut harvest, and other forestry management activities, including road development, maintenance, and abandonment, would increase the likelihood of shallow-rapid landslides and associated events (i.e., debris flow and debris torrent). Riparian buffers and steep slope protections would encourage recruitment of large wood and regulate sediment delivery to streams from these events.	The reduced area of clearcut harvest and limits on expansion of the permanent road network would reduce erosion and the potential to influence landslide from these activities. Erosion from existing roads could increase without the requirement to bring existing roads into compliance with the Oregon FPA. Reduced potential to induce landslide would result in a corresponding reduction in landslide-related effects on streams. Wider riparian buffers would increase large wood recruitment and better regulate sediment delivery; however, the steep slope protections would be reduced on non-coho fish-bearing streams. Restoration thinning in RCAs would cause erosion and sediment delivery to streams but would immediately improve riparian and aquatic functioning in these areas.	**Alternative 3:** Reduced area of clearcut harvest and further limits on extent of the permanent road network and stronger requirements on road decommissioning would reduce erosion and the potential to influence landslide from these activities compared to all alternatives. Wider riparian buffers would increase large wood recruitment and better regulate sediment delivery compared to all alternatives, but steep slope protections may still be reduced on non-coho fish-bearing streams compared to the no action alternative. Restoration thinning in RCAs would be more restriction compared to the proposed action resulting in less erosion and sediment delivery to streams but immediately improvements riparian and aquatic functioning in less area. **Alternative 4:** The area of more intensive harvest treatments and related effects on erosion would be greater than both the proposed action and no action alternative. The potential to influence landslide would fall between the no action alternative and proposed action. Riparian protections and associated effects on stream geomorphology would be between the no action alternative and proposed action.

Alternative 1: No Action	Alternative 2: Proposed Action	Alternatives 3 and 4
Water Resources		
Water Supply		
Timber harvest road management and prescribed burns would increase water yield by removing vegetation, decreasing evapotranspiration, and compacting soil. However, as harvested stands regrow, annual yield would decrease. These effects on water yield are not anticipated to be detectable at the subwatershed scale.	Increases in water yield from forest management activities would be less than the no action alternative due to decreased area of more intensive harvest treatments and limits on the permanent road network.	**Alternative 3:** Increases in water yield from forest management activities would be least under Alternative 3 due to decreased area of more intensive harvest treatments and greater limitations on the permanent road network. **Alternative 4:** Effects on water supply would be the similar to the no action alternative, but short-term increases in average annual water yield could be larger in some areas and detectable at the subwatershed scale in the West Fork Millicoma and Loon Lake-Mill Creek subwatersheds.
Peak Flows and Channel Condition		
Timber harvest would increase peak flows and can result in adverse effects on channel condition. Road construction and prescribed burns would have similar effects. Harvest is not expected to increase peak flows at the subwatershed scale, but where stream reaches drain areas with significant forest cover loss, peak flows would increase and channel structure would be adversely affected at the local scale. As RMAs mature, they would increase the potential for large wood recruitment and, therefore, decrease peak flow velocity and coarse sediment transport.	As with the no action alternative, harvest is not expected to increase peak flows at the subwatershed scale, but the potential for adverse local effects would remain. Expanded riparian protection and limits on road construction under the proposed action would further mitigate some adverse effects.	**Alternative 3:** Reduced area of more intensive harvest treatments and additional limits on road construction would reduce the degree and duration of peak flows. **Alternative 4:** Effects would be the same as the no action alternative, except that localized effects would increase with increased area available for more intensive harvest and limits on road construction would reduce associated effects.
Low Flows		
Based on stand age projections, harvest would have adverse effects on low flows in seven subwatersheds and beneficial effects on low flows in four subwatersheds. Other activities would have both adverse and beneficial localized effects.	Based on stand age projections, low flows would improve or be similar in all subwatersheds compared to the no action alternative. Restoration thinning in riparian areas and increased wood recruitment compared to the no action alternative would	**Alternative 3:** Based on stand age projections, low flows would improve or be similar in all subwatersheds compared to all alternatives. **Alternative 4:** Based on stand age projections, the potential for adverse effects on low flows in

Alternative 1: No Action	Alternative 2: Proposed Action	Alternatives 3 and 4
	improve low flows compared to the no action alternative.	nearly all subwatersheds would increase compared to the no action alternative.
Water Quality		
Timber harvest would increase stream temperature, sedimentation, toxic chemical concentrations in streams, and turbidity. Riparian buffers would reduce some of these adverse effects. Road construction and use would increase sedimentation, turbidity, and other contaminants. Abandoning or decommissioning roads, which could be implemented as part of the Oregon FPA's Forest Road Inventory and Assessment process, would reduce some of these effects. Prescribed burns would temporarily increase stream temperature, sedimentation, turbidity, pH levels, and other contaminants. Quarries could increase turbidity, sedimentation, oil and grease, mineral concentration, and pH of surface water. Implementation of best management practices in compliance with CWA, CZMA, and state regulations, including the Oregon FPA, would minimize and avoid water quality effects from quarries, timber harvest, and stream enhancement.	Types of effects would be the same as described for the no action alternative. Expanded riparian buffers and would reduce stream temperature and better regulate sedimentation compared to the no action alternative, but steep slope protections would be reduced on non-coho fish-bearing streams. Restoration thinning would contribute to greater sedimentation and stream temperature effects than the no action alternative in some locations, but may also benefit stream temperature by reducing vigorously growing vegetation and increasing low flows. Salvage harvest effects would be less than under the no action alternative. Sedimentation from the road network would be similar, with increased restrictions on new road construction, but there would be no requirement to bring existing roads into compliance with the Oregon FPA. Effects of prescribed burning and mechanical vegetation control would be the same as the no action alternative. Siting of prescribed burns outside of riparian buffers would reduce effects on water quality. Compliance with regulations would minimize and avoid water quality effects, as described for the no action alternative.	**Alternative 3:** Effects would be similar to the proposed action, except that reduced area of more intensive harvest treatments, wider riparian buffers, and increased restrictions on new road construction would reduce effects on water quality compared to all alternatives. **Alternative 4:** Effects on surface water quality, including temperature, sediment, and toxics would be between the proposed action and no action alternative, because the extent of harvested area, level of harvest activity, RCAs, and restrictions on road construction would fall between these alternatives.

Alternative 1: No Action	Alternative 2: Proposed Action	Alternatives 3 and 4
Groundwater		
Timber harvest and prescribed burns would temporarily increase groundwater recharge. Road abandonment, decommissioning, maintenance, and drainage repair would increase groundwater recharge. Road construction and quarry activities would decrease groundwater recharge. Overall effects on groundwater recharge would depend on location and timing of management activities. Construction and management activities would pose some risk to groundwater quality, especially use of pesticides; these effects would be mitigated through compliance with regulations, including the Oregon FPA.	Effects from harvest would be similar to the no action alternative but the amount of recharge would vary at the subwatershed scale. Expanded riparian buffers and increased wood recruitment would increase recharge. Limits on road construction could decrease effects of roads on groundwater.	**Alternative 3:** Effects would be similar to the proposed action and no action alternative, but the amount of groundwater recharge would be less. Increased riparian buffers and road construction limits would increase beneficial effects and decrease adverse effects on groundwater compared to all alternatives. **Alternative 4:** Groundwater recharge and associated indirect adverse effects on groundwater quality would increase in most subwatersheds compared to all alternatives. Beneficial effects of RCAs and large wood recruitment would be less than all alternatives.
Flood Hazard		
Timber harvest, salvage harvest, prescribed burns, and road construction could increase flood hazard by decreasing floodwater storage or conveyance capacity; redirecting floodwaters; and increasing flood flow velocity, erosion, and sedimentation potential. Road maintenance, road drainage repair, and closing or vacating roads in floodplains could reduce flood hazard by improving drainage and infiltration capacity, increasing floodwater storage capacity, and decreasing flood velocity. Compliance with CWA, CZMA, and floodplain regulations would minimize adverse effects.	Types of effects would be the same as described for the no action alternative. Increased riparian buffers and large wood recruitment compared to the no action alternative would decrease flood velocity and reduce erosion. The limits on road construction would reduce erosion and flood risk.	**Alternative 3:** Effects would be similar to the proposed action, except that reduced area of more intensive harvest treatments and requirements to fully vacate roads removed from the road network, and no net increase in roads in the entire permit area would further reduce effects. **Alternative 4:** The area of more intensive harvest treatments, narrower buffers, and no limit on road construction would result in more adverse effects than the no action alternative.
Vegetation		
Forest Age and Structure		
The no action alternative would result in a patchwork of clearcuts and younger replanted stands around the older Douglas-fir forest stands in no-harvest areas. No-harvest areas would increase in age and have more complex	Stand age, complexity, and canopy cover would increase compared to the no action alternative. Restoration thinning would be used to accelerate late-seral forest conditions, and the CRW would establish a large block of late-seral	**Alternative 3:** Stand age, complexity, and canopy cover would increase and fragmentation and edge effects would decrease compared to all alternatives.

Alternative 1: No Action	Alternative 2: Proposed Action	Alternatives 3 and 4
forest structures, while clearcut areas would have reduced biodiversity and forest complexity. Salvage harvest would remove standing dead trees and reduce understory complexity.	to old growth forest by the end of the permit term, reducing fragmentation and edge effects compared to the no action alternative. Restrictions on salvage harvest in reserves and RCAs could result in more standing dead matter, understory organic matter, and structural complexity.	**Alternative 4:** Stand age, complexity, and canopy cover, fragmentation, and edge effects would fall between the proposed action and no action alternative.
Spread of Invasive Weeds		
Ground-disturbing activities, especially clearcut harvest and road construction and maintenance, would allow invasive weeds to establish in the study area but would be minimized using best management practices and through implementation of the Oregon FPA's Forest Road Inventory and Assessment process.	Reduced area of clearcut harvest and limits on road construction would reduce the risk of spread of invasive species compared to the no action alternative.	**Alternative 3:** Reduced area of clearcut harvest and stricter road decommissioning requirements would reduce the risk of spread of invasive species compared to all alternatives. **Alternative 4:** Area of more intensive harvest and road restrictions and associated effects would fall between the no action alternative and the proposed action.
Special-Status Plant and Fungus Species		
There are no state or federal listed plant or fungus species likely to occur in the study area. However, forest management activities have the potential to affect rare or imperiled plant and fungus species in the study area through habitat degradation and removal.	Reduced area of more intensive harvest would reduce the potential to affect rare and imperiled plant and fungus species compared to the no action alternative.	**Alternative 3:** Reduced area of more intensive harvest would reduce the potential to affect rare and imperiled plant and fungus species compared to all alternatives. **Alternative 4:** Area available for more intensive harvest and associated potential to affect rare or imperiled plant or fungus species would be similar to the no action alternative.
Wetland Vegetation		
Timber harvest is unlikely to occur in wetlands. However, related ground-disturbing activities (e.g., staging) could affect up to 814 acres of wetlands in the study area. Effects of harvest and thinning on wetlands would be minimized through compliance with existing regulations and management practices. Where not restricted for species protection, salvage harvest in response to disturbance events	Ground-disturbing activities could affect a similar acreage of wetlands (894 acres) to the no action alternative. Salvage harvest would be restricted in more area than under the no action alternative, reducing potential effects on wetlands.	**Alternative 3:** Ground-disturbing activities could affect the same acreage of wetlands as the proposed action, and the reduced area of more intensive harvest treatments would reduce potential post-disturbance effects of salvage activities on wetlands. **Alternative 4:** Ground-disturbing activities would affect the same acreage of wetlands as the proposed action, and effects of salvage

Alternative 1: No Action	Alternative 2: Proposed Action	Alternatives 3 and 4
would have the potential to affect additional wetland areas.		activities would fall between the proposed action and the no action alternative.
Fish and Wildlife		
Oregon Coast Coho Salmon (covered)		
Timber harvest, road construction and use, construction and operation of quarries, and prescribed burns would reduce the quality of salmonid habitat in the study area through effects on wood recruitment, sedimentation, stream temperature, peak and low flows, and habitat complexity, quantity, and connectivity. RMAs, road vacating, and steep slope protections would contribute to improved habitat quality for coho salmon.	Types of effects would be the same as described for the no action alternative. Reduced area of clearcut harvest, wider riparian buffers, and the requirement for no net increase in roads in the CRW would have more beneficial effects on coho salmon populations in those watersheds than the no action alternative. Effects on coho salmon populations in the MRW (outside of the Lower Millicoma) may be similar to the no action alternative.	**Alternative 3:** Decreased harvest and increased riparian protections would benefit coho salmon compared to all alternatives. **Alternative 4:** The extent of harvested area, level of harvest activity, RCAs, and restrictions of road construction and associated effects on coho salmon would be between the no action alternative and proposed action.
Noncovered Fish Species		
Effects on noncovered fish species would be similar to the effects described for coho salmon; habitat quality would be reduced for a range of noncovered native fish. Restrictions in RMAs, road vacating, and steep slope protections would contribute to improved habitat quality for noncovered fish species.	Effects would be similar to those described under the proposed action for coho. Wider riparian buffers and the requirement for no net increase in roads in the CRW would have more beneficial effects on coho salmon than the no action alternative. Effects in the MRW would be similar to the no action alternative.	**Alternative 3:** Decreased harvest throughout the permit area and increased riparian protections compared to all alternatives would benefit noncovered fish species. **Alternative 4:** The extent of harvested area, level of harvest activity, RCAs, and restrictions of road construction and associated effects would be between the no action alternative and proposed action.
Noncovered Stream-Dependent Wildlife Species		
Effects on noncovered stream-dependent wildlife species that may or may not coexist with fish would be similar to the effects described for coho salmon. The no action alternative would adversely affect species that rely on fishless streams. Coastal-tailed frogs and stream-dependent salamanders would experience adverse effects from loss of habitat complexity, disturbance in	Noncovered stream-dependent wildlife species in the CRW would experience more beneficial effects than under the no action alternative because of increased riparian protections and road restrictions. Because of the intensity of harvest and minimal riparian protections in fishless streams, effects in the MRW could be greater than the no action alternative.	**Alternative 3:** Decreased harvest and increased riparian protections and road restrictions compared to all alternatives would benefit noncovered stream-dependent wildlife species. **Alternative 4:** The extent of harvested area, level of harvest activity, RCAs, and restrictions of road construction, and associated effects would be between the no action alternative and proposed action.

Alternative 1: No Action	Alternative 2: Proposed Action	Alternatives 3 and 4
riparian areas, changes in stream temperatures, and loss of habitat connection.		
Northern Spotted Owl (covered)		
Take of northern spotted owl would not be authorized. Habitat removal or modification through timber harvest would be the primary effect on northern spotted owl. Based on forest stand age projections, nesting, roosting, and foraging habitat would decrease for the first 20 years and then increase over the remainder of the analysis period for a net increase of 12% by the end of the analysis period. Habitat would be highly fragmented across the permit area. Road construction and quarry activities would result in potential habitat removal or modification. Avoidance of occupied habitat would shift if species distribution shift. Following disturbance events, restoration of disturbed areas would not be required, and salvage in these areas would remove habitat. The no action alternative does not provide for a response to barred owl competition.	Types of effects would be the same as described for the no action alternative. Unlike the no action alternative, take of northern spotted owl would be authorized. Roughly 66% of the permit area would be retained and enhanced for northern spotted owls, and at least 40% of the MRW would be maintained as dispersal habitat, providing habitat connectivity. Forest management would conform to the HCP research design, and its stay-ahead provision would require the permittee to replace northern spotted owl habitat lost to harvest with equivalent or better-quality habitat. Based on forest stand age projections, northern spotted owl habitat would increase, with 10% more habitat at the end of the permit term than under the no action alternative. There would be greater connectivity and reduced fragmentation compared to the no action alternative. There would also be less area available for salvage harvest. Compared to the no action alternative, the HCP's conservation strategy would provide a greater measure of certainty that northern spotted owl habitat would be maintained for the species' conservation needs. In addition, research conducted under the proposed action is expected to benefit the species as a whole. The adaptive management process would facilitate incorporation of new scientific information about listed species and advances in forest management techniques and facilitate adjustment of conservation measures to	**Alternative 3:** Decreased harvest would result in more habitat increases, greater connectivity and less fragmentation. Reduced area available for salvage harvest would increase potential for habitat to recover after disturbance compared to all alternatives. **Alternative 4:** Increased area of more intensive harvest treatments would result in less northern spotted owl habitat by the end of the analysis period compared to all alternatives. Fragmentation and potential effects of salvage would be between the no action and proposed action.

Alternative 1: No Action	Alternative 2: Proposed Action	Alternatives 3 and 4
	improve implementation of the conservation strategy.	
Marbled Murrelet (covered)		
Take of marbled murrelet would not be authorized. Habitat removal or modification through timber harvest would be the primary effect on marbled murrelet. Based on forest stand age projections, total projected habitat would decrease for the first 20 years and then increase for the remainder of the analysis period for a net increase of 12%. Habitat would be highly fragmented across the permit area. Road construction and quarry development would result in potential habitat removal or modification. Avoidance of occupied habitat would shift if species distribution shifted. Following disturbance, restoration of disturbed areas would not be required, and salvage in these areas would remove habitat. Monitoring would be limited to preharvest surveys to determine species presence.	Take would be authorized and is projected to occur, with the loss of up to 1,400 total acres of occupied marbled murrelet nesting habitat over the term of the permit and from edge effects. Marbled murrelet habitat would increase as forest stands age, with 10% more habitat at the end of the permit term than under the no action alternative. There would be greater connectivity and reduced fragmentation compared to the no action alternative. There would also be less area available for salvage harvest. Forest management would conform to the HCP research design, and its stay-ahead provision would require the permittee to replace marbled murrelet habitat lost to harvest with equivalent or better-quality habitat. The HCP's conservation strategy would provide a greater measure of certainty that marbled murrelet habitat would be maintained for the species' conservation needs. In addition, research conducted under the proposed action is expected to benefit the species as a whole. The adaptive management process would facilitate incorporation of new scientific information about listed species and advances in forest management techniques and facilitate adjustment of conservation measures to improve implementation of the conservation strategy.	**Alternative 3:** Decreased harvest would result in increased habitat, greater connectivity and less fragmentation, and reduced area available for salvage harvest would increase potential for habitat to recover after disturbance compared to all alternatives. **Alternative 4:** Increased areas of more intensive harvest treatments would result in less marbled murrelet habitat by the end of the analysis period compared to all alternatives. Fragmentation and potential effects of salvage would be between the no action and proposed action.

Alternative 1: No Action	Alternative 2: Proposed Action	Alternatives 3 and 4
Noncovered Forest-Dependent Wildlife Species		
Harvest would result in fluctuating increases and decreases in early- and mid-seral forest, which could affect species associated with these seral stages. Harvest activities could have habitat removal, noise, and human disturbance effects on species and would result in fragmentation of stand ages across the permit area. Structural changes that decrease snags and coarse woody debris, such as clearcutting, could affect these species, potentially more than changes in forest stand age. Some species could benefit from the presence of clearcut openings and early-seral forest stands following clearcut timber harvest. Following disturbance, restoration of disturbed areas would not be required and salvage in areas not occupied by listed species would remove habitat.	Similar to the no action alternative, harvest activities could have habitat removal, noise, and human disturbance effects on species. The proposed action would increase late-seral and old growth habitat and create larger, more contiguous habitat areas, increasing dispersal habitat and decreasing exposure to noise and human disturbance, benefiting species that depend on these stands for habitat. The proposed action would also create clearcut openings, forest edges, and early-seral forest stands that would benefit species dependent on this habitat type, but less than the no action alternative. There would also be less area available for salvage harvest.	**Alternative 3:** Reduced area of more intensive harvest treatments would increase the amount and connectivity of late-seral and old growth stands and decrease clearcut openings and early-seral forest stands with associated beneficial and adverse effects on species dependent on these habitat types, respectively, compared to all alternatives. **Alternative 4:** Habitat for species dependent on late-seral and old growth stands would be similar to the no action but with less fragmentation. Habitat for species using forest edges and openings would be similar to the no action alternative.
Noncovered Species Dependent on Wetlands and Riparian Habitat		
Timber harvest could reduce riparian and wetland function through removal of vegetation and ground disturbance. Effects of other activities would be minimized through existing regulatory guidance and practices.	Effects would be similar to those under the no action alternative. However, with less harvest in riparian and wetland areas and increased riparian protections, effects would be less than under the no action alternative. Additionally, Conservation Measure 1 may benefit beavers and other wildlife species dependent on using riparian habitat compared to the no action alternative. Effects of other activities would be minimized through existing regulatory guidance and practices.	**Alternative 3:** Effects would be the same as under the proposed action and less than the no action alternative. **Alternative 4:** Effects would be the same as under the proposed action and less than the no action alternative.
Air Quality		
Forest management activities would result in emissions from the use of vehicles and equipment and from prescribed burns that emit air pollutants. Effects would be localized, short-	Emissions are expected to be less than under the no action alternative due to the decreased harvest activity.	**Alternative 3:** Emissions are expected to be least due to the least amount of harvest activity.

Alternative 1: No Action	Alternative 2: Proposed Action	Alternatives 3 and 4
term, and intermittent and would comply with existing regulatory requirements and are not expected to violate ambient air quality standards.		**Alternative 4**: Emissions are expected to be between the no action and proposed action due to amount of harvest activity.
Climate Change		
Under all alternatives, forest management activities would result in greenhouse gas emissions related to vehicle and equipment use and prescribed burns, while forest stands, vegetation, and soils would sequester carbon from the atmosphere and store carbon in the permit area. Under all alternatives, the permit area would sequester much more carbon than covered activities would emit resulting in a net increase in carbon sequestered from the atmosphere.		
Recreation and Visual Resources		
Supply of Recreation		
Any increases in the permanent road network could expand recreation access. Harvest activities may temporarily restrict access to recreation sites. Forest management activities may restrict the development of future dispersed recreation activities, but planning around seasonal restrictions for species protection would mitigate adverse effects.	Effects would be the same as described under the no action alternative, except that the limit on permanent road extent in the CRW could result in less recreation access in that area.	**Alternative 3:** Limiting the permanent road extent in the entire permit area, could reduce recreation access compared to all alternatives. **Alternative 4:** Effects would be the same as described for the no action alternative.
Quality or Value of Recreation		
Access to all types of forest would be available across the permit area, but the change in spatial distribution over time would have varying effects on different recreation uses. Effects on fish and wildlife species and habitat could increase or decrease recreational value depending on the activity, but this effect is expected to be minimal.	Because the change in spatial distribution of forest types over time would differ from the no action alternative, effects on different recreation uses would also vary. Effects on fish and wildlife species and habitat would have similar varying effects on recreational value as the no action alternative.	**Alternative 3:** Increased riparian protections would increase beneficial effects on water quality and aquatic species habitat compared to all alternatives. **Alternative 4:** Though the distribution of recreation activities may change compared to the no action alternative with differences in timing and location of harvest activities, the overall impact on recreation would be similar.
Vegetation Patterns, Visual Resources		
Although forested landscapes are dynamic by nature, clearcut harvest would result in a higher degree of localized visual changes, adversely affecting visual resources by creating larger	Reduced clearcut area would reduce adverse effects. In addition, increased restoration thinning and variable density harvest would provide more natural patterns of forest structure.	**Alternative 3:** Reduced clearcut area would reduce adverse effects compared to all alternatives.

Alternative 1: No Action	Alternative 2: Proposed Action	Alternatives 3 and 4
areas that have been visibly disturbed and harvested.		**Alternative 4:** Clearcut area and associated effects would be between the proposed action and no action alternative.
Visual Access		
Under all alternatives, the primary change in visual access would result from any expansion or reduction in the permanent road network. Expansion of the permanent road network is expected to be minimal and would likely be seen as a visual extension of the existing roadway system.		
Scenic Byways Views		
Under all alternatives, Oregon State law establishes buffers along scenic byways to manage these visually sensitive corridors. Forestlands near visually sensitive scenic byways would be managed in the same manner under all alternatives. Therefore, it is not anticipated that any of the alternatives would substantially alter or degrade views associated with scenic byways.		
Cultural Resources		
Under all alternatives, timber harvest and forest management activities could cause ground disturbance or changes to the setting and would have potential effects on cultural resources. Locations that may contain cultural resources are known and mapped and could be reviewed in advance of any DSL activity that has potential to affect historic properties. DSL would follow applicable regulations, policies, and procedures to minimize effects on cultural resources.		
Tribal Resources		
Fish and Wildlife Species		
Timber harvest and reforestation activities would increase some habitat types for deer and elk but remove others and would reduce habitat connectivity. Forest management activities would reduce the quality of fish habitat in the study area. Riparian protections and road vacating would reduce these effects but would not fully protect the ecological function of the habitat. Expansion of the operational road network could increase access to fish and wildlife species valued by tribes, but it is expected to be minimal.	Types of effects would be the same as under the no action alternative. Fish species important to the tribe would experience beneficial effects in the CRW and similar effects in the MRW compared to the no action alternative. For deer and elk, and important for hunting, habitat for hiding and concealment would increase but forage habitat would decrease. Limits on expansion of the permanent road network could adversely affect tribal access compared to the no action alternative.	**Alternative 3:** Reduced clearcut harvest and increased riparian protections would benefit fish species of value to tribal members compared to all alternatives. Deer and elk hiding and concealment habitat would increase but forage habitat would decrease compared to all alternatives. Increased road restrictions could reduce tribal access compared to all alternatives. **Alternative 4:** Effects on fish and wildlife species important to the tribes would be similar to the no action alternative. Effects on tribal access would be similar to the proposed action.
Availability of or Access to Plants		
Forest management activities would reduce availability of or access to some plants valued by the tribes. Availability of certain plants	Reduced clearcut area and increased variable density harvest and restoration thinning would result in a more diverse forest landscape with	**Alternative 3:** Further reduced clearcut areas would increase the diversity of plant species of value to tribal members compared to all

Alternative 1: No Action	Alternative 2: Proposed Action	Alternatives 3 and 4
valued by tribes, specifically that rely on late-seral forest, would increase in areas where harvest is restricted. Expansion of the operational road network could increase tribal access but is expected to be minimal.	potentially a greater variety of plants of value to tribal members. Incorporation of traditional ecological knowledge and increased riparian protections would also likely improve the variety of plant species of value to tribal members. Limits on expansion of the permanent road network could adversely affect tribal access compared to the no action alternative.	alternatives. Additional limits on road construction could reduce tribal access compared to all alternatives. **Alternative 4:** Effects would fall between the proposed action and the no action alternative.
Timber Harvest and Available Forest Products		
In addition to direct jobs and labor income in the logging and milling industries, timber harvest in the permit area would support nonforestry jobs, labor income, value added, and output through indirect and induced effects under all alternatives. Economic activity also arises from collection of other forest products for commercial and noncommercial purposes. Some of this economic activity could contribute to employment and income for tribal groups.		
Socioeconomics		
Income and Employment Levels		
Harvest activities in the permit area would generate direct, indirect, and induced jobs and income in the study area. Timber harvest would generate direct jobs and income in the forestry, logging, and milling industries, supporting timber companies and mills in southwestern Oregon. These activities would also generate indirect and induced jobs and income in the communities throughout the study area and more broadly throughout Oregon and California. The permit area would continue to support employment and income directly associated with nonharvest forest management activities, special forest product collection for commercial use, and any guided recreation.	Reduced timber volume would support fewer related direct, indirect, and induced jobs and less labor income compared to the no action alternative. Research and educational programs would support more related jobs and labor income than the no action alternative.	**Alternative 3:** Reduced timber volume would support fewer related direct, indirect, and induced jobs and less labor income compared to all alternatives. Jobs and income from research and education would be the same as the proposed action. **Alternative 4:** Timber harvest volume and associated support for direct, indirect, and induced jobs and labor income would be similar to the no action alternative. Jobs and income from research and education would be similar to the proposed action.
Government Revenue		
Forest management activities would generate timber sale revenues for the CSF and affiliated school districts, state agencies, local county governments, and taxing districts. Revenues	Harvest in the permit area would not contribute to the CSF. Lower timber harvest volumes would decrease the amount of tax revenue and	**Alternative 3:** Harvest in the permit area would not contribute to the CSF. Lower timber harvest volumes would decrease tax revenue relative to all alternatives.

Alternative 1: No Action	Alternative 2: Proposed Action	Alternatives 3 and 4
would fluctuate as the forest matures and the volume of timber of harvestable age changes.	shift the distribution of tax revenues over time compared to the no action alternative.	**Alternative 4:** Effects on state taxes would be similar to those described for the proposed action. Tax revenue would be similar to the no action.
Value of Ecosystem Services		
All forest types and associated special forest products would continue to be available, but the supply and distribution relative to existing conditions would shift as forest age and structure shift. Net carbon sequestration would create social value. There would be minimal change to the value of ecosystem services related to surface water quality regulation. Loss of habitat and threatened and endangered species could diminish the economic well-being of people who care about their survival if it affects overall species population health. The value of cultural services and forest-based educational services from old growth forests would not change.	Increased old growth and late-seral forests, decreased early- and mid-seral forests, and limits on salvage harvests in reserve areas and RCAs would increase the supply of some special forest products and decrease the supply of others relative to the no action alternative. Net carbon sequestration and associated social value would be greater than under the no action alternative. As a research forest, the permit area would create greater opportunities for research and educational programs under the proposed action relative to the no action alternative. Also, projected increase in old growth and late-seral forests would have beneficial effects on value for forest visitors.	**Alternative 3:** Effects would be similar to the proposed action, except carbon sequestration would be greater and increased riparian protections would benefit covered species and water quality. However, these benefits are unlikely to meaningfully increase the value people derive from the ecosystem across the study area. **Alternative 4:** The impacts on ecosystem services under Alternative 4 would be similar to the no action alternative.
Environmental Justice		
Potential disproportionately high and adverse effects were identified for recreation, cultural resources, and socioeconomics (income and employment, government revenue, and the value of ecosystem services).	Potential disproportionately high and adverse effects were identified for the same resources as the no action alternative. Projected decreases in timber harvest compared to the no action alternative could either amplify or minimize adverse impacts on EJ populations.	**Alternative 3:** Impacts on EJ populations would be similar to the proposed action. Larger RCAs and reduced areas of intensive harvest treatments could either amplify or minimize adverse impacts on EJ populations compared to the proposed action. **Alternative 4:** Impacts on EJ populations would be the same as described for the no action alternative.

Chapter 1
Purpose and Need

1.1 Introduction

The Oregon Department of State Lands (DSL) prepared the Elliott State Research Forest Habitat Conservation Plan (HCP) to support its applications for incidental take permits (ITPs) from the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) (collectively, the Services). The ITPs would authorize take of three threatened or endangered species resulting from forest management and research activities on the Elliott State Research Forest in accordance with the requirements of the federal Endangered Species Act (ESA). Section 9 of the ESA and federal regulations prohibit the taking of a species listed as endangered or threatened. The ESA defines *take* to mean "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."[1] The Services have further defined *harm* by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering (50 Code of Federal Regulations [CFR] 17.3; 50 CFR 222.102). FWS and NMFS may issue permits under limited circumstances to take listed species incidental to, and not the purpose of, otherwise lawful activities. ESA Section 10(a)(1)(B) and implementing regulations provide for authorizing incidental take of listed species.

The proposed issuance of an ITP supported by the HCP is a federal action under the National Environmental Policy Act (NEPA) (42 United States Code [USC] 4321 et seq.). This environmental impact statement (EIS) was prepared with the intent of meeting the Services' NEPA requirements under the Council on Environmental Quality's current regulations (40 CFR 1500–1508, May 2022). FWS is the federal lead agency responsible for preparing the EIS and NMFS, the Oregon Department of Forestry (ODF), and Oregon Department of Fish and Wildlife (ODFW) are cooperating agencies. As a cooperating agency, NMFS may adopt the EIS in accordance with 40 CFR 1506.3.

1.2 Proposed Federal Action and Decisions to be Made

The Services are reviewing the ITP applications, received on October 10, 2022, for incidental take of the species under their jurisdiction (one application was submitted to each agency). If the Services find that all requirements for issuance of the ITPs are met, they will each issue a separate permit, subject to terms and conditions deemed necessary or appropriate to carry out the purposes of ESA Section 10. The Services will base their decisions on ESA statutory and regulatory criteria. Their decisions will also be informed by the analysis of best available scientific information, findings in the EIS, and public comments received on the Draft EIS and HCP. The Services will independently document their determinations in separate ESA Section 10 findings documents, ESA Section 7 biological opinions, and NEPA Records of Decision developed at the conclusion of the ESA and NEPA compliance processes. Under Section 10(a)(1)(B) of the ESA, the Services may each issue an ITP

[1] Appendix 1-A, *Glossary*, presents definitions of terms used in the EIS.

conditioned on implementation of the HCP, issue an ITP conditioned on implementation of the HCP and other specified measures, or deny the ITP application.

1.3 Purpose and Need for Federal Action

The purpose of the federal action considered in this EIS is to fulfill the Services' Section 10(a)(1)(B) conservation authorities and obligations under the ESA to address the applications requesting authorization of incidental take of three species listed as threatened under the ESA—the northern spotted owl, marbled murrelet, and Oregon Coast coho salmon. The applicant has determined that operation of the Elliott State Research Forest as proposed would likely result in take of these ESA-listed species and is looking for a long-term solution that assures compliance with the ESA.

The need for the federal action is to respond to the applicant's request for incidental take permits for the covered species and covered activities as described in the HCP. The Services will review the ITP applications to determine if they meet issuance criteria; those criteria include that the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of the incidental taking, that the applicant will ensure adequate funding for the HCP, and that such taking will not appreciably reduce the likelihood of survival and recovery of the species. The Services will also ensure that issuance of the ITPs complies with other applicable federal laws, regulations, treaties, and applicable executive orders, as appropriate.

1.4 Scoping and Public Engagement

FWS initiated the public scoping process for this Draft EIS by publishing the Notice of Intent (NOI) to prepare an EIS in the *Federal Register* (FR) on May 5, 2022 (87 FR 26778). The NOI can be accessed at https://www.regulations.gov/document/FWS-R1-ES-2022-0029-0001. The NOI announced FWS' intent to prepare a Draft EIS, provided information on the public scoping meeting, and requested comments from all interested parties on the scope of issues and alternatives to consider in preparing the EIS. The comment period was from May 5 to June 6, 2022. FWS hosted a virtual scoping meeting on May 16, 2022. Appendix 1-B, *Scoping*, summarizes comments received during the scoping period (see Chapter 5, *Summary of Submitted Alternatives, Information, and Analyses*, for a summary of the alternatives, information, and analyses submitted by state, tribal, and local governments and other public commenters during the scoping process pursuant to 40 CFR 1502.17). FWS considered input from the public in determining the scope of this EIS. FWS also provided additional information (news releases, factsheets, and frequently asked questions) on their project website: https://www.fws.gov/project/elliott-state-research-forest-habitat-conservation-plan.

Chapter 2
Proposed Action and Alternatives

This chapter describes the alternatives analyzed in detail in this Draft EIS and the alternatives considered but eliminated from further consideration. FWS identified a reasonable range of alternatives to consider for detailed study in the EIS through a structured screening process, which was informed by the comments received during the scoping process.

2.1 Alternatives Analyzed in Detail

This section provides a description of the following four alternatives the FWS analyzed in detail in this EIS:

- Alternative 1: No Action
- Alternative 2: Proposed Action (Elliott State Research Forest HCP)
- Alternative 3: Increased Conservation
- Alternative 4: Increased Harvest

All alternatives analyzed in detail include forest management activities (i.e., timber harvest and reforestation, thinning, and supporting management activities and infrastructure), but the implementation of these activities would vary as described in the following subsections.

2.1.1 Alternative 1: No Action

NEPA requires that the federal agency consider impacts of a no action alternative, which serves as a baseline with which to compare impacts of the proposed action and any action alternatives. Under the no action alternative, the Services would not issue incidental take permits (ITPs) to DSL for the covered activities described in Section 2.1.2.2, *Covered Activities*, and DSL would not implement the proposed HCP and research design. DSL's mandate to manage lands under its jurisdiction with the objective of obtaining the greatest benefit for the people of the state, consistent with the conservation of the resource under sound techniques of land management, would remain in place, and DSL would continue to be subject to ESA as well as other federal, state, and local requirements for any forest management activities in the Elliott State Forest. The no action alternative assumes that DSL would manage the Elliott State Forest for timber harvest using a take avoidance approach to ESA compliance. This assumption is for analysis purposes, and DSL does not intend to implement the no action alternative. FWS received public comments during scoping that the no action alternative should assume there is no timber harvest; however, given DSL's mandate to manage the Elliott State Forest, this was not considered a reasonable assumption if the Services do not issue the requested ITPs.

DSL would manage the Elliott State Forest consistent with the Oregon Forest Practices Act (FPA) (Oregon Administrative Rules [OAR] Chapter 527). Updates to the Oregon FPA, consistent with the Private Forest Accord (PFA) report (Conservation Coalition and Working Forest Coalition 2022) are considered reasonably foreseeable, per the provisions of Oregon Senate Bill (SB) 1501.[1] These updates are considered in the analysis of the no action alternative where data and information are available.

For purposes of this analysis, the no action alternative assumes the following restrictions on forest management activities would be implemented to avoid take of ESA-listed species in the absence of the proposed HCP. Further assumptions regarding forest management practices are identified as appropriate in Chapter 3, *Affected Environment and Environmental Consequences*.

- **Northern spotted owl (*Strix occidentalis*):** DSL would avoid incidental take through habitat protections included in the *Revised Recovery Plan for Northern Spotted Owl* (FWS 2011), the FWS *Protocol for Surveying Proposed Management Activities that May Impact Northern Spotted Owls* (FWS 2012), and the *Biological Opinion on Northwest Oregon District, Bureau of Land Management Harvest and Routine Activities* (FWS 2020). DSL would avoid incidental take from habitat modification for northern spotted owl by protecting nest sites and suitable habitat[2] within home ranges (FWS 2011).[3] This includes maintaining a 70-acre no-harvest zone around the nest site, a minimum of 50% of suitable habitat within the core use area (0.5-mile radius around the nest site) and a minimum of 40% of suitable habitat within the provincial home range (in the Oregon Coast region, a 1.5-mile radius around the nest site) (FWS 2012).[4]

  DSL would also implement seasonal restrictions on certain maintenance activities and equipment use during the critical breeding period and the nesting season (FWS 2020).

  Figure 2-1 shows the existing northern spotted owl activity centers that overlap with the permit area. The actual number of activity centers protected could change throughout the analysis period if new sites are identified or if existing sites are found to be unoccupied.

- **Marbled murrelet (*Brachyramphus marmoratus*):** DSL would avoid incidental take through compliance with OAR 635-100-0137, Survival Guidelines for Marbled Murrelet. This policy states that "state agencies shall designate and protect occupied sites and associated buffers on state-owned, managed, and leased lands" such that all continuous suitable habitat[5] in a project area is designated as an occupied site. The guidelines specify that "prior to implementing a project that removes trees and has the potential to take marbled murrelets, approved surveys of the project area shall be conducted for a minimum of two consecutive years to determine if it is occupied by murrelets." Timber harvest would not be permitted in sites determined through surveys to be occupied and in a 100-meter (328-foot) buffer surrounding occupied sites. For the purpose of analysis, occupied habitat is assumed to include the known occupied and modeled potential marbled murrelet habitat identified in the HCP (Figure 2-1). The guidelines also include seasonal restrictions on certain activities (e.g., heavy equipment use, controlled burns) with which DSL would be required to comply.

[1] Per SB 1501, the riparian buffer provisions outlined in this report would go into effect on July 1, 2023 and remain in effect pending an ITP related to an approved HCP consistent with the PFA report no later than December 31, 2027, when the remaining PFA provisions would go into effect. SB 1501 specifies that the HCP and associated changes to Oregon FPA must be consistent with the requirements outlined in the 2022 PFA report. Therefore, these protections were deemed reasonably foreseeable for purposes of the no action alternative.

[2] Suitable habitat includes marginal, suitable, and highly suitable habitat as defined in Davis et al. 2016.

[3] References for cited sources in this EIS are located in Appendix 2-A, *References.*

[4] Standards for maintaining suitable habitat in owl circles apply to the full circle, regardless of ownership.

[5] Per OAR 635-100-0137, *continuous* means no gaps in suitable habitat wider than 328 feet (100 meters).

- **Oregon coast coho (*Oncorhynchus kisutch*):** DSL would avoid incidental take through compliance with the Oregon FPA, including anticipated updates referenced in Oregon SB 1501. Riparian protections would include riparian management areas (RMAs) that would be applied to either side of streams. Buffers are applied to the stream types defined in the Oregon FPA. Table 2-1 shows the width and harvest prescriptions in RMAs and Figure 2-1 shows the RMAs. As noted in Table 2-1, RMAs would be measured along the slope of the stream bank (rather than horizontally, as under the proposed action). Due to the average slope of the landscape, this results in a smaller buffer than a horizontal buffer of the same width.

Table 2-1. Riparian Management Areas and Equipment Limitation Zones, No Action Alternative

Stream Type[a]	Prescribed Width (Slope Distance)[b]
Large or medium SSBT or other fish-bearing stream	110-foot RMA
Small SSBT or other fish-bearing stream	100-foot RMA
Large or medium perennial non-fish-bearing stream	75-foot RMA
Small, perennial non-fish-bearing stream, tributary to SSBT stream	75-foot RMA from the confluence with the SSBT stream for the first 500 feet 50-foot RMA on the next 650 feet (up to 1,150 feet from the confluence with the SSBT stream) 35-foot ELZ above RMA
Small, perennial non-fish-bearing stream, tributary to other (not SSBT) fish-bearing stream	75-foot RMA from the confluence with the fish-bearing stream for up to the first 600 feet 35-foot ELZ above RMA
Other non-fish-bearing stream (seasonal)	35-foot ELZ

[a] Stream types are defined in the Oregon FPA.

[b] RMA widths are measured using slope distance from the edge of the active channel, or channel migration zone if present, on each side of the stream. RMA lengths on non-fish-bearing streams are measured from the confluence with a fish-bearing stream. Due to the average slope of the landscape, measuring buffers along the slope results in a less protective buffer than a horizontal buffer of the same width.

ELZ = equipment limitation zone

RMA = riparian management area

SSBT = salmon, steelhead, and bull trout

Harvest activities in RMAs would be limited to restoration treatments only, though DSL would have no commitment to implement restoration treatments. Treatments that may be implemented in areas available for restoration thinning include variable density thinning, including skips and gaps; creation of snags and downed wood; retaining unique tree forms and structures; retaining and/or encouraging the variety of tree sizes and species; protecting desirable understory vegetation; planting in gaps or in the understory to encourage species diversity; or removal of invasive species. Beyond the end of RMAs on small, perennial, non-fish-bearing streams that are tributaries to salmon, steelhead, and bull trout (SSBT) or other fish-bearing streams, equipment limitation zones (ELZs) would be applied to the remainder of the channel.[6]

[6] The PFA report defines R-ELZs, requiring retention of trees less than 6 inches diameter at breast height and shrubs are where possible, and ELZs, which limit equipment use but do not have the same retention requirement as R-ELZs. R-ELZs or ELZs would apply until the end of the stream channel. See Chapter 2 of the PFA report for additional detail.

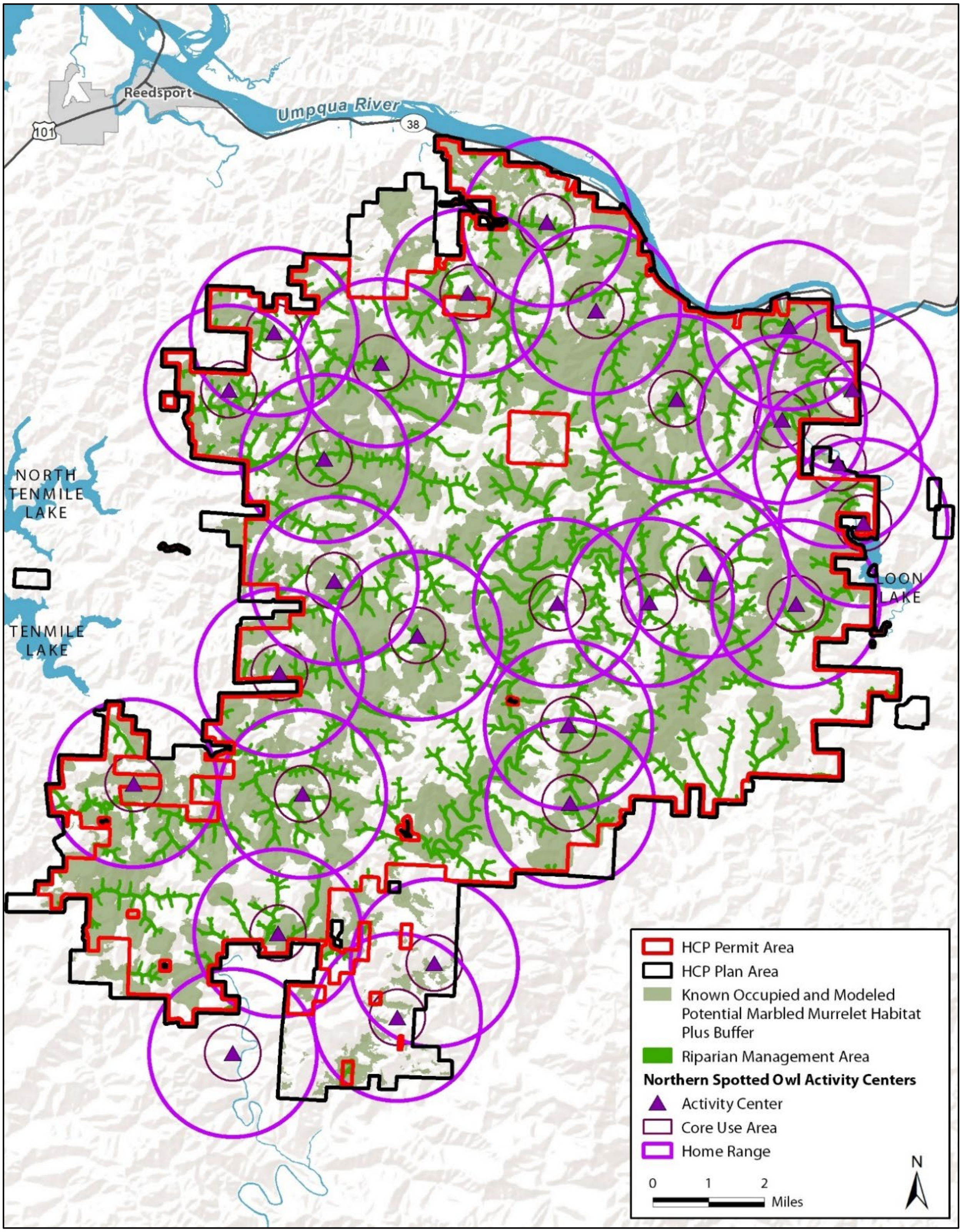
The no action alternative would include steep slope protections for designated debris flow traversal areas and slope retention areas, as defined in Chapter 3 of the PFA report. These protections are intended to deliver large wood and regulate sediment delivery to fish-bearing streams consistent with maintaining or improving aquatic habitat within large basins over long timeframes (Conservation Coalition and Working Forest Coalition 2022). Designated debris flow traversal areas, which would include a 25-foot no-harvest buffer on either side of qualifying stream channels, would be applied based on streams' identified probability of being traversed by a debris flow, per the methodology identified in the PFA report, Appendix B, *Delineating Landslide and Debris Flow Susceptibility in Western Oregon in Support of the Private Forest Accord*. Protections for slope retention areas would include no-harvest restrictions on hillslopes likely to contribute landslide-derived sediment to fish-bearing streams (PFA report, Appendix B). Slope retention areas would occur only in certain sub-basins (U.S. Geological Survey Hydrologic Unit Code-8 watersheds) based on their probability of debris flow traversal.

In areas where harvest is not prohibited by take avoidance restrictions, as described above, the no action alternative assumes that DSL would harvest using clearcutting with up to two commercial thins prior to harvest.

The following are additional assumptions about other forest management activities for the no action alternative:

- **Roads:** DSL would conduct road system management activities in support of timber harvest that would include construction, maintenance, use, abandonment, decommissioning of permanent and temporary roads, and construction and maintenance of landings and drainage structures. The permit area has an extensive existing road network. In the absence of an HCP, there would not be a limit on the number of road miles that could be constructed, DSL anticipates that the need to expand the permanent road network would be minimal. Road system management activities would be required to adhere to applicable Oregon FPA requirements, which are assumed to include the updated rules proposed in the PFA report. The no action alternative would also include implementation of the Forest Road Inventory and Analysis process described in the PFA report, which would require DSL to bring inactive or abandoned roads and culverts into compliance with the revised Oregon FPA rules (PFA report Section 4.4, *Revised Rules in Conformance with Private Forest Accord Commitments*).
- **Water developments:** DSL would operate existing water developments for firefighting or for filling water trucks that may be on standby during controlled burning. There are no plans for the construction of new water developments.
- **Quarries:** DSL would continue to operate the existing quarry for road maintenance and rock slope protection materials and may construct new quarries during the analysis period. In the absence of an HCP, there would be no limit on the number of new quarries that could be constructed, but siting and development of quarries would be required to follow applicable Oregon FPA requirements.
- **Communication sites and lookouts:** DSL would maintain existing lookouts and communication sites in the Elliott State Forest that are leased to the Oregon Department of Transportation/Oregon State Police and Coos Forest Protective Association. This would include vegetation clearing to maintain appropriate fire breaks around these sites.

Figure 2-1. Known Occupied and Modeled Potential Marbled Murrelet Habitat, Existing Northern Spotted Owl Activity Centers, and Riparian Management Areas



- **Prescribed burns:** DSL may implement prescribed burns in the Elliott State Forest in accordance with applicable Oregon FPA requirements. The primary use of prescribed burning would be of slash piles on landings following harvest. Other, more infrequent use of fire would include broadcast burning of harvest units for site preparation prior to planting and underburning areas for fuels reduction purposes.
- **Chemical use:** DSL may conduct chemical application (e.g., herbicides and pesticides) for forest management using either aerial application methods (i.e., fixed-wing airplane, helicopter, unmanned aerial system) or ground methods.
- **Salvage harvest:** DSL would adhere to the requirements of the Oregon FPA regarding post-disturbance salvage harvest[7] (OAR 629-615-0300 and 629-635-0310 through 629-655-0000), which restricts removal of dead trees in RMAs and includes other riparian function targets. The take avoidance measures described above for habitat occupied by northern spotted owl and marbled murrelet would also apply following a disturbance event.

For projects where take cannot be avoided, DSL would have the option to pursue project-by-project incidental take authorization in accordance with Section 10 of the ESA. A project-by-project approach would result in variable application, or non-application, of the avoidance and minimization measures and adaptive management approach included in the proposed HCP. Without knowing the details of any future project-specific proposal, it is not possible to analyze its effects, and so it is not assumed for purposes of evaluating the no action alternative here.

2.1.2 Alternative 2: Proposed Action

The proposed action evaluated in this EIS is the Services' issuance of ITPs, which would authorize incidental take of covered species from covered activities in the permit area and implementation of the conservation strategy described in the associated HCP, over 80-year permit terms. This section summarizes the HCP permit area and plan area, covered activities, covered species, conservation strategy, and monitoring and adaptive management framework. Full descriptions of these topics are provided in HCP Chapter 1, *Introduction*, HCP Chapter 5, *Conservation Strategy*, and HCP Chapter 6, *Monitoring and Adaptive Management*.

2.1.2.1 Permit Area and Plan Area

The HCP permit area includes 83,458 acres of school lands[8] in Douglas and Coos Counties and is the location where all covered activities and conservation actions would occur. The permit area is overseen by the State Land Board and managed by DSL.

The HCP plan area includes the permit area and an additional 8,897 acres of Board of Forestry lands overseen by the State Board of Forestry and managed by ODF. Board of Forestry lands are included

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[7] Rules regarding salvage harvest are anticipated to be modified, per the post-disturbance harvest rulemaking directed by Section 6(2)(a), Chapter 33, Oregon Laws 2022. The details of these modifications are not yet known and therefore cannot be included in the analysis of the no action alternative.

[8] Through the Oregon Admission Act in 1859, the federal government granted school lands to the state with the condition that these lands be used for schools. All revenue from school lands is distributed to school districts through the Common School Fund. DSL is in the process of decoupling the forest from the Common School Fund, compensating the school fund for the forest, and releasing the forest from its obligation to generate revenue for schools.

in the plan area to accommodate any future land exchanges between DSL and ODF within the Elliott State Forest.[9]

Figure 2-2 shows the permit area and plan area. There are 162 acres of private lands within the boundary of the Elliott State Forest that are not included in the permit or plan area.

2.1.2.2 Covered Activities

The covered activities represent all projects and activities necessary to operate the research forest and that have a reasonable potential to take one or more of the covered species. Broadly, the covered activities include the management of the forest for specific research purposes, the silvicultural activities used to create the research platform, experiments conducted within that platform, and the infrastructure needed to facilitate the research. HCP Chapter 3, *Covered Activities,* describes the covered activities in more detail.

Stand Level Research Treatments

The covered activities would be implemented according to the research design outlined in the HCP. This research design subdivides the permit area into two general areas—the conservation research watersheds (CRW) and management research watersheds (MRW). The CRW (34,140 acres) would be maintained as a contiguous reserve with limited management activity allowed. The MRW (48,380 acres) would be managed based on a triad design, with reserve, extensive, and intensive management practices applied in varying proportions. Trees predating the 1868 Coos Bay Fire would be protected from harvest. The experimental unit of measure for the research design is a subwatershed. Treatments would be at the scale of individual stands within the subwatershed. For each acre of land in intensive management, there would be a corresponding acre of land in reserve practices in the same subwatershed. These treatment types are shown in Figure 2-3. Riparian conservation areas (RCAs) would be applied to streams throughout the permit area, with varying widths based on stream type and location.

Within these areas, harvest types would be applied as described in the following sections, depending on the land allocations. Regeneration harvest types include clearcut harvest and retention cuts. Clearcuts removes all (or nearly all) trees in a stand. Retention cuts retain 20 to 80% of pre-harvest relative stand density and aim to develop a stand with two or more distinct age classes.

Thinning is another harvest type and is intended to manage the growth and density of an existing stand with outcomes ranging from restoration of natural conditions to maximizing wood production. Thinning would be applied at varying intensity and with varying outcomes for forest structure depending on the land allocations and management objectives.

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[9] For example, DSL may exchange a limited amount of school lands with Board of Forestry lands to consolidate land ownership and improve management consistency across contiguous parcels. Per HCP Chapter 7, *Implementation and Assurances*, changes to the permit area would require an amendment to the HCP and approval by FWS and NMFS.

Figure 2-2. HCP Permit Area and Plan Area

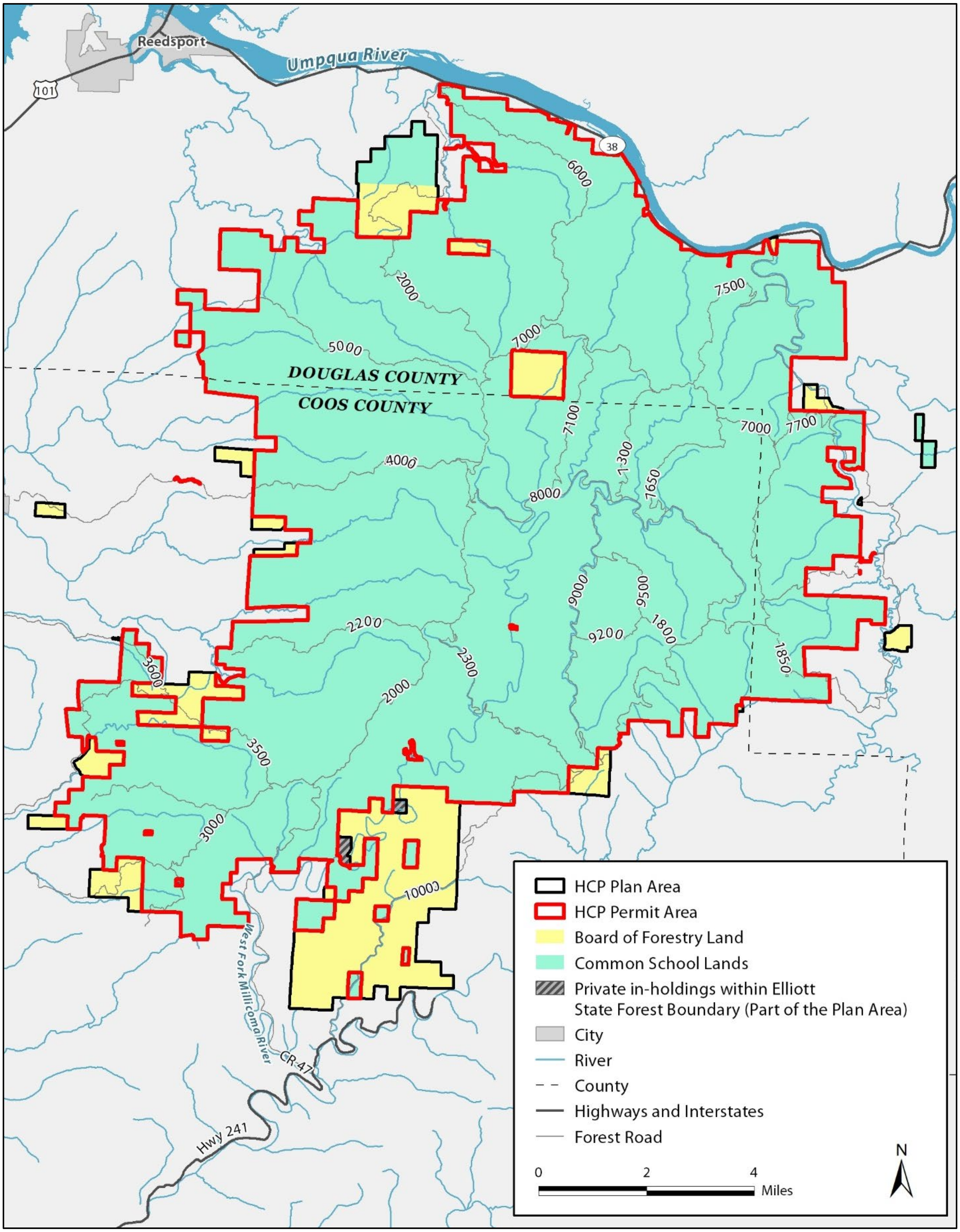
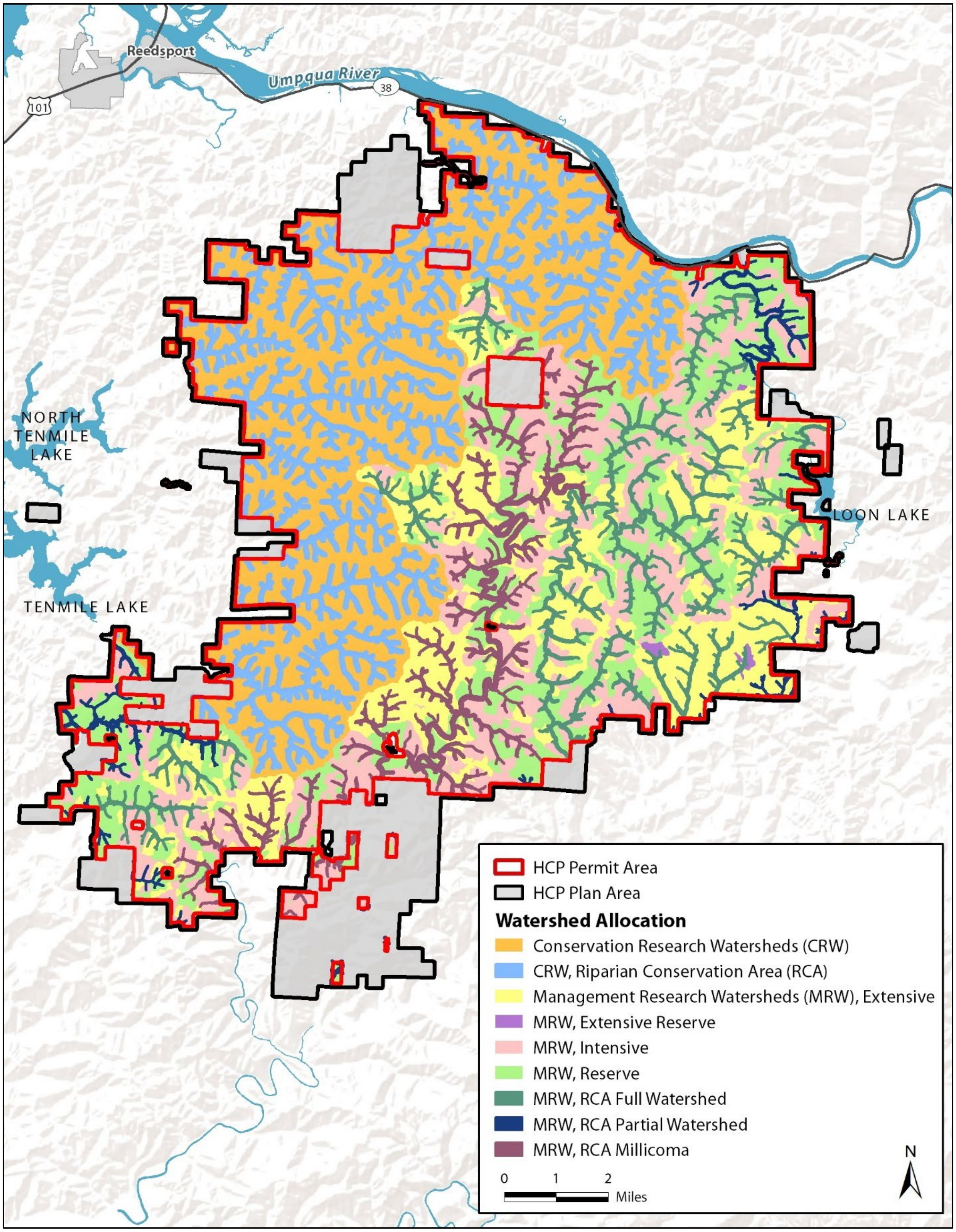


Figure 2-3. Proposed Action Stand-Level Research Treatments



Reserve

Reserve areas (including MRW reserves and the CRW) would be managed on a limited basis for the purpose of increasing the likelihood of achieving mature forest structure. The HCP would allow restoration thinning in portions of reserves that are former plantation stands younger than 65 years old as of 2020 to achieve this forest structure goal. The only allowable harvest type in reserves is restoration thinning that removes between 20 and 80% of basal area. The treatments would be intended to enhance forest complexity and habitat by transitioning young, dense plantations in reserves toward greater compositional, successional, and structural diversity. Other than restoration thinning, no other treatments (including salvage harvest) would be allowed in reserve areas. The CRW is a contiguous reserve area on the western side of the permit area comprising approximately 34,140 acres. Restoration thinning in the CRW would be aimed at accelerating late-seral forest conditions and would occur primarily in the first 20 years of the permit term, with the potential for subsequent entries with concurrence from the Services if it is determined that additional thinning would further benefit the covered species. The MRW includes approximately 14,096 acres of reserve areas (including 144.1 acres of reserve stands within extensive watersheds). Restoration thinning in the MRW reserves would be focused in plantation stands that are less than 65 years old as of 2020 in the first 20 years of the permit term but may occur later in the permit term as needed to support research objectives. HCP Section 3.3.2, *Reserve Treatments,* describes the operations standards that would be implemented in reserve stands.

Extensive

Extensive treatment areas, which comprise approximately 13,413 acres of the MRW, would include a continuum of management options, between the extremes of reserves and intensive management, with the intent of balancing biodiversity objectives and timber demand at the stand level. This would be achieved by retaining (or creating) structural complexity while ensuring conditions exist to obtain regeneration and sustain the complex forest structure through time. Allowable harvest types in extensive areas would include thinning and variable density harvest, retaining 20 to 80% of pre-harvest relative density. The specific management approach in extensive areas would vary between stands but would generally seek to harvest approximately 50% of the fiber production of intensive harvest at the subwatershed level. Extensive treatments would include a variety of spatial and age class patterns[10] to encourage a wide range of conditions that align with the objectives, including prioritizing the retention of large, mature trees. Salvage harvest may occur in stands affected by natural disturbances such as fire, drought, disease, wind, and insects. Salvage operations would consider the biological legacy of the stand prior to the disturbance event, and tree retention standards would be developed to support the maintenance of these legacy characteristics. HCP Section 3.3.3, *Extensive Treatments*, describes the operations standards that would be implemented in extensive stands.

[10] Spatial and age class patterns in extensive treatment areas may include aggregated patterns, keeping retained trees together in patches, and dispersed patterns, distributing retained trees over larger areas.

Intensive

Intensive treatment areas, which comprise 14,334 acres of the MRW, would include even-age management using clearcut harvesting techniques suitable for the terrain. Clearcuts would remove nearly all trees in a stand. Stand-level research treatments in intensive areas would be limited to trees up to age 65 and implemented to investigate management options that prioritize commercial timber harvest at rotations of 60 years or longer. Up to two commercial thins would occur between 30 and 50 years, and these treatments would remove no more than 80 square feet of conifer basal area per acre. Salvage harvest may occur in intensive stands affected by natural disturbances such as fire, drought, disease, wind, and insects. HCP Section 3.3.1, *Intensive Treatments*, describes the operations standards that would be implemented in intensive stands.

Riparian Conservation Areas

RCAs would be established along streams in the Oregon State University Modeled Stream Network (2020) throughout the permit area based on fish presence, landslide delivery potential, and perenniality. RCAs total approximately 15,993 acres in the permit area. Similar to reserves, only restoration thinning would be allowed in RCAs. In RCAs in the CRW and MRW reserves, restoration thinning would be limited to one entry in areas less than 65 years of age as of 2020. In RCAs in intensive and extensive areas, restoration thinning would occur as needed in areas less than 65 years of age as of 2020. Restoration thinning would only occur if determined necessary to support and enhance the long-term ecological functions of the RCAs. The following types of trees would not be harvested: trees in RCAs older than 65 years as of 2020, trees situated on landslide-prone steep or unstable conditions. Salvage harvest would not be permitted in RCAs. Table 2-2 shows RCA widths, and HCP Section 3.3.4, *Riparian Conservation Areas,* describes treatments in RCAs. Additional requirements in RCAs are described in HCP Section 5.4.1, *Conservation Measure 1, Targeted Restoration and Stream Enhancement*.

Table 2-2. Riparian Conservation Areas, Proposed Action

Stream Type[a]	Area	Buffer Distance[b] (Horizontal Distance)
Fish-bearing streams	CRW	200 feet
	MRW, Lower Millicoma[c]	120 or 200 feet[f]
	MRW, other (full watersheds)[d]	100 feet
	MRW, other (partial watersheds)[e]	120 feet
Non-fish-bearing, perennial (PNFB) and high landslide delivery potential (HLDP)[g] streams	CRW	200 feet[f]
	MRW, Lower Millicoma[c]	50 feet (non-fish bearing perennial) or 120 feet (HLDP)
	MRW, other (all watersheds)	50 feet
Non-fish-bearing, non-HLDP seasonal streams	All	0 feet

[a] Stream types are those defined in the OSU Modeled Stream Network (2020).

[b] Riparian conservation areas are measured as the horizontal distance from each side of the channel migration zone.

[c] Along the West Fork Millicoma River mainstem, buffers would be 200 feet measured as the horizontal distance from each side of the channel migration zone. Buffers would be 120 feet measured as horizontal distance along any non-fish-bearing stream that has a high potential to deliver wood to the adjacent fish-bearing stream and fish-bearing tributaries to the mainstem.

[d] Full watersheds are contained entirely within the permit area. Buffers on these streams would be a minimum of 100 feet. Where a 100-foot buffer is applied, increased buffering would be allocated to the HLDP portions of the stream network in order to attain the target level of wood delivery and associated resources.
[e] Partial watersheds overlap with the permit area but extend into adjacent land ownership.
[f] In 200-foot-wide RCAs, log volume from restoration thinning may be removed and sold from the area between 120 and 200 feet from the channel migration zone (HCP Section 5.3.1.1, *Riparian Vegetation Management in RCAs*).
[g] High landslide delivery potential (HLDP) streams are defined as non-fish-bearing streams with the potential to deliver wood to fish-bearing streams.
CRW = conservation research watersheds
MRW = management research watersheds

Harvest Methods

Harvest methods that would be implemented in the land allocations and associated harvest types described above include felling, bucking, yarding or skidding, processing, loading of logs, and hauling. *Felling* is cutting down trees. *Bucking* is cutting felled trees in the field into predetermined log lengths. *Yarding* or *skidding* is moving logs from where they are felled to a landing or road using cable systems, ground-based equipment, helicopters, or other means. Cable yarding uses wire ropes to move logs to a landing. Ground-based yarding uses tracked or rubber-tired tractors (skidders) to skid logs to a landing. *Processing* includes removing limbs and bucking them into logs. *Loading* is moving logs from the landing area to a truck for transport, and *hauling* is transporting logs to mills on trucks. HCP Section 3.4.3, *Harvest Methods*, provides additional detail.

Supporting Management Activities

Supporting management activities are activities to manage stands in support of the research platform. These activities include those conducted as a part of harvest regimes (e.g., tree planting, landing construction, precommercial thinning and pruning, slash removal), those required for infrastructure construction and maintenance (e.g., mechanical vegetation control, heavy equipment use, hazard tree removal) and those necessary for implementation of research or restoration projects (e.g., small fixed-wing aircraft or helicopter use, tree climbing, tree felling). Prescribed fire, including single or multiple controlled burns that incorporate traditional ecological knowledge, may be used to manage fuels and increase or maintain suitable conditions for species of cultural value to local tribal communities. Use of prescribed fire would also include controlled burning of slash piles following harvest and broadcast burning of harvest units for site preparation prior to planting, where appropriate to achieve research objectives. Prescribed burns would not be allowed within RCAs.

Supporting Infrastructure

Supporting infrastructure is needed to facilitate the research platform and programs and includes roads and related facilities, quarries, and communication sites/lookouts.

Road system management would include the construction, use, maintenance, daylighting, abandonment[11], and decommissioning[12] of roads and related facilities, including landings and

[11] Road abandonment is defined as the process of making a road impassable and effectively closed, including stabilizing the roadbed surface and removing culverts and other drainage structures.
[12] Road decommissioning is defined as the process of returning a road to its natural state. These roads are “put to bed” with stream crossing drainage structures and fills being excavated and removed, road and landing surfaces permanently drained, and unstable fill slopes stabilized or removed.

drainage structures such as bridges and culverts. All road construction, maintenance, and abandonment would be performed in accordance with restrictions in the Oregon FPA rules listed in HCP Section 3.6.1, *Road System Management*, and other applicable statutes. The HCP allows the construction of up to 40 miles of new permanent roads in the permit area during the permit term. Any road not decommissioned within 5 years of construction would count towards the limit on permanent road construction.

The HCP allows the construction of up to two new quarries, which would serve as sources of rock slope protection material, in the permit area during the permit term. The quarries would only be sited in the MRW, outside of reserves and RCAs.

The HCP also allows for the maintenance of three existing communication sites/lookouts in the plan area, which would consist primarily of periodic vegetation removal to maintain appropriate firebreaks.

Covered Activities Related to Conservation Measures and Implementation

Covered activities related to implementation of the conservation strategy would primarily include the covered activities described above. Specific actions in this category include:

- Riparian restoration and stream enhancement
- Road restoration and network reduction
- Habitat enhancement for northern spotted owl and marbled murrelet
- Research on the covered species
- Survey and monitoring requirements

2.1.2.3 Covered Species

The covered species include the Oregon coast coho, northern spotted owl, and marbled murrelet. Table 2-3 lists the covered species and their state and federal listing statuses. Complete descriptions of the covered species are provided in HCP Chapter 2, *Environmental Setting*. A brief description of these species is provided in EIS Section 3.5, *Fish and Wildlife*.

Table 2-3. Covered Species

	Status[a]		Federal
Species	**State**	**Federal**	**Jurisdiction**
Fish			
Oregon Coast coho (*Oncorhynchus kisutch*)	--	FT	NMFS
Birds			
Northern spotted owl (*Strix occidentalis*)	ST	FT	FWS
Marbled murrelet (*Brachyramphus marmoratus*)	SE	FT	FWS

[a] SE = State-listed as endangered; ST = state-listed as threatened; FT = federally listed as threatened
NMFS = National Marine Fisheries Service; FWS = U.S. Fish and Wildlife Service

2.1.2.4 Conservation Strategy

The HCP conservation strategy includes biological goals and objectives for each covered species which broadly describe desired future conditions and how they would be achieved. It also includes conservation measures, actions that DSL would implement to avoid, minimize, and mitigate (or offset) impacts on covered species from covered activities such that the impact of the taking is minimized and mitigated to the maximum extent practicable, as required under ESA Section 10(a)(2)(A) and the Services' implementing regulations. DSL would also apply conditions on covered activities. Conditions are rules or standards that would be used when covered activities are implemented to further minimize and sometimes avoid potential effects on covered species.

Conservation Measures

Conservation Measure 1, Targeted Restoration and Stream Enhancement

This conservation measure would include restoration and stream enhancement projects, focusing on key restoration actions identified in the watershed analysis implementation plan (BioSystems et al. 2003), along with other opportunistic projects associated with harvest operations. Projects would occur based on need and opportunities to take advantage of existing equipment onsite during harvest operations. Instream wood placement and gravel augmentation projects would be targeted at fish-bearing streams within or adjacent to all harvest operations when the stream is below the desired level of wood and the operation contains wood meeting size requirements for the intended stream.

As described in Section 2.1.2.2, *Covered Activities*, restoration thinning would be permitted in RCAs. This conservation action specifies that restoration thinning would only occur in overstocked former plantation stands that are 65 years or less in age as of 2020. Restoration thinning may occur throughout the entire width of the RCA with the objective of improving ecological conditions.[13] Of the conifers harvested from RCAs, 15 to 20% of the total volume thinned would be devoted to channel placement and would come from the first 120 feet adjacent to subject streams, provided there is sufficient volume in this area to do so. Where RCA width is 200 feet and there is enough wood in the first 120 feet of the RCA to meet the channel placement requirement, timber may be removed from 120 to 200 feet within the RCA. Potential actions within RCAs include silvicultural treatments such as reducing the density of conifers, conversion of hardwood stands to conifer species, selective removal of hardwoods from mixed-species stands and establishment of shade-tolerant conifer seedlings, creation of gaps in hardwood stands to establish conifer seedlings (shade-intolerant and shade-tolerant), opening riparian areas to an early-seral stage, or other similar practices designed to improve aquatic and riparian conditions.

This conservation measure may also include beaver restoration projects (e.g., installation of a beaver dam analog, beaver habitat enhancement). DSL would coordinate this work with regional partners, the Oregon Department of Fish and Wildlife (ODFW), FWS, and NMFS to ensure beaver management actions fit into the larger context of salmonid recovery and statewide beaver management principles.

[13] HCP Appendix A, *Thinning in Riparian Conservation Areas*, provides detail on the intended benefits of thinning treatments in RCAs.

Conservation Measure 2, Expand RCAs on Lower Millicoma River

This conservation measure includes expanded RCAs along the Lower Millicoma River from its entry into the southwest portion of the permit area through the confluence with Elk Creek. RCAs in this area would be a distance equal to the site's potential tree height (200 feet measured as the horizontal distance from each side of the channel migration zone) on either side of the river mainstem and 120 feet measured as horizontal distance along any non-fish-bearing stream that has a high potential to deliver wood to the adjacent fish-bearing stream and fish-bearing tributaries to the mainstem (HLDP streams) (Table 2-2) (Carlson in prep.).

Conservation Measure 3, Reduce Forest Road Network in CRW

Conservation Measure 3 includes a commitment to no net increase in permanent new road miles in the CRW. Roads not necessary to facilitate the research program, recreation activities, or emergency management would be abandoned or decommissioned to meet these commitments. This measure also includes guidance on locations of new roads and standards for road construction and, maintenance. It includes a commitment to a study on the hydrologic connectivity of the road network in the permit area and states that DSL may pursue upgrades or removal of existing fish passage barriers in the permit area based on the outcome of this study.

Conservation Measure 4, Research on Coho Salmon and their Habitat

Conservation Measure 4 includes research led by an interagency stakeholder advisory committee including representatives from DSL, Oregon State University (OSU), FWS, NMFS, and ODFW to better understand the effects of different forest treatments on Oregon Coast coho evolutionarily significant unit health, its populations, and habitat parameters important to the species. This may include studying water quality and quantity; landscape disturbances such as landslides, debris flows, and fires; and different types of harvest regimes. Research would also include monitoring the effects of differing RCA widths and wood recruitment strategies across the permit area.

Conservation Measure 5, Research on Northern Spotted Owl, Marbled Murrelet, and their Habitat

Conservation Measure 5 includes research led by an interagency stakeholder advisory committee including representatives from DSL, OSU, FWS, NMFS, and ODFW to determine the best methods for increasing old forest structure that would benefit northern spotted owl and marbled murrelet. This conservation measure includes treatments intended to achieve old forest structure and monitoring to determine habitat responses (e.g., variable-density thinning, including skips and gaps; creation of snags and downed wood; retaining unique tree forms and structures; retaining and/or encouraging the variety of tree sizes and species; protecting desirable understory vegetation; planting in gaps or in the understory to encourage species diversity; removal of invasive species).

Conservation Measure 6, Barred Owl Research

This conservation measure would include collaboration with FWS and other federal and state management agencies to design and implement appropriate barred owl removal protocols in support of federal management strategies for northern spotted owl recovery. Related research initiatives, including on the effects of generalist predators such as the barred owl on ecosystem processes, would be integrated into monitoring and data collection in the Elliott State Forest.

Conditions on Covered Activities

The conditions on covered activities include restrictions and protections for northern spotted owl and marbled murrelet, tree retention standards in intensive treatments, measures for management on steep slopes, and design standards for road construction and maintenance. These conditions are briefly described below.

- **Condition 1, Seasonal Restrictions around Northern Spotted Owl Nest Sites:** This condition includes seasonal restrictions on forest management activities within specified distances of northern spotted owl nest sites.
- **Condition 2, Retention of Northern Spotted Owl Nesting Core Areas:** This condition specifies that, for the 23 protected owl sites, there would be no harvest (i.e., no modification or treatment) in a 100-acre nesting core area surrounding the nest tree and made up of the best contiguous habitat. The distance between the nest tree and the edge of the nesting core will be no less than 300 feet.
- **Condition 3, Retention of Northern Spotted Owl Core Use Areas:** This condition requires that, per the guidance in the revised Recovery Plan (FWS 2011) for northern spotted owl, at least 50% (more than 251 acres) of the 502-acre northern spotted owl core use areas will be retained as nesting, roosting, and foraging habitat[14] at all times. The 502 acres do not need to be in a circle but will consist of the best contiguous habitat, and the edge of the core use area will be no less than 300 feet from the nest location. The location of nesting, roosting, and foraging habitat within the core use areas may change, as long as the target continues to be met. The HCP uses the definitions of highly suitable, suitable, and marginal habitat according in Davis et al. (2016), but the definition of nesting, roosting, and foraging habitat will be based on the most up-to-date scientific information and regulatory standards throughout the permit term. This standard will be applied to the 23 northern spotted owl core use areas. If new owl nest locations are discovered in the future, DSL, in coordination with FWS, could choose to remove protections from an inactive core use area from the 23 existing owl sites in favor of the newly discovered (active) nest site.
- **Condition 4, Retention of Habitat in Northern Spotted Owl Home Ranges:** This condition requires that, per the guidance in the revised Recovery Plan for northern spotted owl (FWS 2011), at least 40% of the northern spotted owl home range (a 1.5-mile buffer around the nest site) is maintained as nesting, roosting, and foraging habitat around the active nest core areas. This is equivalent to 1,809 acres of nesting, roosting, and foraging habitat.
- **Condition 5, Maintenance of Northern Spotted Owl Dispersal Landscape:** This condition requires that at least 40% of the MRW is retained as dispersal habitat, per the standards set forth in Thomas et al. (1990), which are met when at least 50% of trees are at least 11 inches in diameter at breast height with at least 40% canopy cover.
- **Condition 6, Seasonal Restrictions in Marbled Murrelet Occupied Habitat:** This condition includes seasonal restrictions on forest management activities in and near designated occupied marbled murrelet habitat.

[14] In the HCP, this is assumed to mean habitat that contains all of the elements of nesting, roosting, and foraging habitat (per Davis et al. 2016, highly suitable and suitable habitat), not habitat that only supports foraging (per Davis et al. 2016, marginally suitable habitat).

- **Condition 7, Survey Requirements for Designated Occupied and Modeled Potential Marbled Murrelet Habitat:** This condition lays out a process for surveying all designated occupied and modeled potential marbled murrelet stands (HCP Figure 2-11) for marbled murrelet presence. Based on the findings of these surveys, DSL will determine if areas with murrelet presence need to be added to reserves or extensive treatment areas and intensive areas reallocated.
- **Condition 8, Limits on Harvest in Designated Occupied and Modeled Potential Marbled Murrelet Habitat:** This condition sets a limit on the area of designated occupied and modeled potential marbled murrelet habitat that can be subject to extensive treatments. There is a total limit of 1,400 acres over the permit term and an initial limit of no more than 500 acres in the first 10 years of the permit term with a minimum of 80% retention of pre-harvest relative density, at which time DSL could proceed with treatments in the remaining 900 acres following FWS' review of the initial research outcomes.
- **Condition 9, Maintaining Aggregate Amount of Marbled Murrelet Occupied Habitat Over Time:** This condition requires no temporal loss of the aggregate number of acres of designated occupied or modeled potential marbled murrelet habitat as a result of harvest treatments in the permit area. DSL must demonstrate that at least as many acres of designated occupied or modeled potential habitat proposed for extensive harvest have been replaced by habitat in the CRW or MRW reserves that is first determined to be occupied during the term of the permit.
- **Condition 10, Retention Standards for Intensive Treatments:** This condition specifies that live tree retention in intensively managed areas must meet or exceed the requirements of the Oregon FPA.
- **Condition 11, Management on Steep Slopes:** This condition specifies that harvest plans in areas with slopes with an average gradient greater than 65% would be reviewed by a geotechnical specialist to advise on how to modify management activities where necessary to minimize the risks that may have a negative effect on coho salmon, including risk of sediment transfer or increased risk of landslides.
- **Condition 12, Road Construction and Maintenance:** This condition includes road design standards to ensure hydrologic disconnection from streams and operational standards to reduce erosion and stream sedimentation from construction and maintenance. This condition also specifies that culvert removal and replacement would meet NMFS and ODFW fish passage criteria.

2.1.2.5 Monitoring and Adaptive Management

The proposed action would include implementation of a monitoring and adaptive management program (HCP Chapter 6, *Monitoring and Adaptive Management*). The program is intended to ensure compliance with the HCP, assess the status of covered species habitat, and evaluate the effects of management actions such that the conservation strategy, including the biological goals and objectives, is achieved.

The program includes monitoring for aquatic and riparian habitat quantity and quality, monitoring for terrestrial habitat, and species-specific monitoring for northern spotted owl and marbled murrelet. HCP Chapter 6, *Monitoring and Adaptive Management*, outlines the adaptive management process and describes potential triggers for identifying a need for adaptive management actions. Broadly, adaptive management may be required if existing practices under or overachieve the biological goals and objectives or if more efficient or effective practices could be implemented to achieve the biological goals and objectives.

2.1.3 Alternative 3: Increased Conservation

Under Alternative 3, the HCP would include the same permit and plan area, covered species, permit term, and monitoring and adaptive management program as the proposed action. The HCP's covered activities and conservation strategy would be modified in the following ways.

All known occupied and modeled potential existing marbled murrelet habitat, northern spotted owl core use areas, and extensive stands over 80 years as of 2020 would be allocated to reserves. Northern spotted owl habitat requirements and the conservation strategy's conditions for northern spotted owls (Conditions 1 through 5) would apply to any future northern spotted owl activity centers.

RCAs would be modified as shown in Table 2-4. Minimum RCAs on fish-bearing streams in full watersheds in the MRW would be expanded from 100 to 120 feet. RCAs on perennial non-fish-bearing streams in watersheds in the MRW would be expanded from 50 to 120 feet. RCAs on HLDP streams in the MRW outside of the Lower Millicoma region would be expanded from 50 to 120 feet. RCAs on non-fish bearing, non-HLDP non-perennial streams that are second order or greater would expand from 0 to 35 feet. In addition to the proposed action's requirement of limiting restoration thinning in RCAs to stands less than 65 years old as of 2020, restoration thinning in RCAs would be prohibited on slopes greater than 65% and would be limited to removing a maximum of 5% of existing shading.[15]

Conservation Measure 3 would be modified to apply the no net increase in permanent new road miles to the entire permit area rather than just the CRW. To count as a road removed from the permanent road network, roads must be decommissioned, rather than abandoned or decommissioned. Decommissioning must also include the following measures, beyond those defined in the HCP:

- Reshape the channel and streambanks at crossing sites to pass expected flows without scouring or ponding, minimize potential for undercutting or slumping of streambanks, and maintain continuation of channel dimensions and longitudinal profile through the crossing site.
- Restore or replace the streambed materials to a particle size distribution suitable for the site.
- Restore floodplain function.
- Reestablish stable slope contours and surface and subsurface hydrologic pathways.
- Recontour and stabilize cut slopes and fill material and sidecast material to natural slopes.
- Implement suitable measures, including scarifying and de-compacting compacted surfaces, to promote infiltration of runoff and intercepted flow and desired vegetation growth on the road prism and other compacted areas.
- Use suitable measures in compliance with local direction to prevent and control invasive species, including covering disturbed areas with native seed and lopped and scattered branches and trees from side slopes.
- Barricade the road.

[15] The amount of trees removed from a particular stream segment would depend on site conditions contributing to shade, such as aspect, topography, density and tree height.

Table 2-4. Riparian Conservation Areas, Alternative 3

Stream Type[a]	Area	Buffer Distance (Horizontal Distance)[b]
Fish-bearing streams	CRW	200 feet
	MRW, Lower Millicoma mainstem	200 feet
	MRW, other	120 feet
Non-fish-bearing, perennial (PNFB) streams	CRW	200 feet
	MRW	120 feet
High landslide delivery potential (HLDP) streams	CRW	200 feet
	MRW	120 feet
Non-fish-bearing, non-HLDP streams	CRW and MRW, 2nd order streams and higher	35 feet
	CRW and MRW, 1st order streams	0 feet

[a] Stream types are those defined in the OSU Modeled Stream Network (2020).

[b] Riparian conservation areas are measured as the horizontal distance from each side of the channel migration zone.

CRW = conservation research watershed; PNFB = perennial, non-fish-bearing; HLDP = high landslide delivery potential; MRW = management research watershed

2.1.4 Alternative 4: Increased Harvest

Under Alternative 4, the HCP would include the same permit and plan area, covered activities, covered species, permit term, and monitoring and adaptive management program as the proposed action. The layout of the HCP's research design would be modified in the following ways. The CRW and MRW reserve areas located outside of occupied and modeled potential marbled murrelet habitat would be eliminated. In these areas, intensive prescriptions would be applied to stands under 65 years of age as of 2020, and extensive prescriptions would be applied to stands over 65 years of age as of 2020.

RCAs in the CRW would be modified to be the same width as RCAs in the MRW (Table 2-5). Additionally, the conservation strategy would be modified to remove Conservation Measure 2, Expand RCAs on Lower Millicoma River. RCAs in these areas would be the same width as RCAs in the rest of the MRW.

The requirement for there to be no net increase in permanent road miles in the CRW would not apply under Alternative 4.

Table 2-5. Riparian Conservation Areas, Alternative 4

Stream Type[a]	Area	Buffer Distance[b] (Horizontal Distance)
Fish-bearing streams	CRW	100 feet
	MRW, Lower Millicoma	100 feet
	MRW, other (full watersheds)[c]	100 feet
	MRW, other (partial watersheds)[d]	100 feet
Non-fish-bearing, perennial (PNFB) and HLDP seasonal streams	CRW	50 feet
	MRW, Lower Millicoma[c]	50 feet
	MRW, other (all watersheds)	50 feet
Non-fish-bearing, non- HLDP seasonal streams	All	0 feet

[a] Stream types are those defined in the OSU Modeled Stream Network (2020).

[b] Riparian conservation areas are measured as the horizontal distance from each side of the channel migration zone.

[c] Full watersheds are contained entirely within the plan area.

[d] Partial watersheds overlap with the plan area but extend into adjacent land ownership.

CRW = conservation research watershed; PNFB = perennial, non-fish-bearing; HLDP = high landslide delivery potential; MRW = management research watershed

2.2 Alternatives Considered but Eliminated from Detailed Study

In addition to analyzing the proposed action and no action alternative, FWS is required to evaluate reasonable alternatives as defined by the Council on Environmental Quality regulations. For alternatives that the agency eliminated from detailed study, FWS must briefly discuss in the EIS the reasons they were eliminated (40 Code of Federal Regulations [CFR] 1502.14; 40 CFR 1508.1(z)). Alternatives submitted during scoping are summarized in Chapter 5, *Summary of Submitted Alternatives, Information, and Analyses.* Comments received during scoping are summarized in Appendix 1-B, *Scoping*. The full contents of all scoping comments are available on Regulations.gov at https://www.regulations.gov/document/FWS-R1-ES-2022-0029-0001.

The following alternatives were considered but dismissed from detailed analysis for the reasons summarized below.

- **Limit Forest Management in Covered Species Habitat.** This alternative would be the same as the proposed action, but would limit forest management in the following ways as compared to the HCP:
  - No restoration thinning in RCAs.
  - No harvest in 23 northern spotted owl home ranges (1.5-mile radius from nest site).
  - No harvest in known occupied and modeled potential existing marbled murrelet habitat.
  - No restoration thinning in CRW and MRW reserves.

  This alternative was eliminated from detailed study because it would not meet the purpose and need to respond to the applicant's ITP applications to cover a research and management program as described in the HCP. The ability to study how species respond to a variety of forest management conditions would be greatly reduced if harvest does not occur in some covered species habitat. In addition, this alternative is similar to Alternative 3, which includes increased conservation measures, and would not meaningfully add to the range of alternatives analyzed.

- **Increased Harvest Options.** This alternative would be the same as Alternative 4 except that it would also reallocate extensive treatment areas that are less than 65 years of age as of 2020 to allow intensive forest management prescriptions, described in Section 2.1.2.2, *Covered Activities*.

  This alternative was eliminated from detailed study because it would not meet the purpose and need to respond to the applicant's ITP applications to cover a research and management program as described in the HCP. This alternative would eliminate the extensive allocations, reducing the variety of forest structure attainable to only two trajectories, old growth or intensive harvest. Limiting research to these two trajectories would eliminate the ability to undertake research on a dynamically managed complex forest. This would reduce the potential value of such research for improving conservation management of the covered species in such environments. Finally, this alternative was similar to Alternative 4 and would not meaningfully add to the range of alternatives analyzed.

  Shorter Permit Term. This alternative would be the same as the proposed action, but the ITP term would be 40 years instead of 80 years. This alternative was eliminated from detailed study because it would not meet the purpose and need to fulfill the Services' conservation obligations under the ESA, since the HCP would not be expected to show adequate conservation benefits in a 40-year timeframe to achieve mitigation goals. Similarly, because the alternative would not allow adequate time for older forest structure to develop, it would not provide for research benefits addressing conservation needs for the covered species.

- **Reduced Covered Species.** This alternative would be the same as the proposed action but would either only cover Oregon coast coho or only cover northern spotted owl and marbled murrelet.

  This alternative was eliminated from detailed study because it would not meet the purpose and need, as it does not fully respond to the applicant's request for ITP coverage for the species likely to be incidentally taken and included in the proposed HCP. It is the applicant's responsibility to decide whether to request incidental take coverage for a particular species, but all ESA-listed species that would potentially be taken through the covered activities should be included, or the Services may not be able to issue the ITPs. Additionally, it would not be technically or economically feasible for the applicant to avoid take of a more limited set of covered species while implementing the proposed forest management activities.

- **Additional Covered Species.** This alternative would be the same as the proposed action but would include coverage of non-listed salamanders and/or the coastal marten. This alternative was eliminated from detailed study because it would not meet the purpose and need to respond to the applicant's request because the applicant did not seek incidental take coverage for these species (see discussion in Section 1.4.4 of the HCP for screening conducted by the applicant to determine the covered species). It is the applicant's responsibility to decide whether to request incidental take coverage for a particular species. Despite some survey effort, no coastal marten have been detected in the Elliott State Forest for many decades. The latest predicted distribution model did not predict the species in this area (Moriarty et al. 2021). In addition, there is a paucity of information on non-listed salamanders from which to develop and meaningfully analyze an alternative that includes non-listed salamanders.

- **ODF's 2017 HCP.** This alternative would cover the same species as the proposed action but would modify the covered activities and conservation strategy to follow ODF's 2017 HCP.

  This alternative was eliminated from detailed study because it would not meet the purpose and need to respond to the applicant's ITP applications. The 2017 conservation framework was designed for Elliott State Forest to be managed by ODF, which is no longer proposed. The framework is inconsistent with the current research forest design and goals of Elliott State Research Forest to have active harvest in a research setting. The 2017 conservation framework also served as the starting point for the current proposed HCP. Additional conservation measures and conditions have since been added to meet permit issuance criteria and research forest goals. Furthermore, this alternative would not meaningfully broaden the range of reasonable alternatives considered because it would consist of a combination of elements analyzed in other alternatives.

- **Carbon Sequestration and Research.** Under this alternative, DSL would apply for ITPs from the Services for the same species but for different covered activities that involve managing the forest for carbon storage. This alternative was eliminated from detailed study because it would not meet the purpose and need to respond to the applicant's ITP applications; this alternative would require the applicant to completely change the proposed covered activities. Eliminating this alternative from detailed study does not preclude DSL from considering carbon storage in the future. Additionally, there is not enough information provided on managing the forest for carbon to analyze it in detail.

- **Expanded Permit Area.** This alternative would be the same as the proposed action but would expand the permit area to include the East Hakki Ridge parcel and incorporate the parcel into the CRW. This alternative was eliminated from detailed study because it would not meet the purpose and need to respond to the applicant's ITP applications. In addition, it would not be different enough from the proposed action to provide a meaningful comparison of effects.

Chapter 3
Affected Environment and Environmental Consequences

3.1 Introduction

This chapter presents the existing conditions and potential environmental effects of the proposed action and alternatives.

3.1.1 Scope of Analysis

The remaining sections of this chapter present the comparative analysis of effects of the proposed action and alternatives on the following resources: geology and soils (Section 3.2), water resources (Section 3.3), vegetation (Section 3.4), fish and wildlife (Section 3.5), air quality (Section 3.6), climate change (Section 3.7), recreation and visual resources (Section 3.8), cultural resources (Section 3.9), tribal resources (Section 3.10), socioeconomics (Section 3.11), and environmental justice (Section 3.12). Appendix 3.1-A, *Regulatory Environment*, presents the regulatory context for each resource.

Each resource section consists of a description of the study area, methods, affected environment, and the potential environmental consequences (i.e., impacts) of the proposed action and alternatives on the resources. The affected environment sections describe the existing environmental conditions and reasonably foreseeable changes to those conditions. The environmental consequences sections describe the potential direct and indirect impacts of the proposed action and alternatives and the significance of those impacts. In considering the significance of potential effects, the analysis addresses the degree and duration of beneficial and adverse effects and whether any effects would violate federal, state, tribal, or local law protecting the environment. Effects on short-term use of the environment and long-term productivity of the forest are addressed as part of the environmental consequences in this chapter. Cumulative impacts are described in Chapter 4, *Cumulative Effects*.

Measures to minimize and mitigate the impact of the potential taking of covered species to the maximum extent practicable are incorporated into the proposed action, as required under ESA Section 10(a)(2)(B)(ii) as a condition of incidental take permit issuance. Alternative 3 includes additional measures to further minimize impacts on covered species. The analysis of effects in Chapter 3, *Affected Environment and Environmental Consequences*, considers these measures as well as additional protections that may be required in compliance with existing laws, policies, and regulations presented in Appendix 3.1-A, *Regulatory Environment*. The analysis also considers best management practices that may be implemented to mitigate or reduce adverse effects on other resource areas, where applicable and in accordance with existing regulatory requirements.

3.1.2 Study Areas and Analysis Period

Study areas are defined for each resource based on the area where implementation of covered activities in the permit area could affect the resource, and include areas outside the permit area or plan area in some cases. Although the permit area could change over time based on land exchanges, these changes would require an HCP amendment (HCP Chapter 7, Section 7.6.2, *Amendments*) and could require additional NEPA analysis depending on the change. The analysis period is 80 years to reflect the length of the proposed permit term.

3.1.3 Areas Available for Harvest

The primary driver of effects under the proposed action and alternatives is timber harvest. Differences in restrictions on location and intensity of harvest drive the differences in effects on resources. To understand differences in large-scale effects of harvest, harvest treatments were grouped by level of intensity in the following categories: no harvest, variable density harvest, restoration thinning, and clearcut harvest. Although specific treatments within these categories differ under the alternatives in some cases, the comparison of acreages assigned within these broader categories under the alternatives (Table 3.1-1) is helpful to understanding the general differences in total area treated and level of intensity of treatment. Figure 3.1-1 shows the layout of the harvest treatment types across the permit area.[1]

Table 3.1-1. Approximate Acreage of Harvest Treatment Types under the Proposed Action and Alternatives [a]

Treatment Type	No Action[b]	Proposed Action	Alternative 3	Alternative 4
No harvest	47,303	37,453[b]	46,998[b]	27,164[b]
Restoration thinning	2,236	16,987	17,355	9,651
Variable density harvest	2,735	13,474	7,714	20,011
Clearcut harvest	30,268	14,385	10,438	25,752

[a] Minor differences in the sum of acreages are due to small errors in spatial data across alternatives.

[b] The acreage presented for the no action alternative omits additional acreage that would be restricted from harvest to comply with requirements in the anticipated updates to the Oregon Forest Practices Act for management on steep slopes.

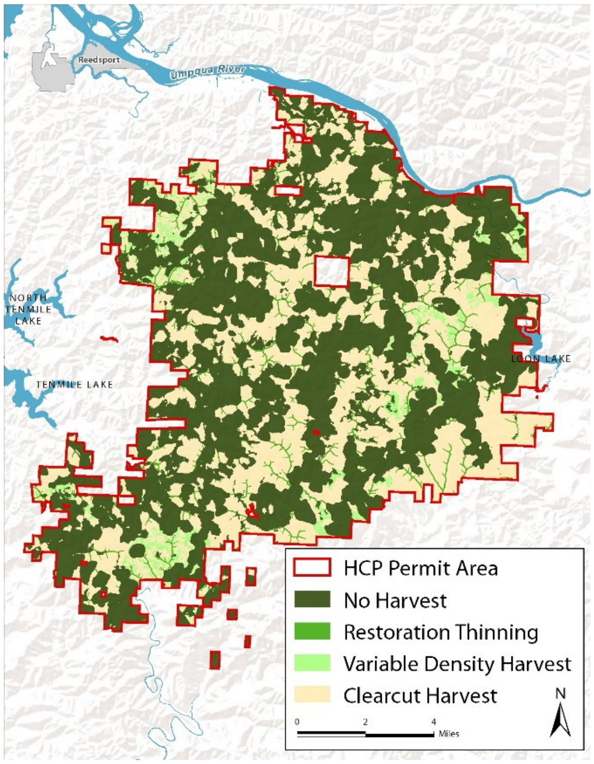
[c] Northern spotted owl nesting core areas (HCP Chapter 5, Condition 2) could increase the acreage of no-harvest area, which would likely result in a corresponding reduction in the acreage available for restoration thinning.

The sections below describe the areas available for different treatment types under the alternatives. These treatment types are described in more detail in Chapter 2, *Proposed Action and Alternatives*. The specific differences in treatments under the alternatives are considered in the impact discussions in the remaining sections of this chapter.

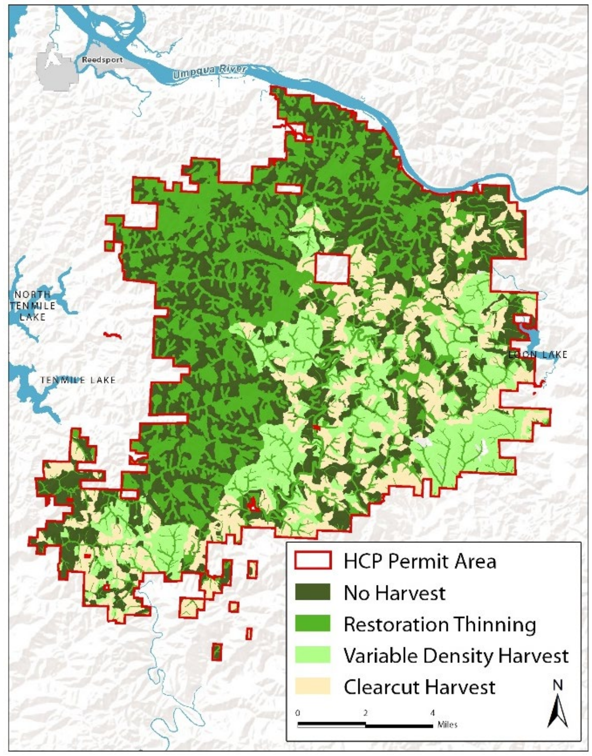
[1] Salvage harvest conducted in response to disturbance events is not included in the estimates provided in Table 3.1-1 and shown in Figure 3.1-1. Restrictions on salvage harvest under the proposed action and alternatives are described in Chapter 2, *Proposed Action and Alternatives*.

Figure 3.1-1. Areas Available for Harvest

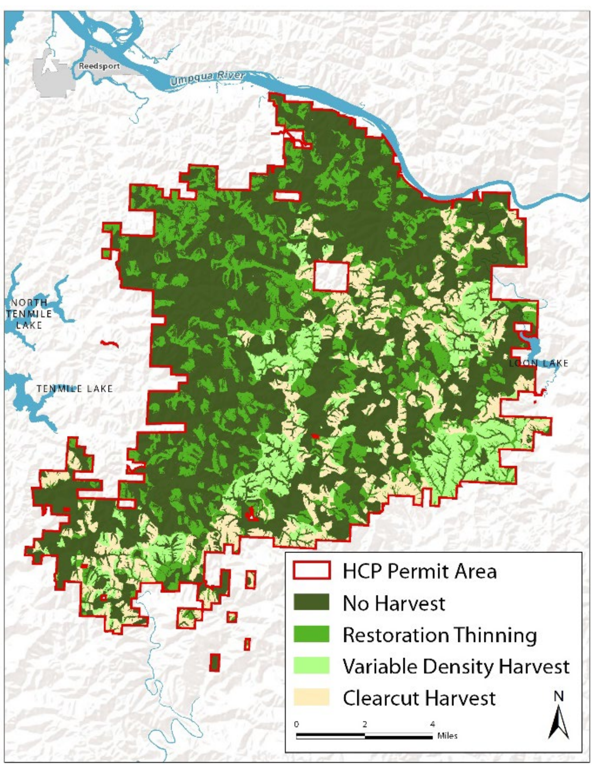
No Action Alternative



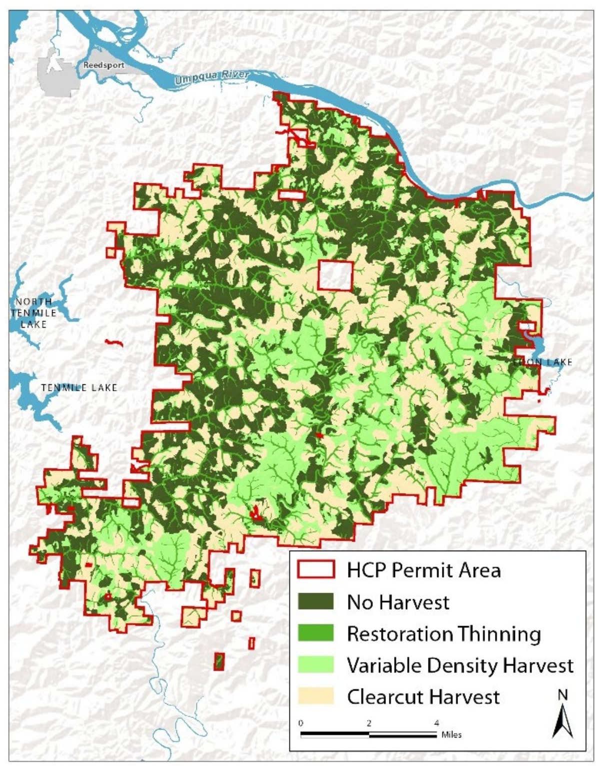
Proposed Action



Alternative 3



Alternative 4



3.1.3.1 No Harvest

- **No action:** No-harvest areas would include occupied marbled murrelet habitat and a 100-meter (328-foot) buffer around occupied habitat,[2] and nesting core area for occupied northern spotted owl nest sites[3] No-harvest prescriptions would also be applied to Designated Debris Flow Traversal Areas and Slope Retention Areas, as defined in the Private Forest Accord (PFA) Report (Conservation Coalition and Working Forest Coalition 2022). These areas are not included in Table 3.1-1 or depicted on Figure 3.1-1 because they cannot be quantified based on available data. To the extent that these areas occur outside of other no-harvest areas, the total acreage of no-harvest areas would increase relative to the acreages presented in Table 3.1-1.
- **Proposed action and action alternatives:** No-harvest areas would include areas in reserves and riparian conservation areas (RCAs) that are over 65 years of age as of 2020, stands and individual trees in any land allocation that are older than 152 years of age as of 2020,[4] and a 100-acre nesting core area around each northern spotted owl nest site delineated to include the best contiguous habitat while maintaining a minimum distance of 300 feet between the nest tree and the edge of the nesting core area (HCP Chapter 5, Condition 2).[5] Under Alternative 3, no-harvest areas would also include RCAs on slopes 65% or greater.

3.1.3.2 Restoration Thinning

- **No action:** Areas available for restoration thinning only include the riparian management areas (RMAs). There is no commitment to implementing restoration treatments such as thinning in RMAs, but activities intended to promote ecological restoration would be permitted in these areas.
- **Proposed action and action alternatives:** Areas available for restoration thinning would include areas in reserves and RCAs that are younger than 65 years of age as of 2020. Under Alternative 3, restoration thinning in RCAs would be further limited to slopes less than 65%.

3.1.3.3 Variable Density Harvest

- **No action alternative:** Variable density harvest areas would include areas protected for northern spotted owl suitable habitat requirements beyond the suitable habitat in the no-harvest areas, where 60% crown cover must be maintained in 50% of the core use area and 40% of the home range. These areas were mapped to approximate acreage (Table 3.1-1) and geographic location (Figure 3.1-1) but actual acreage and layout would likely vary.[6]

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[2] For purposes of analysis, all modeled potential occupied marbled murrelet habitat, as defined in Betts et al. (2020), was assumed occupied throughout the analysis period. Actual restrictions on harvest related to marbled murrelet could change over the analysis period if occupancy changes.

[3] For purposes of analysis, it was assumed that the 23 existing occupied northern spotted owl nest sites remain occupied. Actual restrictions on harvest related to northern spotted owls could change over the analysis period if existing sites become unoccupied or new sites become occupied.

[4] This is intended to preserve trees that predate the 1868 Coos Bay fire, which burned approximately 90 percent of the plan area.

[5] The analysis assumes that to the extent feasible, these nesting core areas would be designated in reserves and RCAs.

[6] These areas of protection were identified by determining the amount of suitable habitat in the core use areas and home ranges protected in no-harvest or restoration thinning areas, as well as areas protected as suitable habitat under other ownership outside of the permit area. In owl circles where these restrictions did meet suitable habitat protection requirements, additional suitable habitat within the permit area was assumed protected for purposes of

- **Proposed action and action alternatives:** Variable density harvest areas would include extensive areas, removing between 20% and 80% of pre-harvest relative stand density and using the treatments summarized in Chapter 2, *Proposed Action and Alternatives*.

3.1.3.4 Clearcut Harvest

- **All alternatives:** Areas outside of the other treatment areas would be available for clearcut harvest.

this analysis. When identifying additional suitable habitat, the core use area and habitat connectivity were prioritized.

3.2 Geology and Soils

3.2.1 Methods

The study area for geology and soils includes lands and waters where the proposed action and alternatives could directly or indirectly cause erosion, landslide, and stream geomorphology effects. The study area for effects on landslide consists of the permit area. The study area for soil erosion and changes to stream geomorphology consists of the subwatersheds overlapping the permit area.[1]

This analysis evaluates the potential for forest management activities under the proposed action and alternatives to result in erosion and soil destabilization, and to increase the likelihood of landslides[2] and associated events. It also considers how differences in restrictions on management practices would affect the potential for adverse effects (e.g., stream channel scour and delivery of fine sediment to streams, which lead to stream channel simplification) and beneficial effects (e.g., large wood recruitment and coarse sediment delivery to streams, which lead to more complex stream channel morphology) related to these events.

3.2.2 Affected Environment

3.2.2.1 Soils

Soils and soil characteristics in the permit area vary, depending on area. Soils in 92% of the permit area have an erosion hazard rating of severe or very severe off roads and trails, and 94% of the permit area on roads and trails. Soils in 93% of the permit area are poorly suited for log landings and roads (Appendix 3.2, *Geology and Soils Technical Supplement*, Tables 1 and 2).

3.2.2.2 Shallow-Rapid Landslide

As described in HCP Chapter 2, Section 2.1.2, *Topography*, topography in the Elliott State Forest is generally characterized by steep, narrow, convergent canyons (DSL and ODF 2011:2-43). Gradients commonly exceed 65%. The study area's steep mountainous terrain is susceptible to shallow-rapid landslides (subsequently referred to as landslides) and associated debris flow and debris torrent[3] under both natural and forestry management conditions (Benda and Miller in prep.:2-3; DSL and ODF 2011:ES-8, 2-26, 2-45 to 2-46). Mass wasting, which includes landslides, debris flows, and related movements of rock and soil, is the predominant landform-altering agent in the Oregon Coast Range (HCP Chapter 2, Section 2.1.7, *Mass-Wasting Processes and Stream Channels*). Approximately

[1] These are the same subwatersheds that overlap with the broader plan area.

[2] This analysis does not consider deep-seated landslide. Some forest management activities can initiate a deep-seated landslide, in particular those that make large-scale modifications to topography, including quarrying, aggregate stockpiling, placement of large fill, and construction of large road cuts, especially at the base along the toe of the landslide. However, shallow-rapid landslide and associated debris torrent are the predominant ground failure characteristics that shape the landscape.

[3] In this analysis, a *debris flow* is a fast-moving landslide. It generally is triggered by heavy precipitation or rapid snowmelt, and consists of wet soil, trees, boulders, and smaller debris. A *debris torrent* is a debris flow that has entered a stream channel.

91% of the study area has high or very high susceptibility to landslides (Appendix 3.2, *Geology and Soils Technical Supplement*, Table 3).

The potential for destabilizing events to increase the likelihood of landslides varies according to local conditions and is not evenly distributed across the landscape (Robison et al. 1999:44; Cover et al. 2010:1596–1597; Burnett and Miller 2007:2). Landslide initiation sites have physical characteristics (e.g., slope, soil type) that create higher potential for landslides. The highest frequency of landslides occurs on slopes of over 70 to 80%, depending on landform[4] and underlying soils and geology (Robison et al. 1999:iii), especially the presence of thick, saturated soils (Department of Oregon Geology and Mineral Industries 2008). Landslide frequency is moderate on slopes between 50 and 70%. Landslides occur within the forest rooting zone, generally less than 10 feet deep (Cohen and Schwarz 2017:452; Hairiah et al. 2020:256). Such landslides are typically initiated by intense rainfall or rapid snowmelt. Conditions in the study area are favorable to the initiation of landslides, namely steep slopes and high precipitation rates (Appendix 3.2, *Geology and Soils Technical Supplement*, Table 3).

As discussed in HCP Appendix A, *Active Management of Riparian Conservation Areas*, rates of landslides and debris flows have increased in heavily roaded and logged watersheds in the Oregon Coast Range as a result of forestry activities (Goetz et al. 2015:1311). The Oregon Forest Practices Act (Oregon FPA) was enacted and amended to reduce these effects of forestry practices (ODF 2021). Most landslides associated with roads in the Oregon Coast Range have been assessed as larger in volume than landslides not associated with roads by a factor of four (Robison et al. 1999:v). Roads on steep slopes were associated with the majority of landslides. In the permit area, approximately 47% of roads are located mid-slope on steep slopes (over 65% slope), whereas 41% are on ridgelines and the remainder in flatlands or areas of shallower slope (Appendix 3.2, *Geology and Soils Technical Supplement*, Table 4).

In addition, nearly one-third of the 550 miles of road in the permit area were constructed following a major storm in 1962 that blew down an estimated 100 million board feet of timber (DSL and ODF 2011:1-5 to 1-6). These roads were constructed using an old practice, now prohibited by the FPA, of leaving excavated materials downslope of the excavated road prism. These materials on an oversteepened slope are particularly susceptible to failure (ODF 2011:2-16, 2-47). Subsequent road maintenance has focused on preventing failures associated with these previous practices. However, forestry roads, even with compliance with the FPA requirements, increase the likelihood of landslides.

Landslides have both onsite and offsite effects (DSL and ODF 2011:2-46). Onsite effects generally occur at the landslide initiation site, where the soil has often been completely removed. Offsite effects include changes to riparian vegetation, stream channel morphology, and streambed materials through debris flow and debris torrent (discussed in more detail in Section 3.2.2.3, *Stream Geomorphology*). In the short term, landslides and related effects are destructive; they remove soil, trees, and habitat and potentially kill organisms (Conservation Coalition and Working Forest Coalition 2022:29). However, in the longer term, these natural processes can create and maintain productive habitat for aquatic organisms (Benda and Miller in prep.:2).

[4] *Landform* refers to the shape of the ground surface.

3.2.2.3 Stream Geomorphology

Stream geomorphology describes stream systems, including physical shape, water and sediment transport processes, and the landforms that the streams create and alter. It encompasses processes that create, alter, and maintain structure across whole watersheds (Independent Multidisciplinary Science Team 1999:11). These processes shape aquatic habitat, discussed further in Section 3.5, *Fish and Wildlife*.

Landslides that become debris torrents generally initiate in steep landscapes or adjacent to stream channels, including in inner gorge regions (areas next to a stream where the adjacent slope is significantly steeper than the gradient of the surrounding hillsides). Even landslides that begin as relatively small slides can mobilize large volumes of material through scour and move up to thousands of feet once they enter a stream (Robison et al. 1999:58). The wood and water content, as well as stream channel geometry, affect how far debris torrents travel in stream channels (Robison et al. 1999:107; Benda et al. 2004:3-4).

Results of a debris torrent can cause changes in the stream channel that can persist over thousands of years. These include changes to stream hydrology and geomorphology through sediment deposition, as well as rapid movement of high loads of debris through the stream channel (Geertsema et al. 2009:589–593; Burnett and Miller 2007:239; Robison et al. 1999:v–vi; Lyons and Beschta 1983:463). Sediment deposition can reshape stream channels, increase the width of stream channels, lead to gravel bars that become vegetated, and even dam streams and rivers. Movement of debris through the stream channel can scour streambeds down to bedrock.

Over decades to centuries, debris torrents can result in benefits, such as creation of complex geomorphic structures through deposition of large wood and coarse gravels and boulders (Benda and Miller in prep.:2; Geertsema et al. 2009:593–598; Miller and Scurlock 2018:2; Burnett and Miller 2007:239; May and Gresswell 2003:1352–1353). However, the potential of debris torrents for creating high quality habitat depends on the ratio of delivered wood to sediment.

Forestry activities, including harvest and road system management, can affect the amount of wood delivered to streams. Anticipated updates to the Oregon FPA prohibit harvest in riparian management areas (RMAs), but do not prohibit restoration activities[5] (Conservation Coalition and Working Forest Coalition 2022:142). As discussed in HCP Appendix A, thinning can reduce the potential amount of wood that can be delivered to streams when the wood is removed from the harvest site. However, thinning when the wood is not removed from the harvest site and the downed trees are directly introduced to adjacent streams is beneficial for wood recruitment (Benda et al. 2016:821).

The stream-adjacent riparian forest is important to stream channel morphology, providing root strength that maintains desirable channel characteristics and organic material inputs (e.g., large wood) that support a complex channel morphology (Gregory et al. 1991; Forest Ecosystem Management Team 1993; Meehan 1996), as described in HCP Chapter 2, Section 2.1.7, *Mass-Wasting Process and Stream Channels*. Reeves et al. (2003) studied the sources of large wood in Cummins Creek, a fourth-order watershed in the Oregon Coast Range; they found that 46% of the estimated

[5] Restoration treatments allowed in RMAs include removing conifers to ensure diverse hardwood habitats, removing stems in dense riparian areas, reforesting degraded riparian areas, adding large wood to stream channels, reintroducing fire through controlled burning, and high-disturbance treatments that remove invasive species or anthropogenic structures (Conservation Coalition and Working Forest Coalition 2022:26).

volume of wood originated from upstream sources delivered by landslides or debris flows more than 300 feet from the channel. The remainder of the wood originated in streamside sources immediately adjacent to the channel.

When trees are left in a riparian buffer, if a debris flow should encounter the buffer, trees in the buffer can be carried to the stream and deposited there, where they can trap sediment and contribute to more complex channel morphology (Pacific Northwest Research Station 2008:2). Riparian forests throughout western Oregon were often harvested to the edge of streams, prior to the advent of current management practices, as discussed in HCP Appendix A, *Active Management of Riparian Conservation Areas*. Accordingly, there is a historical deficit of large wood in streams in western Oregon forests. Recent management practices under the Oregon FPA have moderated that condition.

3.2.3 Environmental Consequences

3.2.3.1 Soil Erosion

Alternative 1: No Action

Forest management activities under the no action alternative that involve soil disruption, such as vegetation removal, compaction, and earth moving, would increase erosion rates in the study area. More intensive harvest treatments, especially clearcut harvest, and road construction, whether permanent or temporary, would cause the greatest amount of erosion. Removing vegetation leaves the newly exposed soil susceptible to erosion from water. Erosion strips the topsoil, affecting soil productivity; changes local topography, creating rills and gullies that can concentrate water runoff that leads to intensified water erosion; increases frequency of landslide by lubricating the soil and increasing its weight through changes in direction and quantity of water runoff; and worsens stream water quality through delivery of sediment as forestry activities change hydrologic connectivity.

RMAs and ELZs (Table 2-1) would reduce sediment delivery to streams as a result of soil erosion that results from harvest activities (Conservation Coalition and Working Forest Coalition 2022:20-21). Adherence to the Oregon FPA requirement to replant clearcut areas within 2 years of harvest (OAR 629-610-0040) would further minimize risk of delivery of fine sediment after the plants are established. This FPA requirement states that planted stands of trees must be established within 6 years of completion of a harvest operation. Restoration treatments (e.g., thinning) would be allowed in RMAs and would cause sediment delivery to streams, if and where they occur. However, the effects of these treatments on surface erosion would likely be short-term and diminish as shrubs and other understory vegetation recover.

In addition to harvest, road construction, maintenance, and use can increase erosion. Anticipated updates to the Oregon FPA include revised rules for road location, design, and standards (Conservation Coalition and Working Forest Coalition 2022:44-47). These rules cover the timing of road construction and use, road surfaces, stabilizing techniques such as mulching and seeding, road drainage, road maintenance, hydrologic disconnection of roads from streams, removal of fish passage barriers, and construction on unstable slopes. Anticipated updates to the FPA also include the Forest Road Inventory and Assessment (FRIA) process, which would require landowners to bring roads into compliance with the FPA. However, the effectiveness of best management practices to reduce erosion as a result of forest road construction and management is mixed (Cristan et al. 2016:144–147). Some studies conducted in western Oregon (e.g., Beschta and Jackson 2008) have found that best management practices for forest road system management can reduce sediment production, while others (e.g., Stednick 2008a, 2008b) found they do not.

Alternative 2: Proposed Action

Under the proposed action, the reduced area available for more intensive harvest treatments, especially clearcut harvest compared to the no action alternative, would result in reduced erosion from these activities. More widespread restoration thinning in riparian conservation areas (RCAs) would increase the potential for erosion in these areas and increase sediment delivery to stream when occurring within 30 to 50 feet of the stream compared to the no action alternative.

All road construction, maintenance, and abandonment would be performed in accordance with the FPA rules listed in HCP Section 3.6.1, *Road System Management*. HCP Condition 12, *Road Construction and Maintenance*, includes standards for road construction and maintenance with similar intent to the anticipated FPA updates assumed under the no action alternative. Additionally, limiting new permanent road construction to 40 miles (with any spur roads left in place after 5 years counting toward this limit) and requiring no net increase in permanent road miles in the Conservation Research Watershed (Conservation Measure 3) would reduce potential for erosion from road management activities compared to the no action alternative. Although the extent of the permanent road network would be more restricted under the proposed action, erosion from existing roads could be greater in the absence of the requirement assumed under the no action alternative to bring all existing roads into compliance, or to decommission them, through the FRIA process. Although projects implemented as a result of the hydrologic connection study included in Conservation Measure 3 would reduce these effects, the measure does not include a commitment to implement these projects.

Alternative 3: Increased Conservation

Under Alternative 3, RCAs would be expanded, restoration thinning would be further restricted, and requirements on road decommissioning would be strengthened compared to the proposed action and no action alternative. The reduced area available for more intensive harvest treatments compared to the no action alternative and proposed action would result in reduced erosion from these activities. In addition, restoration thinning in RCAs would be more rigorously restricted than under the proposed action based on slope, which would similarly result in less erosion.

In addition, the potential for erosion from road management activities would be further reduced compared to the proposed action and no action alternative because Alternative 3 includes additional requirements for decommissioning. The practice of full decommissioning involves actions that would minimize erosion, e.g., pulling back sidecast material and recontouring to natural hillslopes and removing all stream crossing structures.

Accordingly, erosion as a result of both harvest and road system management under Alternative 3 would be less than under the proposed action or no action alternative.

Alternative 4: Increased Harvest

Under Alternative 4, the area for clearcut harvest would be greater than under the proposed action but less than under no action alternative. However, variable density harvest (extensive areas) would be substantially greater than under the no action alternative and proposed action. In addition, overall acreage of harvest and therefore area of ground disturbance would be greater under

Alternative 4 than under either the no action alternative or the proposed action. Accordingly, it is likely that Alternative 4 would lead to increased erosion compared to the no action alternative and proposed action. Restrictions on road system management and associated potential for erosion from road management activities would fall between the proposed action and no action alternative.

3.2.3.2 Shallow-Rapid Landslide

Alternative 1: No Action

Timber harvest, particularly clearcut harvest, and other forestry management activities, including road development, maintenance, and abandonment, under the no action alternative would increase the likelihood of shallow-rapid landslides and associated events (i.e., debris flow and debris torrent) (DSL and ODF 2011:2-47, 4-40; Swanson et al. 1987:15). As stated in Section 3.2.2.2, *Shallow-Rapid Landslide,* approximately 91% of the study area has high or very high susceptibility to landslide.

Although the influence of forest management activities on landslides and associated effects has been reduced since enactment of the Oregon FPA, forestry management activities, especially clearcut harvest and forest road construction, still increase the likelihood of landslides and associated effects (Rice 1977:278–281; Swanson et al. 1987:15; BOF 2001:vi).

Because clearcut harvest removes the greatest number of trees, this harvest type creates conditions most conducive to landslides. Harvest and root decomposition remove the vegetative structure that holds soil in place, making recently harvested areas more susceptible to landslides until roots re-establish. Loss of evapotranspiration by mature trees leads to increased water in the soil, making it more susceptible to landslides. Figure 3.1-1 shows areas available for clearcut harvest. However, Anticipated updates to FPA restricting harvest on steep slopes (Section 2.1.1) would limit harvest in additional areas not reflected in the figure.

As required by the Oregon FPA, written plans to evaluate public safety risk for activities in areas of steep slopes considered high landslide hazard locations (i.e., near human land uses) would be reviewed by the State Forester to determine whether there is public safety exposure from shallow-rapid landslide. If the review determines there is public safety exposure, the FPA rules would prohibit harvest in these areas. Ground-disturbing activities related to road system management have potential to increase the likelihood of landslides and associated events because of the steep terrain and soil conditions. Road use would also contribute to increased likelihood of landslides, especially use of roads built before the Oregon FPA. Road construction disrupts subsurface drainage; water that would ordinarily flow through the soil can instead emerge to the surface, concentrating in flows and increasing the likelihood of landslides and quantity of sediment transported (Heiken n.d.). Use of heavy equipment, timber processing, and hauling compact the soil, increasing potential for runoff, which in turn, increases the likelihood of landslides.

As described in Section 3.2.3.1, all road construction, maintenance, and decommissioning would be performed in accordance with restrictions placed by the Oregon FPA (OAR 629), including anticipated updates (Conservation Coalition and Working Forest Coalition 2022:44, 50–64).[6] This

[6] Road location, design, and standards for the Elliott State Forest are established in the Private Forest Accord report (Conservation Coalition and Working Forest Coalition 2022:44). Recommendations include (1) using existing roads whenever possible; (2) locating roads as far from streams as possible; (3) locating roads to follow the existing slope contours; (4) locating roads on well-drained soils and avoiding wetlands, seeps, and other wet areas; (5) avoiding

guidance includes avoiding physical steepening of slopes, directing water to steep or hazardous slopes, and constructing roads on steep slopes (BOF 2001:44–45). It also includes development of a forest road inventory that would require roads not in compliance with FPA, including anticipated updates, to be brought into compliance (Conservation Coalition and Working Forest Coalition 2022:50) would minimize the potential for road management activities to increase the likelihood of a landslide. However, these activities would continue to increase potential for these events (BOF 2001:49–50). Any reduction in the road network through decommissioning or abandonment, especially of roads built before the Oregon FPA, would reduce the likelihood of landslides

Construction of quarries, if near a landslide initiation site, could increase the likelihood of landslides and related events through use of explosives and bulldozers. Standard practices, including slope stability evaluation of potential quarry sites and removal of overlying soil, as well as compliance with the Oregon FPA,[7] would reduce the likelihood of landslides and related events.

Alternative 2: Proposed Action

Proposed action harvest and reforestation activities would have the same type of effects as described under no action alternative; however, the timing and intensity of these activities and associated effects would differ.

Under the proposed action, more intensive harvest types (clearcut and variable density harvest) would occur on much smaller portion of the permit area compared to the no action alternative (Table 3.1-1). In addition, as discussed in Section 3.4, *Vegetation*, stand age would be greater under the proposed action than under the no action alternative, and mature stands experience landslides less frequently than younger stands. Further, under Condition 11 of the HCP, harvest plans in harvest units with an average gradient greater than 65%, regardless of whether the plans are in high landslide hazard locations near human land uses, would be reviewed by a geotechnical specialist, who would advise on harvest layouts to minimize the risk of landslide or sediment transfer that could have a negative effect on coho salmon. Under these conditions, harvest activities would have less potential to induce landslide under the proposed action than the no action alternative.

All road construction, maintenance, and abandonment would be performed in accordance with the FPA rules listed in HCP Section 3.6.1, *Road System Management*. HCP Condition 12, *Road Construction and Maintenance*, includes standards for road construction and maintenance with similar intent to the anticipated FPA updates assumed under the no action alternative. Adherence to these rules and guidelines would reduce potential for road management activities to increase the likelihood of landslides. However, the proposed action would further reduce the potential for road management activities to increase likelihood of landslide limiting new permanent road construction to 40 miles (with spur roads left in place after 5 years counting towards this limit) and requiring no net increase in permanent road miles in the Conservation Research Watershed. Although the extent of the permanent road network would be more restricted under the proposed action, potential effects of existing roads to contribute to landslide could be greater in the absence of the requirement assumed under the no action alternative to bring all existing roads into compliance, or to

steep, unstable slopes to minimize potential for landsliding; (6) minimizing excavation; and (7) minimizing the number of stream crossings.

[7] The Oregon FPA requires that development, use, and abandonment of rock pits or quarries on forestland and used for forest management must be conducted using practices that maintain stable slopes and protect water quality. Further, quarry operators must stabilize banks, headwalls, and other quarry surfaces to prevent shallow-rapid landslides, associated debris torrents, and delivery of fine sediment to streams.

decommission them, through the FRIA process. Although projects implemented as a result of the hydrologic connection study included in Conservation Measure 3 would reduce these effects, the measure does not include a commitment to implement these projects.

Impacts of quarry development and the standard procedures and Oregon FPA requirements to reduce effects would be the same as the no action alternative; however, limiting the construction of new quarries could reduce the potential for quarries to increase the likelihood of landslide.

Alternative 3: Increased Conservation

Under Alternative 3, clearcut acreage would be less (Table 3.1-1) and stand age would be greater (Appendix 3.4, *Vegetation Technical Supplement*, Table 1) than under the proposed action and no action alternative, which would reduce. ground disturbance which can initiate landslides. Alternative 3 would also expand the requirement for road abandonment to require full decommissioning of roads. Therefore, Alternative 3 would reduce the likelihood of landslides compared to the proposed action and no action alternative.

Alternative 4: Increased Harvest

Under Alternative 4, clearcut acreage (Table 3.1-1) would be between acreages estimated for the no action alternative and proposed action. Stand age would be less than under the no action alternative and proposed action (Appendix 3.4, *Vegetation Technical Supplement*, Table 1). Restrictions on road system management would fall between the proposed action and no action alternative. Therefore, the likelihood of landslide would fall between the no action alternative and proposed action.

3.2.3.3 Stream Geomorphology

Alternative 1: No Action

Debris flow and debris torrents associated with landslides would continue to cause both adverse and beneficial changes to stream geomorphology over the analysis period where the debris enters streams, as described in Section 3.2.2.3, *Stream Geomorphology*. Landslides that become a debris flow would transport wood and sediment downhill, potentially encountering and entering a stream and becoming a debris torrent. The increased flow, sediment load, and volume of large wood can scour stream channels and deliver fine sediment to streams,[8] which adversely affect stream geomorphology through simplification. However, these debris torrents can also lead to large wood recruitment and coarse sediment delivery to streams, which ultimately create more complex stream geomorphology. Timber harvest would reduce the amount of wood available for delivery to streams. Clearcut harvest would remove the most wood.

RMAs and steep slope protections described in Section 2.1.1 would support recruitment of large wood and regulate sediment delivery to streams in case of landslides and related events. Wood recruitment to streams is projected to increase over the analysis period as trees in these protected areas mature.

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[8] Impacts related to changes in water quality due to sediment delivery are discussed in Section 3.3.3.4, *Water Quality*, in Section 3.3, *Water Resources*.

Alternative 2: Proposed Action

Reduced potential to induce landslide under the proposed action, as discussed in Section 3.2.3.2, *Shallow-Rapid Landslide*, would result in a corresponding reduction in landslide-related effects on streams. Wider RCAs under the proposed action (Table 2-2) compared to RMAs under the no action alternative (Table 2-1) would increase large wood recruitment and better regulate sediment delivery to streams in the event of debris flow, compared to the no action alternative. However, the steep slope protections assumed under the no action alternative would not apply under the proposed action. Geotechnical review and harvest plan modification on all steep slopes under Condition 11 would mitigate sediment delivery to coho streams in event of landslide but would be less protective than the no action alternative on other fish-bearing streams. In addition, restoration thinning in RCAs under the proposed action would have potential to immediately improve riparian and aquatic functioning in these areas because 15 to 20% of the volume thinned would be devoted to channel placement (Conservation Measure 1). Thinned trees would grow faster and thus increase the rate at which key wood pieces (large diameter) would eventually be available to the channel. While increased erosion from restoration thinning in RCAs could result in more fine sediment entering streams compared to the no action alternative, the increased wood recruitment would improve filtering of fine sediment and accretion of gravel substrate important for habitat function.

Alternative 3: Increased Conservation

Riparian and steep slope protections would be the same as the proposed action except that RCAs on some streams would be wider. Where RCAs are wider than proposed action, harvest sediment delivered to streams would be less. Further, with wider RCAs, landslides that become a debris flow have potential to contribute more large wood and rock to streams than the proposed action or no action alternative, providing for greater filtering and less delivery of eroded fine sediments to streams than under the proposed action or no action alternative.

Alternative 4: Increased Harvest

Steep slope protections and RCAs would be between the proposed action and no action alternative. Therefore, recruitment of large wood and rock to streams would be less than under the proposed action but greater than under the no action alternative.

3.3 Water Resources

3.3.1 Methods

The study area for water resources consists of waters that could be affected (directly and indirectly) under the proposed action and alternatives. For surface water and water quality this includes the permit area and the subwatersheds (hydrologic unit code [HUC] 12) overlapping the permit area.[1] The study area includes 13 subwatersheds distributed across 2 surface water subbasins (HUC 8): the Coos and Umpqua (USGS 2021a). Table 3.3-1 shows the acreage distribution of study area and permit area across the subbasins and watersheds. Appendix 3.3, *Water Resources Technical Supplement*, Table 11 shows the percent area of each subwatershed by allowable harvest type (e.g., clearcut, variable density, and restoration thin) for each alternative. Figure 3.3-1 illustrates the distribution of the permit area across the study area.

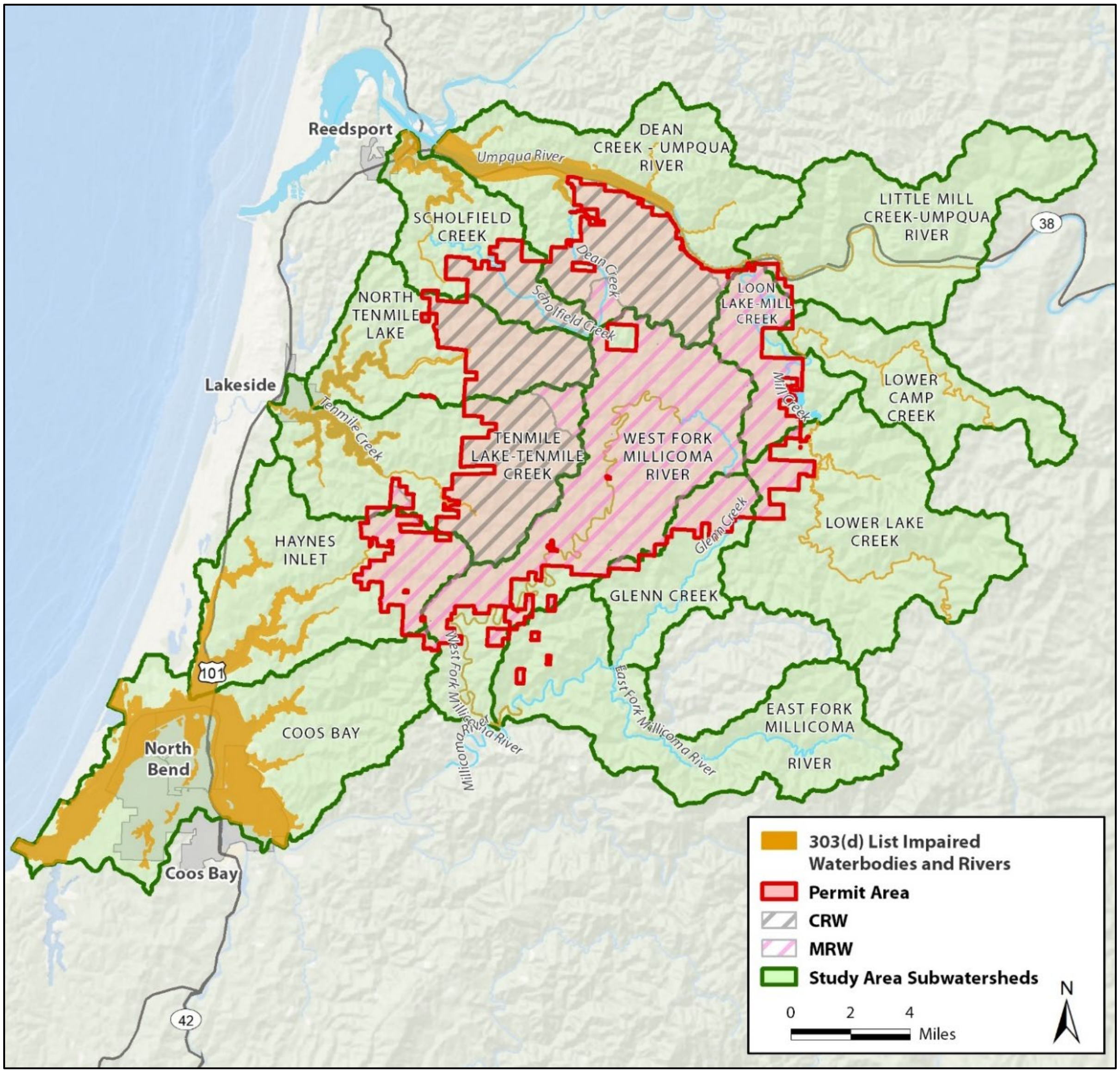
Table 3.3-1. Distribution of Permit Area and Study Area across Subbasins and Watersheds

Subbasin (HUC 8)	Watershed (HUC 10)	Subwatershed (HUC 12)	Study Area (Subwatershed acres)	Permit Area (acres)	% of HUC 12 Area
Coos Bay	Coos Bay-Frontal Pacific Ocean	Hayes Inlet	26,406	5,281	20%
		Coos Bay	38,666	177	0.5%
	Millicoma River	East Fork Millicoma River	27,599	183	1%
		Glenn Creek	11,289	2,932	26%
		West Fork Millicoma River	34,963	28,060	80%
	Tenmile Creek-Frontal Pacific Ocean	North Tenmile	18,669	7,450	40%
		Tenmile Lake-Tenmile Creek	26,770	12,463	47%
Umpqua River	Middle Umpqua	Little Mill Creek-Umpqua River	26,770	226	1%
	Mill Creek	Loon Lake-Mill Creek	9,859	6,870	70%
		Lower Camp Creek	13,483	39	0.3%
		Lower Lake Creek	32,328	1,845	6%
	Lower Umpqua River	Dean Creek-Umpqua River	36,339	12,180	34%
		Schofield Creek	14,195	4,769	34%

Source: USGS 2021a

[1] The study area encompasses the portions of the plan area that are outside of the permit area.

Figure 3.3-1. Distribution of Study Area across the Permit Area



For groundwater, the study area includes the regional groundwater system. The flood hazard study area includes areas prone to flooding within the subwatersheds (HUC 12) that overlap with the permit area.

The analysis evaluated all covered activities with potential to affect water resources through changes in surface water (i.e., annual water yield, peak and low flows, drainage patterns, and water quality); groundwater supply, recharge, upwelling, and quality; and flood hazard (i.e., floodwater storage, conveyance, erosion, sedimentation of floodplains). Evaluation of these changes was based on review of scientific literature and relevant studies pertaining to general effects of forestry and infrastructure activities on water resources, projected areas available by harvest type (Table 3.1-1), projected forest age class distribution (Appendix 3.3, *Water Resources Technical Supplement*, Tables 13 through 16), and analysis results in Section 3.2, *Geology and Soils*, Section 3.4, *Vegetation*, and Section 3.7, *Climate Change*.

The analysis of effects related to water yield, peak and low flows, and channel condition was based, in part, on how forest cover and evapotranspiration would change over the analysis period. Changes in forest cover and evapotranspiration were estimated based on existing stand age class and harvest rules described in Chapter 2, *Proposed Action and Alternatives*. Variable density harvest treatments were assumed to remove 50% of the area covered by the age class over 60 on average, resetting that area to age 0 and growing the age forward in 10-year increments. Clearcut treatments were conservatively assumed to remove 100% in areas where age class had reached 60 years for the given timestep, regardless of restrictions on patch size, and to regrow the area in 10-year increments. For the purpose of estimating impacts, restoration thinning was characterized as removing 25% of the area covered by trees less than 65 years old in 2020, and to hold those areas constant at age 0 based on the purpose of restoration thin, which is to reduce density and promote older stands. Actual loss of forest cover due to restoration thinning would be estimated on a project-by-project basis. Appendix 3.3, *Water Resources Technical Supplement*, Tables 13 through 16 present the average percent area of harvest treatment allocations and estimated changes in age class across subwatersheds. The analysis of effects on peak flows qualitatively considered various additional factors, including road and stream network density, depth to bedrock, slope, and soil infiltration rate. Effects of new roads, prescribed burning, quarries, and water withdrawals were analyzed qualitatively.

3.3.2 Affected Environment

3.3.2.1 Surface Water

Surface Water Hydrology

Table 3.3-2 summarizes the waterbodies and streams in the study area. Waterbodies in the study area include lakes, ponds, reservoirs, inlets, bays, and estuaries. Section 3.4.2.4, *Wetland Vegetation*, describes wetlands in the permit area. Most of the waterbody acreage in the Coos subbasin portion of the study area is Coos Bay (15,730 acres).

Table 3.3-2. Waterbodies and Streams in the Study Area

Subbasin	Study Area Waterbodies (acres)	Study Area Streams (miles)
Coos	19,004	1,407
Umpqua	2,001	680

Source: USGS 2021a

Almost all precipitation in western Oregon falls in winter when human water demand is at its lowest. Based on nearby weather station data, the average annual precipitation ranges from approximately 60 to 70 inches, with maximum on record reached in 1996 at approximately 95 inches (NOAA 2022a, 2022b). Most of the snowfall in Oregon occurs above 3,000 feet (Cooper 2005). In the study area, the maximum elevation is 2,100 feet (USGS 2021b); therefore, snowfall is rare.

Most of the study area is made up of soils that have a moderate to low infiltration rate and high runoff potential (NRCS 2019). In the coastal range watersheds, soil permeability and soil storage capacity are governing factors of peak flows (Cooper 2005). In all parts of the study area, rainfall intensity is a major factor governing peak flows. With climate change, expected increased rainfall intensity will result in increased peak flows across the study area (OCCRI 2020; Dalton and

Fleishman 2021; Easterling et al. 2017; Cooper 2005). Appendix 3.3, *Water Resources Technical Supplement*, describes the factors driving peak flows across the study area, statistics of physiographic characteristics, and hydrologic soil distribution across the study area. Rain-dominated areas likely will also experience a decrease in summer low flows with climate change (OCCRI 2020; Liebowitz et al. 2014). Section 3.7, *Climate Change*, and Section 3.4, *Vegetation*, discuss projected changes to vegetation with climate change.

Surface Water Quality

The Oregon Department of Environmental Quality (ODEQ) has identified 13 beneficial uses of waters of the state: fish and aquatic life, water contact recreation, fishing, public and private domestic water supply, industrial water supply, boating, irrigation, livestock watering, aesthetic quality, wildlife and hunting, hydropower, and commercial navigation and transportation. All tributaries to the Umpqua Rivers and to the estuaries in the Coos Subbasin are designated for all beneficial uses other than commercial navigation and transportation (ODEQ 2003a, 2003b).

OAR 340-041-0300 sets water quality standards for the South Coast Basin, and OAR 340-041-0320 sets water quality standards for the Umpqua Basin. In the permit area, 1.2 miles of stream in the Coos Bay Watershed are classified as Core Cold Water Habitat, which have a stream temperature standard of 16 degrees Celsius (°C) (ODEQ 2021). The rest of the permit area streams are classified as Salmon and Trout Rearing beneficial use, meaning the 7-day-average maximum temperature standard is 18 °C.

There are water quality impairments in all subwatersheds, except for Hayes Inlet and East Fork Millicoma River (ODEQ 2019, 2020). For most subwatersheds, the primary cause of water quality impairment in the study area rivers and streams is temperature. The exceptions are Scholfield Creek, which contains rivers and streams almost equally impaired by sediment and biocriteria and not by temperature, and Tenmile Lake–Tenmile Creek, which contains significantly higher miles impaired by dissolved oxygen and pH than temperature. The primary causes of impairments in study area waterbodies include temperature, fecal indicators, and dissolved oxygen. Stream and waterbody temperature will likely increase across the study area with climate change, as air temperatures increase and summer stream flows decrease (OCCRI 2020). Stream temperature is expected to increase by about 4 degrees Fahrenheit (°F) in most parts of Oregon by the 2080s (Dalton and Fleishman 2021). Stream temperature increases due to climate change are projected to be greatest in streams that are fed by surface water as opposed to groundwater (Dalton and Fleishman 2021).

Sediment is impairing 15 miles of rivers in North Tenmile Lake, Tenmile Lake–Tenmile Creek, and Scholfield Creek subwatersheds, as well as North Tenmile Lake itself, which spans North Tenmile Lake and Tenmile Lake–Tenmile Creek watersheds. Impaired uses include fish and aquatic life, fishing, and private and public water supply. ODEQ developed the Tenmile Lakes Watershed total maximum daily load (TMDL) to support water quality improvement. Appendix 3.3*, Water Resources Technical Supplement*, Tables 7 and 8 list miles and acres of impaired uses and causes in the study area by basin.

Surface Water Supply

The study area overlaps with surface water drinking water source areas (ODEQ 2019; ODEQ and OHA 2017), including Eel Lake (12.6 acres in North Tenmile Lake subwatershed) and Umpqua River (2.6 acres in Lower Camp Creek subwatershed) (ODEQ 2019b). Consequences to average annual water supply, peak flows, and summer low flows are not expected to be detectable in these subwatersheds (Section 3.3.3, *Environmental Consequences*). The top contaminant risks statewide are managed forests, irrigated crops, livestock, above ground tanks, auto repair, wastewater treatment plants, and heavy recreation (ODEQ 2005). Demand for water is forecasted to stay constant in Coos County and increase only slightly in Douglas County (OWRD 2015, 2017).

3.3.2.2 Groundwater

Aquifers and Recharge Areas

None of the permit area overlaps with a major regional aquifer system or unconsolidated deposits, where groundwater use, recharge, and susceptibility to contamination is highest (USGS 2000). However, there is substantial groundwater use outside of the major aquifer system and many streams depend on groundwater upwelling in dry summer months when flows are critically low (ODEQ and OHA 2017; USGS 1994). The minor aquifer in the study area is made up of pre-Miocene rocks (USGS 1994), which generally do not allow much recharge. Appendix 3.3, *Water Resources Technical Supplement*, Table 10 describes principal human groundwater use and well yields.

Groundwater Quality and Special Management Areas

ODEQ beneficial uses for groundwater are public and private drinking water, irrigation and livestock, and rural businesses. ODEQ has identified three special groundwater management areas where contaminant concentrations are elevated. The study area does not overlap with any of these management areas (ODEQ 2004:7) or with areas identified as potential groundwater quality concern (ODEQ and OHA 2017).

3.3.2.3 Flood Hazard

Federal Emergency Management Agency (FEMA) Special Flood Hazard Areas are summarized in Table 3.3-3. Most of the study and permit area is not designated as floodplain. Almost half of the area designated as floodplain having greater than 1% annual exceedance probability of flood is located in the Coos Bay watershed downstream of the permit area. Over half of the roads in floodplain with greater than 1% annual probability of flood are located in the West Fork Millicoma River subwatershed.

Table 3.3-3. FEMA Special Flood Hazard Areas in the Permit Area and Study Area

Annual Exceedance Probability of Flood	Study Area (acres)	Permit Area (acres)	Roads in Permit Area (miles)
Less than 1%	313	8	0.6
Greater than 1%	26,263	464	3.5
Areas not classified[2]	290,760	82,003	NA

Source: FEMA 2022

The Natural Resources Conservation Service (NRCS) soil survey also classifies land as floodplains, which sometimes covers areas outside of the FEMA hazard mapped areas. Within the study area, 25,917 acres are classified as floodplain by NRCS (2019). Of these, 244 acres are located in the

[2] This could mean that the National Flood Hazard Layer contains the area and found it was not in a floodplain or that the NFHL does not cover the area.

permit area and they constitute less than 1% of any of the subwatersheds. Within the permit area, Coos Bay, East Fork Millicoma, and Little Mill Creek-Umpqua also have no NRCS-classified floodplain.

3.3.3 Environmental Consequences

3.3.3.1 Water Supply

Alternative 1: No Action

This section discusses the effects of the no action alternative on surface water supply. For a discussion of effects on soil moisture, see Appendix 3.3, *Water Resources Technical Supplement*. Timber harvest, associated stand and road management activities, and burns would have the most extensive effects on water supply because they affect vegetation cover at the landscape scale. Restrictions on these activities in riparian management areas (RMAs) under the no action alternative would reduce these effects. Other management activities would affect surface water but to a lesser and more localized extent. Although prescribed burns and restoration thinning may reduce the likelihood of severe fire, which can severely affect water supply, the effects analysis only discusses the direct effects of prescribed burns.

Annual water yield, the annual average water discharged from an area, is a measure of water supply. Generally, reducing mature forest cover (e.g., through timber harvest and road construction) decreases evapotranspiration and increases annual yield, particularly in rain-dominated drainages (Goeking and Tarboton 2020; Moore and Wondzell 2005). Increases in water yield may not be detectable unless at least 20% of the catchment area is harvested (Institute for Natural Resources 2020). Clearcuts tend to produce higher water yields per percentage of catchment harvested than selective harvesting (similar to variable density harvest) (Moore and Wondzell 2005). Gradual patch cutting of 10% of the catchment every 6 years produced a modeled 33% increase in annual water yield that stabilized after 20 years (Du et al. 2015).

However, if fog drip is a significant hydrologic input, timber harvest and road construction may cause annual yield to decrease (Goeking and Tarboton 2020; Moore and Wondzell 2005). Fog drip may be a significant input in the study area. On the Oregon coast, measurements of annual precipitation under forest canopy were 26% greater than measurements made in the open (Harr 1982).

Increased annual yield can benefit water users downstream, if they have the capacity to store higher wet-season peak flows for use during the dry season when water is in higher demand. As forest cover regrows or areas are reforested, annual yield decreases. Most changes in annual yield diminish over the first 15 years of regrowth (Moore and Wondzell 2005). Subsequent sections discuss decreases in low flows after 15 years. These decreases tend not to affect annual average water yield, because the vast proportion of precipitation occurs in the wet winter months when evapotranspiration is at its lowest. For this analysis, land area covered by stands aged 0 to 15 years old on average is considered equivalent to clearcut area.

Salvage harvest may have a variable effect on annual yield, including more pronounced effects than timber harvest, because if left alone, stands may produce less water on an annual basis than living stands (Goeking and Tarboton 2020) and because burned soils can be more easily compacted by logging equipment, which reduces infiltration and increases runoff. The degree of effect would depend on the extent of the disturbance and associated salvage harvest, both of which are likely to increase over the analysis period due to climate change. Prescribed burns would increase annual yield by reducing younger vegetation that consumes more water than older vegetation. Under the no action alternative, salvage in response to disturbance events and prescribed burns would be limited to those plans that avoid take and would be evaluated on a case-by-case basis. Salvage would be limited in RMAs, where removal of dead trees are restricted and other riparian function targets are set per OAR 629-615-0300 and 629-635-0310 through 629-655-0000. Prescribed burns would be limited as described in OAR 629-615-0300, which requires written plans for prescribed burns near fish-bearing streams, wetlands, and estuaries specifying how detrimental effects would be minimized. OAR 629-615-0300 also requires protection of components such as live trees, snags, downed wood, and understory vegetation required to be retained by OAR 629-635-0310 through 629-650-0040.

Under the no action alternative, the change in forest cover due to timber harvest level would fluctuate throughout the analysis period based on which stands are reaching the harvestable age of at least 60 years old. Across the subwatersheds and time periods analyzed, the maximum percent area of subwatersheds covered by trees aged 0 to 15 years due to timber harvest is projected to range from 0% in East Fork Millicoma to 13.69% in West Fork Millicoma (Appendix 3.3, *Water Resources Technical Supplement*, Table 14). Because the extent in forest cover change is unlikely to exceed 20% of any subwatershed, the effect on water supply from timber harvest alone is unlikely to be detectable at the subwatershed scale. Some areas would experience short-term increases in water yield at the local level, where harvest is occurring, or decrease if fog trip is significant.

Construction of new roads would result in permanent removal of vegetation, increased soil compaction, and interception and diversion of groundwater via road cuts and ditches, which can increase water yield, as would mechanical vegetation removal for road maintenance and quarry construction, though to a lesser degree. The existing permanent road network is well developed, but spur roads, yarding corridors, skid trails, and landings would be built intensively in areas subject to forest management activities, and there is no limit on road construction under the no action alternative. DSL may abandon or decommission roads when roads are no longer needed or to meet the requirements of the Oregon Forest Practices Act (FPA) Forest Road Inventory and Assessment (FRIA) process (Conservation Coalition and Working Forest Coalition 2022). Though road activities would affect a far smaller area than harvest activities, they could result in changes in forest cover exceeding 20% in the West Fork Millicoma when combined with harvest effects, and thereby have a detectable effect on water yield at the subwatershed scale.

Alternative 2: Proposed Action

The types of effects on water supply under the proposed action would be the same as described for the no action alternative. The estimated maximum percent area of subwatersheds covered by trees aged 0 to 15 years due to timber harvest is less than 20% of all subwatersheds. Across the subwatersheds and time periods analyzed, West Fork Millicoma River subwatershed would have the highest projected increase in this age class, at 17.32%, which is greater than the no action alternative (Appendix 3.3, *Water Resources Technical Supplement*, Table 14). Nevertheless, increases to average annual water yield are unlikely to be detectable at the subwatershed scale from timber harvest. If fog drip is a significant factor, water yield may remain higher than the no action alternative in the conservation research watersheds (CRW) where less of the watershed is subject to timber harvest and where riparian buffers are wider.

The requirement for no net increase in permanent road miles in the CRW by the end of the permit term would reduce the potential for permanent effects from road activities compared to the no action alternative. Additionally, the permanent road network in the permit area would not expand by more than 40 miles over the permit term (with spur roads left in place after 5 years counting toward this limit). However, similar to the no action alternative, if forest cover and compaction effects from road-related activities combined with timber harvest effects in the West Fork Millicoma River subwatershed exceeded 20% of the subwatershed area, there would be an increase in water yield at the subwatershed scale.

Effects of other activities would be the same as described for the no action alternative.

Alternative 3: Increased Conservation

The types of effects on water supply under Alternative 3 would be the same as described for the no action alternative. As under the no action alternative and proposed action, the estimated maximum percent area of subwatersheds covered by trees aged 0 to 15 years due to timber harvest is less than 20% of all subwatersheds and would therefore not be expected to increase average annual water yield at the subwatershed scale. In the CRW, and at the local scale, where riparian buffers are wider than the no action alternative and proposed action, water yield may remain relatively higher, depending on the relative contribution of fog drip to precipitation (Moore and Wondzell 2005).

Application of the requirement for no net increase in permanent road miles to the entire permit area would reduce the potential for permanent effects from road activities compared to the proposed action and no action alternative. However, if forest cover and road-related compaction effects exceeded 20% of the subwatershed area, water yield would increase at the subwatershed scale. Effects of other activities would be the same as described for the no action alternative.

Alternative 4: Increased Harvest

Effects on water supply under Alternative 4 would be similar to the no action alternative, except short-term (0 to 15 years) increases in average annual water yield may be detectable at the subwatershed scale for Loon Lake-Mill Creek and West Fork Millicoma (Appendix 3.3, *Water Resources Technical Supplement*, Table 14) due to equivalent to clearcut area exceeding 20% in at least one year (Stednick and Troendle 2016). If fog drip is a significant portion of precipitation, water yield may actually decrease due to increased harvest.

Effects of road activities would be similar to those described for the proposed action, but could be more adverse because there would be no requirement for no net increase in permanent roads in the CRW. However, similar to the no action alternative, if forest cover and compaction effects from road-related activities combined with timber harvest effects exceeded 20% of the subwatershed area, there would be an increase in water yield at the subwatershed scale. Subwatersheds just below the 20% equivalent to clearcut area threshold, based on harvest alone, include North Tenmile Lake and Scholfield Creek (Appendix 3.3, *Water Resources Technical Supplement*, Table 14).

3.3.3.2 Peak Flows and Channel Condition

Alternative 1: No Action

The no action alternative would have similar relative capacity for effects on peak flows and channel condition as described for water supply. Timber harvest, associated stand and road management activities, and prescribed burns would have the most extensive effects. Restrictions on these activities in RMAs would reduce these effects. Other management activities would have smaller, more localized effects.

Increases in peak flow can adversely affect channels by increasing erosion and sedimentation, which can increase sediment yield and drainage density and drain groundwater. Appendix 3.3, *Water Resources Technical Supplement*, Figures 1 and 2 depict the relationship between watershed conditions, management considerations, and percentage area harvested on peak flow. The sensitivity of a watershed to changes in forest cover is related to its size, climate, and road density. For large rain-dominant watersheds, the limit of detection for peak flow changes may be as high as 45% cover loss (Grant et al. 2008). The largest increases in peak flows occur in catchments subject to clearcuts (Institute for Natural Resources 2020). Appendix 3.3, Table 12 shows the projected maximum percent area of each subwatershed covered by 0- to 15-year-old trees across 10-year intervals. Under the no action alternative, none of the subwatersheds show greater than 45% cover trees age 0 to 15 at maximum, due to projected harvest activities. Therefore, based on projected results, harvest activities alone are not expected to increase peak flows at the subwatershed scale by more than the detectable limit. The *Forest Stand Age Projections* section in Appendix 3.3, *Water Resources Technical Supplement*, provides projection results (Tables 14 through 16) and a detailed discussion regarding factors affecting peak flows. Salvage harvest is not included in these projections and can also adversely affect peak flows and channel condition by removing forest cover and decreasing infiltration by compacting sensitive burned soils.

Where stream reaches drain areas with significant forest cover loss, peak flows would increase, and channel structure would be adversely affected at the local scale (Reid et al. 2010). Appendix 3.3, *Water Resources Technical Supplement*, provides details on factors affecting peak flows.

Increases in road density and road-stream crossings can increase peak flows, while road decommissioning and abandonment can decrease peak flows, assuming abandoned roads revegetate and do not rut. The existing permanent road network is well developed, but spur roads, yarding corridors, skid trails, and landings would be built intensively in areas subject to forest management activities. As described in Section 3.3.3.1, *Water Supply*, the extent of the permanent road network is not limited under the no action alternative; therefore, the no action alternative could result in permanent increases to peak flows. Compliance with anticipated updates to the FPA rules governing road location, design, and standards, as described in Section 3.2.3.1, *Soil Erosion,* would improve drainage and minimize effects of roads on peak flows.

Timber harvest reduces the quantity of large wood available for recruitment into streams, which can increase peak flow velocity and exacerbate channel erosion and sedimentation (Ryan et al. 2014; Dixon et al. 2016). The recruitment of large wood to streams is projected to increase over the analysis period from implementation of riparian buffers (RMAs), which are wider than under historical practices that pre-date the Oregon FPA implemented in 1972, and as expanded under anticipated updates. Under the no action alternative, RMAs and steep slope protections included in the Oregon FPA (Section 2.1.1) would support wood recruitment to streams, resulting in a decrease in peak flow velocity and coarse sediment transport.

Prescribed burns can also adversely affect peak flows and channel condition through removal of forest cover. The effect would be lower than timber harvest on a per unit area basis, because prescribed burns leave overstory forest cover intact and do not cause increased soil compaction, and because new spur roads, yarding corridors, and skid trails are not required for prescribed burns. Effects of all other management activities on peak flows would be localized and, therefore, minimal relative to timber harvest and road system management.

Because changes in peak flows can cause increased channel erosion, which can impair water quality, compliance with the Clean Water Act (CWA) may result in limitations on the percent of watershed area harvested. Individual projects, under all alternatives, must comply with the CWA, which includes complying with the antidegradation rule for nonimpaired streams and compliance with any restoration plans that ODEQ imposes to manage TMDLs on impaired streams.

Alternative 2: Proposed Action

The types of effects on peak flow and channel condition under the proposed action would be the same as described for the no action alternative. The projected increase in stands aged 0 to 15 years would not exceed 45% in any subwatershed (Appendix 3.3, Table 14), which is the threshold at which peak flow changes may be detectable in large rain-dominant watersheds (Grant et al. 2008). Therefore, effects of harvest on peak flows are not expected to be detectable at the subwatershed level. However, wherever stream reaches drain areas that are significantly harvested, channel erosion is likely to occur (Reid et al. 2010).

The subwatersheds with the highest increase in harvestable area relative to the no action alternative are already among the highest in terms of road density and stream crossings. West Fork Millicoma River subwatershed has 1,482 stream crossings and a road density of approximately 3.4% (square feet of road per square foot of watershed area) (Appendix 3.3, *Water Resources Technical Supplement*, Table 3). Glenn Creek has 403 stream crossings and 6.0% road density. The road network is already well developed in these subwatersheds and, thus, may not require many additional new road miles to accommodate expanded harvest. Conversely, these watersheds are more susceptible to increased peak flows and deteriorating channel condition at the local scale, because they are already heavily roaded. Adverse effects of increases in the permanent road network in the CRW on local peak flows and channel condition would be offset, because every new mile of road construction would be offset by decommissioning 1 mile of road under Conservation Measure 3. Additionally, the permanent road network in the permit area would not expand by more than 40 miles over the permit term (with spur roads left in place after 5 years counting toward this limit), which would reduce potential channel scour compared to the no action alternative.

Other factors would mitigate the effects of peak flows on channel condition, such as increased large wood, as discussed in Section 3.2.3.3, *Stream Geomorphology*. Thinned trees would grow faster and, thus, increase the rate at which key wood pieces would be available to the channel.

All road construction, maintenance, and abandonment would be performed in accordance with the FPA rules listed in HCP Section 3.6.1, *Road System Management*, and would follow the requirements included in Condition 12, which are intended to minimize impacts of road use and construction on channel condition. For example, Condition 12 requires that roads and landings be constructed at least 35 feet away from the edge of the aquatic zone; limits road development in RCAs to cases where other options are not operationally feasible and economically viable; requires roads be outsloped at the stream approach; and requires underdrains be installed at areas where roads intercept groundwater. Condition 12 requires additional best management practices, and Conservation Measure 3 includes a risk assessment to inform decisions on siting and decommissioning.

Use of prescribed burning and associated effects would the same as described under the no action alternative. Effects of all other management activities on peak flows would be localized and, therefore, minimal relative to timber harvest and road system management.

Alternative 3: Increased Conservation

The types of effects on peak flow and channel condition under Alternative 3 would be the same as described for the no action alternative. The projected increase in stands aged 0 to 15 years would not exceed 45% in any subwatershed (Appendix 3.3, *Water Resources Technical Supplement*, Table 14). Therefore, effects of harvest on peak flows are not expected to be detectable at the subwatershed level but localized channel erosion is likely where stream reaches drain significantly harvested areas. Localized effects on peak flows and channel condition under Alternative 3 would be similar to the proposed action. However, the degree and duration would be lower due to lower equivalent to clearcut area in all watersheds (Appendix 3.3, Table 14), increased riparian buffer widths, and greater restrictions on riparian thinning. Application of the requirement for no net increase in permanent roads to the entire permit area and the additional requirements for decommissioning would further reduce road-related effects on peak flow and channel condition. Effects on peak flows would be least under Alternative 3.

Alternative 4: Increased Harvest

The types of effects on peak flow and channel condition under Alternative 4 would be the same as described for the no action alternative. The projected increase in stands aged 0 to 15 years would not exceed 45% in any subwatershed (Appendix 3.3, *Water Resources Technical Supplement*, Table 14). Therefore, effects of harvest on peak flows are not expected to be detectable at the subwatershed level, but channel erosion is likely where stream reaches drain significantly harvested areas. Localized effects on peak flows and channel condition related to harvest activities under Alternative 4 would be greater than under the no action alternative because equivalent clearcut area would be larger. Restricting increases in the permanent road network to 40 miles over the permit term (with spur roads left in place after 5 years counting toward this limit) would limit associated effects. The only subwatersheds where equivalent clearcut area would decrease relative to the no action alternative and thereby better mitigate local channel degradation are Lower Lake Creek and Glenn Creek.

3.3.3.3 Low Flows

Alternative 1: No Action

The covered activities would have similar relative capacity for effects on low flows as described for water supply. Tree and vegetation removal related to timber harvest, road management, and prescribed burns would have the most extensive effects. Restrictions on these activities in RMAs would reduce these effects. Other management activities would have smaller, more localized effects. Decreases in summer low flows can adversely affect water supply, water quality, and fish habitat.

Initially, timber harvest reduces evapotranspiration, which typically causes low flows to increase during the first 5 to 15 years after harvest (Goeking and Tarboton 2020; Moore and Wondzell 2005). As the stand regrows, low flows decrease and can drop below low flows in older stands (greater than 100 years) (Segura et al. 2020; Coble et al. 2020; Perry and Jones 2017) (Appendix 3.3, *Water Resources Technical Supplement*).

Appendix 3.3, Table 15 shows the total acres that would have an adverse effect on low flows, that is, where the average tree age was 100 years old at the start of the permit term and is allocated for harvest. Appendix 3.3, Table 16 shows the difference in the percent area of stand ages that would contribute to decreased low flows and the percent area of stand ages that would contribute to increased low flows in each subwatershed—stands that are between 15 and 100 years old at the start of the permit term and are allowed to age beyond 100 years by the end of the permit term and stands where restoration thinning removes trees less than 65 years old but retains enough shade to inhibit growth of new young trees. In four of the subwatersheds, the difference shows a potential for beneficial effects on low flows. In seven of the subwatersheds, the difference shows a potential for adverse effects on low flows. In the remaining subwatersheds, low flows are projected to remain the same.

Flows tend to be more sensitive to changes in vegetation in the riparian zone than in the rest of the watershed (Moore and Wondzell 2005; Segura 2020). Under the no action alternative, 6,982 acres would be protected in RMAs, which would allow stands to age out of the vigorously growing age class that transpires more (stands aged approximately 15 to 100 years) and thereby mitigate timber harvest adverse effect on low flows by the end of the permit term. Increases in large wood recruitment described in the discussion of peak flow effects could also enhance low flows at the reach scale in the form of enhanced pools (Wohl et al. 2019). In summary, effects of harvest on low flows would not exceed the observable limit at the subwatershed scale but would adversely affect the local stream scale for most subwatersheds. Compliance with the CWA, which applies to all alternatives, would require that projects be timed and designed to avoid or limit decreases to low flows in streams where such decreases could adversely affect stream temperature and other water quality parameters by decreasing cold water inputs and dilution.

Prescribed burning would increase low flows by reducing understory vegetation. Because these burns are used for younger understory plants (Allen et al. 2019), the effect may last approximately 10 years and could mitigate local negative effects of young trees on low flows. Beneficial effects on low flows would be of substantially lower degree than the effects of timber harvest. Water drafting associated with prescribed burns could have an adverse effect on low flows.

Road construction and decommissioning could increase or decrease low flows by decreasing forest cover and transpiration, increasing drainage efficiency, and diverting groundwater from hillsides to streams. Water developments and drafting associated with road building would have an adverse effect on low flows. Quarries and facilities have the potential to draw down the water table and increase runoff, thereby reducing low flows.

Alternative 2: Proposed Action

The types of effects on low flows under the proposed action would be the same as described for the no action alternative. The area covered by a change in tree age class that would have an adverse effect on low flows would decrease in all subwatersheds (Appendix 3.3, *Water Resources Technical Supplement*, Table 15). As shown in Appendix 3.3, Table 16, the net difference in tree age class change under the proposed action would have the potential for increased (i.e., improved) low flows in more subwatersheds than the no action alternative.

Stream enhancements under Conservation Measure 1 could also improve low flows by restoring surface–groundwater interaction and storage. Increased large wood recruitment and placement potential compared to the no action alternative, as described for peak flows and channel condition, would better mitigate adverse effects on low flows. Effects of all other management activities on low flows would be localized and, therefore, minimal relative to timber harvest.

Alternative 3: Increased Conservation

The types of effects on low flows under Alternative 3 would be the same as described for the no action alternative. The area covered by a change in tree age class that would have an adverse effect on low flows would decrease in all subwatersheds, resulting in beneficial effects on low flows compared to the no action and proposed action (Appendix 3.3, *Water Resources Technical Supplement*, Table 15). The net difference in tree age class change under Alternative 3 would have the potential for increased low flows in more subwatersheds than the no action and proposed action, and by a higher degree, especially in the West Fork Millicoma River subwatershed (Appendix 3.3, Table 16).

Alternative 4: Increased Harvest

The types of effects on low flows under Alternative 4 would be the same as described for the no action alternative. The area covered by a change in tree age class that would have an adverse effect on low flows would decrease in some subwatersheds and increase in some subwatersheds compared to the no action alternative, resulting in mixed effects on low flows compared to the no action alternative (Appendix 3.3, *Water Resources Technical Supplement*, Table 15). The greatest adverse impacts would be in Loon Lake-Mill Creek subwatershed. The net change in tree age class change under Alternative 4 would have the potential for increased low flows in the same amount of subwatersheds as the no action and in less subwatersheds than the proposed action (Appendix 3.3, Table 16).

3.3.3.4 Water Quality

Alternative 1: No Action

The no action alternative would have similar relative capacity for effects on water quality as described for water supply. Timber harvest, mechanical vegetation removal, road management activities, and prescribed burns would have the most extensive effects. Restrictions on these activities in RMAs would reduce these effects. Other management activities would have smaller, more localized effects.

Timber harvest, mechanical vegetation removal, and prescribed burns can adversely affect water temperature and sediment by decreasing shading, increasing bare soil, and disturbing soil. Harvest also has indirect adverse effects on toxic chemical concentrations in streams through reforestation site preparation and release treatment activities, which use pesticides or herbicides and through increased road construction and use, which can spread insects and weeds that are subsequently controlled by increased use of pesticides or herbicides.

Oregon water quality standards prohibit activities from increasing stream temperatures by more than 0.3°C where salmon, steelhead, or bullhead trout are present. In the study area, the Umpqua temperature TMDL further restricts temperature increases to 0.1°C (ODEQ 2006). ODEQ is required to develop TMDLs for all other temperature-impaired streams. ODEQ (2022) expects the required temperature TMDL for West Fork Millicoma to be developed in 2030, at the earliest, and encourages landowners to maximize riparian buffers and promote establishment of vegetation that can maximize shade effectiveness in the meantime.

Modeling shows segments of streams that have less than a 120-foot-wide riparian buffer experience increase in water temperature due to timber harvest (Leinenbach 2016; Leinenbach 2021). Streams with buffers 110 feet wide experienced 0.1°C increase on average and 0.3°C within the 95% confidence interval. Streams with buffers 100 feet wide experienced 0.2°C on average and 0.4°C within a 95% confidence interval. Figure 3 in Appendix 3.3, *Water Resources Technical Supplement*, depicts these relationships. Studies have shown that increased stream temperature, ranging from 0.5 to 7°C, can persist for 150 to 3,000 feet downstream of a harvest unit where there are narrow or nonexistent riparian buffers (Bladon 2018; Keith et al. 1998; MacDonald et al. 1998; Wilkerson et al. 2006; Zwieniecki and Newton 1999) and tends to persist at larger magnitudes the larger the proportion of the catchment is underlain by less permeable aquifers (Bladon et al 2018), which may be one factor that explain high temperatures in the West Fork Millicoma River (ODEQ 2022). Appendix 3.3, *Water Resources Technical Supplement*, contains additional details.

All riparian buffers under the no action alternative are less than 120 feet and restoration thinning is allowed in riparian buffers. Therefore, water temperature would increase in all streams flowing through harvest units and streams receiving waters from harvest units that are not otherwise shaded by topography or large wood or in areas protected for marbled murrelet and northern spotted owl. However, the increase in stream temperature is not likely to exceed the regulatory thresholds on large and medium fish-bearing streams, except near confluences with adversely affected non-fish-bearing streams. On average, small fish-bearing streams are expected to meet the regulatory threshold outside of the Umpqua Basin, except near confluences with adversely affected non-fish-bearing streams. Were DSL to implement restoration thinning in RMAs, it could also reduce shade and increase stream temperature (Leinenbach 2016). However, the temperature effect of decreased shading would be offset by increased low flows caused by removing vigorously growing vegetation in some areas through restoration thinning. Some streams would avoid adverse temperature effects due to site conditions, including streams shaded by hillslopes, streams fed by groundwater seeps, higher velocity and deeper streams, and streams with higher percent large wood.

Timber harvest can also adversely affect water quality by increasing fine sediment delivery to streams through surface erosion, channel erosion, and landslides. Depending on hill slope, soil type, and vegetation mix, riparian buffers have been found to be effective at mitigating sediment from entering streams from hillslope surface erosion (Hawes and Smith 2005; Lakel et al. 2010; Sweeney and Newbold 2014; Rashin et al. 2016). Based on these studies, a buffer width of 50 feet would be sufficient to prevent most sediment from harvest operations from reaching the stream channel, unless water is concentrated by skid trails or yarding paths. The no action alternative would prevent most sediment delivery from surface erosion to all fish-bearing streams, large and medium non-fish-bearing perennial streams, and upstream of confluences with fish-bearing streams (Chapter 2, Table 2-2). The equipment limitation zones upstream of buffers would further mitigate sediment delivery by avoiding water concentration in skid trails and yarding paths. Under the no action alternative, the potential for sediment delivery from landslides would be mitigated by steep slope protections (Chapter 2, Section 2.1.1). In addition, harvest activities can increase turbidity and sedimentation by increasing gully erosion of the channels themselves (Reid et al. 2010). Equipment limitation zones upstream of RMAs and vegetation retention rules for harvest near streams would reduce the potential for water concentration and sediment contribution from channel erosion to small perennial non-fish-bearing streams and seasonal streams. For additional discussion on landslides, see Section 3.2, *Geology and Soils*. Salvage harvest can adversely affect water quality by increasing stream temperature and sedimentation by removing stream shade and increasing surface and channel erosion. Limits on salvage harvest in RMAs per OAR 629-642-0600(3) and prohibition in habitat occupied by listed species would reduce effects of salvage.

Forest road failure and chronic surface erosion has adverse effects on water quality related to delivery of sediment to streams and waterbodies (Boston 2016; Kastridis 2020), increased temperature from vegetation removal, and increased need for herbicides and pesticides for weed and pest control. Approximately 0.5% of the existing road network occurs within 100 feet of a waterbody. Almost 102 miles of road are located within 50 feet of water and almost half of those miles are in the West Fork Millicoma River subwatershed. Almost 260 miles of road are located within 150 feet of water. Appendix 3.3, *Water Resources Technical Supplement*, Table 9, summarizes the total miles of road near water in the permit area for each subwatershed. Native surface roads on steeper slopes, with small culverts, no outsloping, and heavy use are more likely to contribute sediment to streams. Road maintenance decreases sediment delivery to streams and road drainage repair decreases adverse effects on water quality by addressing drainage issues. New road development and road use would likely increase sediment delivery to streams and indirectly increase pesticide or herbicide delivery to streams.

Existing regulation OAR 629-625 specifies road siting, design, and maintenance to reduce sediment impacts on streams. For example, wet-weather road use requires durable surfacing to resist rutting or development of a mud layer that drains to streams (OAR 629-625-0700). Where road surfaces become rutted or covered in mud, the rule requires operators to cease use if the road is causing visible increase in turbidity to fish-bearing streams; salmon, steelhead, and bull trout streams; or domestic water use streams. ODEQ (2022b) requires mitigation of road operation and maintenance and reduction in sediment inputs attributed to legacy roads. Under the no action alternative, anticipated updates to the FPA rules governing road location, design, and standards, as described in Section 3.2.3.1, *Soil Erosion*, and implementation of the Forest Roads Inventory and Assessment (FRIA) process would limit the impact of roads on sedimentation.

Abandoning or decommissioning roads, which could be implemented as part of the FRIA process, would also decrease these adverse effects. Decommissioning roads has a greater beneficial effect than abandoning roads, because it increases infiltration and vegetation and removes fill from flood-prone areas, whereas road abandoning slows drainage feature degradation by reducing traffic.

Depending on their extent and burn severity, prescribed burns in riparian areas can temporarily increase stream temperature, nutrients, sediment, and reduce dissolved oxygen (Ice et al. 2004; Stednick 2010); streams already impaired by these contaminants would be most vulnerable to this activity. Appendix 3.3, *Water Resources Technical Supplement*, contains additional details.

Mechanical vegetation control near streams could decrease water quality by removing vegetation, disturbing soil, and creating potential for chemical spills. OAR 629-615-0200 would mitigate effects (ODF 2021).

As described in Section 3.3.3.2, *Peak Flows and Channel Condition*, the recruitment of large wood to streams is projected to increase over the analysis period from implementation of riparian buffers (RMAs) and steep slope protections. This increased wood recruitment would mitigate the adverse effects of harvest on water quality, including water temperature, nutrients, and dissolved oxygen.

Quarries can increase turbidity, sedimentation, oil and grease, mineral concentration, and pH of surface water by permanently changing the drainage patterns in the local area, decreasing vegetative cover, increasing compaction, and exposing mineral soil. Areas most sensitive to potential effects are waters impaired by temperature, sediment, and naturally occurring minerals, such as iron and arsenic. Under the no action alternative, development of quarries in riparian areas would be allowed, which would increase the risk of water quality impacts. Development and operation of quarries must comply with OAR 629-625-0500, which requires that these facilities be developed and used in such a way that maintains stable slopes and protects water quality.

For all alternatives, compliance with CWA and state regulations (e.g., CWA permitting processes, TMDL requirements, and ODEQ regulations) requires best management practices that are effective in meeting water quality standards or TMDL restoration plans that would minimize and avoid water quality effects from quarries.

Where streams already exceed CWA standards or would be at risk of degradation, ODEQ may require implementation of additional, project-specific best management practices to comply with the CWA, based on plans that manage TMDL allocations as set by ODEQ and as authorized by state regulation ORS 527, OAR 340-041, or other CWA implementation guidance (EPA 2003; ODEQ 2018). Appendix 3.3, *Water Resources Technical Supplement*, contains additional details regarding these regulations.

ODEQ (2022b) expects that implementation of anticipated updates to the Oregon FPA would substantially improve water quality and narrow additional water quality actions needed to meet water quality standards.

Alternative 2: Proposed Action

The types of effects on water quality under the proposed action would be the same as described for the no action alternative, and the same regulatory requirements for CWA and ODEQ compliance would apply.

RCAs would be more likely to prevent direct adverse effects of clearcut and variable density harvest on stream temperature in fish-bearing streams than RMAs under the no action alternative, except where non-fish-bearing streams in the management research watersheds (MRW) outside of the Lower Millicoma River flow into fish-bearing-streams (Table 2-2). Specifically, wider RCAs under the proposed action would likely prevent adverse temperature effects on all perennial and high landslide delivery potential (HLDP) streams in the CRW, the Lower Millicoma mainstem and its contributing perennial and HLDP streams, and on fish-bearing streams in research watersheds partially contained within the MRW except near the confluence with non-fish bearing streams (Leinenbach 2021; Groom et al. 2018). Similarly, RCAs are more likely to reduce adverse effects of clearcut and variable density harvest on stream sedimentation from surface erosion except in streams that are protected by ELZs under the no action.

Reduced potential to induce landslide under the proposed action, as discussed in Section 3.2.3.2, *Shallow-Rapid Landslide*, would result in a corresponding reduction in landslide-related delivery of sediment to streams. Geotechnical review and harvest plan modification on all steep slopes (Condition 11) and RCAs would mitigate sediment delivery to streams from landslide processes. Because Condition 11 and RCAs on HLDP streams are applied to protect coho streams, whereas the no action steep slope protections are applied to protect fish-bearing streams more broadly, the proposed action may be less protective of non-coho streams in the event of landslide.

Wider buffers around HLDP streams could better mitigate adverse effects of peak flows on sediment from channel erosion and temperature by ensuring more large wood is delivered to streams, which provides shade and traps coarse sediment. HLDP buffers may also reduce the amount of fine sediment delivered to the stream through surface erosion by increasing downed wood on hillslopes, which can trap fine sediment. Landslide monitoring required in the HCP's monitoring and adaptive management program (HCP Chapter 6) would improve the ability of management to protect streams from excess fine sediment by providing essential data for adaptive management.

Streams that experience adverse temperature and sediment effects have the potential to transport those effects downstream. Seasonal streams that are not protected as HLDP streams or under Condition 11 under the proposed action could have indirect adverse temperature and sedimentation effects on the perennial and fish-bearing streams they flow in to. Perennial non-fish-bearing and HLDP streams in full MRW watersheds that do not flow into the Lower Millicoma would have higher risk of adverse temperature and sediment effects than the no action alternative for 500 feet upstream of the confluence with salmon, steelhead, and bull trout streams.

Because restoration thinning is more likely to occur under the proposed action, adverse sediment effects wherever ground disturbance from these activities occur within 30 to 50 feet of the stream and adverse temperature effects where shade is reduced would be greater. Adverse temperature effects from reductions in shade would be mitigated locally by leaving downed wood across the stream, which can help with pool formation (Santelmann2022) and by reducing the extent of vigorously growing vegetation (10 to 65 years old), which can reduce transpiration and increase low flows. As with the no action alternative, adverse temperature effects may also be mitigated or avoided according to site conditions, such as cold water sources, water velocity, water depth, aspect, and topographic shading.

At the project level, adverse temperature effects would be limited through compliance with the OAR's Cold Water Protection and Antidegradation rules and the Umpqua Basin temperature TMDL and Tenmile Lakes Watershed TMDL, where they apply. A detailed description of where the OAR and TMDLs apply is provided in Appendix 3.3, *Water Resources Technical Supplement* (*Regulations* section). The extent of stream miles where OAR temperature standards apply may decrease with climate change, as natural stream temperatures increase and summer low flows decrease.

The area actively managed and associated indirect effects of pesticide or herbicide use would be similar to the no action alternative at the subwatershed scale, except in the West Fork Millicoma subwatershed, where total area under active management and potential for impacts would be greater (Appendix 3.3, *Water Resources Technical Supplement*, Table 13).

Adverse effects of salvage harvest on water quality would be less under the proposed action relative to the no action alternative, because salvage harvest would be more restricted.

All road construction, maintenance, and abandonment would be performed in accordance with the FPA rules listed in HCP Section 3.6.1, *Road System Management*. HCP Condition 12, *Road Construction and Maintenance*, includes standards for road construction and maintenance with similar intent to the anticipated FPA updates assumed under the no action alternative. Additionally, the permanent road network in the permit area would not expand by more than 40 miles over the permit term (with spur roads left in place after 5 years counting towards this limit) and there would be no net increase in permanent road miles in the CRW by the end of the permit term (Conservation Measure 3), which would reduce potential for erosion from road management activities compared to the no action alternative. Although greater limits on the extent of the permanent road network compared to the no action alternative would reduce the extent of roads contributing to sedimentation, the amount of sedimentation from existing roads could be greater under the proposed action in the absence of the requirement assumed under the no action alternative to bring all existing roads into compliance, or to decommission them, through the FRIA process. Although projects implemented as a result of the hydrologic connection study included in Conservation Measure 3 would reduce these effects, the measure does not include a commitment to implement these projects.

Additionally, although permanent road density would not increase in the CRW, depending on road system planning, the total number of crossings and the density in a given watershed may either increase or decrease, which could increase or decrease the potential for sedimentation at the subwatershed level. Road density in the permit area and the number of road-stream crossings are summarized in Appendix 3.3, *Water Resources Technical Supplement*, Table 3.

Because road use is expected to be lower due to decreased amount of clearcut harvest, the associated adverse effects on sediment delivery and toxic chemical concentration, such as herbicides and pesticides, would likely be lower under the proposed action than the no action alternative.

Effects of prescribed burning would be the same as the no action alternative. Effects of mechanical vegetation control would be the same as the no action alternative, because they are governed by Oregon FPA rules. Increased recruitment of large wood to streams compared to the no action alternative would better mitigate adverse effects on water quality. Effects of new quarries would be reduced under the proposed action due to restrictions on development in RCAs, limited number, and limits on road construction.

As with all alternatives, management activities must still comply with the CWA. Therefore, management activities may have stricter limitations, based on site-specific conditions, to protect water quality from degrading or to comply with water quality restoration plans.

Based on the increased buffers, increased large wood recruitment, and beneficial effects to low flows in some subwatersheds, and assuming compliance with CWA requirements at the project level, the proposed action would have less adverse effects on water quality than the no action alternative.

Alternative 3: Increased Conservation

Effects on surface water quality under Alternative 3 would be similar to the proposed action, but increased riparian buffer widths on perennial, HLDP, and seasonal streams; increased restrictions on restoration thinning in riparian buffers on steep slopes; reduced clearcut and variable density harvest; reduced associated road use and subsequent need for herbicides or pesticides; increased requirements for decommissioning; and application of the no net increase in permanent road miles to the entire permit area would result in reduced impacts on water quality compared to the proposed action and no action alternative.

Alternative 4: Increased Harvest

Effects on surface water quality, including temperature, sediment, and toxics, under Alternative 4 would be between the proposed action and no action alternative, because the extent of harvested area, level of harvest activity, RCAs, and restrictions on road construction would fall between these alternatives.

3.3.3.5 Groundwater

Alternative 1: No Action

Timber harvest, prescribed burns, and mechanical vegetation removal temporarily increase groundwater recharge at the shallow level (Smerdon et al. 2009), which can increase upwelling (Waswa and Lorentz 2019). Riparian buffers (RMAs) and wood recruitment increase the potential for infiltration to groundwater in and around stream channels during flood events.

Management activities would indirectly increase the potential for fuel spills, transport of other toxic materials from equipment components, and use of pesticides or herbicides, which can infiltrate to shallow groundwater. However, the study area is covered by lower infiltration soils and rocks that are less likely to allow contaminants to penetrate groundwater. The Chemical and Other Petroleum Product Rules and Water Protection Rules of the Oregon FPA (OAR 629) would further reduce effects on groundwater quality.

New road construction would decrease recharge by increasing compaction and decreasing roughness. New roads can also increase groundwater discharge, where road cuts intercept subsurface flow zones and redirect discharge to streams (Goeking and Tarboton 2020). Locations in the permit area where seeps and springs are more common are more susceptible to this effect. Catchments that are already heavily roaded, have steep slopes, and have shallower soils are more susceptible to decreases in recharge, because they are more efficient at draining any intercepted groundwater (Grant et al. 2008). Appendix 3.3, *Water Resources Technical Supplement*, Table 3 provides details regarding road density, slopes, and depth to bedrock.

Road drainage repairs would increase recharge by distributing drainage across the hillside where it can recharge the shallow groundwater. Abandoning and decommissioning roads would increase infiltration by decreasing compaction and increasing cover and roughness on the road surface. Compliance with the Oregon FPA, including anticipated updates, would require roads to be brought into compliance with FPA through implementation of the FRIA process, improving drainage, and could include road abandonment and decommissioning, increasing recharge. Maintaining roads would increase shallow groundwater recharge by restoring proper drainage.

In and around quarries, recharge to groundwater decreases due to increased ground compaction and removal of soil. Quarries can encounter subsurface flow zones, altering subsurface pathways and rates. Quarries located in riparian areas, unconsolidated materials, and on steep hillsides near fault lines are most susceptible to this effect. Operations of these facilities involve heavy equipment fuel and oils that may be transported into groundwater and their development in riparian areas would have an adverse effect on local groundwater recharge and quality.

Alternative 2: Proposed Action

The types of effects on groundwater and regulatory requirements to reduce those effects under the proposed action would be the same as described for the no action alternative, but the degree of effects would differ as described below.

In subwatersheds where there is less maximum equivalent clearcut area than the no action alternative, groundwater recharge would decrease compared to the no action alternative. In subwatersheds where there is greater maximum equivalent clearcut area than the no action alternative, groundwater recharge would increase compared to the no action alternative, unless fog drip is a major factor (Appendix 3.3, *Water Resources Technical Supplement*, Table 14). The area actively managed and associated indirect effects of pesticide or herbicide use would be similar to the no action alternative at the subwatershed scale, except in the West Fork Millicoma subwatershed, where total area under active management and potential for impacts would be greater (Appendix 3.3, *Water Resources Technical Supplement*, Table 13). Expanded riparian buffers (RCAs) and increased wood recruitment would capture more runoff and increase beneficial effects on recharge and upwelling. Increased steep slope protections relative to the no action alternative and monitoring requirements for steep slopes would reduce the potential for change in groundwater discharge and flow paths. The requirement for no net increase in road miles in the CRW would decrease effects of roads on groundwater in this area and the additional requirement in Conservation Measure 3 to study current and legacy roads that pose risks to water quality would inform decisions on road siting and decommissioning.

Alternative 3: Increased Conservation

The types of effects on groundwater and regulatory requirements to reduce those effects under Alternative 3 would be the same as described for the no action alternative and the proposed action, but the degree of effects would differ as described below. Under Alternative 3, maximum equivalent clearcut area is less than the no action alternative in all but three subwatersheds—Little Mill Creek-Umpqua River, East Fork Millicoma River, and Coos Bay (in these subwatersheds, the difference in maximum equivalent clearcut area is less than 1%)—and less than the proposed action in all subwatersheds. (Appendix 3.3, *Water Resources Technical Supplement*, Table 14). Therefore, groundwater recharge, and associated indirect adverse effects on groundwater quality, would decrease in most subwatersheds compared to both the no action alternative and proposed action, with a greater decrease compared to the no action, unless fog drip is a major factor. Expanded riparian buffers (RCAs) and increased wood recruitment would capture more runoff and increase beneficial effects on recharge and upwelling compared to the no action alternative and proposed action. Application of the requirement for no net increase in road miles to the full permit area and the additional requirements for decommissioning would further reduce adverse and increase beneficial road-related effects on groundwater compared to the no action alternative and proposed action.

Alternative 4: Increased Harvest

The types of effects on groundwater and regulatory requirements to reduce those effects under Alternative 4 would be the same as described for the no action alternative, but the degree of effects would differ as described below. Under Alternative 4, maximum equivalent clearcut area is greater than the no action alternative in all but two subwatersheds—Lower Lake Creek and Glenn Creek—and greater than or equal to the proposed action in all subwatersheds (Appendix 3.3, *Water Resources Technical Supplement*, Table 14). Therefore, groundwater recharge, and associated indirect adverse effects on groundwater quality, would increase in most subwatersheds compared to both the no action alternative and proposed action, with a greater increase compared to the no action, unless fog drip is a major factor. Riparian buffers (RCAs) and wood recruitment would be less than the no action alternative; and therefore, the beneficial effects of RCAs and large wood capturing and slowing down runoff, increasing recharge, and increasing upwelling by increasing channel complexity and connectivity to the floodplain would be less than all alternatives. Restrictions on road system management and associated potential for adverse effects would fall between the no action alternative and proposed action.

3.3.3.6 Flood Hazard

Alternative 1: No Action

By disturbing land and removing vegetation, timber harvest, salvage, and prescribed burns—and to a lesser extent, mechanical vegetation control—could affect floodplain functions, such as floodwater storage and conveyance capacity and erosion and sedimentation potential. Riparian buffers would likely cover most of the floodplains in the permit area, because valleys are generally steep and narrow, and RMAs are measured from the edge of the channel migration zone. Riparian buffers and steep slope protections, which would support large wood recruitment. would decrease flood velocities, and control erosion. FPA rules protecting public safety would mitigate risk of debris flows reaching downstream infrastructure.

By compacting soils and adding fill in floodplains and floodways, construction of roads could interfere with the storage and passage of floodwater. A decrease in floodwater storage capacity may increase floodwater levels downstream. Road construction may also result in the redirection of floodwaters, potentially causing erosion in adjacent areas. North Tenmile Lake, Scholfield Creek, and Tenmile Lake–Tenmile Creek have the most NRCS-classified floodplain of any study area subwatersheds, and West Fork Millicoma River has the most miles of road in the FEMA special flood hazard area; therefore, these subwatersheds may be the most likely to experience effects.

Road maintenance, road drainage repair, and abandoning or decommissioning roads can reduce the adverse effects on flood hazards by improving drainage features and increasing infiltration and flood conveyance capacity, which can decrease velocities, scour, and flood surface elevation. Compliance with the Oregon FPA, including anticipated updates, would require roads to be brought into compliance with the FPA through implementation of the FRIA process, improving drainage, and could include road abandonment and decommissioning. Compliance with the state and federal regulations governing development in floodplains would mitigate the effect of road system management on flood hazard.

Quarries built in floodplains would increase flood hazards by placing and removing fill in floodplains. State and federal floodplain regulations, which apply to all alternatives, such as OAR 141-085, Section 10 of the Rivers and Harbors Act, CWA, and executive orders, would minimize adverse effects.

Alternative 2: Proposed Action

The types of effects on flood hazard under the proposed action would be the same as described for the no action alternative, but the degree of effects would differ as described below. Increased riparian buffers and large wood recruitment compared to no action would further decrease flood velocities and control erosion. In addition to FPA rules protecting public safety, which would mitigate risk of debris flows reaching downstream infrastructure, wider RCAs and increased steep slope protections would mitigate risk by protecting more large material that is less likely to flow downstream and more likely to trap material. The landslide monitoring program would provide information to enable managers to reduce the risk of landslide effects. Limiting the increase in the permanent road network could limit interference with the storage and passage of floodwater and associated effect on floodwater levels downstream and reduce erosion associated with roads. Requiring no net gain in CRW roads by the end of the permit term would likely reduce flood risk and the additional requirement in Conservation Measure 3 to study current and legacy roads that pose risks to water quality would inform decisions on road siting and decommissioning.

Alternative 3: Increased Conservation

The types of effects on flood hazard under Alternative 3 would be the same as described for the no action alternative, but the degree of effects would be less than under the no action alternative and proposed action because of the reduction in harvestable area, additional requirements for decommissioning, and application of the no net increase in road miles requirement to the full permit area.

Alternative 4: Increased Harvest

The types of effects on flood hazard under Alternative 4 would be the same as described for the no action alternative but the degree of effects would differ as described below. Erosion control and associated decreased flood velocities from riparian buffers and large wood recruitment would fall between the no action and proposed action. Restrictions on road system management and associated potential for adverse effects would fall between the no action alternative and proposed action.

3.4 Vegetation

3.4.1 Methods

The study area for vegetation consists of the permit area, where vegetative cover, wetlands, and special-status plant species could be affected (directly or indirectly) under the proposed action and alternatives.

Forest stand age projections were developed by applying harvest and thinning treatments under the proposed action and alternatives, described in Section 3.1.3, *Areas Available for Harvest*, to age data from the stand-level inventory (ODF 2015) over the analysis period. For no-harvest and restoration thinning areas (Table 3.1-1), stands were projected to continue to grow older throughout the analysis period. Though trees would be removed in restoration thinning areas, stands would be dominated by older trees, as these trees would be retained. For variable density harvest areas, half of stands over 60 years but under 150 years (as of 2020) were returned to age 0 after harvest from three entries over the permit term. The other half of these stands were grown forward along with stands under 60 years of age. In the extensive treatment areas, stands over 150 (as of 2020) were also grown forward. For clearcut areas, stands aged 60 and up were returned to age 0 after clearcut. The stand age projections do not reflect future climate change, disturbance events, or post-disturbance forest management. Projected effects of climate change on stand age are described based on Section 3.7, *Climate Change*. Changes in stand age from salvage harvest were evaluated qualitatively based on differences in management activities.

Changes in forest structure were evaluated based on the stand age projections as well as on differences in management activities allowed under the alternatives (e.g., thinning, salvage harvesting, prescribed burns).

Changes to riparian vegetation structure and age were assessed based on the differences in riparian buffer widths and management restrictions under the alternatives. The potential for spread of invasive weeds in the study area was assessed qualitatively based on anticipated differences in extent and timing of ground-disturbing activities under the alternatives. Impacts on special-status plant and fungus species were evaluated by identifying documented species occurrences in the study area and the species potential habitat in areas of ground-disturbing activities under the alternatives. Finally, effects on wetlands were evaluated by overlaying mapped wetlands on expected forest management activities under the alternatives.

3.4.2 Affected Environment

3.4.2.1 Forest Structure and Age

The study area is currently dominated by conifer stands—where conifer species comprise at least 30% of the canopy cover in the stand—with a minority of hardwood stands largely found in riparian areas (DSL and ODF 2011:133). These hardwood stands (dominated by red alder and then big leaf maple) comprise roughly 28% of the canopy cover in the study area (DSL and ODF 2011:82) with the remaining canopy cover dominated by conifer species, primarily Douglas-fir.

Current stand age distribution falls into three groups based on previous forest management activities and disturbance events.

- Approximately 41,000 acres of forest stands 65 years or younger (OSU 2020:2-16). These stands were part of the cycle between clearcutting and regrowth or management largely starting in 1955 to generate revenue under the Common School Fund. They consist largely of densely planted Douglas-fir stands with some red alder, western hemlock, and western redcedar and limited to no understory. Based on age and structure these would be considered early-seral to mid-seral[1] forests.
- Between 5,000 and 10,000 acres of forest stands are largely between 100 and 160 years old (OSU 2020:2-16). These stands regenerated after natural disturbance events that remove up to 30% of the total tree volume. They were thinned after 1957 with limited clearcut harvests resulting in conversion to Douglas-fir plantations in some areas. Overall, these stands are expected to reflect advanced forest structure whereby large trees are present, significant downed woody debris has begun to accumulate, and a diverse, vertically layered understory is present (DSL and ODF 2011:176). Over time disturbance events may create new openings for understory and tree seedling growth as well as large wood sliding from upslope into riparian areas resulting in late-seral forests.
- Between 30,000 and 35,000 acres of forest stands between 80 and 230 years old, 71% of which are between 130 and 160 years old (OSU 2020:2-16). This includes late-seral stands regenerated after the 1868 fire and subsequently left unmanaged and old growth stands that predate the 1868 fire. Old growth stands comprise multilayered canopies with large living trees, a number of snags or broken tops, and heavy accumulation of downed wood. Over time disturbance events would be expected to create new openings and potentially migrate large wood similar to what is described above.

In addition to forest management activities, disturbance events such as fires, windstorms, and landslides have historically shaped and will continue to shape the forest landscape in the study area. The Coos Bay fire of 1868 burned 90% of the study area. However, with current fire suppression throughout the study area and the moist climate on the western slopes, wildfires have not been a major source of disturbance in the study area (DSL and ODF 2011:2-24; OSU 2020:3-28). Severe windstorms are more common in the study area, leveling large swaths of forest land leaving all organic matter in place (DSL and ODF 2011:2-25 to 2-26; Washington Department of Natural Resources 2017:17). Historically, salvage logging after disturbance events was conducted prior to planting and no large conifers or fallen trees were maintained along riparian corridors, resulting in low levels of wood recruitment along stream channels and little to no standing dead or understory complexity (DSL and ODF 2011:4-38; Pacific Northwest Research Station 2007).

Tree mortality can arise from fungus such as laminated root rot (*Phellinus weirii*), as well as native pathogens and pests like Swiss needle cast and the Douglas-fir bark beetle (*Dendroctonus pseudotsugae*), respectively. These insects and diseases result in patches of dead or dying individual trees or groups of trees within the landscape. Though insects and diseases continue to affect some

[1] Early-seral forest stands are generally between 0 and 30 years of age; mid-seral forests between 30 and 80 years of age, but can be as old as 120 years; late-seral forest stands are between 91 and 199 years; and old growth forests are 200 years and over. See Appendix 3.4, *Vegetation Technical Supplement*, for a more detailed discussion of seral forest structure.

areas overall, the study area does not appear to have had a major outbreak in recent history, with the Douglas-fir bark beetle being the most significant pest (DSL and ODF 2011:2-25 to 2-37).

As described in Section 3.7, *Climate Change*, climate change is expected to result in an extended growing season, which could increase vegetation growth rates. However, drought and prolonged heat waves could result in widespread vegetation mortality and could decrease growth in water limited areas. Disturbance events may also remove or damage vegetation. Major events, especially stand-replacing events, would reduce overall forest stand age and structural complexity in the study area.

3.4.2.2 Invasive Weeds

Invasive plant species affect the forest structure by outcompeting native species, reducing the biological diversity in the shrub and herbaceous layers. Three invasive plant species have been documented in the study area. Tansy ragwort (*Senecio jacobaea*) is scattered throughout the study area with isolated occurrences of Armenian blackberry (*Rubus armeniacus*) and butterfly bush (*Buddleja davidii)*. However, scotch broom (*Cytisus scoparius*) and other invasives immediately border the study area, especially along the eastern border, on federal and privately owned land, and are an emerging problem (Oregon Department of Agriculture 2019; DSL and ODF 2011:101).

3.4.2.3 Special-Status Plant and Fungus Species

Twenty-one plant species and three fungus species were identified as federal or state-listed threatened, endangered, or species of concern or had a conservation status of imperiled or critically imperiled and were documented in Douglas and Coos Counties and in the Coast Region (Oregon Biodiversity Information Center 2019). Of these, five may occur in the study area based on historical documentation and potential range and habitat type (Appendix 3.4, *Vegetation Technical Supplement*, Table 2). None are federal or state-listed threatened or endangered. Appendix 3.4, Tables 2 and 3 list and describe all plants and fungi and their likelihood of occurring in the study area.

3.4.2.4 Wetland Vegetation

Wetlands comprise approximately 2.6% of the total study area. Riverine systems are the most common wetland type (approximately 91% of total wetland acreage) in the study area; freshwater forested/shrub wetlands are the second most common (5%). Riverine systems include wetlands and deepwater habitats contained within a defined channel; freshwater forested/shrub wetlands are areas dominated by woody vegetation, including shrubs, saplings, or trees such as willows (Cowardin et al. 1979). Existing protections and regulations, and related forest management practices are discussed in Appendix 3.4, *Vegetation Technical Supplement*.

3.4.3 Environmental Consequences

3.4.3.1 Forest Age and Structure

Alternative 1: No Action

Under the no action alternative, timber harvest, thinning and tree selection, reforestation, salvage harvest, and prescribed burns would affect forest stand age and structure in the study area.

As described in Section 3.1, *Introduction*, forest management activities would be restricted in take avoidance areas. In no-harvest areas (approximately 47,303 acres or 57% of the study area), forest stands which are primarily Douglas-fir would increase in age and develop fully closed canopy and complex forest structures such as snags and woody accumulation over the analysis period. Outside of these no-harvest areas, additional harvest practices would occur for maintenance of suitable habitat for northern spotted owl (*Strix occidentalis*) and in riparian management areas (RMAs). Variable density harvest would occur in areas identified as suitable habitat for the northern spotted owl (approximately 2,735 acres of primarily Douglas-fir or 3% of the study area). Restoration thinning would be allowed in RMAs (2,236 acres of mixed hardwood and Douglas-fir or 3% of the study area). Forest stands where variable density harvest or restoration thinning would occur would increase in age and complexity of forest structure over the period of analysis. If DSL were to conduct restoration in RMAs, the health and function of treated areas would be expected to improve by reducing stand density and increasing plant diversity and canopy height. Natural disturbance events in all of these forest management areas would create gaps and patches in the forest canopy likely resulting in a multilayered overstory, greater understory development, and increase in plant diversity over time.

Clearcut harvest would be allowed outside of the areas described above (approximately 30,268 acres or 37% of the study area). Based on the assumptions presented in Section 3.1, *Introduction*, and the forest stand age projections, up to 13% of forest stands would be clearcut over 20-year intervals of the analysis period. Stands clearcut in the first 20 years would range between 65 and 200 years old; thereafter, it is expected that they would be harvested at about 60 years. DSL would adhere to Oregon Forest Practices Act (FPA) retention standards of at least two trees per acre remaining after clearcut.

In areas available for clearcut harvest, reforestation would occur following harvest. Thinning and tree selection would occur prior to clearcutting to allow certain trees to become larger to optimize timber production. For example, during hardwood release practices, red alders are removed to ensure conifer dominance. These practices tend to reduce understory biodiversity through spraying of herbicides, mechanical removal, or other activities destructive to vegetation.

Over the analysis period, the no action alternative would result in a patchwork of clearcuts and younger replanted stands around the older Douglas-fir forest stands in take avoidance areas across the study area. By the end of the analysis period, the study area is projected to comprise 24% early-seral forest (stands 0–30 years), 15% mid-seral forest (stands 31–90 years), 22% late-seral forest (stands 91–200 years), and 39% old growth (stands over 200 years) (Appendix 3.4, *Vegetation Technical Supplement*, Table 1).

Given the continued potential for disturbance events and the projected increased frequency, duration, and extent of certain disturbance events with climate change (e.g., fire) (Section 3.7, *Climate Change*), post-disturbance salvage harvest could substantially alter the structure described above, by removing standing dead trees and reducing understory complexity (Pacific Northwest Research Station 2007). In the case of stand replacing events, where large areas of standing live trees are harvested, stand age would be reduced. Salvage harvest in RMAs would be limited per OAR 629-642-0600(3) and would be prohibited in habitat occupied by listed species. These RMA restrictions conserve stream shade, woody debris, and bank stability while creating favorable conditions for establishment of new, healthy riparian stands.

Prescribed burns of slash piles on landings following harvest could be conducted throughout the study area. Other types of burns may be used infrequently, including broadcast burns for site preparation prior to planting and underburns for fuel reduction. Prescribed burns would be conducted per the requirements of Oregon FPA 629-615-0300. These burns would result in nutrient release, fuels reduction, and decreased understory structure, but would not be expected to change stand age or dominant stand species. Best management practices would reduce impacts on long-term health of the understory.

Alternative 2: Proposed Action

Under the proposed action, the same type of forest management activities described under the no action alternative would affect forest stand age and structure in the study area.

In intensive treatment areas in the management research watersheds (MRW) (approximately 14,385 acres or 17% of the study area), clearcut harvest would occur on an approximate 60–65-year rotation resulting in up to 4% of forest stands removed over 20-year intervals, based on the forest stand age projections. Stands harvested would largely comprise densely planted Douglas-fir mid-seral forest, approximately 60 to 70 years of age. Retention standards would be the same as under the no action alternative. Reforestation following clearcut harvest would result in densely planted Douglas-fir stands, which would be thinned over time to optimize timber harvest similar to the no action alternative. Clearcut harvest would not occur outside of the intensive treatment areas.

In the extensive treatment areas in the MRW (approximately 13,474 acres or 16% of the study area), variable density harvest would remove between 20 and 80% of pre-harvest relative stand density with the goal of producing mixed-age stands with layered canopies. Large mature trees with complex canopy structures or complex early-seral forest stands would be retained. Based on this prioritization, the extensive treatment areas are projected to consist of 28% early seral stands, 43% mid-seral stands, 25% late-seral forest and 4% old growth forest by the end of the analysis period, based on the forest stand age projections.

In the MRW reserves, approximately 14,000 acres or 17% of the study area, harvest activity would be limited to restoration thinning in densely planted Douglas-fir stands under 65 years of age (as of 2020). These stands make up to roughly 1,900 acres or 14% of reserves in the MRW. Restoration thinning would occur primarily during the first 20 years of the analysis period, but potentially later in the permit term if needed, with the intent of promote late-seral forest conditions including reducing Douglas-fir stand density, removing red alder stands, and increasing forest structure complexity. Extensive reserves, roughly 144 acres or 0.2% of the study area, are those stands within the MRW identified as predating the 1868 fire. No timber harvest, including restoration thinning, would occur within the extensive reserves. At the end of the analysis period, the stands in the MRW reserves are expected to have increased structural complexity and canopy coverage. Based on the reserve distribution and locations (Figure 2-2), these stands would collectively result in improved vegetative corridors in the study area which would then increase vegetation permeability, or the ability for plant species to spread or move across a landscape and reduce stand fragmentation. Based on the forest stand age projections, by the end of the analysis period, the MRW reserve areas are projected to consist of 77% late-seral stands and 23% old growth stands with no early or mid-seral stands.

In the conservation research watersheds (CRW), comprising 34,140 acres or 42% of the study area and including the CRW RCAs, harvest activity would be limited to restoration thinning in stands 65 years of age or less as of 2020. These stands make up to roughly 12,500 acres or 37% of the CRW.

Restoration thinning would be aimed at accelerating late-seral forest conditions and would primarily occur in the first 20 years of the permit term, with the potential for subsequent entries with concurrence from the Services if it is determined that additional thinning would further benefit the covered species. Thinning methods and timing described for the MRW reserves would also be used here. By the end of the analysis period, the CRW would establish a large block of late-seral to old growth forest over a range of environmental gradients or elevations. This range of environments could increase the forestland resiliency when considering climate change as some plant species may be able to migrate to cooler, higher elevations if needed (Buttrick et al. 2015). In addition, this large block would reduce fragmentation or forest border area increasing resiliency to potential for windthrow (Somerville 1980).

RCAs would comprise 15,991 acres (19% of the study area) of largely hardwood or Douglas-fir stands aging across the analysis period. Restoration thinning could occur in the RCAs but would only occur where necessary to support and enhance long-term ecological function. Fifteen to 20% of trees cut within 120 feet from a waterway would be placed in the stream with the remainder left in the RCA; trees more than 120 feet from a waterway could be used for commercial harvest. Only plantation-like stands aged 65 years or less in 2020 on stable ground (not in landslide-prone steep or unstable conditions) would be considered for thinning (HCP Section 3.3.4, *Riparian Conservation Areas*). RCAs in the CRW that meet the criteria described above could be thinned in the first 20 years of the analysis period. Whereas, RCAs in the MRW that meet those criteria could be thinned as needed throughout the analysis period to support research objectives such as wood recruitment. Benefits to riparian forest structure in the RCAs in the CRW and MRW would be similar to those described under the no action alternative in the RMAs. However, these benefits would be greater when compared to the no action alternative due to the expanded area of riparian protections (Tables 2-1 and 2-2) and broader implementation of restoration thinning under the proposed action (Conservation Measure 1).

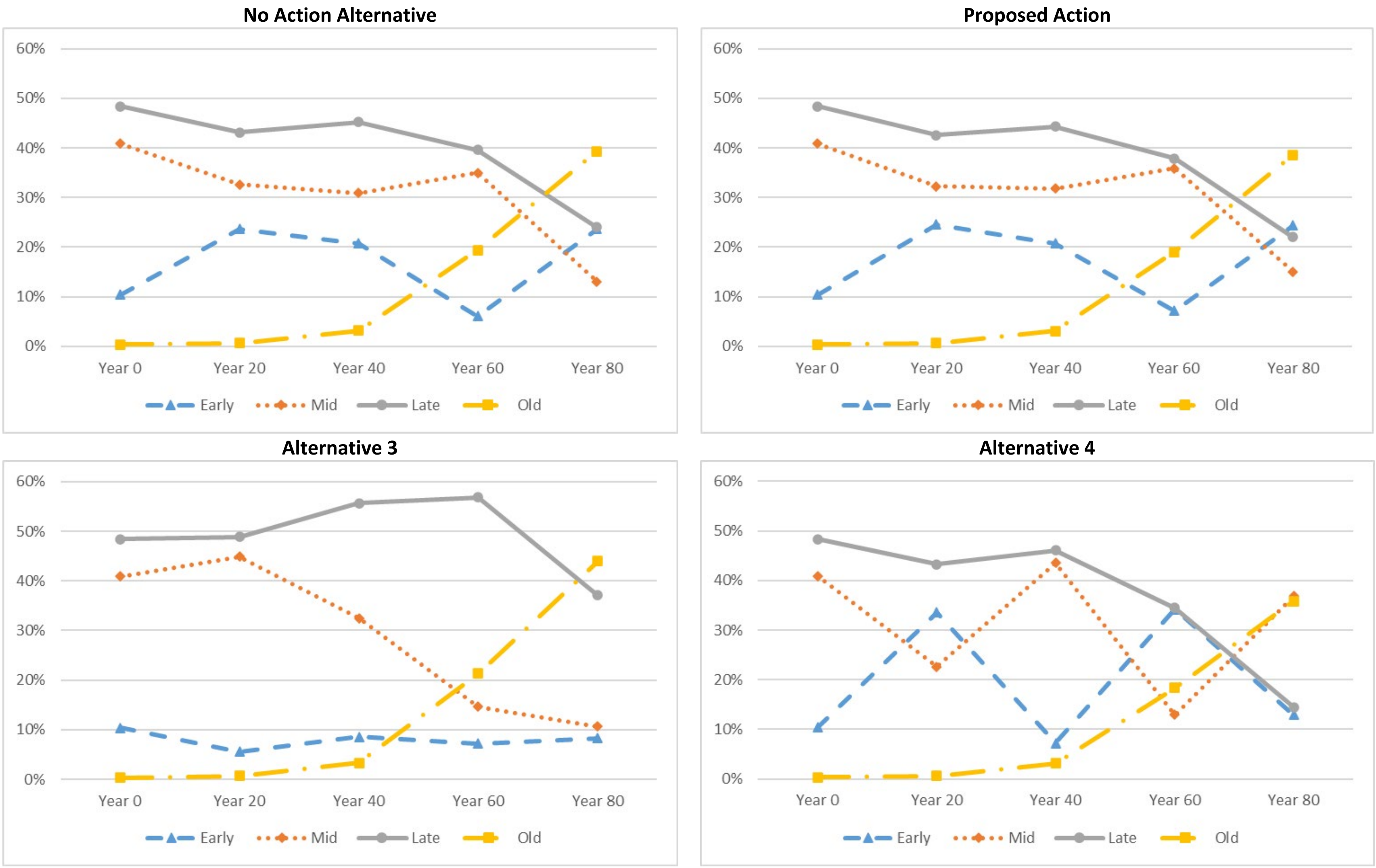
Based on the forest stand age projections, by the end of the permit term, the study area is projected to comprise 11% early-seral forest, 18% mid-seral forest, 30% late-seral forest, and 41% old growth (Figure 3.4-1, Appendix 3.4, *Vegetation Technical Supplement*, Table 1).

Under the proposed action, salvage harvest in response to disturbance events would be prohibited in reserves[2] and RCAs, which would reduce the effects of salvage harvest described under the no action alternative.

Prescribed burns may be used in specified conditions to accomplish research objectives but would not be allowed in RCAs. These burns would follow the same Oregon FPA requirements and best management practices as described under the no action alternative and would result in the same effects where implemented.

[2] Salvage of dead trees may occur in reserves if an introduced insect or disease are documented in an attempt to control spread.

Figure 3.4-1. Projected Seral Stages of Forest Stands in Study Area Over the Analysis Period



Alternative 3: Increased Conservation

Forest management activities described under the no action alternative would affect forest stand age and structure in the study area under Alternative 3. Treatment types (intensive, extensive, reserves, and RCAs) would largely be the same as those described under the proposed action with some modifications to covered activities and conservation strategy. Specifically, Alternative 3 would increase the no-harvest and reserve areas as well as the minimum RCA buffers (Table 3.1-1). This would result in the following: the area available for clearcutting and variable density harvest would be less than the proposed action and alternatives and the area of restoration thinning would be less than the proposed action but greater than Alternative 4 and the no action alternative. Based on the forest stand age projections, over the permit term, up to 3% of forest stands could be clearcut over a 20-year interval (compared to 13% under the no action alternative, and 4% under the proposed action).

RCAs would comprise 21,361 acres (26% of the study area) compared to roughly 16,000 acres designated as RCAs under the proposed action and 6,981 acres of designated RMAs under the no action alternative. Therefore, Alternative 3 would provide the most benefits to riparian forest structure when compared to the proposed action and alternatives.

Based on the forest stand age projections, by the end of the permit term, the study area is projected to comprise 8% early-seral forest, 11% mid-seral forest, 37% late-seral forest, and 44% old growth (Figure 3.4-1; Appendix 3.4, *Vegetation Technical Supplement*, Table 1).

Increased area of reserves and RCAs under Alternative 3 would reduce potential salvage harvest and related effects compared to the proposed action and no action.

As under the proposed action, prescribed burns may be used in specified conditions to accomplish research objectives but would not be allowed in RCAs. Their implementation would be more limited due to the increased areas of RCAs under Alternative 3. These burns would follow the same Oregon FPA requirements and best management practices as described under the no action alternative and would result in the same effects where implemented.

Alternative 4: Increased Harvest

Forest management activities described under the no action alternative would also affect forest stand age and structure in the study area under Alternative 4. Treatment types (intensive, extensive, reserves, and RCAs) would be the same as those described under the proposed action. However, the reduction in reserves would change the area available for harvest (Table 3.1-1) as follows: area of clearcutting would be greater than the proposed action and Alternative 3 but less than the no action; area of variable density harvest would be greater than the proposed action and alternatives; and the area of restoration thinning would be less than the proposed action and Alternative 3 but greater than the no action. Based on the forest stand age projections, over the permit term, up to 24% of forest stands could be clearcut over a 20-year interval (compared to 13% under the no action alternative and 4% under the proposed action).

RCAs would comprise 9,650 acres (12% of the study area) compared to roughly 16,000 acres designated as RCAs under the proposed action and 6,981 acres of designated RMAs under the no action alternative. Therefore, Alternative 4 would provide more benefits to riparian forest structure when compared to the no action alternative but less when compared to the proposed action.

By the end of the permit term, the study area is projected to comprise 13% early-seral forest, 37% mid-seral forest, 14% late-seral forest, and 36% old growth (Figure 3.4-1; Appendix 3.4, *Vegetation Technical Supplement*, Table 1).

The area available for salvage harvest in response to disturbance events and associated level of effects under Alternative 4 would be similar to the no action alternative.

Use and restrictions on prescribed burns under Alternative 4 would be the same as under the proposed action, but the area available for prescribed burns would be greater due to the reduced extent of RCAs. These burns would follow the same Oregon FPA requirements and best management practices as described under the no action alternative and would result in the same effects where implemented.

3.4.3.2 Spread of Invasive Weeds

Alternative 1: No Action

Activities that remove vegetation and cause ground disturbance would create the opportunity for spread of invasive weeds. Under the no action alternative, DSL would implement best management practices to reduce the spread of invasive weeds as required under the noxious weed law (Oregon Revised Statute 569, OAR 603-052). These would likely include periodically washing seeds, plants, and mud from heavy equipment and agency vehicles and equipment; mechanical removal of invasive plants; and chemical spot treatment.

Of the harvest methods, clearcutting would remove the most vegetation and have the greatest disturbance per acre and therefore the greatest potential for invasive species to repopulate the disturbed area. Invasive species typically outcompete native species at newly clearcut sites. Variable density harvest would have similar effects to clearcutting but to a lesser extent. In areas subject to thinning only, ground disturbance from heavy equipment and staging areas would also create the opportunity for spread of invasive weeds but to a lesser extent than the other harvest methods.

Road construction and maintenance could act as potential corridors spreading invasive species by either creating or maintaining disturbed shoulders along which weeds could colonize. Under the no action alternative, road construction and maintenance would increase the opportunity for spread of invasive weeds, while abandonment and decommissioning, which could be implemented through the Forest Road Inventory and Assessment process, would reduce these effects.

Removal of vegetation as part of quarry construction and communication lookout site maintenance would also have the potential to introduce and spread invasive weeds, but to a lesser degree than harvest and road construction because the locations of these activities would be isolated and have much smaller footprints. Compliance with OAR 660-023-0180 would minimize effects of quarry development siting on high-quality vegetation reducing the potential for spread of invasive species into areas of high-quality vegetation.

Alternative 2: Proposed Action

The same activities described for the no action alternative would create the opportunity for spread of invasive weeds under the proposed action, and the same noxious weed laws and Oregon FPA rules would apply.

Clearcutting (intensive areas) would affect substantially less area under the proposed action (17%) than the no action alternative (37%), while variable density harvest and restoration thinning would affect more area—16 and 21% respectively under proposed action (compared to 3% for both under the no action). Because clearcutting poses the greatest risk of invasive species spread, the substantial decrease in area of clearcut compared to the no action would reduce risk of weed spread. Although the area of available variable density harvest and thinning would be greater than under the no action alternative, these activities have a lower potential for impact than clearcutting. In addition, most of the areas of restoration thinning would be limited to the first 20 years of the analysis period, further limiting the potential for impact over the analysis period.

Road system management would have the same type of effects as described for the no action alternative. However, the proposed action limits construction of new permanent roads (with spur roads left in place after 5 years counting toward this cap) and no net increase in permanent roads in the CRW would reduce the potential for invasive weed spread compared to the no action alternative. While active road shoulders can be corridors for invasive species, abandoned or unmaintained roads also have the potential to be colonized by weedy species. Additional restrictions on road construction and maintenance (Conservation Measure 1 and Conservation Measure 3) would also reduce vegetation removal and thereby reduce the potential to spread invasive weeds.

Potential spread of invasive weeds from quarry construction, communication lookout site maintenance, and mechanical vegetation control would be similar to the no action alternative.

Alternative 3: Increased Conservation

The same activities described for the no action alternative would create the opportunity for spread of invasive weeds under Alternative 3, and the same noxious weed laws and Oregon FPA rules would apply.

Clearcutting (intensive areas) would affect less area under Alternative 3 than other alternatives (13% of the permit area, compared to 37% under the no action alternative and 17% under the proposed action), while variable density harvest and restoration thinning would affect more area than the no action alternative but less than the proposed action and Alternative 4 (Table 3.1-1). Therefore, the risk of spreading invasive weeds from harvest and thinning activities would be lowest under Alternative 3.

Broader application of the requirement for no net increase in permanent roads to the entire permit area under Alternative 3 would further reduce the potential for spread of invasive weeds from road system management compared to the proposed action and no action alternative. Potential for spread of invasive weeds from quarry construction, communication lookout site maintenance, and mechanical vegetation control would be similar to the no action alternative and proposed action.

Alternative 4: Increased Harvest

The same activities described for the no action alternative would create an opportunity for spread of invasive weeds under Alternative 4. The same noxious weed laws and Oregon FPA rules would apply.

Clearcutting (intensive areas) would affect less area under Alternative 4 (31% of the permit area) than the no action alternative (37%) but more area than the proposed action (17%). Variable density harvest would affect more area than other alternatives and restoration thinning would affect more area than the no action alternative but less than the proposed action and Alternative 3 (Table 3.1-1). Therefore, the risk of spreading invasive weeds from harvest and thinning activities would be between the no action and proposed action.

Restrictions on road system management and the related potential for spread of invasive weeds from these activities would fall between the proposed action and no action alternative, as Alternative 4 would retain the 40-mile cap but would not have the no net increase requirement. Potential for spread of invasive weeds from quarry construction, communication lookout site maintenance, and mechanical vegetation control would be the same as described for the no action alternative.

3.4.3.3 Special-Status Plant and Fungus Species

As noted in Section 3.4.2.3, *Special-Status Plant and Fungus Species*, there are no state or federal listed plant or fungus species likely to occur in the study area. However, under all alternatives, forest management activities that cause ground disturbance, including harvest, thinning, and infrastructure construction, would have the potential to affect five rare or imperiled plant and fungus species in the study area (Appendix 3.4, *Vegetation Technical Supplement*, Table 2) through habitat removal and degradation. Clearcutting followed by variable density harvest would have greatest level of ground disturbance and, therefore, the greatest potential to affect plant and fungus species of concern. While restoration thinning would also result in ground disturbance, this disturbance would be less than harvest activities and so would have less potential to affect plant and fungus species of concern. Of five species, three are associated with forested habitats—tall bugbane, *Glomus pubescens*, and *Hydropus marginellus*—and have the greatest potential to be affected by harvest activities. As noted in Section 3.4.3.2, *Spread of Invasive Weeds*, clearcutting would have the greatest disturbance per acre, followed by variable density harvest and restoration thinning. The area available for clearcut would be greatest under the no action alternative, followed by Alternative 4, then the proposed action, and least under Alternative 3. Based on this, the no action alternative and Alternative 4 would have the greatest potential to affect rare or imperiled plant or fungus species, Alternative 3 would have the least potential, and the potential for effects under the proposed action would fall in between.

3.4.3.4 Wetland Vegetation

Alternative 1: No Action

Any removal of vegetation from harvest activities in wetlands has the potential to reduce wetland function since vegetation helps reduce flow, improves water quality, and adds to habitat. Timber harvest is likely to occur in Douglas-fir stands, which are only occasionally found in wetlands and typically prefer drier, upland habitat (Lichvar et al. 2016). Therefore, timber harvest is unlikely to occur in wetlands, reducing the potential for effects on wetland vegetation or function. However, staging activities occurring adjacent to harvested stands could affect wetland vegetation or wetland function. Staging related to harvest, timber harvest, or thinning could occur on up to 814 acres (40% of wetlands, primarily riverine) in the study area. These effects on wetlands would be minimized through compliance with OAR 629-655 (Appendix 3.4, *Vegetation Technical Supplement*). Salvage harvest in response to disturbance events would have the potential to affect additional wetland areas in the study area with the exception of areas where salvage is restricted in RMAs and areas occupied by listed species.

Roads and quarries are unlikely to be constructed in existing wetlands because it would require converting wetlands to upland, which would require additional permitting and mitigation under Clean Water Act Section 404 to ensure no net loss of wetlands. Lookout communication sites are unlikely to be in wetlands, as wetlands are typically found in low-lying areas or depressions which are not compatible with lookout sites. Therefore, lookout communication site maintenance is unlikely to affect wetland vegetation. Road maintenance would remove vegetation from road shoulders, but these effects would be minimal.

Alternative 2: Proposed Action

The types of effects on wetlands and minimization of effects through compliance with OAR 629-655 would be the same as under the no action alternative. Ground-disturbing activities related to harvest and thinning could affect similar acreage (894 acres or 42%) of wetlands (primarily riverine) under the proposed action when compared to the no action alternative.

The prohibition of salvage harvest in the CRW, MRW reserves, and RCAs, as well as restrictions in extensive areas would reduce potential post-disturbance effects of these activities on wetlands compared to the no action. No effects are expected from road or quarry construction or lookout communication sites maintenance for the reasons described under the no action alternative.

Alternative 3: Increased Conservation

The types of effects on wetlands and minimization of effects through compliance with OAR 629-655 under Alternative 3 would be the same as under the no action alternative. Ground-disturbing activities related to harvest and thinning could affect similar acreage (894 acres or 42%) of wetlands as compared to the proposed action and no action alternative.

Potential post-disturbance effects of salvage activities on wetlands would be less than the proposed action and no action alternative. Prohibitions and restrictions on salvage harvest would be the same as described under the proposed action, but would apply to a broader area, which would reduce the effects of salvage harvest compared the proposed action and no action alternative. No effects are expected from road or quarry construction or lookout communication sites maintenance for the reasons described under the no action alternative. Overall potential for wetland vegetation effects would be the lowest under Alternative 3.

Alternative 4: Increased Harvest

The types of effects on wetlands and minimization of effects through compliance with OAR 629-655 under Alternative 4 would be the same as under the no action alternative. Ground-disturbing activities related to harvest and thinning could affect similar acreage of wetlands as the proposed action and no action alternative. Prohibitions and restrictions on salvage harvest would be the same as described under the proposed action, but would apply to a reduced area, which would increase potential effects on wetlands compared to the proposed action but still reduce effects compared to the no action alternative. No effects are expected from road or quarry construction or lookout communication sites maintenance for the reasons described under the no action alternative. Overall potential for wetland vegetation effects under Alternative 4 would be between the no action alternative and proposed action.

3.5 Fish and Wildlife

3.5.1 Methods

The study area for fish and stream-dependent wildlife includes the streams and other waterbodies that could be affected (directly or indirectly) by forest management activities under the proposed action and alternatives. These include streams in the permit area and downstream of the permit area (the Umpqua River, Tenmile Creek and Lake, and streams leading to Coos Bay downstream of the permit area streams).

The study area for forest-dependent and wetland and riparian habitat-dependent wildlife consists of the areas where these resources could be affected directly and indirectly by the proposed action and alternatives. This includes the permit area, where forest management activities would occur, and a 1-mile buffer surrounding the permit area to encompass northern spotted owl home ranges extending beyond the permit area and potential effects extending beyond the immediate area of activities such as noise or habitat fragmentation. For fish and other stream-dependent wildlife, the analysis considered effects on the covered species, as well as other federally listed species, Oregon Department of Fish and Wildlife (ODFW) state sensitive species, native species listed in the Oregon Biodiversity Center database, and species of recreational, cultural, or ecological significance with the potential to occur in the study area.

The analysis of effects on fish and stream-dependent wildlife species considered activities in the study area including timber harvest (and other types of harvest) and other covered activities, as well as protected areas and other conservation actions in terms of their effect on stream and riparian habitat among alternatives. In some cases, spatial differences in activities within the study area were distinct and conclusions were drawn relative to watersheds. Sections 3.2, *Geology and Soils*, 3.3, *Water Resources*, 3.4, *Vegetation*, and 3.7, *Climate Change*, informed assessment of effects on fish and stream-dependent wildlife.

Federally listed species, candidate species, and designated critical habitats were identified through the FWS's IPaC map tool (FWS 2022), and state-listed and sensitive species were obtained from Oregon Department of Fish and Wildlife (ODFW) websites (ODFW 2016, 2021a, 2021b).

The analysis of impacts on forest-dependent and wetland and riparian habitat-dependent wildlife relied primarily on the vegetation analysis described in Section 3.4, *Vegetation*, and existing literature correlating forest structure with habitat requirements, as described in Section 3.5.2, *Affected Environment*. Effects of forest management practices were assessed quantitatively by evaluating forest growth and stand age over time as described in Sections 3.1, *Introduction* and 3.4, *Vegetation*. Changes in retention of snags and downed wood/woody debris were assessed qualitatively based on descriptions of the policies and requirements under each alternative, in addition to literature on changes in snag and woody debris availability with forest succession and information in Section 3.4, *Vegetation*. Effects of road management and quarries were assessed qualitatively based on descriptions of the policies and requirements under each alternative. Visual and noise effects of covered activities on forest-dependent and wetland and riparian habitat-dependent wildlife were assessed qualitatively based on information related to the types and locations of covered activities and literature and knowledge related to their effects on wildlife.

3.5.2 Affected Environment

This section describes the species in the study area that are evaluated in the EIS and the habitats on which they depend. Appendix 3.5-A, *Fish and Stream-Dependent Species Technical Supplement*, and Appendix 3.5-B, *Wildlife Technical Supplement*, describe the process for determining which species to consider for analysis in the EIS. Detailed descriptions of relevant life history and habitat needs and threats to covered species are provided in HCP Chapter 2, *Environmental Setting*.

3.5.2.1 Fish and Stream-Dependent Species

Table 3.5-1 lists the fish and stream-dependent species in the study area evaluated in the EIS. These include the covered coho salmon (Oncorhynchus kisutch), special-status species, and species that are of ecological, cultural, and recreational interest. This analysis focuses on native fish species and stream-dependent wildlife. Brief descriptions of the listed species and few endemic or federal species of concern habitat requirements are provided here.

Table 3.5-1. Fish and Stream-Dependent Wildlife Species Evaluated in the EIS

Common Name	Scientific Name	Status[a]
COVERED SPECIES		
Fish		
Oregon Coast coho salmon	*Oncorhynchus kisutch*	Federal threatened State endangered
NONCOVERED SPECIES		
Fish		
Eulachon	*Thaleichthys pacificus*	Federal threatened State threatened
Oregon Coast steelhead	*Oncorhynchus mykiss*	State sensitive
Oregon Coast Chinook salmon	*Oncorhynchus tshawytscha*	State sensitive
Pacific coast chum	*Oncorhynchus keta*	State sensitive
Coastal cutthroat trout	*Oncorhynchus clarki*	State sensitive
Umpqua chub	*Oregonichthys kalawatseti*	State sensitive
Pacific lamprey	*Entosphenus tridentatus*	Federal species of concern State sensitive
Oregon western brook lamprey	*Lampetra richardsoni*	State sensitive
Western river lamprey	*Lampetra ayresi*	State sensitive
Sculpin (coast range, reticulated, riffle, prickly)	Family *Cottidae*	N/A
Dace (speckled, Umpqua)	*Rhinichthys* (spp.)	N/A
Millicoma dace	*Rhinichthys cataractae*	Federal species of concern State sensitive
Additional native fish (redside shiner, largescale sucker, threespine stickleback, rainbow trout)	*Richardsonius balteatus, Catastomus macrocheilus, Gasterosteus aculeatus, Oncorhynchus mykiss*	N/A

Common Name	Scientific Name	Status[a]
AMPHIBIANS		
Coastal tailed frog	*Ascaphus truei*	Federal species of concern State sensitive
Southern torrent salamander	*Rhyacotriton variegatus*	State sensitive
Pacific giant salamander	*Dicamptodon tenebrosus*	N/A
Rough-skinned newt	*Taricha granulosa*	N/A
INVERTEBRATES		
Floater mussels	*Anodonta* (spp.)	N/A
Western ridged mussel	*Gonidea angulata*	Federal candidate
Western pearlshell	*Margaritifera falcata*	N/A

[a] Status as relates to federal ESA designation or ODFW sensitive species list; species may have other designations not recognized here.
N/A = not applicable

Fish and stream-dependent wildlife species occupy habitat throughout the study area, which ultimately lead to three larger drainages: the Umpqua River, Tenmile Lake and Creek, and the Coos River. Species are dependent on a variety of aquatic habitats depending on their unique life histories and habitat needs. Instream habitat suitability for native species in the study area varies spatially based on the entire suite of environmental characteristics. Specific substrate types may be important, such as fine sediment in slow-moving water for Umpqua chub (*Oregonichthys kalawatseti*) or spawning gravel for native salmonids. Some aquatic species rely on certain flow characteristics; for example the native Millicoma dace (*Rhinichthys cataractae*) requires swift flows in riffle areas. Certain habitat types are very important to different native aquatic species, from side channels and off-channel pools, to in-channel pools and riffles, to calm glides. Water quality characteristics including temperature, contaminants, fine sediment, and dissolved oxygen levels among others also can improve or degrade habitat for these species. Riparian conditions in the study area influence flow conditions, temperature, sediment level, large wood contributions, and input of food (allochthonous macroinvertebrates) falling from trees. The community of organisms that interact with native species as co-inhabitants, predators and prey, competitors, or otherwise also affect their health and survival in the study area. The habitat for fish and stream-dependent wildlife in the study area is expected to be affected by climate change in several ways, including a shift in timing of the flow regime (i.e., earlier floods), larger and flashier floods, lower summer low flows, increased stream temperatures, and increased sediment and wood input from increased landslides. Contributions of the riparian area to habitat, including shade and large wood, may be affected by increased fires in the future. Climate change is also expected to increase invasive species and disease, causing challenges to native populations in the study area.

Fish species discussed in this EIS include Oregon Coast coho (introduced in HCP Chapter 2, *Environmental Setting*), additional salmonids, eulachon, Umpqua chub, lamprey, and Millicoma dace. Oregon Coast coho salmon are federally threatened and state endangered and have spawning and rearing areas throughout the study area. Coho in the study area can be grouped into three distinct watersheds: the Umpqua River, Tenmile Lake/Creek, and Coos River. Coho populations require passage to spawning areas, cool stream temperatures, complex habitat including deep pools and large wood, and off-channel or slow-water habitats including floodplains, beaver ponds, or even connected lakes. Federally threatened eulachon occur in the study area, having critical habitat in the Umpqua River where permit area tributaries flow in. Spending less time in freshwater than salmonids, eulachon is most sensitive to disturbance during its spawning period (Schweigert et al. 2012). Umpqua chub (state sensitive) are endemic to the Umpqua basin and have distribution in the northern and eastern portions of the study area. They require off-channel habitat with low flows, abundant vegetation, and cover (ODFW 2022). Three state-sensitive species of lamprey are found in the study area, one a federal species of concern. They require fine gravel for spawning and developing larvae burrow into fine sediment substrate and have special requirements including specific temperature regimes (ODFW 2022). Millicoma dace, a state sensitive species and federal species of concern, are endemic to the Coos River drainage in Oregon, and have been found to be most abundant in the West Fork Millicoma including parts of the study area. These dace require swift water habitat with sufficient habitat complexity including cobble and boulder substrate. This type of habitat has been reduced from historical levels in the basin, primarily due to scour and channelization (Scheerer et al. 2017). Additional native fish in the study area are listed in Table 3.5-1.

Stream-dependent wildlife discussed in this EIS include four amphibian species and three mussel species. Additional stream-dependent invertebrates reside in the study area as well. Coastal tailed frogs, state sensitive and a federal species of concern, require fast-flowing, cool water in forested areas. They need both instream and riparian habitat complexity, including seeps and springs, logs, and clean hard rock stream substrate (ODFW 2022). Southern torrent salamanders, a state sensitive species, live in high-gradient streams near springs and seeps. They are sensitive to flow changes and prefer loose gravel and cool, clear water (ODFW 2022).

3.5.2.2 Forest-Dependent Species

Table 3.5-2 lists the forest-dependent special-status wildlife species that may be affected by the proposed action and alternatives. The table also indicates the type of forest habitat each species is most likely to inhabit.

Table 3.5-2. Forest-Dependent Wildlife Species Evaluated in the EIS

Common Name	Scientific Name	Status [a]	Forest Type
Clouded salamander	*Aneides ferreus*	State sensitive	Early to mid-successional forest
Marbled murrelet	*Brachyramphus marmoratus*	Federal threatened Designated critical habitat State endangered	Late-successional
Northern spotted owl	*Strix occidentalis caurina*	Federal threatened Designated critical habitat State threatened	Late-successional
Evening grosbeak	*Coccothraustes vespertinus*	Bird of conservation concern	Mid – to late-successional conifer
Olive-sided flycatcher	*Contopus cooperi*	Bird of conservation concern, Sensitive species	Late-successional (but requires openings and edges)
Rufous hummingbird	*Selasphorus rufus*	Bird of conservation concern	Early-successional forest (also Wetlands: Wet meadows)
Migratory birds	Multiple	Protections under Migratory Bird Treaty Act	Multiple
California myotis	*Myotis californicus*	State sensitive	Variety of forest types

Common Name	Scientific Name	Status [a]	Forest Type
Fringed myotis	*Myotis thysanodes*	State sensitive	Variety of forest types
Long-legged myotis	*Myotis volans*	State sensitive	Mid- to late-successional conifer near drainages
Hoary bat	*Lasiurus cinereus*	State sensitive	Variety of forest types
Silver-haired Bat	*Lasionycteris noctivagans*	State sensitive	Late-successional near drainages
Red tree vole	*Arborimus longicaudus*	State sensitive	Late-successional conifer
Coastal marten[b]	*Martes caurina humboldtensis*	State sensitive	Late-successional
Fisher[c]	*Pekania pennanti*	State sensitive	Late-successional

[a] Status: Definition

Designated Critical Habitat: A species for which critical habitat has been designated under the ESA.

Federal Threatened: A species listed as threatened by FWS under the ESA (IPaC: FWS 2022).

State Endangered: A species listed as endangered on the Oregon Threatened and Endangered Species List (ODFW 2021a).

State Threatened: A species listed as threatened on the Oregon Threatened and Endangered Species List (ODFW 2021a).

State sensitive: A species listed as an Oregon Sensitive Species. *Sensitive* refers to wildlife species, subspecies, or populations that are facing one or more threats to their populations, habitat quantity, or habitat quality or that are subject to a decline in number of sufficient magnitude such that they may become eligible for listing on the state Threatened and Endangered Species List (ODFW 2021a).

[b] Despite some survey effort, no coastal martens (a subspecies of Pacific marten and sometimes called Humboldt marten) have been detected in Elliott State Forest in many decades. The latest predicted distribution model did not predict the species in this area (Moriarty et al. 2021). However, the nearest marten population is less than 12 kilometers from the plan area and given the 80-year analysis period, this species is included because it may occur in the study area in the future.

[c] Fishers have not been detected in the permit area in recent years, despite some recent survey efforts, and the nearest range is more than 50 kilometers from the plan area, but the species could potentially occupy the study area in the future, over the 80-year analysis period.

Forest-dependent species potentially affected and addressed in this EIS include two covered species (northern spotted owl and marbled murrelet) and the sensitive species identified as forest dependent in Table 3.5-2, and other forest-dependent wildlife of cultural or recreational importance. Species of recreational and cultural importance include deer and elk.

Section 3.4, *Vegetation*, describes forest vegetation present in the permit area. The associations of forest-dependent species with forest stand age stages may be broad or specific, but these species tend to be limited in their distribution, survival, and reproductive success by the presence of specific forest elements such as snag and coarse woody debris availability, multilayered tree canopy, presence of trees with structural elements useful for wildlife species, and understory floristic and structural diversity.

Forests managed for timber production tend to have a simplified structure compared to natural forests because of the emphasis on producing a fully stocked crop of one or two tree species; therefore, they lack some of these elements. Even if left to regenerate naturally after timber harvest, many stands do not have adequate deadwood to meet the habitat requirements of many wildlife species. Noncrop trees and other competing vegetation have traditionally been removed from managed timber stands. Shorter rotations may not allow trees enough time to develop features such as large limbs and cavities that are used by wildlife species.

Although many wildlife species, such as northern spotted owl and cavity-nesting birds, may be associated with older conifer forests, most forest-associated species can occur with great regularity throughout all stages of forest development when suitable understory cover, legacy trees, dead and downed trees, live trees with suitable structural elements, and floristic diversity are present. Deer and elk use all forest stages for various needs. They occupy early-seral stages of the forest for forage and use older (late-seral and old growth) forests for hiding and concealment cover (Kie et al. 2008).

3.5.2.3 Wetland- and Riparian-Dependent Species

Many wildlife species in the study area are dependent on ponds, lakes, freshwater marshes, seeps, springs, wet meadows, and riparian habitat. Riparian- and wetlands-dependent species potentially affected by the proposed action and alternatives include the sensitive species identified as riparian- and wetlands-dependent in Table 3.5-3, and other, more common riparian-dependent wildlife.

Table 3.5-3. Wetland- and Riparian-Dependent Wildlife Species Evaluated in the EIS

Common Name	Scientific Name	Status [a]	Habitat
Northern red-legged frog	*Rana aurora*	State sensitive	Wetlands: Aquatic
Southern torrent salamander	*Rhyacotriton variegatus*	State sensitive	Riparian and Wetlands: Aquatic
Northwestern pond turtle	*Actinemys marmorata*	State sensitive	Wetlands: Aquatic.
Rufous hummingbird	*Selasphorus rufus*	Bird of conservation concern	Wetlands: Wet meadows (also early successional forests)
Migratory birds	multiple	Protections under Migratory Bird Treaty Act	Multiple
American beaver	*Castor canadensis*	none	Riparian and Wetlands

[a] Status: Definition

Designated Critical Habitat: A species for which critical habitat has been designated under the ESA.

Federal Threatened: A species listed as threatened by FWS under the ESA (IPaC: FWS 2022).

State Endangered: A species listed as endangered on the Oregon Threatened and Endangered Species List (ODFW 2021a).

State Threatened: A species listed as threatened on the Oregon Threatened and Endangered Species List (ODFW 2021a).

Sensitive: A species listed as an Oregon Sensitive Species. *Sensitive* refers to wildlife species, subspecies, or populations that are facing one or more threats to their populations, habitat quantity, or habitat quality or that are subject to a decline in number of sufficient magnitude such that they may become eligible for listing on the state Threatened and Endangered Species List (ODFW 2021a).

Riparian habitat for wildlife addressed in this section consists primarily of deciduous vegetation near the streams' edge.[1] Riparian habitat typically support a higher biodiversity of terrestrial species than surrounding areas. An estimated 53% of wildlife species in Oregon and Washington use riparian habitat, even though these habitats cover only an estimated 1 to 2% of the landscape (Kauffman et al. 2001:365). This high biodiversity can be attributed to various factors including input of organic matter from water flows; disturbance from flooding, landslides, and debris flows that result in varied habitat composition and structure; diverse geomorphology; and high productivity due to deep soils and availability of water and nutrients (Kauffman et al. 2001:362). Additionally, American beavers (*Castor canadensis*) occur in riparian habitats and play important roles in creating suitable habitat conditions for salmon, various amphibians, and small mammals, and mitigating climate change effects on ponds along streams (Pollock et al. 2004; Stevens et al. 2007; Hood and Bayley 2008).

3.5.3 Environmental Consequences

3.5.3.1 Covered Fish Species

Coho Salmon

Alternative 1: No Action

Under the no action alternative, forest management activities including timber harvest, thinning, vegetation management, prescribed burns, road system management, and quarry construction may affect Oregon coast coho salmon.

Harvest and thinning activities could increase sediment delivery—especially fine sediment—to streams both directly and as a result of increased landslide potential (Section 3.2, *Geology and Soils*). Direct sediment impacts would be greatest in areas of clearcut harvest, especially where it occurs closer to waterways and on steeper slopes. As described in Section 3.3.3.4, *Water Quality*, riparian management areas (RMAs) under the no action alternative would prevent most sediment delivery from surface erosion to all fish-bearing streams, large and medium non-fish-bearing perennial streams, and upstream of confluences with fish-bearing streams. The equipment limitation zones (ELZs) upstream of RMAs would further mitigate sediment delivery. Steep slope protections (Section 2.1.1, *No Action Alternative*) would reduce fine sediment input to aquatic habitat from landslide and related events, which would benefit coho. However, there are tributaries where riparian protections would not be sufficient to mitigate increases in sedimentation.

Where sediment enters spawning gravel in fish-bearing reaches, it decreases survival of eggs to fry emergence, and coho have been shown to be one of the most susceptible species to this effect (Jensen et al. 2009). Mechanisms of the effect may include lowered dissolved oxygen or physical trapping of individuals from emerging due to packed-in sediment. Turbidity associated with increased fine sediment also can decrease growth of coho by inhibiting feeding, and juvenile coho avoid areas with high turbidity (Kemp et al. 2011). Increased fine sediment has been shown to have a wide array of indirect and direct effects on freshwater fish, including coho, such as reduced or changed food resources, stress elevation, and disrupted gas exchange (Kemp et al. 2011). Harvest

[1] Riparian vegetation described in Section 3.4, *Vegetation*, addresses a wider swath on either side of the stream that includes evergreen vegetation. The vegetation described as riparian in this section consists of freshwater forested/shrub wetland.

may also increase coarse sediment input to streams, which while in the long run could improve habitat, in the short term could cause excessive scour or burial of habitat, or direct mortality and injury of individuals.

Harvest may also decrease woody material available to streams in case of landslides and related events. Wood contribution to streams, especially large wood and large wood structures, increases habitat complexity, changes flows to produce pools and backwaters, and encourages healthy macroinvertebrate communities, all of which benefit coho. Large wood addition in an Oregon coastal stream was shown to significantly increase coho survival (Johnson et al. 2005), and in another study of coho in an Oregon stream higher coho abundance was associated with large pools, which were often formed by or contained large wood (Gonzalez et al. 2017). Reduction of large wood can cause increased scouring, erosion, and sedimentation, causing declines in channel integrity, as described in Section 3.3.3.2, *Peak Flows and Channel Condition*. As described in Section 3.2.3.3, *Stream Geomorphology*, while harvest would reduce wood available in the permit area for recruitment to streams, wood recruitment is projected to increase over the analysis period as trees in RMAs and steep slope protection areas mature, benefiting coho.

Large areas of harvest, especially clearcut harvest, can also change streamflow dynamics. Reducing trees and habitat complexity and use of machinery in harvest may decrease pervious forest surfaces and increase runoff to streams. Peak flows are shown to noticeably increase at 45% forest cover loss, with the greatest increases in clearcut areas as described in Section 3.3.3.2, *Peak Flows and Channel Condition*. As described in Section 3.3.3.2, harvest activities are not expected to increase peak flows at the subwatershed scale by more than the detectable limit, but where stream reaches drain areas with substantial forest cover loss, peak flows would increase, and channel structure would be adversely affected at the local scale (Reid et al. 2010). Increases in peak flows could cause direct negative impacts on coho redds by causing scour and mortality or changed behavior due to turbidity and decreasing habitat quality due to erosion and sedimentation. These flow impacts would be greatest in smaller streams and just downstream of clearcut areas. Coho are more vulnerable to scouring flows than some other salmonids because they are more likely to have portions of their population that spawn in higher gradient, confined channels that are more affected by scour (Sloat et al. 2018).

While low flows may temporarily increase directly post-harvest, after 5 to 15 years these low flows are reduced while stands are vigorously growing as described in Section 3.3.3.3, *Low Flows,* having a negative impact on coho populations at the local scale. In no-harvest areas or areas limited to restoration thinning, such as RMAs, where forest stands would age into late-seral and old growth over the analysis period, effects on low flows would be reversed (increasing low flows), which would have a beneficial effect on coho. Coho have been shown to have increased survival with increased volume of water, with connection of habitat being an important driver (Obedzinski et al. 2018). Modeling work conducted by Ohlberger et al. (2018) demonstrated that coho productivity was significantly lowered due to decreased summer low flows in western Washington coast streams. Effects of lowered flows on coho vary throughout the study area by watershed (as a result of flow variability described in Section 3.3.3.3). RMAs may somewhat mitigate the impact of management-related flow changes on coho habitat.

Harvest may also cause increases in stream temperature, especially where harvest occurs in riparian areas, which would have negative impacts on coho. As discussed in Section 3.3.3.4, *Water Quality,* riparian buffers less than 120 feet wide have been shown to result in increased stream temperatures associated with harvest. Under the no action alternative, the widest minimum riparian buffers are estimated to be approximately 100 feet, on average,[2] increasing the probability of increased stream temperatures due to harvest primarily from loss of shade. Though temperature increases would likely be less than the Oregon water quality temperature threshold of 0.3 degree Celsius (°C) increase in most locations with 100-foot buffers, where buffers are less than 100 feet temperature increases in this range may occur. Also, the Umpqua temperature total maximum daily load (TMDL) limits increase to 0.1°C and a similar TMDL will be developed for the West Fork Millicoma (see Section 3.3.3.4, *Water Quality*); temperature increases especially in these watersheds would negatively affect coho. Were DSL to implement restoration thinning in RMAs, it could also reduce shade and increase stream temperature (Leinenbach 2016). However, the temperature effect of decreased shading would be offset by increased low flows caused by removing vigorously growing vegetation in some areas through restoration thinning.

Coho are most likely to be affected by harvest-related temperature increases near confluences with adversely affected non-fish-bearing streams and in the Umpqua basin. There are maximum temperatures life stages of coho can survive, and individual growth and stress are affected by shifts in temperature. Above about 15°C, smoltification—adaptation from living in fresh water to living in seawater—is inhibited in coho; above about 12 to 15°C, pre-spawning coho and eggs experience negative effects; and above 26°C, likelihood of direct mortality strongly increases (Richter and Kolmes 2005). Indirectly, coho may be more susceptible to pollutants, disease (Cairns et al. 2005), or other challenges when temperatures become too high. All of these effects at the individual level can cascade up to affect entire coho population productivity and abundance. Increases in stream temperature due to forest management activities would cause an adverse effect on the populations in the study area.

Any chemical applications have the potential to harm coho populations (including herbicide and pesticide applications that may occur as part of forest management activities). Prescribed burns may further increase fine sediment input to streams or cause temporary shifts in water chemistry, having potential negative impacts on coho.

Road construction may have negative impacts on coho by increasing impervious surfaces (and thus runoff and peak flows) and by increasing fine and coarse sediment inputs to streams, which would have the same effects described above for sediment increase due to harvest. Where roads are built across stream networks, they also have the potential to decrease fish passage, negatively affecting populations. Sedimentation from existing roads would be reduced through implementation of the Forest Roads Inventory and Assessment process, as described in Section 3.3.3.4, *Water Quality*. Quarry construction may negatively affect coho by increasing fine sediment input to streams.

Salvage harvest in response to disturbance events, which are projected to increase over the analysis period with climate change (Section 3.7, *Climate Change*) produce the same types of negative effects of harvest described above, though effects may be greater due to operating in an already disturbed environment. Limitations on salvage harvest described in Section 2.1.1, *No Action Alternative*, would reduce impacts of these activities on the aquatic system.

[2] RMA widths under the no action alternative are measured on the slope, which results in a lower equivalent horizontal width. Given the steepness of the permit area, the estimated average horizontal width of a 110-foot-wide slope-measured buffer is approximately 100 feet.

Alternative 2: Proposed Action

The HCP is built on an overarching research and conservation strategy (Chapter 2, Section 2.1.2, *Alternative 2: Proposed Action*) and management in the permit area would be based surrounding this strategy. This includes minimization and mitigation of take, through meeting biological goals and objectives (HCP Chapter 5, Section 5.3, *Biological Goals and Objectives*) and implementing conservation measures and conditions on covered activities (HCP Chapter 5, Sections 5.4 and 5.5, *Conservation Measures* and *Conditions on Covered Activities)*. Research conducted in the permit area is expected to benefit conservation of coho both through adaptive management over time in the permit area, and by applying principles learned in the permit area to other basins outside of the permit area (HCP Chapter 6, *Monitoring and Adaptive Management*). The type of effects of forest management activities on coho would be the same for the proposed action as described for the no action alternative; however, impacts would vary in degree, location, and extent.

The reduced area available for more intensive harvest, especially clearcut, under the proposed action would reduce negative effects from these activities on coho overall. Negative effects would be reduced most in the conservation research watersheds (CRW) subwatersheds where these types of harvest would not be allowed. However, in some watersheds associated with the management research watersheds (MRW) where areas available for more intensive harvest would increase compared to the no action, such as in the West Fork Millicoma, adverse effects associated with forest management activities on coho may increase.

Overall, effects of peak flow changes would not be detectable at the subwatershed level under the proposed action, as described in Section 3.3.3.2, *Peak Flows and Channel Condition*, and would not affect coho populations at this scale. Coho could be adversely affected locally where stream reaches drain areas with substantial forest cover loss, as described for the no action alternative, especially in the MRW. Overall, peak flow impacts would be reduced under the proposed action compared to the no action alternative.

Low flows are expected to improve under the proposed action compared to the no action alternative in all but two subwatersheds where effects would be similar to the no action, as described in Section 3.3.3.3, *Low Flows*. Increased low flows and potentially decreased stream temperatures in low flow months would benefit coho.

Water quality effects on coho populations associated with the CRW, primarily coho from the Tenmile Creek population and those that spawn or rear in the headwaters of Scholfield Creek and Dean Creek that flow into the Umpqua River (Figure 3.3-1), would be limited to short-term negative effects associated with restoration thinning. These effects may include fine sediment entry and temporary decreases in shade and food input for fish. Over time, areas that undergo riparian thinning are expected to reach a higher canopy height and to grow faster contributing more key wood pieces (larger diameter) to the stream. Restoration thinning in riparian conservation areas (RCAs) would also include requirements to place a percentage of large wood thinned in stream and to retain the remainder as downed wood. Large wood placed in streams can enhance habitat for coho by improving temperature variability, habitat complexity, and sediment sorting. These treatments would be implemented to improve ecological function and would be studied to determine the magnitude and nature of the potential long-term beneficial effects on coho salmon and their habitats. Restoration thinning would first occur in a limited area during a 5-year period, after which adaptive management could be implemented (changing protocol if needed) before expanding to the entire area. Both positive and negative effects of restoration thinning would be greater under the proposed action due to the expanded area of riparian protections and broader implementation of restoration thinning under the proposed action.

The proposed action has wider minimum buffers in much of the permit area (see Section 3.3, *Water Resources*), that apply to fish-bearing streams throughout the permit area, non-fish-bearing perennial streams in the CRW, and streams with high potential to deliver wood to fish-bearing streams in the CRW and in Lower Millicoma (MRW). These wider buffers would prevent negative stream temperature effects where more intensive harvest occurs adjacent to buffers, mitigating harvest impacts on coho. In the MRW, outside of the Millicoma watershed, where non-fish-bearing streams that do not have high debris flow potential into fish-bearing streams, coho could be negatively affected by temperature increases.

As described in Section 3.3.3.4, *Water Quality*, fine sediment and potential chemical or toxin input from clearcut and variable density harvest would also be lessened compared to the no action alternative as a result of wider riparian buffers on certain stream types and additional protections on steep slopes (geotechnical review and harvest plan modification and wider buffers on high landslide delivery potential [HLDP] streams). Streams (non-fish-bearing, non-HLDP seasonal streams) that have no riparian protections under the proposed action that would have an approximately 30-foot ELZ[3] under the no action alternative, would have less protection from sedimentation to coho habitat than the no action alternative where these streams flow into fish-bearing streams.

Road construction throughout the permit area could have negative effects on coho as described under the no action alternative when constructed near streams or in unstable locations. Limiting expansion of the permanent road network throughout the permit area, committing to no net increase in the permanent road network in the CRW would provide additional stream protection and have beneficial effects on coho populations, especially in the CRW, compared to the no action. However, the amount of sedimentation from existing roads could be greater under the proposed action as described in Section 3.3.3.4, *Water Quality*.

All coho populations would benefit from Conservation Measures 1 and 4. Conservation Measure 1 would encourage opportunistic restoration actions in areas near harvest, including addition of large wood and beaver-associated restoration, which could benefit coho populations throughout the study area. Under Conservation Measure 4, research on the effects of management in the CRW and MRW on coho populations and contribution to Oregon Coast coho evolutionarily significant unit health would benefit coho. Because the proposed action is designed at the subwatershed level, results of research would be informative to and have direct implications for improvement in forest practices related to health of coho populations both in the study area and statewide. In addition, the proposed action has a commitment of a monitoring and adaptive management program, which would assist in tracking progress of habitat for coho populations in the watersheds in response to management and allow adjusted management actions in response to results. Some key monitoring elements in the HCP relevant to coho include turbidity monitoring upstream and downstream of a subset of new roads where they cross streams, water temperature monitoring in key watersheds, and instream habitat monitoring. The proposed action also includes provisions for responding to changed circumstances (HCP Section 7.8, *Changed and Unforeseen Circumstances*), including management of new aquatic invasive plant infestations and measures to address potential changes in water

[3] Given the steepness of the permit area, the estimated average horizontal width of a 35-foot-wide slope-measured ELZ is approximately 30 feet.

temperature and flow from climate change, that would not be required under the no action alternative.

Overall, the proposed action would have beneficial effects on coho in the CRW compared to the no action alternative, while effects in the MRW (outside of the Lower Millicoma) may be similar to the no action alternative, for the reasons described above.

Alternative 3: Increased Conservation

Impacts on coho under Alternative 3 would be similar to the proposed action, but adverse effects would be reduced. The reduced area of clearcut and variable density harvest adjacent to RCAs in the MRW and wider minimum RCAs on fish-bearing streams in full watersheds in the MRW and some non-fish-bearing streams in the MRW would improve shade, reduce temperature effects, increase large wood recruitment, and help prevent fine sediment entering the streams compared to the proposed action (and no action), directly benefiting coho populations in these watersheds. Prohibiting restoration thinning in RCAs on steep slopes and limiting the extent of thinning to protect shading would eliminate short-term adverse effects from these activities throughout the permit area including decreased shade, increased stream temperature, or fine sediment input. However, these restrictions would also reduce the potential long-term benefits to coho of large wood addition to streams after restoration thinning.

Expanding the commitment to no net increase in permanent roads to the entire permit area and additional road decommissioning requirements would decrease sediment input, decrease flashiness of flows due to decreased impermeable surfaces, and potentially improve passage, compared to the proposed action and no action.

Adverse effects on peak flows would be similar to the proposed action but of lower magnitude and duration in most watersheds (Appendix 3.3, *Water Resources Technical Supplement*, Table 14) due to increased riparian protections. Localized effects of peak flow increases on coho would decrease under Alternative 3, reducing adverse effects on coho related to scour or detrimental habitat changes. Low flows would be improved compared to the proposed action and no action in all subwatersheds, resulting in greater beneficial effects on coho.

Overall, Alternative 3 would decrease adverse effects and increase beneficial effects on coho throughout the permit area compared to both the proposed action and no action alternative.

Alternative 4: Increased Harvest

Under Alternative 4, the area available for clearcut would be less than under the no action alternative but the area available for variable density harvest would be greater. Therefore, negative effects of these harvest types on coho would be similar to the no action.

Water quality effects on coho, including temperature, sediment, and toxics, under Alternative 4 would be between the proposed action and no action alternative, because the extent of harvested area, level of harvest activity, RCAs, and restrictions of road construction would fall between these alternatives.

As under the no action alternative, there would be no peak flow or channel condition effects on coho at the subwatershed scale. Localized harvest effects would be greater than under the no action alternative because equivalent clearcut area would be larger, but localized road-related effects could be less due to the cap on new road miles.

Low flows would improve compared to the no action alternative in all but five affected subwatersheds, where adverse effects would be slightly greater, due to projected changes in age class from harvest (Section 3.3.3.3, *Low Flows*).

Overall, coho would likely experience similar effects to those described under the no action alternative under Alternative 4, and greater adverse effects compared to the proposed action, with localized effects varying based on the location of forest management activities.

3.5.3.2 Noncovered Fish Species

Alternative 1: No Action

Eulachon would be affected by many of the same activities as coho and would be most vulnerable to disturbance during their spawning period. Eulachon can be especially negatively affected by noise impacts, alteration of flow, passage barriers, and fine sediment or other water quality issues (Schweigert et al. 2012).

Umpqua chub could be especially affected by reduced riparian areas or harvest in riparian areas due to their requirements for moderate or no flow habitats associated with off-channel areas and habitat with extensive cover and vegetation; areas with smaller buffer widths (less than 120 feet) that are near management activities may provide less shade and a less intact riparian system under the no action alternative.

Lamprey in the study area could be especially affected by sediment pulses or landslides that may occur as a result of forest management activities under the no action alternative, due to the developing larvae burrowing in substrate. Larval development is affected by temperature regimes (ODFW 2022), so changes to the stream temperature due to management activities, as described in Section 3.3.3.4, *Water Quality*, could negatively affect lamprey. Impaired water quality (high temperatures and sedimentation) and reduced flows as described in Section 3.3.3.3, *Low Flows*, and for coho above (ODFW 2020), would negatively affect lamprey under the no action alternative. Other effects would be similar to those described for coho.

Effects of the no action alternative on Millicoma dace would be similar to those on coho, though Millicoma dace may be even more sensitive to reductions in low flows because they rely on swift-flowing riffle habitat.

Oregon Coast Chinook salmon, Oregon Coast steelhead, coastal cutthroat trout, and other native non-game fish in the study area would experience effects similar to those described for coho, though effects would vary based on their distribution in the permit area and their specific life histories. Oregon Coast fall-run Chinook salmon have distribution throughout the permit area, though they are more common in larger streams and rivers and not found in higher-gradient and smaller streams that coho use for spawning and rearing. The majority of fall-run Chinook habitat in the permit area is in the West Fork Millicoma River. Fall-run Chinook salmon spend less time as juveniles as well as less time as holding adults in fresh water than many salmonids, so are less exposed to river conditions; thus, while experiencing similar effects to coho these effects would be lessened and less related to activities occurring in and surrounding steeper headwater streams. Oregon Coast spring-run Chinook salmon are not found within the permit area, though they are found immediately downstream of northern permit area streams that flow into the Umpqua River. Effects on spring-run Chinook would be similar to but less than effects on fall-run Chinook. Oregon coast winter steelhead and coastal cutthroat trout have a similar distribution to coho in the permit area except that they reach even further into some smaller headwater streams. Juvenile steelhead may spend a year or two in fresh water before migrating to the ocean. Steelhead and coastal cutthroat trout would experience greater adverse effects than coho due to their occupancy of higher-gradient habitats and an increased number of non-fish-bearing streams with lesser protections flowing into these areas. Steelhead and cutthroat trout may be more susceptible to effects of landslides and fine sediment input.

Alternative 2: Proposed Action

Effects on eulachon under the proposed action would be similar to those described for coho. Eulachon would be most sensitive to effects during spawning.

Effects on Umpqua chub would be similar to those described for coho, as its range (Umpqua basin) overlaps with portions of the CRW and MRW. Umpqua chub in the CRW would experience beneficial effects from the proposed action as compared to no action due to comparatively greater riparian protections, while those in the MRW would likely experience similar effects to the no action condition.

Effects on lamprey would be similar to those described for coho. Lamprey would experience beneficial effects in the CRW and similar effects in the MRW compared to no action alternative.

Effects on Millicoma dace would be similar to those described for the no action alternative due to the increased harvest surrounding the West Fork Millicoma watershed, though some additional riparian protections are in place.

Effects on Oregon Coast Chinook, Oregon Coast steelhead, Pacific Coast chum, coastal cutthroat trout, and other native fish in the study area would be similar to those described for coho, though the effects would vary based on their life histories and distribution. Effects on fall-run Chinook would be similar to those described for the no action alternative overall, with increased effects of clearcut harvest but improved low flows, due to their predominance in the West Fork Millicoma watershed. Indirect effects on spring-run Chinook would be similar to the no action alternative; with increased effects related to activities in the MRW under the proposed action balancing decreased effects from activity in the CRW on the Umpqua River. Effects on steelhead and coastal cutthroat trout would be beneficial in the CRW for the reasons described for coho. Effects on steelhead and coastal cutthroat trout would be similar to the no action alternative in most of the MRW and potentially adverse in portions of the MRW with increased harvest activities due to the wider distribution of these species into steep headwaters that intersect with less-protected small streams.

Alternative 3: Increased Conservation

Alternative 3 would decrease harvest throughout the permit area and increase riparian protections compared to both the no action alternative and the proposed action, which would benefit noncovered fish species. Effects on noncovered fish species under Alternative 3 would be the similar to those described for coho above. Low flows would be improved substantially in the West Fork Millicoma, benefiting Millicoma dace, fall-run Chinook, and all species in this basin. Noncovered fish species would benefit from these changes in harvest and protections compared to both the no action alternative and the proposed action.

Alternative 4: Increased Harvest

Effects on noncovered fish species under Alternative 4 would be the same as described for coho, with adverse effects similar to the no action alternative and greater than the proposed action.

3.5.3.3 Noncovered Stream-Dependent Wildlife Species

Alternative 1: No Action

Many effects on noncovered stream-dependent wildlife species would be similar to those described for fish above, especially for stream-dependent wildlife that co-exist with fish—freshwater mussels, and some amphibians and other invertebrates. Freshwater mussels are more vulnerable to many disturbances than fish due to their inability to migrate to more suitable habitat and are especially affected by changes in flow regimes (scouring flood flows or lower low flows) and by fine sediment pulses and chemicals. The no action alternative would adversely affect non-fish species that reside in headwater and fishless streams due to limited riparian protections in many headwater and fishless areas. Many amphibians are more successful in these areas due to less competition with fish or predation by fish.

Coastal tailed frogs would experience adverse effects from loss of habitat complexity and disturbance in riparian areas due to thinning activities or harvest, especially in fishless streams with less riparian protection, and would be sensitive to changes in stream temperatures due to forest management activities. Coastal tailed frogs would experience decreased resilience as a population overall due to loss of habitat connection (Wahbe 2003). Southern torrent salamanders primarily rely on humid, cool, and stable headwater habitats (ODFW 2022) and would experience adverse effects from direct loss of suitable habitat due to stream impacts especially in fishless areas. Loss of forest cover due to harvest, and decreased habitat connectivity due to road building, would be detrimental to southern torrent salamanders (Emel et al. 2019) and other stream-dependent amphibians.

Alternative 2: Proposed Action

Noncovered stream-dependent wildlife species in the CRW would experience beneficial effects under the proposed action due to the greater protections from forest management activities in this area compared to the no action alternative, as well as from the requirement of no net increase in permanent roads in the CRW (Conservation Measure 3).

Noncovered stream-dependent wildlife in the MRW would experience many of the same effects as described for fish, especially for those species that cohabitate with native fish (i.e., freshwater mussels, some amphibians and invertebrates). Loss of habitat connection in the MRW would cause adverse effects for coastal tailed frogs, which require connected forest habitat for overland dispersal and genetic diversity (Wahbe 2003). Noncovered stream-dependent wildlife that are more successful in fishless streams (i.e., some amphibians) would experience adverse effects due to minimal riparian protections in these areas and often more intensive forest management activities, including lack of ELZs. Overall, effects would be similar to the no action alternative, and may be greater in the MRW.

Alternative 3: Increased Conservation

Effects of Alternative 3 on stream-dependent wildlife species related to stream habitat would be the same as described for coho, with decreased adverse effects related to harvest and thinning and decreased potential long-term beneficial effects of thinning in RCAs, as compared to both the no action alternative and proposed action. In addition, for stream-dependent species that use riparian and upland habitat, increased restrictions on riparian thinning under Alternative 3 would reduce trampling of amphibians and riparian habitat and the expanded commitment to no net increase in permanent roads in the full permit area would reduce barriers to overland migration for amphibians.

Alternative 4: Increased Harvest

Effects of Alternative 4 on stream-dependent wildlife species would be the same as described for coho, with adverse effects similar to the no action alternative and greater than the proposed action.

3.5.3.4 Covered Forest-Dependent Species

Northern Spotted Owl

Alternative 1: No Action

Removal or modification of forest habitat through timber harvest would be the primary driver affecting northern spotted owl under the no action alternative. Other activities that would affect the species include construction of supporting infrastructure (e.g., roads and quarries), salvage harvest, prescribed burns, and herbicide and pesticide use, all of which could remove or degrade northern spotted owl habitat. Maintenance of communications facilities and lookout sites would have negligible effects on the species' habitat because these facilities are already developed and would not result in habitat removal. In addition to forest habitat loss and modification, behavioral disturbance due to noise and human presence would be a primary mechanism affecting spotted owls.

Under the no action alternative, take of northern spotted owl would not be authorized. DSL would manage the permit area for timber production and would use the standards of protection described in Chapter 2, Section 2.1.1, *Alternative 1: No Action*, to avoid incidental take.

Under the no action alternative, forest stands in take avoidance areas would continue to age. The combined projected amount of northern spotted owl nesting, roosting, and foraging habitat, as represented by late-seral and old growth stands, in the permit area would decrease during the first 20 years, then increase throughout the remainder of the analysis period for a net increase of 12% (Figure 3.4-1 and Appendix 3.4, *Vegetation Technical Supplement*, Table 1).

Areas not designated as take avoidance areas would be managed for sustained timber production and would not develop the habitat elements described above for take avoidance areas. Therefore, these areas would likely be unsuitable for northern spotted owl nesting, foraging, and roosting since they would not retain late-seral and old growth stands.

The projected increase in combined late-seral and old growth habitat assumes that the 23 northern spotted owl sites currently assumed to be occupied would remain occupied over the analysis period. If northern spotted owl occupancy in the study area continues to decline over time due to competition with barred owls or other factors unrelated to habitat availability (Franklin et al. 2021), unoccupied areas could be removed from protection, resulting in less protected habitat. This could reduce the late-seral and old growth projections described above, but only by up to an estimated 2% over the analysis period of 2%. Estimated reductions are small because avoidance of occupied marbled murrelet habitat would continue to retain spotted owl habitat.

As shown in Figure 3.5-1, projected northern spotted owl habitat (late-seral and old growth stands) at year 80 of the analysis period would be highly fragmented across the permit area, reducing not only the total amount of nesting, foraging, and dispersal habitat, but increasing risk of exposure of northern spotted owls to indirect effects of harvest activities adjacent to intact habitat (e.g., noise, human disturbance).

Construction of supporting infrastructure such as roads and quarries could also result in habitat removal in addition to the habitat loss from harvest. Additionally, increased access to occupied habitat provided by roads could result in disturbance of northern spotted owl feeding, breeding, and sheltering behavior as a result of noise and human presence and introduction of invasive plant species (described in Section 3.4.3.2, *Spread of Invasive Weeds*) that could reduce habitat quality.

Prescribed burns would follow Oregon Forest Practices Act (Oregon FPA) requirements and best management practices and would be required to avoid take of northern spotted owl. Because prescribed burns would primarily occur on landings following harvest or in areas for replanting, they would not occur in late-seral or old growth forest that provides habitat for northern spotted owl.

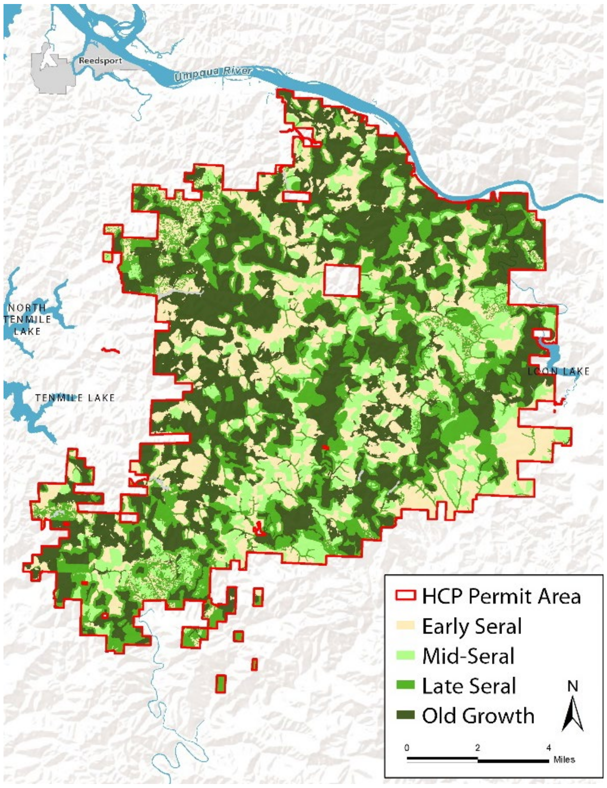
Use of herbicides and pesticides could indirectly affect northern spotted owls by reducing prey base and modifying habitat. However, herbicide use is not expected to adversely affect necessary structural habitat components for spotted owls. All use would be required to follow restrictions under the Oregon FPA and to avoid take of northern spotted owls; therefore effects on the species are expected to be minimal.

Disturbance events such as wildfire, windstorms, forest pests, and diseases will likely affect the availability, quality, and spatial distribution of spotted owl habitat in unpredictable ways over the analysis period. DSL would need to shift harvest locations in response to large disturbance events such as fires or storms if spotted owl distribution shifts because of disturbance. Since only occupied habitat would be protected, areas could continue to be logged if spotted owls or marbled murrelets do not occupy them following disturbance and would not likely mature into spotted owl habitat in the future. DSL would have the ability to implement salvage harvest following natural disturbances, with no requirement to restore the habitat, potentially impeding the ability of damaged sites to provide legacy elements useful to spotted owls. This may lead to a decrease in the likelihood of occupation by the species and the long-term species persistence.

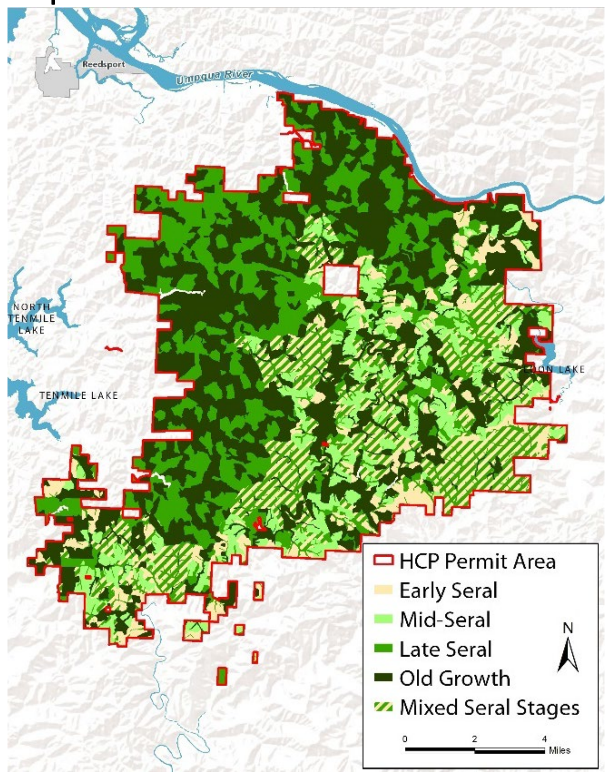
Monitoring of the spotted owl population would be limited to required occupancy surveys prior to timber harvest. There would be no provisions for habitat monitoring or adaptive management under the no action alternative. Adequate habitat patch size, habitat connectivity, and dispersal habitat to support viable populations for northern spotted owls would not be assured. Connectivity between habitat patches may be ultimately limited to riparian corridors, as these may be the only areas with continuous corridors of intact habitat. The no action alternative does not provide for a response to competition from barred owl populations.

Figure 3.5-1. Projected Stand Age at End of Analysis Period

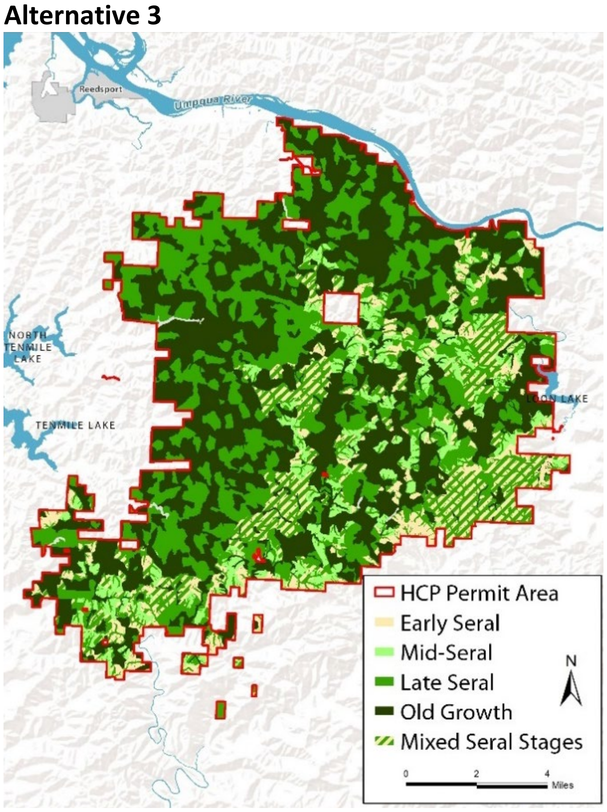
No Action Alternative



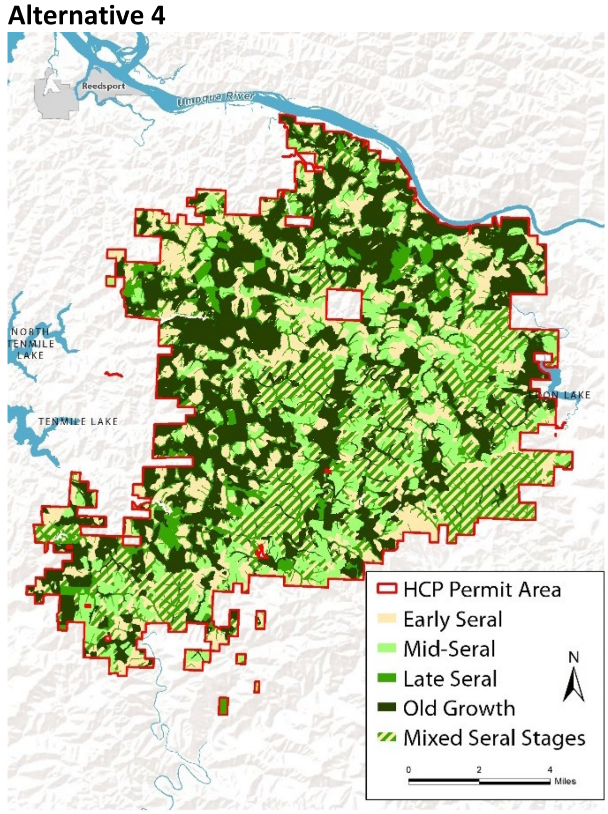
Proposed Action



Alternative 3



Alternative 4



Alternative 2: Proposed Action

The mechanisms affecting northern spotted owl under the proposed action would be the same as described for the no action alternative, but FWS would issue authorization for incidental take of this species for the permit term. Management in the permit area would be subject to the overarching research and conservation strategy of the HCP (Chapter 2, Section 2.1.2, *Alternative 2: Proposed Action*), which would minimize and mitigate take through meeting the HCP's biological goals and objectives (HCP Chapter 5, Section 5.3, *Biological Goals and Objectives*) and implementing the HCP's conservation measures (HCP Chapter 5, Section 5.4, *Conservation Measures*) and conditions on covered activities (HCP Chapter 5, Section 5.5, *Conditions on Covered Activities*). Furthermore, research conducted in association with the proposed action is expected to benefit conservation of the species as a whole, beyond the study area.

Under the proposed action, forest management would conform to the research design described in HCP Chapter 3, *Covered Activities*, and summarized in Chapter 2, Section 2.1.2.2, *Covered Activities*, of this EIS*.* The HCP's stay-ahead provision (HCP Chapter 7, *Implementation and Assurances*) require the permittee to replace northern spotted owl habitat lost to harvest with at least as much habitat of equivalent or better quality grown over the permit term within reserves (i.e., in the CRW and the MRW reserves). As stated in HCP Goal 1, roughly 54,000 acres (66%) of the permit area would be retained and enhanced for the benefit of northern spotted owls, and at least 40% of the MRW (roughly 48,000 acres) would be maintained as dispersal habitat, providing habitat connectivity.

Based on the forest age projections (Figure 3.4-1 and Appendix 3.4, *Vegetation Technical Supplement*, Table 1), the combined amount of northern spotted owl nesting, roosting, and foraging habitat, as represented by late-seral and old growth stands, would increase throughout the analysis period. The percentage of habitat would be greater than the no action alternative at each 20-year period, with 10% more habitat than the no action alternative at the end of the analysis period.

Initially, HCP Condition 3 (Habitat Retention in Northern Spotted Owl Core Use Areas) would be applied to at least 23 northern spotted owl core use areas shown in HCP Figure 2-7. These existing core use areas are distributed across the MRW and the CRW. If new spotted owl activity centers or nest locations are identified in the future, DSL, in coordination with FWS, could choose to remove protections from another inactive core use area within the MRW in favor of the newly discovered (active) nest site. This "swapping" of nest sites would maintain protections on at least 23 core use areas. The potential loss would similar to the no action alternative where inactive sites are no longer protected.

While habitat increases alone would not necessarily result in increase in spotted owl populations due to many factors, including barred owl competition, the CRW and MRW areas are projected to collectively increase the capacity of the study area to support northern spotted owl territories and provide important demographic support for the Coast Range population.

As shown in Figure 3.5-1, the CRW would provide a large, contiguous area of late-seral and old growth forest at year 80, compared with widespread clearcut areas resulting in scattered patches of early-seral state forest patches under the no action alternative. In the MRW, clearcut harvest would be limited in extent compared to the no action alternative with early- and mid-seral forest primarily occurring in the southeastern portion of the study area, with large areas of intact habitat consolidated in the west and north. These differences would result in less northern spotted owl habitat fragmentation and a greater amount of total nesting, foraging, and dispersal habitat compared to the no action alternative. Reduced fragmentation would result in reduced risk of exposure of northern spotted owls to indirect effects of harvest activities adjacent to intact habitat (e.g., noise and human disturbance).

Road system management and development of quarries could also result in habitat removal, increased access to occupied habitat, and increased spread of invasive species, similar to the no action alternative. However, the requirement for no net gain in permanent road miles in the CRW under the proposed action would result in fewer impacts in this area compared to the no action alternative.

Prescribed burns may be used in specified conditions to accomplish research objectives but would not be allowed in RCAs. These burns would follow the same Oregon FPA requirements and best management practices as described under the no action alternative and would result in the same effects where implemented, although prescribed burns would not be expected to adversely affect northern spotted owl habitat since they would be designed to ensure HCP biological objectives for the species are met.

Effects of herbicides and pesticides on northern spotted owls would be minimal. As described for the no action alternative, these activities would be required to comply with Oregon FPA and to avoid take under the ESA because they are not covered under the HCP.

As under the no action alternative, unpredictable events such as wildfire, windthrow, and forest pest/disease outbreaks, which may increase in frequency and intensity with climate change, may affect availability and suitability of northern spotted owl habitat. Although individuals may move across the landscape to respond to altered habitat, the locations of protected areas would not change under the proposed action based on species occurrence as they would for the no action alternative, except for minor temporary shifts under changed circumstances. The set designation of protected area locations could be a disadvantage for the species because protected areas would not shift to adapt to changing environmental conditions. The focus on fixed habitat conservation areas under the proposed action would have benefits, however, in that prohibition of salvage harvest in reserve areas and RCAs in response to these events would provide opportunities for habitat to recover. The requirement to develop and implement tree retention standards that support maintenance of the biological legacy characteristics of stands prior to disturbance when conducting salvage harvest in extensive areas would provide additional opportunities for habitat restoration following disturbance. Additionally, under the proposed action, the adaptive management program (HCP Chapter 6, *Monitoring and Adaptive Management*) and changed circumstances provisions (HCP Section 7.8, *Changed and Unforeseen Circumstances*) would be used to respond to these changes in a manner that aligns with achievement of the HCP's biological goals and objectives for northern spotted owl and other covered species.

Compared to the no action alternative, the HCP's conservation strategy would provide a greater measure of certainty that northern spotted owl habitat will be maintained for the species' conservation needs, particularly in relation to meeting the HCP's biological goal of retaining and enhancing existing northern spotted owl nesting, roosting, and foraging habitat and increasing the availability of these habitat types in the permit area. Monitoring programs would inform understanding of habitat and species abundance and distribution trends and confirm compliance with the conditions of the HCP (or indicate whether changes are needed). Research would be conducted to assess appropriate actions for reducing effects of barred owls on spotted owl populations, and research would be integrated into HCP monitoring and data collection to inform the approach for removal of barred owls, the timing and extent of which would be determined in part by experimental design (Conservation Measure 6). The adaptive management process would facilitate incorporation of new scientific information about listed species and advances in forest management techniques and facilitate adjustment of conservation measures to improve implementation of the conservation strategy.

Alternative 3: Increased Conservation

Effects on northern spotted owl under Alternative 3 would be similar to the proposed action but would result in more habitat for the species at each 20-year period, with 10% more habitat than the proposed action and 20% more habitat than the no action alternative at the end of the analysis period (Appendix 3.4, *Vegetation Technical Supplement*, Table 1; Figure 3.4-1). As shown in Figure 3.5-1, the CRW would provide the same large, contiguous area of late-seral and old growth forest at year 80 as the proposed action, but Alternative 3 would have more late-seral and old growth stands with greater connectivity in the MRW. Increased areas of reserves and RCAs would reduce the areas where salvage harvest could be implemented in response to disturbance events compared to the proposed action, increasing the potential for habitat to recover after disturbance.

Alternative 4: Increased Harvest

Habitat increases under Alternative 4 would be similar to the no action during the first 60 years of the analysis period but would drop off during the last 20 years. By the end of the analysis period, habitat would be 11% less than under the no action and 21% less than under proposed action (Appendix 3.4, *Vegetation Technical Supplement*, Table 1; Figure 3.4-1). As shown in Figure 3.5-1, late-seral and old growth stands would be scattered throughout the permit area in smaller patches than the proposed action, similar to the no action alternative. Resulting habitat fragmentation would be greater than the proposed action, but broader swathes of mixed stand ages in the extensive areas result in reduced fragmentation compared to the no action alternative.

Restrictions on road system management and associated potential for adverse effects would fall between the no action alternative and proposed action. Impacts of quarries would be similar to the proposed action and no action alternative. As under the proposed action, salvage harvest would be prohibited in in reserve areas and RCAs; however these areas would be under Alternative 4, which would decrease opportunities for habitat recovery compared to the proposed action.

Marbled Murrelet

Alternative 1: No Action

The mechanisms affecting marbled murrelets under the no action alternative are similar to those described for the northern spotted owl. Under the no action alternative, take of marbled murrelet would not be authorized, and the permittee would use the standards, which include all provisions set forth in the Survival Guidelines for Marbled Murrelet (OAR 635-100-0137) described in Chapter 2, Section 2.1.1, *Alternative 1: No Action*, which require state agencies to designate and protect occupied sites and associated buffers to avoid incidental take.

As described for northern spotted owl, forest stands in take avoidance areas would continue to age. The combined amount of late-seral and old growth stands (which provide marbled murrelet habitat) in the permit area would decrease during the first 20 years, then increase throughout the remainder of the analysis period for a net increase of 12% (Figure 3.4-1; Appendix 3.4, *Vegetation Technical Supplement*, Table 1). However, if owls decline in the study area, these habitat projections could be up to 2% less. Forest stands in these areas would develop characteristics over time that are suited to nesting, including large-diameter trees with appropriate platform branches. As shown in Figure 3.5-1, projected marbled murrelet habitat (late-seral and old growth stands) at year 80 of the analysis period would be highly fragmented across the permit area, reducing not only the total amount of nesting, foraging, and dispersal habitat, but increasing risk of exposure of marbled murrelets to indirect effects of harvest activities adjacent to intact habitat (e.g., noise, human disturbance).

As described for northern spotted owl, habitat that is not avoided (e.g., confirmed unoccupied) would be available for harvest, with clearcutting the primary method. Assuming harvest rotation cycles of approximately 60 years, these unprotected areas would likely not develop necessary habitat elements to support the species.

Construction of supporting infrastructure such as roads and quarries would have the same effects on marbled murrelet as those described under the no action alternative for northern spotted owl.

Prescribed burns would follow Oregon FPA requirements and best management practices and would avoid take of marbled murrelet. Because prescribed burns would primarily occur on landings following harvest or in areas for replanting, they would not occur in late-seral or old growth forest that provides habitat for marbled murrelet.

As described for northern spotted owls, use of herbicide and pesticides would be required to follow restrictions under the Oregon FPA and avoid take of marbled murrelets under the ESA; therefore, effects on the species are expected to be minimal.

Disturbance events would affect the marbled murrelet over the analysis period as described under the no action alternative for spotted owl. DSL would need to shift harvest locations in response to large disturbance events such as fires or storms if spotted owl distribution shifts because of disturbance. Since only occupied habitat would be protected, areas could continue to be logged if spotted owls or marbled murrelets do not occupy them following disturbance and would not likely mature into marbled murrelet habitat in the future. DSL would have the ability to implement salvage following natural disturbances, with no requirement to restore the habitat, potentially impeding the ability of damaged sites to provide legacy elements useful to marbled murrelets. This may lead to a decrease in the likelihood of occupation by the species and the long-term species persistence.

Monitoring of the marbled murrelet population would be limited to required occupancy surveys prior to conducting timber harvest, but there would be no monitoring requirements over the entire permit area, and no provisions for adaptive management under the no action alternative. There would be no assurance of retaining adequate habitat connectivity, leading to increases in habitat fragmentation and greater amounts of forest/clearing edge. These changes would increase edge effects, including increasing rates of nest predation by corvids. Although incidental take of marbled murrelets would be avoided, the no action alternative would not contribute to recovery of the species because it would not reduce habitat fragmentation and edge effects such as increased nest predation.

Alternative 2: Proposed Action

The mechanisms affecting marbled murrelets under the proposed action would be the same as described for the no action alternative, but FWS would issue authorization for incidental take over the permit term. Effects of pesticide or herbicide use would be similar to the no action alternative, as pesticide use is not a covered activity and take of northern spotted owls resulting from this use would be prohibited. Management in the permit area would be subject to the overarching research and conservation strategy of the HCP (Chapter 2, Section 2.1.2, *Alternative 2: Proposed Action*), which would minimize and mitigate take through meeting the HCP's biological goals and objectives (HCP Section 5.3) and implementing the HCP's conservation measures (HCP Section 5.4) and conditions on covered activities (HCP Section 5.5). Furthermore, research conducted in association with the proposed action is expected to benefit conservation of the species as a whole, beyond the study area.

Take projected to occur under the HCP would be associated with the loss of up to 1,400 total acres of occupied marbled murrelet nesting habitat over the term of the permit, and additional take may result from edge effects. Since the 100-meter buffers around occupied sites would not be required, harvest treatment adjacent to marbled murrelet nesting habitat would create a sharp edge that would subject any nesting murrelets to increased risk of nest site predation and may alter habitat through microclimate effects. This effect would occur at the affected site for several years until regeneration occurs to create a softer edge and less direct access to nesting stands for predators. The HCP's research design and treatments, together with conservation measures and conditions on covered activities (HCP Chapter 5, *Conservation Strategy*), are projected to result in a net increase in marbled murrelet habitat over the permit term through habitat maintenance, enhancement, and expansion. The stay-ahead provision in the HCP (HCP Chapter 7, *Implementation and Assurances*) requires the permittee to replace marbled murrelet habitat lost to harvest with at least as much habitat of equivalent or better quality grown over the permit term within reserves (i.e., in the CRW and in MRW reserves).

Based on the forest age projections (Figure 3.4-1; Appendix 3.4, *Vegetation Technical Supplement*, Table 1), the combined amount of marbled murrelet habitat, as represented by late-seral and old growth stands, would increase throughout the analysis period. The percentage of habitat would increase during each 20-year period compared to the no action alternative, with increases being 10% greater under the proposed action than the no action alternative at the end of the analysis period. Increases in habitat are expected to support colonization and increase of the nesting marbled murrelet population over time. Habitat increases would also improve the value of existing habitat by reducing edge effects through the creation of larger blocks of nesting habitat as a factor of expanding habitat over time as described for northern spotted owl and illustrated in Figure 3.5-1.

As shown in Figure 3.5-1, the CRW would provide a large, contiguous area of late-seral and old growth forest at year 80, compared with widespread clearcut areas resulting in scattered patches of early-seral forest under the no action alternative. In the MRW, clearcut harvest would be limited in extent compared to the no action alternative with early- and mid-seral forest primarily occurring in the southeastern portion of the study area, with large areas of intact habitat consolidated in the west and north. These differences would result in less habitat fragmentation compared to the no action alternative, which would reduce risk of exposure of marbled murrelets to indirect effects of harvest activities adjacent to intact habitat (e.g., noise and human disturbance).

Construction of supporting infrastructure such as roads and quarries would have effects on marbled murrelets the same as those described under the proposed action for spotted owl.

Prescribed burns would follow the same Oregon FPA requirements and best management practices as described under the no action alternative and would result in the same effects where implemented, although prescribed burns would not be expected to adversely affect marbled murrelet habitat since such burns would be designed to ensure HCP biological objectives for the species are met.

Effects of herbicides and pesticides on marbled murrelets would be minimal as described for the no action alternative, because these activities would be required to comply with Oregon FPA and to avoid take under the ESA because they are not covered under the HCP.

Similar to the no action alternative, disturbance events such as wildfire, windthrow, and forest pest/disease outbreaks, which may increase in frequency and intensity with climate change, may affect availability and suitability of study area forests for marbled murrelets. Although individuals may move across the landscape to respond to altered habitat, the locations of protected areas would not change under the proposed action based on species occurrence as they would for the no action alternative, except for minor temporary shifts under changed circumstances. The set designation of protected area locations could be a disadvantage for the species because protected areas would not shift to adapt to changing environmental conditions. The focus on fixed habitat conservation areas under the proposed action would have benefits, however, in that prohibition of salvage harvest in reserve areas and RCAs and retention standards in extensive areas would provide opportunities for habitat to recover. Additionally, under the proposed action, the adaptive management program and changed circumstances provisions would be used to respond to these changes, with the overarching goal of meeting the HCP's biological goals and objectives for marbled murrelet and other covered species.

Compared to the no action alternative, the proposed action's conservation strategy would provide a greater measure of certainty that marbled murrelet habitat would be maintained for the conservation needs of the species, particularly in relation to meeting the HCP's biological goal of increasing occupied and potentially occupied marbled murrelet habitat in the permit area. Monitoring programs would inform understanding of habitat and species abundance and distribution trends and confirm compliance with the conditions of the HCP (or indicate whether changes are needed). Moreover, the research programs considered in the HCP (OSU 2021: Appendix 11) and the adaptive management process would facilitate incorporation of new scientific information about listed species and advances in forest management techniques, and facilitate adjustment of conservation measures to improve implementation of the conservation strategy.

Alternative 3: Increased Conservation

Effects on marbled murrelet under Alternative 3 would be similar to the proposed action but would result in more habitat for the species at each 20-year period, with 10% more habitat than the proposed action and 20% more habitat than the no action alternative at the end of the analysis period (Appendix 3.4, *Vegetation Technical Supplement*, Table 1; Figure 3.4-1). As shown in Figure 3.5-1, the CRW would provide the same large, contiguous area of late-seral and old growth forest at year 80 as the proposed action, but Alternative 3 would have more late-seral and old growth stands with greater connectivity in the MRW. Increased areas of reserve and RCAs would reduce the areas where salvage harvest could be implemented in response to disturbance events compared to the proposed action, increasing the potential for habitat to recover after disturbance.

Alternative 4: Increased Harvest

Habitat increases under Alternative 4 would be similar to the no action during the first 60 years of the analysis period but would drop off during the last 20 years. By the end of the analysis period, habitat would be 11% less than under the no action and 21% less than under proposed action (Appendix 3.4, *Vegetation Technical Supplement*, Table 1; Figure 3.4-1). As shown in Figure 3.5-1, late-seral and old growth stands would be scattered throughout the permit area in smaller patches than the proposed action, similar to the no action alternative. Resulting habitat fragmentation would be greater than the proposed action, but broader swathes of mixed stand ages in the extensive areas result in reduced fragmentation compared to the no action alternative. Edge effects described under the proposed action would also occur under Alternative 4, which could increase predation risk and alter habitat through microclimate effects for nesting murrelets compared to the no action alternative . Restrictions on road system management and associated potential for adverse effects would fall between the no action alternative and proposed action. Impacts of quarries would be similar to the proposed action and no action alternative. As under the proposed action, salvage harvest would be prohibited in in reserve areas and RCAs; however these areas would be under Alternative 4, which would decrease opportunities for habitat recovery compared to the proposed action.

3.5.3.5 Noncovered Forest-Dependent Wildlife Species

Alternative 1: No Action

The mechanisms that affect noncovered forest-dependent wildlife species would be the same as described for northern spotted owl, except that there would not be take avoidance requirements for the nonlisted species. Take avoidance requirements under the Migratory Bird Treaty Act (MBTA) would apply to nesting migratory birds. For species that inhabit late-seral and old growth forests, including special-status species listed for these seral stages in Table 3.5-2 and migratory birds dependent on these seral stages, the effects of forest protection and structural change in listed species take avoidance areas and RMAs would be similar to those described for the northern spotted owl because they have similar habitat requirements. Forest stands in take avoidance areas would continue to age.

The amount of combined late-seral and old growth stands in the permit area is projected to decrease during the first 20 years, then increase throughout the remainder of the analysis period for a net increase of 12% (Figure 3.4-1 and Appendix 3.4, *Vegetation Technical Supplement*, Table 1). If northern spotted owls decline in the study area, these projections could be reduced by up to 2%. As shown in Figure 3.5-1, projected late-seral and old growth stands at year 80 of the analysis period would be highly fragmented across the permit area. Forest stands in these areas would develop characteristics over time that are suited to nesting, including large-diameter trees with appropriate platform branches. Because of the lack of take avoidance requirements for the nonlisted wildlife species, noise and visual disturbances as well as removal of occupied habitat during timber harvest and road and quarry construction and management could disrupt feeding, breeding, and foraging behavior or cause injury or death of these species.

Changes in early- to mid-seral forest could affect special-status species associated with these seral stages as listed in Table 3.5-2, and migratory birds associated with these seral stages. As described in Section 3.4, *Vegetation*, and depicted in Figure 3.4-1, the no action alternative is predicted to result in a fluctuating increase and decrease of early- and mid-seral stage forest over the analysis period with a net 3% increase in early-seral stage forest by year 80 and a net 5% decrease in mid-seral stage forest by year 80.

Structural changes that decrease availability of snags and coarse woody debris, reduce understory diversity, and reduce canopy structural complexity may be more important than stand age. This is because most of the forest-associated species have the ability to use a range of forest stand age stages as long as specific structural elements are present. For example, clearcut harvest would decrease availability of coarse woody debris, adversely affecting clouded salamanders.

Fragmentation of forested blocks would result from forest management under the no action alternative. Some species could benefit from increased access to openings, such as rufous hummingbird, olive-sided flycatcher, and hoary bat, provided adjacent forest habitat provides specific structural elements such as snag trees. Removal of late-seral, multilevel forest structure would reduce hiding and concealment cover but increase patches of foraging habitat for deer and elk.

As described for northern spotted owl, prescribed burns would not occur in late-seral or old growth forest; therefore, they are not expected to affect noncovered species dependent on these habitat types. Because prescribed burns create or maintain openings and new growth, they would be beneficial for species dependent on early successional forest and forest openings.

Use of pesticides could indirectly affect forest dependent wildlife by reducing prey base and causing injury or mortality to some species. All use would be required to follow restrictions under the Oregon FPA and to avoid take of listed species; therefore, effects on other forest-dependent wildlife are expected to be minimized.

Disturbance events may also affect habitat for noncovered forest-dependent species over the analysis period as described under the no action alternative for spotted owl. Restricting salvage only in areas occupied by listed species after disturbance and having no requirement to restore remaining habitat would limit the potential for affected stands to mature into habitat for these species. This would reduce the likelihood of occupation by the species and the long-term species persistence.

Alternative 2: Proposed Action

The mechanisms that affect other noncovered forest-dependent wildlife species would be the same as described for the no action alternative. Protections under the MBTA would be the same as under the no action alternative.

The management goals and objectives developed to minimize and mitigate incidental take of the federally listed species would provide benefits to other noncovered species that occupy similar late-seral and old growth forest habitats. The combined availability of late-seral and old growth habitat would be greater than under the no action alternative, with associated increases in the structural elements as described in Section 3.5.3.4, *Covered Forest-Dependent Species*. This increase in late-seral and old growth habitat under the proposed action would increase the capacity for wildlife that depend on these seral stages to expand into new areas under the proposed action. As described above for northern spotted owl and marbled murrelet (and shown in Figure 3.5-1), the proposed action would also provide larger, more contiguous habitat areas than under the no action alternative, providing increased ability for dispersal and decreased risk of exposure to disturbances such as noise and human activity associated with timber harvest activities.

Similar to the no action alternative, where continued harvest of younger stands occurs (intensive and extensive areas under proposed action), the proposed action would have adverse effects due to habitat removal and potential adverse effects of noise and human disturbance but would also have beneficial effects on the sensitive species that use forest edge and openings, provided structural elements are available. Clearcut openings and early-seral forest stands would be available throughout the analysis period to wildlife species that use these habitats, including deer and elk, but the acreage allocated to these stand conditions would be less than under the no action alternative. Therefore, less habitat would be available to species using forest edges and openings under the proposed action compared to the no action alternative. Densely vegetated areas used by deer and elk for concealment would be less fragmented than under the no action alternative.

Prescribed burns may be used in specified conditions to accomplish research objectives but would not be allowed in RCAs. These burns would follow the same Oregon FPA requirements and best management practices as described under the no action alternative and would result in the same effects on noncovered forest-dependent species where implemented.

Effects of pesticide use on noncovered forest-dependent wildlife would be similar to the no action alternative, although because road use is expected to be lower due to decreased amount of clearcut harvest, associated chemical use and impacts would likely be lower.

As described under the no action alternative, disturbance events may also affect habitat for noncovered forest-dependent species over the analysis period. Prohibition of salvage harvest in reserve areas and RCAs in response to these events under the proposed action would provide opportunities for habitat to recover. Salvage operations in extensive areas under the proposed action would consider the biological legacy of the stand prior to the disturbance event and tree retention standards would be developed to support the maintenance of these legacy characteristics, thus providing additional opportunities for habitat restoration following disturbances. Additionally, under the proposed action, the adaptive management program (HCP Chapter 7, *Implementation and Assurances*) would be used to respond to these changes in a manner that aligns with achievement of the HCP's biological goals and objectives for northern spotted owl and other covered species, thus benefiting noncovered species with similar habitat needs.

Alternative 3: Increased Conservation

Wildlife species dependent on late-seral and old growth forest under Alternative 3 would be similar to the proposed action but would result in more habitat for the species and increased connectivity as described for northern spotted owl. Increased areas of reserves and RCAs would reduce the areas where salvage harvest could be implemented in response to disturbance events compared to the proposed action, increasing the potential for habitat to recover after disturbance. Continued harvest of younger stands under Alternative 3 would have beneficial effects on the sensitive species that use forest edge and openings (provided structural elements are available) as described under the no action alternative, and clearcut openings and early-seral forest stands would be available throughout the analysis period to wildlife species that use these habitats, including deer and elk that use open areas for foraging. The acreage of habitat available to species using forest edges and openings would be least under this alternative.

Alternative 4: Increased Harvest

Effects on wildlife species dependent on late-seral and old growth forest under Alternative 4 are expected to be the same as those described above for northern spotted owl and marbled murrelet with habitat increases similar to the no action and fragmentation between the no action and proposed action. Continued harvest of younger stands under Alternative 4 would have beneficial effects on the sensitive species that use forest edge and openings (provided structural elements are available) as described under the no action alternative, and clearcut openings and early-seral forest stands would be available throughout the analysis period to wildlife species that use these habitats. As shown in Figure 3.5-4, the amount of clearings and patches of early seral forest, which provide habitat for species using forest edges and openings would be similar to the no action alternative, greater than under the proposed action.

3.5.3.6 Noncovered Wildlife Species Dependent on Wetlands and Riparian Habitat

Alternative 1: No Action

Trees for timber harvest are only occasionally found in riparian habitat (i.e., freshwater forested/shrub wetland) and wetlands; therefore, timber harvest is unlikely to occur in these habitats. Harvest-related ground disturbance activities such as staging, however, could affect habitat for wetland and riparian dependent species in the vicinity of harvest activities. Effects of harvest and thinning on wetlands would be minimized through compliance with OAR 629-655.

Effects of forest management in wetland and riparian areas in the permit area are described in Section 3.4.3.4, *Wetland Vegetation*. Species potentially affected, including migratory birds, are listed in Table 3.5-2. Ground disturbing activities could affect an estimated 113 acres of wetlands and riparian areas, including 58 acres of riparian habitat (freshwater forested/shrub wetland), 49 acres of freshwater emergent wetland, 5 acres of freshwater pond, and less than 1 acre of lake habitat. Vegetation loss would be temporary and the habitat would recover over time. Riparian-associated species such as northern red-legged frog would be protected by buffer-zone retention prescriptions stated in the Oregon FPA rules, but vegetation removal would occur in wetlands located outside of RMAs. Take avoidance requirements under the MBTA would apply to nesting migratory birds. Amphibians could be killed or injured during harvest operations and adversely affected by habitat loss. Bat species that typically forage along watercourses and over wetlands would be adversely affected where vegetation removal occurs outside of RMAs.

Timber harvest under the no action alternative would likely increase sedimentation in wetlands and increase water temperature, as described above for streams (Section 3.5.3.2, *Noncovered Fish Species*). For wetlands that occur outside of RMAs, vegetation removal could occur up to the edge of the wetland.

Use of pesticides could indirectly affect wetland-dependent wildlife by reducing prey base and causing injury or mortality to some species. Compliance with restrictions under the Oregon FPA would be expected to minimize effects.

DSL would not conduct the following activities in riparian habitat and wetlands because these activities would result in conversion to uplands: road construction, quarry construction, and water drafting. Prescribed burns have the potential to reduce riparian and wetland (including wet meadow) function through removal of vegetation. Prescribed burns could increase fine sediment runoff to wetlands, temporarily alter the pH of streams due to ash, and temporarily decrease the input of terrestrial invertebrates as food into wetlands postburn. Prescribed burns could also injure or kill wildlife occurring in these habitats.

Alternative 2: Proposed Action

Effects on noncovered riparian and wetland (including wet meadow) species under the proposed action would be similar to those described for the no action alternative. Protections under the MBTA would be the same as under the no action alternative. Effects of harvest and thinning on wetlands would be minimized through compliance with OAR 629-655, as with the no action alternative.

Under the proposed action, ground-disturbing activities would affect an estimated 72 acres of wetlands and riparian areas, including 62 acres of riparian habitat (freshwater forested/shrub wetland), 5 acres of freshwater emergent wetland, and 5 acres of freshwater pond. Total estimated ground disturbance in wetlands and riparian areas would be 63% less than under the no action alternative and as a result would result in fewer impacts on the species described in Sections 3.5.2.5, *Riparian-Dependent Species*, and 3.5.2.6, *Wetland-Dependent Species*.

No effects are expected from road construction, quarry construction, or water drafting for the reasons stated for the no action alternative. Effects of prescribed burns would be nominal as described for the no action alternative.

Effects of pesticide use on noncovered wetland-dependent wildlife would be similar to the no action alternative, although because road use is expected to be lower due to decreased amount of clearcut harvest, associated chemical use and impacts would likely be lower.

Conservation Measure 1, *Targeted Restoration and Stream Enhancement*, could include creation or re-creation of beaver habitat, which would result in benefits to beavers and other wildlife species dependent on using riparian habitat under the proposed action, whereas there would be no ensured commitments for beavers under the no action alternative.

Alternative 3: Increased Conservation

Similar to the no action alternative and proposed action, wetlands and riparian habitats could be adversely affected during forest management activities under Alternative 3. Estimated impacts on riparian and wetland habitat and associated wildlife species would be the same as under the proposed action and less than the no action alternative.

Alternative 4: Increased Harvest

Similar to the no action alternative and proposed action, wetlands and riparian habitats could be adversely affected during forest management activities under Alternative 4. Estimated impacts on riparian and wetland habitat and associated wildlife species would be the same as the proposed action and less than the no action alternative.

3.6 Air Quality

3.6.1 Methods

The study area for air quality consists of the permit area and areas within 5 miles where air quality could be affected by the proposed action and alternatives, which includes the plan area.

3.6.2 Affected Environment

The U.S. Environmental Protection Agency (EPA) has established national ambient air quality standards (NAAQS) for six air pollutants determined to be criteria pollutants (commonly emitted air contaminants that affect human health), including carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter 10 and 2.5 microns or less in diameter (PM10 and PM2.5), and sulfur dioxide (EPA 2022a:1-3). Air quality is determined by measuring ground-level ambient (outdoor) air pollutant concentrations over certain time periods.

EPA designates geographic regions as nonattainment areas when measured concentrations of these air pollutants exceed the NAAQS for specific pollutants and time periods, and as attainment areas when pollutant levels are less than the NAAQS. EPA designates former nonattainment areas that have reduced pollutant levels below the NAAQS as maintenance areas. There are no air quality nonattainment or maintenance areas in the study area (EPA 2022b:1).

Some pollutants, specifically particles emitted by fires, can affect air quality by contributing to regional haze and reduced visibility. The Clean Air Act lists other pollutants known as hazardous air pollutants, which are pollutants known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. The Oregon Department of Environmental Quality (ODEQ) Air Quality Division implements EPA's air quality regulations, including the NAAQS. ODEQ has delegated smoke management responsibilities to the Oregon Department of Forestry (ODF). ODF has developed the *Oregon Smoke Management Plan*, which requires dispersion, dilution, and avoidance techniques to minimize smoke impacts on mandatory Class 1 areas,[1] designated air quality nonattainment and maintenance areas, and Smoke Sensitive Areas.[2] There are no mandatory Class 1 areas or Smoke Sensitive Areas in the study area (ODF 2020:4). The nearest Class 1 area is the Kalmiopsis Wilderness 62 miles to the south and the closest Smoke Sensitive Area is the Coos Bay/North Bend 12 miles to the southwest.

3.6.3 Environmental Consequences

Air quality impacts under the proposed action and alternatives would be driven by equipment exhaust from timber harvest activities, thinning, reforestation, and road system management. Differences in emissions under the alternatives would be approximately proportional to board feet harvested and miles of road constructed and maintained. Miles of road constructed are expected to be similar under all alternatives, but annual average board feet harvested and associated criteria

[1] Mandatory Class 1 areas are areas, such as designated Wilderness Areas, identified under the Clean Air Act as requiring the highest level of protection.

[2] A Smoke Sensitive Area is an area that has the highest level of protection under the Oregon Smoke Management Plan due to a history of smoke incidents, its population density, or from a legal protection related to visibility.

pollutant emissions are projected to be greatest under the no action alternative, followed by Alternative 4, then the proposed action, then Alternative 3. The remaining covered activities would have no or negligible differences in the degree of activity among alternatives.

Under all alternatives forest management activities would use vehicles and equipment that emit air pollutants, including criteria pollutants and hazardous air pollutants from engine exhaust and fugitive particulate matter (dust) from travel on roadways and disturbed earth surfaces. Effects would tend to be localized and specific to the conditions and equipment in use within a localized area.

Under all alternatives, vehicle and equipment use typically would be short term and intermittent at any one location, depending on the work schedule and the specific equipment in use. Continued compliance with ODEQ requirements for fugitive emissions (OAR 340-208-0210) would ensure that dust emissions are suppressed with watering or chemical control. Ongoing maintenance of vehicles and equipment would keep equipment emissions in compliance with their emission certification standards. Therefore, these activities are not likely to cause a violation of ambient air quality standards or have an adverse effect on long-term air quality in the study area.

Use of prescribed burning would cause emissions through the combustion of biomass. They have the potential to emit air pollution at sufficient levels to measurably affect temporary air quality within the study area. Because prescribed burns are intentionally kept small and controlled and do not affect the overstory, they would not have the potential to reach any smoke-sensitive areas. Continued compliance with required prescribed burning regulations under the *Oregon Smoke Management Plan* would ensure that smoke emissions from prescribed burns do not violate ambient air quality standards or impair visibility within or outside of the study area, consistent with the EPA Regional Haze Program and Oregon’s Visibility Protection Plan.

3.7 Climate Change

3.7.1 Methods

The study area for climate change consists of two areas: (1) the central Oregon coastal region where effects of climate change on environmental resources could overlap with effects of the proposed action and alternatives, and (2) the regional and global climate that the proposed action and alternatives would affect through greenhouse gas (GHG) emissions and carbon storage.

Climate change is analyzed based on the Council on Environmental Quality's (CEQ) 2016 final guidance that recommends agencies address climate change impacts by considering (1) the effects of climate change on a proposed action and its environmental impacts, and (2) the potential effects of the proposed action on climate change as indicated by changes in GHG emissions (CEQ 2016).[1]

Section 3.7.2.1, *Climate Change,* presents the anticipated effects of climate change on environmental resources in the central Oregon coastal region, based on general circulation models and published assessments. These climate change effects are also acknowledged as part of the changing environmental baseline in the affected environment descriptions in Sections 3.3, *Water Resources*, 3.4, *Vegetation*, 3.5, *Fish and Wildlife*, and 3.8, *Recreation and Visual Resources*, consistent with 40 CFR 1502.15. The potential for the incremental effects of the proposed action and alternatives to result in cumulative effects on these environmental resources when combined with the effects of climate change is discussed in Chapter 4, *Cumulative Effects.*

Section 3.7.3, *Environmental Consequences*, describes the GHG emissions and carbon sequestration under the proposed action and alternatives. GHG emissions and carbon storage were quantified, based on information provided in the *Summary Report Oregon State University College of Forestry Financial and Carbon Modeling for the Elliott State Research Forest* (OSU 2019). Key information used in the report included the annual standing inventory, the annual average timber harvest volumes, and acreage by time periods for scenarios similar to the proposed action and alternatives. Carbon sequestration was estimated using the total standing inventory from scenarios modeled in the Oregon State University study.

GHG emissions were calculated from forest operations using the following approach.

- Forest model outputs for volume of annual average timber and thinning harvest and total standing inventory were used (OSU 2019).
- The highest modeled GHG emissions rates from forestry operations in the Oregon Coast Range (Sonne 2006:9) were used to conservatively estimate the GHG emissions rate. This emissions rate of 108 metric tons (MT) of carbon dioxide equivalent (CO_2e) per million board feet

[1] Per Executive Order 13990 and a subsequent Federal Register Notice (86 FR 10252), CEQ will review, revise, and update the guidance; in the interim agencies should use the 2016 CEQ GHG guidance as appropriate and relevant.

harvested or thinned[2,3] includes emissions from precommercial thinning, commercial thinning, herbicide, fertilization, and transport to mill.

Road system management would result in GHG emissions from equipment use and vehicle activity. Because estimates for equipment use and vehicle activity were not readily available, this analysis calculates GHG emissions from road construction using the following.

- Fuel consumption related to construction of 40 miles of new permanent roads over the analysis period assuming no more than 2 new miles of permanent roads each year under all alternatives.
- Fuel consumption rate of 588 gallons of diesel fuel per mile of road constructed, based on a U.S. Forest Service study (Loeffler et al. 2009:5) assuming road slopes of less than 50%.[4]
- The GHG emissions factors (carbon dioxide [CO_2], methane [CH_4], and nitrous oxide [N_2O] per gallon) for diesel fuel mobile equipment recommended by the most recent U.S. Environmental Protection Agency guidance (EPA 2021:2-3). The emissions factor was converted to CO_2e per gallon using the 100-year global warming potential values from the *Intergovernmental Panel on Climate Change Sixth Assessment Report* (IPCC 2022:44), yielding an emissions factor of 23 pounds CO_2e per gallon.

3.7.2 Affected Environment

3.7.2.1 Climate Change

Mean annual temperatures in Oregon have risen 2.5 degrees Fahrenheit (°F) since the beginning of the twentieth century and temperatures in the 1990s and 2000s were higher than any other historical period. 2015 was the warmest year since 1895 and Oregon experienced a multitude of drought impacts; 2014 was the third warmest. The periods 2005–2009 and 2015–2020 saw the highest number of extremely hot days. Winter warming is also occurring, as evidenced by a below-average occurrence in the frequency of very cold nights since 1990 and the number of freezing days near or below average since 1995, in addition to 2000–2004 having the lowest multiyear value (Frankson et al. 2022). Wintertime warming across the northern United States has been greater than summertime warming (Vose et al. 2017), though the data for southern Oregon show fairly uniform historical warming across all seasons with the exception of spring, which shows the least warming (Halofsky et al. 2022).

Although the Pacific Northwest has among the least amount of projected future temperature change in the United States, climate change will continue to affect the study area through the analysis period (Vose et al. 2017). Climate models project continued warming this century, though there is a large range of projected temperature increases using both high (RCP8.5) and low (RCP4.5) emissions

[2] The study's GHG inventory boundary, which accounts for the emissions within the permit area, excluded emissions associated with production at sawmills and construction of facilities and equipment.

[3] The emissions factors used in the study to model emissions from offroad equipment and vehicles are based on year 2006 and prior engines. Vehicle and equipment engine emissions factors improve over time due to improvements in emissions control technologies and more stringent regulations. Therefore, use of this study is conservative in that it results in an overestimate of emissions expected during the future analysis years.

[4] Fuel consumption estimates are based on historical vehicle and equipment engines with less fuel-efficient engines than would be generally expected over the future years of the 80-year permit term. Use of these values is, therefore, conservative in that it overestimates fuel consumption and, thus, GHG emissions.

scenarios. By the 2050s, models suggest Oregon may experience little change in average daily temperature to as much as temperatures 5°F higher. It is highly likely that by the end of the century Oregon will experience warming of at least 5°F if not warming exceeding 8°F (Vose et al. 2017; Dalton and Fleishman 2021). Downscaled modeling for the end of the century under the low (RCP4.5) emissions scenario (RCP4.5) shows the largest increases in temperature occurring in the summertime. Under the high emissions scenario (RCP8.5), the largest increases are projected for the summer and fall seasons (https://climate.northwestknowledge.net/MACA). Below 5,900 feet, the growing season could become year-round as freeze events become a rare occurrence. Even at the highest elevations, the length of the growing season, which is indicative of warming, could increase to nearly 9 months as winter low temperatures continue to increase (Halofsky et al. 2022).

Areas west of the Cascades currently experience large variations in seasonal rainfall amounts and also see large annual variations. Since 1895, no trend in annual precipitation has been detected. While uncertain, models suggest that winter precipitation will increase, with more falling as rain as opposed to snow, and summer precipitation will decrease. Higher temperatures will result in more precipitation falling as rain at high elevations as the snow line rises, a substantial decline in mountain snowpack, earlier snow melt, and decreases in summer streamflow as a result (Frankson et al. 2022). Snowpack throughout Oregon, especially on the west slope of the Cascade Range at low to intermediate elevations, has been accumulating more slowly, reaching lower peak values, and melting earlier. These trends are likely to continue, and even accelerate, as temperature increases (Dalton and Fleishman 2021). Cascade spring snowpack declined 23% between 1930 and 2007 (Stoelinga et al. 2010). Mote et al. (2018) documented further declines in spring snowpack through 2016. As a harbinger, the unusually low western U.S. snowpack of 2015 may become the norm. By mid-century snow water equivalent (SWE) is projected to be 41% lower, snow cover reduced by 22%, and snowfall 11% lower than the 1901–1960 baseline under the high emissions scenario (RCP8.5). By the end of the century the projections are SWE 90% lower, snow cover reduced by 73%, and snowfall 50% lower (Wehner et al. 2017).

Oregon has not experienced an upward trend in the frequency of extreme precipitation events. The number of 2-inch or higher precipitation events has been highly variable since 1900 and mostly below normal since 2000. The last three decades have seen 5-year periods with both the highest (1995–1999) and lowest (2000–2004) frequency of extreme precipitation events (Frankson et al. 2022). Much of the precipitation along the U.S. west coast is delivered by "atmospheric rivers." These events play a beneficial role in building up snowpack but are also the source of the majority of floods in the region.

Under the high emissions scenario (RCP8.5) the number of extreme events (exceeding a 5-year return period) more than doubles over the historical average by the end of the twenty-first century. Under the lower emissions scenario (RCP4.5), climate models show more limited increases in frequency. There is strong evidence, both from the observed record and modeling studies, that increased water vapor resulting from higher temperatures is the primary cause of the increases. Atmospheric rivers, especially along the west coast of the United States, are projected to increase in number and water vapor transport and experience landfall at lower latitudes by the end of the twenty-first century (Easterling et al. 2017).

Anticipated streamflow changes include higher winter peak flow events associated with increased rain and rain-on-snow in mid to higher elevations that may yield increased flooding, and overall declines in summer baseflows (Reilly et al. 2018; Halofsky et al. 2022). One study found that seasonal extreme runoff will increase seasonally west of the Cascades with the highest extremes during winter and fall (Najafi and Moradkhani 2015). Higher winter precipitation in conjunction with higher winter peak flow events will increase soil moisture, increase landslide risk, and potentially degrade aquatic habitat.

Climatic warming is already causing reduced summer low flows and streamflow timing has shifted earlier at many sites (Dalton et al. 2017:18–19). The 2015 drought generated very low streamflows and elevated stream water temperatures is a preview of what might be expected with continuing warming (Dalton et al. 2017:13). Distribution and abundance of coldwater fish species are expected to decrease as reduced streamflow and higher water temperature reduce suitable habitat. Increasing temperature and changes in the amount and timing of precipitation and runoff will also affect water quality, water availability, soils, and vegetation (Halofsky et al. 2022).

Climate change is expected to increase dryness of forest fuels, which will increase vulnerability of forests to wildfire even in cool and wet areas. Estimated expansion in area burned by the 2080s based on a 2.2°F increase in temperature and projected precipitation changes in western Oregon is quadruple the average annual area burned from 1916 to 2007 (Mote et al. 2014). If future larger, more severe and more frequent wildfire patterns manifest as expected, previously denser, moist forests may begin resembling their drier, lower-elevation mixed-conifer and hardwood counterparts in structure and composition (Sheehan et al. 2019; Busby et al. 2020). While fire may be seen as the driver of these future changes, climate is projected to be the proximate cause due to water deficits. Soil water deficits will occur as a result of longer, hotter growing seasons and will increase tree stress, vulnerability to insects and disease, and fuel flammability. Through the resultant tree mortality and vegetation change, vegetation shifts are likely through the twenty-first century regardless of fire regime changes (Sheehan et al. 2019). Resilience of existing forest will be negatively affected by climate change directly and also indirectly from greater risk of erosion from floods on fire-scarred landscapes and by invasive species. Vegetation change may lead to altered structure and function of ecosystems and will alter wildlife habitat, with both positive and negative effects depending on animal species and ecosystem. Animal species with a narrow range of preferred habitats (e.g., riparian, old forest) will be the most vulnerable to more disturbance and large-scale shifts in flora (Halofsky et al. 2022).

As noted, higher air temperature will produce loss of soil moisture and cause changes in the abundance and distribution of vegetation species, with drought-tolerant species being more competitive. Riparian areas may be increasingly sensitive to lower summer streamflows and higher evapotranspiration, decreasing the extent of the riparian zone and altering plant community composition. Drier conditions and more frequent fire in riparian areas may favor conifers over species typically associated with riparian areas (e.g., deciduous hardwoods). The amount of early-seral forest is expected to increase as fire frequency increases (Halofsky et al. 2022). Plant species distributions are likely to shift northward and upward in elevation with warming temperatures assuming there is sufficient soil moisture to support them.

3.7.2.2 Greenhouse Gas Emissions and Carbon Sequestration

GHGs include CO_2, CH_4, N_2O, water vapor (H_2O), and ozone (O_3), all of which occur in the natural environment. Human activities contribute to additional GHG emissions in the atmosphere from activities such as fossil-fuel combustion and the use of industrial gases (e.g., sulfur hexafluoride). The Intergovernmental Panel on Climate Change (IPCC) has confirmed that this buildup of GHGs in the atmosphere is changing Earth's energy balance and causing the atmosphere and oceans to warm, in turn affecting precipitation patterns, cloud cover, ocean currents, ocean acidification, polar snowfall, and decrease in ice accumulation, leading to sea-level rise (IPCC 2022).

A carbon pool (or storage) is a system that has the capacity to both take in and release carbon. Transfer of carbon from the atmosphere to any other carbon pool is called *carbon sequestration*. Sequestration occurs in forests when plants photosynthesize CO_2 and convert it to carbon in plant biomass and soil. Live vegetation and the forest floor/soils typically accumulate carbon, while dead vegetation emits carbon into the atmosphere through cellular respiration and decomposition. The absolute quantity of carbon that has been sequestered and stored within the forest ecosystem at a specified time is called forest carbon stock. A carbon pool is deemed a carbon sink if, during a given time interval, more atmospheric carbon flows into it than flows out of it.

3.7.3 Environmental Consequences

3.7.3.1 Effects of the Proposed Action and Alternatives on Climate Change

Under the proposed action and alternatives, forest management activities would result in GHG emissions related to vehicle and equipment use and prescribed burns, while forest stands, vegetation, and soils would sequester carbon from the atmosphere and store carbon in the permit area. The amount of GHG emissions would vary under the proposed action and alternatives depending on the level of forest management activities. Similarly, the amount of carbon sequestered and stored in trees, vegetation, and soils would vary depending on the amount of timber harvest, thinning, and soil disturbance, with timber harvest being the primary driver.

GHG emissions and carbon sequestration were quantified based on available data for timber harvest activities and road system management. Based on this analysis, under all alternatives the permit area would sequester much more carbon than quantified activities would emit (Table 3.7-1). GHG emissions from covered activities that were not quantified (i.e., prescribed burns and vehicle and equipment exhaust from use, maintenance, abandonment, and decommissioning of supporting infrastructure) would subtract from the carbon pool under all alternatives; however, emissions from these activities would be negligible in scale relative to the quantified net sequestration. Therefore, the amount of carbon sequestered would remain well above the amount of carbon released to the atmosphere under the proposed action and alternatives, resulting in a net increase in carbon sequestered from the atmosphere.

Table 3.7-1. Estimated Change in Carbon Sequestration and Emissions (MT CO_2e per year) from Modeled Activities [a,b]

Covered Activity	No Action	Proposed Action	Alternative 3	Alternative 4
Carbon Sequestration	31,809	38,175	57,263	27,995
Forestry Operations Emissions	-3,122	-1,891	-1,432	-2,619
Road Construction Emissions	<0.1	<0.1	<0.1	<0.1
Net Carbon Sequestration [c]	**26,687**	**36,284**	**55,831**	**25,376**

[a] Emissions from quantified covered activities are presented as negative values (i.e., subtracting from the carbon pool); carbon sequestration is presented as positive values (i.e., adding to the carbon pool).

[b] Only modeled activities were quantified. Non-quantified covered activities include quarries, prescribed burns, road system management and drainage maintenance. All non-quantified covered activities emit GHGs and, therefore, would subtract from the carbon pool.

[c] Net only includes the quantified covered activities. All values are positive, denoting a carbon sink and not a carbon source.

3.8 Recreation and Visual Resources

3.8.1 Methods

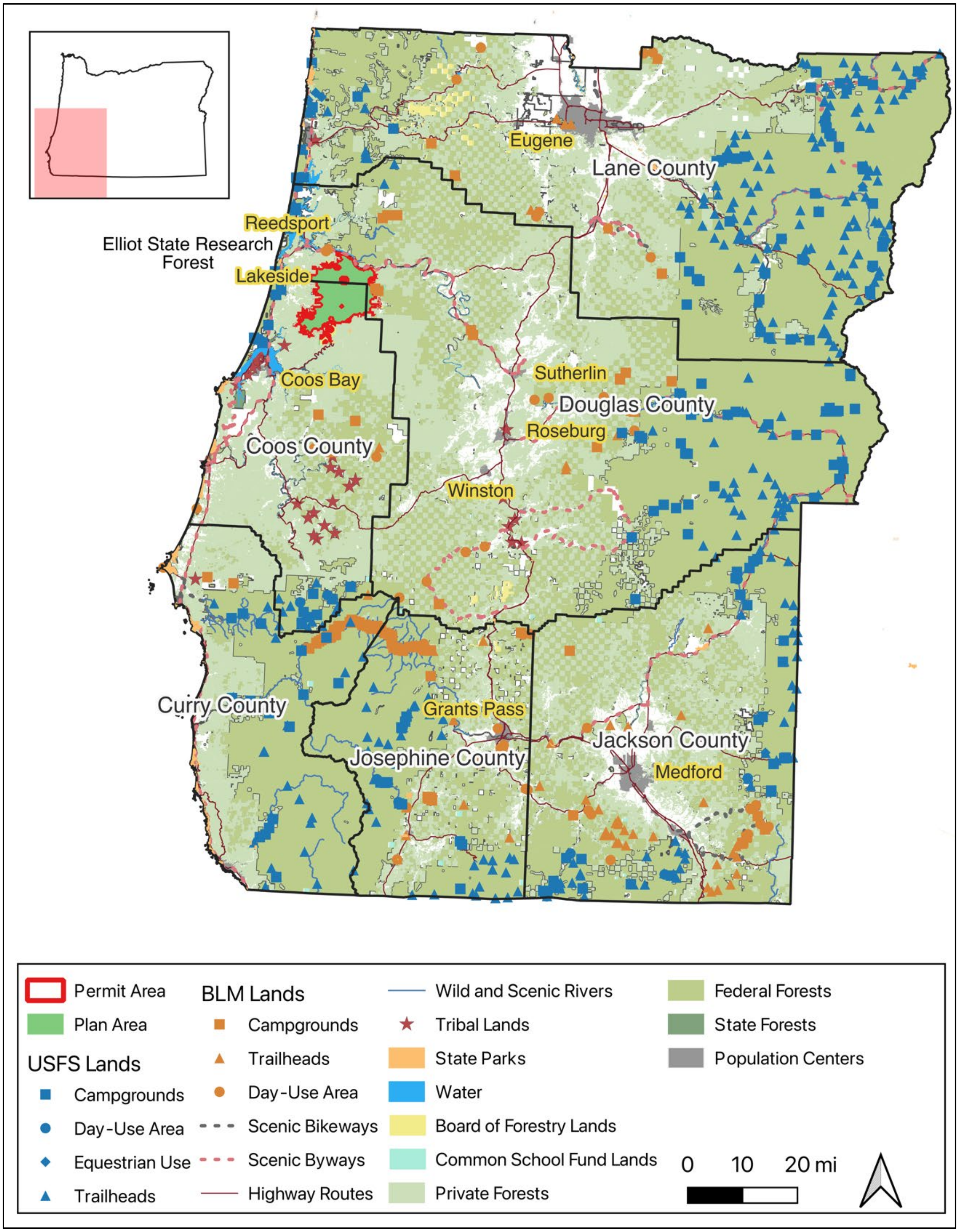
The study area for recreation covers southwestern Oregon, specifically Coos, Curry, Douglas, Jackson, Josephine, and Lane Counties (Figure 3.8-1). This geography captures the supply of recreation on Elliott State Forest lands in the permit area and the plan area and other forestlands adjacent to these areas, including developed recreation sites and areas used for dispersed recreation (i.e., any area where recreation is an allowable use, but dedicated infrastructure is not present). Southwestern Oregon also captures where most people who recreate in the permit area and plan area come from, and the supply of recreation sites on public and private lands that are substitutes for or complements to recreation resources in the Elliott State Forest.

The study area for visual resources consists of areas with views of the permit area and plan area, which includes areas within 0.5 mile of the permit area and plan area. Visual resources are all objects (artificial and natural, moving and stationary) and features (e.g., landforms, waterbodies) visible on a landscape.

This analysis identifies how forest management practices along with their effects on forest characteristics would affect the supply of recreation infrastructure and lands attractive to dispersed recreation, demand for recreation activities, and the value of recreation in the study area under the proposed action and alternatives.

This analysis also evaluates potential effects on visual resources from alteration of existing terrain, vegetative cover, and other natural or built features; alteration of the overall visual quality of a site or the region; introduction of incompatible visual elements; elimination of visual resources; and obstruction or permanent reduction of visually important features. The analysis considers changes to recreation experiences described in this section and to waterways and vegetation, described in Sections 3.3, *Water Resources*, and 3.4, *Vegetation*, respectively.

Figure 3.8-1. Recreation Facilities in the Study Area



3.8.2 Affected Environment

3.8.2.1 Recreation

The permit area and plan area do not contain any developed recreation facilities. DSL has not invested in and does not manage recreation infrastructure like campsites, maintained trails with trailheads and signage, or restroom facilities in the permit area (DSL n.d.). However, the permit area and plan area are open to the public and may be used for dispersed recreation wherever people can access the land. Dispersed recreation activities that occur in the permit area and plan area include camping, hiking, fishing, off-highway vehicle (OHV) use, forest product harvest and collection, and hunting. DSL does not regulate the use of the permit area for dispersed recreation.

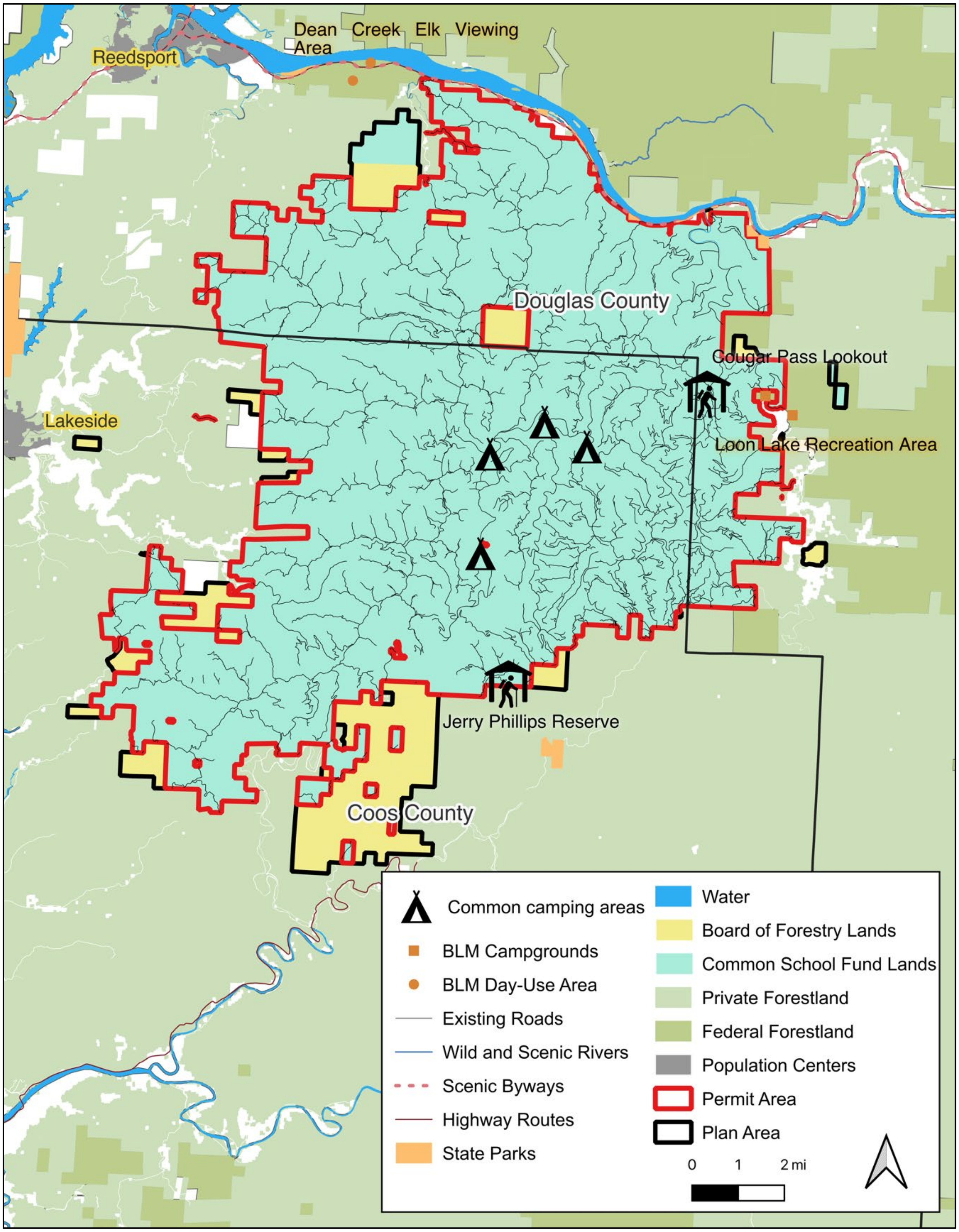
At least three dispersed camping areas are frequently used by visitors to the permit area and plan area (Figure 3.8-2). Multiple decommissioned roads in the forest now serve as hiking trails. Visitors may hike to attractions such as the Jerry Phillips Reserve, Elkhorn Ranch Homestead, or Cougar Pass Lookout (Figure 3.8-2). Visitors may travel along the Umpqua Scenic Byway that runs along the northern boundary of the permit area and plan area. People fish in the West Fork of the Millicoma River (Kronsberg et al. 2018). According to the 2011 Forest Management Plan, people frequently hunted for deer and elk in the permit area and plan area (DSL and ODF 2011). Hunting and trapping occur less now with fewer open stands in the absence of timber harvests (Kronsberg et al. 2018).

DSL does not collect data on dispersed recreation use. While people engage in dispersed recreation activities throughout the permit area and plan area, they generally follow and stay close to roads. Dispersed recreation use is more limited in remote, more densely forested areas.

Future Trends in Demand

Demand for outdoor recreation is increasing overall nationally including participation in activities such as hiking, trail running, mountain biking, and skiing (Outdoor Foundation 2021: 6, 21–22). In addition to these activities, registrations for OHVs have increased in Oregon suggesting increasing interest and participation in OHV use on public forestlands (Lindberg and Bertone-Riggs 2015:2–4). Other recreation activities, such as hunting, fishing, and wildlife watching have been declining nationally and in Oregon (Outdoor Foundation 2021:21-22; ODFW 2020:3).

Figure 3.8-2. Recreation in and around the Permit and Plan Area



Recreation Use Value and Spending

Recreation use of the permit area and plan area lands generates economic benefits in two ways: (1) people—especially those traveling from outside the study area—spend money in local communities that supports employment and income (White 2017:1); and (2) people receive value from their experience in excess of what they spend to participate. The latter value is called consumer surplus and reflects the range of benefits one might enjoy from engaging in outdoor recreation such as the inherent value placed on aesthetic beauty or the enjoyment of a wilderness experience (Rosenberger 2018:4).

Per-trip spending and consumer surplus vary by activity.[1] Spending on things like gas, food, and supplies ranges from about $13 to $33 (in 2020 dollars) per person per trip on average, with backpacking at the low end and hunting at the high end.[2] Consumer surplus—the additional value people enjoy from their experience beyond what they spend—ranges from about $26 to $144 (in 2020 dollars) per trip on average, with backpacking at the low end and mountain biking and nonmotorized boating at the high end (Rosenberger 2018; White 2017).

Forest composition can affect the consumer surplus value people derive from their experience. Some users, particularly those who engage in hiking, camping, backpacking, and wildlife viewing, tend to favor (i.e., more highly value) old growth forests or forests with fewer signs of visible disturbance from timber harvest activities (Shelby et al. 2005; Kearney et al. 2010; Boxall and Macnab 2000). Hunters may experience relatively less loss in value from timber harvest disturbance than these other types of users because hunting success is higher where forests are less dense or cleared (Boxall and Macnab 2000).

3.8.2.2 Visual Resources

Visual Character

The study area's visual landscape comprises mountains within the Coast Range that are covered predominantly with Douglas-fir forests, with red alder and bigleaf maple hardwood stands being located on lower slopes and along stream corridors. There is a complex network of rivers and streams that wind through the steep terrain to create corridors and narrow canyons, in addition to ponds, lakes, and emergent wetlands. Terrain, evergreen forests, and waterways are the primary features associated with the study area. The visual landscape of forests in the study area range from dense forested terrain with little views to the forest floor to areas where forest management activities are more apparent in the landscape and canopies have undergone clearcutting or thinning for timber harvest and where terrain, tree stumps, slash, and skid trails can be seen. Other areas have been reforested through natural regeneration that was followed by seeding and plantings and may primarily consist of saplings or even-aged stands, or they may include a mix of mature trees interspersed with saplings. Therefore, views associated with the forest are dynamic.

Natural events, such as wildfires, extreme storms (e.g., heavy rains, wind, ice, snow), and invasive species and disease, can also result in large-scale visual changes to a forest landscape. A major fire has not occurred in the study area since 1868, and insects and disease are not severe in the study area, resulting in large areas of undisturbed forest. However, blow down and landslides from storms

[1] Spending and consumer surplus amounts are sensitive to the prices of goods and services and can fluctuate over time.

[2] 2014 and 2018 dollar values inflated to values of $1.09 and $1.03 in 2020 using the CPI Inflation Calculator.

have affected the forest's visual landscape, more recently, as described in HCP Chapter 2, *Environmental Setting*. Historical and more recent events contribute to areas of the forest with healthy, dense stands; large areas with landscape scars from blown down trees and landslides; and areas of forest in the process of recovering. As described in Section 3.7, *Climate Change*, climate change can contribute to slowly changing the visual landscape of the forest not only through severe weather events, but by changing climatic conditions, making forests more compatible for growing different species. This results in a slowly evolving landscape with changing species composition and densities.

This dynamic landscape provides high-quality scenic views, which have been the subject of federal and state actions to create state forests, scenic designations, and natural areas that protect large areas of land (Figure 3.8-1). The study area includes the state-designated Umpqua River Scenic Byway (State Route 38), which travels along the northern border of the permit area and can be seen on Figure 3.8-2 (Oregon Tourism Commission and Oregon Department of Transportation 2018). Natural areas that protect large areas of land within the study area include Bureau of Land Management lands associated with the Coos Bay District and various state and county parks that abut or are within 0.5 mile of the permit area. There are no All-American Roads, National Scenic Byways, Federal Wild and Scenic River segments, designated state scenic waterways, or state scenic bikeways in the study area (FHWA 2022; Oregon State Parks 2019; Oregon Wild 2022; FWS 2022). Although the River Democracy Act of 2021 seeks to designate an additional 4,700 miles of rivers throughout Oregon as Federal Wild and Scenic Rivers, none of these occur in the study area (Oregon Wild 2021). Because no federal- or state-designated Wild and Scenic Rivers occur in the study area, these resources would not be affected by the proposed action or alternatives and are not addressed further.

Recreation facilities in the permit area are limited, as described under *Recreation.* As shown on Figure 3.8-2, there are also a limited number of public recreation facilities in the visual resources study area, such as dispersed camping areas and day-use areas that provide views to the permit area. Views to the permit area are also provided by both paved and unpaved roadways that traverse ridgelines and travel along the numerous waterways in the permit area. Elevated vantage points offer panoramic scenic vista views and include views over the natural landscape toward the many ridgelines, mountain slopes, and valleys. Waterways, where present, contribute to these scenic views. In the state forests, there are no residential areas that provide views of the permit area. Mostly low-density residential areas border forest lands and have limited views of the permit area.

Affected Viewers

Affected viewers are defined by their relationship to the study area, visual preferences, and sensitivity to changes. Visual preferences define the study area's visual quality, which serves as the baseline for determining the nature and magnitude of visual impacts. A project can affect two overarching groups of viewers: neighbors, who have views *of* an affected area from adjacent areas, and users, who have views *from within* an affected area. Neighbors include residential, recreational, commercial, and agricultural viewers and roadway travelers with views of the permit area. Users primarily include recreational viewers, workers harvesting forest resources, and roadway travelers within the permit area. Visual sensitivity for neighbors and users ranges from moderate to high based on having shorter- or longer-term views and vested interest in the affected lands. Residents and recreationists tend to have longer-term views and more of a vested interest in views and, therefore, higher visual sensitivity than roadway travelers and workers who tend to have shorter-term views and a less-vested interest in views (FHWA 2015:5-6–5-10).

3.8.3 Environmental Consequences

3.8.3.1 Supply of Recreation

Alternative 1: No Action

Changes to the road network over time would affect access to dispersed recreation sites in the permit area. Any existing roads that remain operational would facilitate recreation access. Depending on timing and location, harvest activities may temporarily restrict access to recreation sites. Because the existing road network is well built out; future increases in the permanent road network are expected to be minimal. If the permanent road network is expanded to facilitate forest management activities, it could expand access, particularly for dispersed recreation, if the new roads are left open to the public.

There are no current formal plans to develop and actively manage recreation infrastructure such as campgrounds in the permit area and plan area. Future development of recreation infrastructure may occur subject to forest management practices and budget constraints. Any future restrictions on dispersed recreation activities for forest management purposes would reduce recreation opportunities available to visitors relative to existing conditions. Seasonal restrictions that limit when heavy construction activities may occur around northern spotted owl and marbled murrelet habitat in the species' respective nesting seasons could restrict the development and maintenance of any future recreation facilities. Appropriate planning efforts to focus construction activities during other times of the year would mitigate any adverse impacts on development of new recreation infrastructure. Delayed maintenance could temporarily reduce access to future developed recreation sites during the early part of the summer season, although use in early summer is less intense relative to the latter part of summer.

Alternative 2: Proposed Action

The types and direction of effects on the supply of recreation under the proposed action would be the same as described for the no action alternative.

Under the proposed action, any existing roads that remain operational would facilitate recreation access. As with the no action alternative, the need to increase the permanent road network is expected to be minimal, but any expansion could increase access to recreation where and when accessible by the public. The proposed action limit on construction of new permanent roads in the permit area to 40 miles (with spur roads left in place after 5 years counting toward this cap) and the requirement that for every mile of new permanent road network in the conservation research watersheds (CRW) a mile of existing permanent road be abandoned or decommissioned could reduce operational roads used for recreation access compared to the no action alternative. As described for the no action alternative, harvest activities may temporarily restrict access to recreation sites, mostly in areas subject to clearcut harvest or variable density harvest.

The proposed action would have similar types of impacts on the future supply of recreation in the permit and plan area as the no action alternative. Development of recreation infrastructure is not a covered activity under the proposed action; however, guiding principles outlined in the Elliott State Research Forest Proposal suggest the potential for promotion of diverse recreational opportunities in the permit area and plan area (OSU 2021:11–12). Forest management practices and budget constraints could limit the future supply of dispersed recreation under the proposed action, like the no action alternative. Similar to the no action alternative, seasonal restrictions around northern spotted owl and marbled murrelet habitat in the species' respective nesting seasons (Conservation Conditions 1 and 5) could restrict the development and maintenance of future recreation facilities however, appropriate planning of development and maintenance activities are likely to reduce adverse impacts to recreation.

Alternative 3: Increased Conservation

Effects on the supply of recreation under Alternative 3 would be the same as described for the proposed action, except that broader application of the requirement for no net increase in permanent road miles to the entire permit area rather than just the CRW could reduce operational roads used for recreation access across the permit area compared to the proposed action and no action alternative.

Alternative 4: Increased Timber Harvest

Effects on the supply of recreation under Alternative 4 would be the same as described for the no action alternative.

3.8.3.2 Quality or Value of Recreation

Alternative 1: No Action

Changes in forest structure and composition during the analysis period would affect how and where people enjoy dispersed recreation in the permit area and plan area. Restrictions on timber harvest in the visually sensitive corridor along the Umpqua River Scenic Byway would maintain the existing quality of recreation related to scenic routes.

Harvest patterns under the no action alternative would result in fluctuating areas of early- and mid-seral forest, a declining area of late-seral forest, and an increasing area of old growth forest over the analysis period (Figure 3.4-1). The relative combined amount of late-seral and old growth forest would remain generally stable over the analysis period. The presence of late-seral and old growth forest and associated complex understory development over the analysis period, would continue to support the value of recreation for people who hike and backpack. Where harvests occur, presence of early-seral stands would support the value for people who hunt, as hunting favors younger, more open areas.

Presence of late-seral and old growth forests would support species populations dependent on such habitat over the analysis period. Localized changes in early-seral and mid-seral habitat could have both beneficial and adverse effects on wildlife species and, consequently, wildlife watching and hunting of species that depend on a variety of habitat. Regardless of these trends, all types of forests would be available for recreation across the analysis period.

In general, habitat for covered terrestrial species, which consists primarily of late-seral and old growth habitat, would remain relatively stable over time. Adverse impacts on species through potential loss of habitat, fragmentation, and lack of monitoring and adaptive management would have a limited impact on recreation since encounters with covered terrestrial species are already rare. However, when encounters occur, they may be highly valuable—especially when people know what they are looking at—because of their rarity.

The no action alternative would adversely affect most fish species of recreational value by degrading habitat quality through temperature increases, sedimentation, and lowered wood recruitment in river passages without riparian buffers (RMAs) (Section 3.5, *Fish and Wildlife*). Where forest management activities result in a decline in habitat quality, participation in, and the value of, recreational fishing in the permit area and plan area could be adversely affected. Restrictions on timber harvest and management activities would benefit certain habitat parameters inside RMAs. Harvest, road development, and other management activities could result in adverse effects on water quality, which may be reduced by road decommissioning and presence of RMAs. Overall, this would have a minimal effect on the quality of water-based recreation.

As forest structure changes over time, the location, use, and value of recreation activities could shift over time and across the permit area and plan area. For example, the four dispersed camping areas identified in the permit area lie in take avoidance areas that would mature into older forests, increasing the value of recreation for campers who prefer older stands. Conversely, Jerry Phillips Reserve and Cougar Pass Lookout lie in areas where clearcut and variable density harvest would be allowed over the permit term decreasing the value for hikers. Overall, levels of recreation activity throughout the permit area and plan area would be more heavily influenced by factors other than forest management, including demographic changes and availability of substitute recreation resources.

Alternative 2: Proposed Action

Forest management activities under the proposed action would have the same type of effects as described for the no action alternative.

Differences in the timing and intensity of harvest activities (Table 3.1-1) would result in differences in forest stand age and structure compared to the no action alternative. The combined amount of late-seral and old growth forests with complex understory development would be greater over the analysis period under the proposed action (Figure 3.4-1) compared to the no action alternative. If the existing dispersed recreational use of the permit area and plan area is allowed over the analysis period, on average, this would increase the value of recreation for people like hikers and backpackers who prefer visiting older stands and could reduce the value for people like hunters who prefer younger and more open stands. All types of forest would be available for any recreation allowed across the permit area and plan area, but the spatial distribution of recreation activities would change over time compared to the no action alternative.

Effects of forest management activities on fish compared to the no action alternative would vary depending on location. Where habitat quality for fish species of recreational value would improve compared to the no action alternative, the quality and value of recreational fishing would improve. Conversely, where habitat quality would decline, the quality and value of recreation fishing would decline. Similar to the no action alternative, a variety of habitat would continue to support wildlife populations and hunting opportunities in the permit area and plan area. Relative to the no action alternative, greater restrictions on road construction and harvest in riparian areas would have a beneficial impact on water quality relative to the no action alternative but minimal impacts on water-based recreation.

Similar to the no action alternative, localized changes in forest structure would shift recreation use geographically as visitors shift where they recreate based on their preferences, but overall changes in recreation would depend on other factors like demographic shifts and trends in recreation preferences.

Alternative 3: Increased Conservation

Effects of Alternative 3 would be the same as described for the proposed action, except that increased riparian protection could reduce adverse effects on water quality and habitat for aquatic species and increase beneficial effects. Depending on the localized effects, this could improve the recreation experience for users downstream engaged in water-based recreation and fishing compared to the proposed action and no action alternative.

Alternative 4: Increased Timber Harvest

Effects under Alternative 4 would be similar to those described for the no action alternative. All types of forest stands would be available for recreation users, but more early-seral stands could favor hunting similar to the no action alternative. Timber harvest would adversely affect fish and wildlife but is not anticipated to result in noticeable differences in effects on fishing, hunting, and wildlife viewing. While the distribution of recreation activities may change compared to the no action with differences in timing and location of harvest activities, the overall impact on recreation would be similar.

3.8.3.3 Vegetation Patterns, Visual Resources

Alternative 1: No Action

As described in Section 3.4, *Vegetation,* forest management activities (e.g., timber harvest, thinning, reforestation, salvage harvest, prescribed burns) would result in a patchwork of clearcuts and younger replanted stands around the older Douglas-fir forest stands in take avoidance areas across the permit area and plan area under the no action alternative (Figure 3.1-1). In addition, the frequency of disturbance events is projected to increase which, coupled with salvage harvest, would create larger areas that have sparse tree cover or are clearcut.

Viewers are accustomed to seeing where past forest management practices are scattered throughout the landscape, including areas of clearcut and thinning. Under the no action alternative, the permit area and plan area would largely comprise no-harvest areas (take avoidance areas) and clearcut harvest areas. Therefore, there would be distinct areas where the forest canopy remains intact, creating areas of connectivity, or has been cleared, leaving areas that are more open. At the permit-area scale, visual changes to the landscape would result in a gradual shift in forest structure as areas of clearcut become more prevalent. However, reforestation would occur in clearcut areas so that there would be less variation in stand age. Although forested landscapes are dynamic by nature, clearcut harvest would result in a higher degree of localized visual changes under the no action alternative. This would adversely affect visual resources by creating larger areas of forest that have been visibly disturbed and harvested. Clearcut areas would also create a forest that is more open and sunnier due to the removal of mature trees that provide a greater amount of shade than young trees.

Alternative 2: Proposed Action

Under the proposed action, the reduced area available for clearcut harvest (Table 3.1-1, Figure 3.1-1) and post-disturbance salvage would result in the retention of larger areas of older forest stands with greater connectivity, which would be beneficial for visual resources compared to the no action alternative. Restoration thinning and variable density harvest, which could occur in more of the permit area and plan area than under the no action alternative, would aid in providing more natural patterns of forest structure, including clearings in the forest. Also, the increase in the amount of older trees compared to the no action alternative (Figure 3.4-1 and Appendix 3.4, *Vegetation Technical Supplement*, Table 1), would result in views evolving from more open and sunnier to more closed and shaded. In general, visual changes under the proposed action would result from localized changes in the landscape.

Alternative 3: Increased Conservation

Effects of Alternative 3 would be the same as the proposed action, except that further reduced area available for clearcut harvest (Table 3.1-1, Figure 3.1-1) and post-disturbance salvage would result in the retention of even larger areas of older forest stands with greater connectivity, which would be beneficial for visual resources compared to the proposed action and no action alternative.

Alternative 4: Increased Timber Harvest

Effects of Alternative 4 related to area available for clearcut harvest (Table 3.1-1, Figure 3.1-1) and post-disturbance salvage and extent of older forest stands and connectivity and associated effects on visual resources would fall between the proposed action and no action alternative.

3.8.3.4 Visual Access

The primary change in visual access would result from any expansion or reduction in the permanent road network. As described in Section 3.8.3.1, *Supply of Recreation*, expansion of the permanent road network is expected to be minimal under all alternatives. Given the size of the permit area, the anticipated change in the road network under any alternative would not result in a notable change to visual access, especially given the terrain and vegetation associated with the forest that would greatly limit views of new roadways. In addition, new roadways would be built off of existing routes, so they would likely be seen as a visual extension of the existing roadway system. Therefore, new roadways are not likely to degrade the visual character or quality of the forest. However, new roadways would create the opportunity for potential new access to areas with high visual quality, which would be seen as beneficial to recreational viewers.

3.8.3.5 Scenic Byways Views

As identified in Section 3.8.2.3, *Visual Resources*, the Umpqua River Scenic Byway is the only scenic byway in that study area that travels along the northern border of the permit area. Oregon State law establishes visually sensitive corridors along scenic byways and a 150-foot buffer from the outermost edge of both sides of the highway (ORS 527.620.18). Special rules apply to timber harvest in this corridor to retain scenic buffers while maintaining motorist safety (ORS 527.755). Forestlands near visually sensitive scenic byways would be managed in the same manner under all alternatives. Therefore, it is not anticipated that any of the alternatives would substantially alter or degrade views associated with the scenic byway.

3.9 Cultural Resources

3.9.1 Methods

For purposes of this analysis, *cultural resources* are defined as archaeological resources, buildings, structures, districts, objects, and traditionally important places on the landscape. These resources may be historic properties as defined in 36 Code of Federal Regulations (CFR) Part 800, listed on a state or local historic register, or identified as being important to a particular group through consultation. Section 3.10, *Tribal Resources*, further considers effects on other resources of cultural importance, such as traditionally important plants and animals.

The study area for cultural resources in this document is the permit area. The study area covers several climatic and geological zones ancestrally used by numerous bands and tribes in the region. Many descendants of these groups are affiliated with federally recognized tribes. As the lead federal agency, FWS is engaging in consultation with the following tribes: Cow Creek Band of Umpqua Tribe of Indians; Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians; Confederated Tribes of Grand Ronde; Coquille Indian Tribe; and Confederated Tribes of Siletz Indians. For more information, see Section 3.10, Appendix 3.10, *Tribal Resources Technical Supplement,* and Appendix 3.9, *Cultural Resources Technical Supplement*.

This analysis evaluates potential effects of the proposed action and alternatives on cultural resources in the study area by considering the locations of known or potential precontact and historic archaeological sites and built resources relative to the type and extent of management activities that would be implemented under the proposed action and alternatives. The evaluation also considers the existing regulations, policies, and procedures in place to mitigate effects.

3.9.2 National Historic Preservation Act

Compliance with Section 106 of the NHPA, as amended, is required by law for all federal undertakings. In this case, the federal undertaking is the Services' proposed issuance of incidental take permits for the covered activities. Section 106 requires federal agencies to consider the effects of the undertaking when there is potential to affect a historic property—a district, site, building, structure, or object—that is listed in, or eligible for listing in, the National Register of Historic Places (NRHP). Section 106 contains specific consultation requirements with certain parties such as the State Historic Preservation Officer (SHPO), affected tribes, and individuals and organizations with a demonstrated interest in the undertaking.

The Services have agreed that FWS will serve as lead federal agency for the Section 106 undertaking. In letters dated August 16, 2022, FWS initiated consultation under Section 106 with the SHPO and Tribal Historic Preservation Officers (THPOs) for five tribes. In those letters, FWS described the undertaking, defined the area of potential effects (APE), summarized the historic property identification effort, and submitted a determination of no adverse effect under 36 CFR 800.5(b).

3.9.3 Affected Environment

This section describes known and expected cultural resources in the study area. To provide further context about the cultural setting of the study area, Appendix 3.9, *Cultural Resources Technical Supplement*, provides an overview of the study area's geographic, precontact, ethnographic, and historical contexts.

3.9.3.1 Cultural Resources Identification

DSL performed a cultural resources analysis of the permit area in the mid-2010s. That effort, detailed in the *Cultural Resource Inventory of the Elliott State Forest* (Curtis et al. 2016) used the same method and rigor as would be employed in a Section 106 cultural resources identification study. The report was submitted to the Oregon SHPO.

Curtis et al. (2016) conducted the following cultural resources identification tasks for the permit area.

- Searched archives for previously recorded cultural resources sites and surveys, as well as background information on archaeology, ethnography, history, and environment of the permit area.
- Created a geographic information system (GIS) database of known historic period and pre-contact sites and surveys.
- Conducted field verification of a sample of previously recorded sites.
- Contacted, consulted, and interviewed state, federal, tribal, and SHPO, archaeologists, and other historians.
- Developed a suitability model that identifies settings with a high probability for the presence of cultural resources.
- Planned and implemented archaeological field survey and shovel probing.
- Prepared a cultural resources overview and survey report (Curtis et al. 2016).

Curtis et al. (2016) and other studies pertinent to the permit area including cultural resources overviews (Beckham and Minor 1980; Beckham et al. 1982), ethnographies, (e.g., Zenk 1990), and planning documents (e.g., DSL and ODF 2011) are summarized in Appendix 3.9, *Cultural Resources Technical Supplement*. In summary, cultural resources identification for the permit area demonstrates that the permit area has very few known cultural resources and low potential for the presence of undiscovered historic properties.

3.9.3.2 Existing Data Review: Sites and Surveys in and near the Study Area

The review of the Oregon Archaeological Records Remote Access database identified 12 previous cultural resources surveys in the permit area (Appendix 3.9, Table 1). Apart from the Curtis et al. (2016) study discussed below, the surveys collectively covered about 60 acres and identified one cultural resources site, a historic period septic tank.

3.9.3.3 Curtis et al. (2016) Cultural Resources Overview, Model, and Field Survey of the Permit Area

Curtis et al. (2016) conducted a cultural resources overview, site sensitivity model, and archaeological field survey of the Elliott State Forest (permit area). This effort identified the following sites.

- 32 undocumented historic-period sites (mostly homesteads and logging facilities) reported by Phillips (1997) and Stepp (1998).
- 36 Native American allotment parcels connected to the Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians.
- Several historic-period sites, roads, and trails marked on GLO maps, 1924 and 1946 Siuslaw National Forest maps, plat maps, and mid-twentieth century Metsker maps.
- No previously recorded pre-contact Native American archaeological sites within or immediately adjacent to the Elliott State Research Forest and permit area.

After background research and consultation with SHPO and tribes, Curtis et al. (2016) concluded that slope and elevation were the most useful environmental factors that define areas with a high probability for cultural resources in the permit area. Two factors were particularly important: slopes of less than 10% and places with proximity to novel landscape features such as waterfalls, lakes, and trails. Curtis et al. (2016) developed a sophisticated GIS model that identified site probabilities across the permit area. After deleting places less than 0.25 acre in size, the model mapped only 762 acres among the 83,458-acre permit area with a high potential for the presence of cultural resources sites.

Curtis et al. (2016) mounted a field survey of the high probability acres in the permit area. Given time limitations, access constraints, and agency priorities, the survey covered 452 of the 762 acres of high probability area. In addition, Curtis et al. (2016) attempted to relocate 15 previously reported (Phillips 1997; Stepp 1998), but undocumented, cultural resources sites in the permit area (Appendix 3.9, *Cultural Resources Technical Supplement*, Table 2). The Curtis et al. (2016) field survey and relocation effort resulted in the documentation of four historic-period cultural resources sites in the permit area (Appendix 3.9, Table 3). No pre-contact archaeological sites have been identified in the permit area.

In their conclusion, Curtis et al. (2016) attribute the dearth of cultural resources sites in the permit area to the permit area's extremely steep, inaccessible terrain and the considerable challenges of finding cultural material in the only places likely to contain cultural sites, the relatively flat terrain associated with stream corridors. Climate, geomorphology, and recent land-use history make the stream corridors of the permit area an unlikely place to harbor, preserve, or reveal cultural resources sites.

3.9.3.4 Summary, Expectations for Cultural Resources

Potential cultural resources in the permit area include those associated with Native American use and settlement and historic-period homesteading, transportation, and logging. Review of existing information indicates that the permit area is unlikely to contain a large number of Native American or recent historic-period cultural resources. This is because (1) the natural setting of the permit area was not particularly conducive to Native American settlement, (2) the permit area lacks relatively flat ground and geologically stable landforms—settings that are more conducive to containing and preserving pre-contact and historic-period cultural resources, and (3) recent land-use history (commercial logging) has likely masked or erased archaeological evidence of Native American settlement or use, if such sites were present.

3.9.4 Environmental Consequences

DSL's forest management activities under all alternatives, including the no action alternative, would cause ground disturbance or changes to the setting and would have the potential to affect cultural resources. These potential effects on cultural and historic resources would be similar under all alternatives. Although the precise location and timing of the activities may differ depending on the alternative, DSL would follow the applicable federal and state regulations and DSL policies and practices described in this section.

In its existing plans and programs, DSL acknowledges its role as a steward of public lands and its obligation to cooperate with local governments, tribal governments, and state and federal agencies to protect built environment, archaeological, and cultural resources within its jurisdiction (DSL 2006, 2012). DSL's cultural resources management procedures are described in the existing Oregon Forest Practices Act (FPA) (ORS 527 and OAR 629) and carried out by the DSL archaeologist. DSL has indicated it is best practice for a professional archaeologist to complete a cultural resources inventory and evaluation (as needed) any time a project that involves ground-disturbing activities is undertaken in areas within its jurisdiction in accordance with state and federal laws. Because of the recent cultural resources overview of the permit area (Curtis et al. 2016), locations that may contain cultural resources are known and mapped and can be reviewed in advance of any DSL activity that has potential to affect historic properties if present.

Potential effects on cultural resources from forest management activities under the proposed action and alternatives would be similar to under the no action alternative. In addition, DSL would follow applicable regulations, policies, and procedures under all alternatives. For these reasons, the proposed action and alternatives would not result in effects on cultural resources that differ from those that would occur under the no action alternative.

3.10 Tribal Resources

Western Oregon has long been inhabited by Native American peoples. This section identifies the five tribes in western Oregon potentially affected by the proposed action and alternatives and their ancestral and current relationships to the region.

The Services recognize the sovereign status of tribal governments and offer pre-decisional government-to-government consultation at the earliest practicable time. The Services recognize that each federally recognized tribe is unique and sovereign and may have different treaties and other agreements with the United States (FWS 2016; NMFS 2013). FWS, on behalf of the Services, has sought and continues to seek involvement of the tribes to gain understanding of the tribes' perspective on potential impacts of the proposed action and alternatives and tribal management of the resources that may be affected.

As the lead federal agency under NEPA and for consultation under the National Historic Preservation Act (Section 3.9, *Cultural Resources*), FWS is offering consultation with five potentially affected tribes on behalf of itself and NMFS as a cooperating agency. FWS will continue to interact with the tribes to identify those aspects of the proposed action and alternatives with the potential to affect tribal resources, tribal rights, and Indian lands. Appendix 3.10, *Tribal Resources Technical Supplement*, presents letters FWS sent to tribes outside of the Section 106 process.

3.10.1 Methods

The study area for tribal resources includes the area where natural resources that tribal members traditionally accessed, currently access, or may access in the future could be affected by activities in the permit area under the proposed action and alternatives (see the study areas for Section 3.4, *Vegetation*, and Section 3.5, *Fish and Wildlife*). In addition, the study area includes southwestern Oregon to account for effects on tribes related to timber harvest and availability of forest products (see the study area in Section 3.11, *Socioeconomics*).

The following tribes access resources or have traditional territories, reservations, and/or trust lands in the study area: the Confederated Tribes of the Grand Ronde Community of Oregon; Confederated Tribes of Siletz Indians of Oregon; Coquille Indian Tribe; Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians; and the Cow Creek Band of Umpqua Tribe of Indians.

The description of the affected environment for tribal resources was based on a review of information about the tribes and their ancestral, current, and future use of resources in the study area that could be affected by the proposed action and alternatives. The analysis describes effects of the proposed action and alternatives on resources relevant to the tribes.

Consultation is being conducted in accordance with Executive Order 13175, U.S. Fish and Wildlife Service Native American Policy (January 20, 2016), Department of Commerce Administrative Order 218-8, and National Oceanic and Atmospheric Administration (NOAA) Procedures for Government-to-Government Consultation with Federally Recognized Indian Tribes and Alaska Native Corporations (November 13, 2013), described in Appendix 3.1-A, *Regulatory Environment*.

3.10.2 Affected Environment

3.10.2.1 Tribal Coordination

FWS contacted five tribes associated with the study area to engage in consultation. These tribes are listed in Table 3.10-1 along with the location of their trust lands.

Table 3.10-1. Overview of Indian Tribes Contacted by FWS

	Location Trust Lands	
Tribe	**Region**	**Counties**
Confederated Tribes of the Grand Ronde Community of Oregon	Western Oregon	Yamhill and Polk Counties
Confederated Tribes of Siletz Indians of Oregon	Western Oregon	Lincoln County
Coquille Indian Tribe	Western Oregon	Coos County
Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians	Western Oregon	Lane, Douglas, and Coos Counties
Cow Creek Band of Umpqua Tribe of Indians	Western Oregon	Douglas County

Coordination and information sharing with the tribes included but was not limited to the following.

- Communication with Colin Beck, Forestry Manager with Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians (June 6 and 14, 2022) for background information regarding the use of natural resources in the permit area.
- In letters dated August 16, 2022, FWS initiated consultation under Section 106 with the SHPO and Tribal Historic Preservation Officers for five tribes.

3.10.2.2 Northwest Indian Treaties and Federally Recognized Tribes

This section is an overview of history of the tribes associated with the study area since Euro-American contact. This section is included to provide an understanding of the significance of access to public lands such as the Elliott State Forest by tribal members to maintain and traditional cultural practices, harvest of fish and wildlife, and gathering of plants. The tribal organizations in the study area include bands, tribes, and confederations of tribes. The term *tribe* is used generally when referencing a federally recognized tribal entity, though many of the Oregon tribes are a confederation of multiple bands and tribes with, in some cases, different backgrounds and differing uses of cultural and natural resources in the study area. Appendix 3.10, *Tribal Resources Technical Supplement*, provides additional details on each tribe, including its organization, federal recognition, ratified and unratified treaties, ceded lands, treaty reserved rights, case law, federal trust doctrine, and use of study area resources.

In 1855, Washington Territorial Governor Isaac Stevens, representing the United States, negotiated treaties with many Indian tribes living in the Pacific Northwest, including those with ancestral ties to large portions of the study area. Accordingly, these treaties secured both reserved lands on which to live and reserved off-reservation rights for access and subsistence, comprising the collection of fish, wildlife, plants, and forage for their horses. The U.S. Senate ratified several of these treaties but in the case of the five tribes identified in Table 3.10-1 treaties were not ratified, tribal traditional lands were ceded to the government without compensation, and the tribes were not provided with tribal reservations (Zucker et al. 1983). Furthermore, passage of the Western Oregon Termination Act (Public Law 83-588) in 1954 terminated federal recognition and reservation lands granted through executive order to the five tribes west of the Cascade Range listed in Table 3.10-1.

Federal recognition was not restored until the 1970s and 1980s. Since then, all the western Oregon tribes have programs to restore their land base through federal actions (e.g., Western Oregon Tribal Fairness Act, Public Law 115-103) and land purchases. The tribes are using their expanded land base to reestablish tribal management of these lands for cultural and economic uses. Some of these lands are forestlands managed for forest resources for the benefit of members and the tribe's economic wellbeing. However, despite a growing land base, the management and access of public lands (federal and Oregon state) for fishing, hunting, gathering of cultural plants, and cultural practices remains important to the tribes. Several tribes have consent decrees with the State of Oregon and the United States that define tribal hunting, fishing, trapping, and animal gathering rights on federal and state lands. The consent decrees are implemented through tribal ordinances to provide members' access to cultural hunting and fishing in portions of their ancestral lands.

3.10.2.3 Tribe Access and Use of Natural Resources

Tribal members from all of the five tribal entities associated with the study area are closely associated with the natural resources of the region and the Elliott State Forest (Curtis et al. 2016). The ethnographic and archaeological records document the long and intensive association of Native Americans with this part of western Oregon and the permit area; see Appendix 3.10, *Tribal Resources Technical Supplement*.

The tribes' traditional cultures are closely tied to abundant populations of fish and wildlife. Tribal members hunt for deer and elk and fish for salmon, steelhead, cutthroat trout, and Pacific lamprey. Plants are an important source of food and materials for the making of traditional goods (Long et al. 2018; Phillips 2016). In addition to gathering berries such as huckleberries, native blackberries, and salmonberries, other culturally important plants are gathered for basketry and carving such as hazel, red cedar, ash, and maple. These plants are gathered to maintain traditional practices and to celebrate and share traditional crafts and skills in museums, galleries, and educational environments. Tribal members are teaching new generations traditional woodworking skills to continue the traditional construction of canoes from cedar trees and the making of other traditional wooden goods for personal use and sharing of traditional crafts and skills (Coquille Indian Tribe 2022; Beck pers. comm.).

Many traditional plants grow in disturbed areas. The five tribal entities associated with the study area traditionally used fire to promote growth of selected plant species (Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians no date; Phillips 2016). Plants that occur in disturbed areas are huckleberry, native blackberry, salmonberry, hazel, and beargrass. Fire was also used to maintain open meadows for elk forage habitat (Beck pers. comm.).

The tribes also look to the forest for resources that support commercial activity. The tribes with trust forestlands manage their lands for economic value in addition to cultural value (Beck pers. comm; Coquille Indian Tribe 2019). Tribal forestlands are not presently large enough to support a timber industry absent harvest on non-tribal forestlands. The non-tribal forest industry includes services necessary to manage tribal lands, a market for timber from tribal lands, and a work force to support timber harvest (Beck pers. comm.). The economic value of tribal forestlands is dependent on a thriving timber industry supported by public and private forests, including the Elliott State Forest. Finally, tribal members work in the timber industry supported by public and private forestlands, including the Elliott State Forest.

3.10.3 Environmental Consequences

This section describes potential effects of the proposed action and alternatives on resources relevant to the tribes by highlighting and building on the analysis of impacts described in Section 3.3, *Water Resources*, Section 3.4, *Vegetation*, and Section 3.5, *Fish and Wildlife.* This section includes a focus on distinct considerations associated with tribal resources and access, tribal sovereign self-governance, and tribal lands.

3.10.3.1 Fish and Wildlife Species

Alternative 1: No Action

As described in Section 3.5, *Fish and Wildlife*, under the no action alternative, management activities would adversely affect habitat for fish species in the study area. The intensity of harvest activities would vary across the permit area as illustrated in Figure 3.1-1 in response to restrictions intended to avoid take of listed species. The effects of management activities described for coho salmon in Section 3.5 would generally apply to other species of cultural value to the tribes such as Chinook salmon, steelhead trout, and cutthroat trout. Habitat in the study area accessed by these species does not entirely overlap areas accessed by coho salmon and thus impacts would likely differ, species occupying higher-gradient habitats and headwaters such as steelhead trout and cutthroat trout may experience greater adverse effects due to an increased number of non-fish-bearing streams with lesser protections flowing into these areas and may be more susceptible to effects of landslides and fine sediment input. Resident cutthroat and rainbow trout, and steelhead trout in higher-gradient headwater streams may experience greater negative effects from forest management activities than those described in Section 3.5 for coho salmon.

Riparian protections under the no action alternative may also provide less relative protection for non-salmonid species of cultural value to the tribes such as Pacific lamprey, depending on how much their habitat overlaps with coho salmon. Lamprey would be especially affected by sediment pulses or landslides that may occur as a result of forest management activities. Warming of stream temperature and reduced low flows from management activities would negatively affect lamprey.

As described in Section 3.4, *Vegetation*, timber harvest under the no action alternative would be the primary drivers of changes in forest structure and type. Deer and elk use all forest stages for various needs. They occupy early-seral stages of the forest for forage and use older (late-seral and old growth) forests for hiding and concealment cover (Kie et al. 2008). As described in Section 3.4, outside of areas managed for take avoidance, clearcut harvest would remove mid- to late-seral forest and result in a patchwork of clearcuts with greater ratio of forest edge to undisturbed forest area, while reforestation would result in dense forests with closed canopies and little or simple understory structures. Removal of late-seral, multilevel forest structure would reduce hiding and concealment cover for deer and elk and increase habitat fragmentation, and increased perimeter area could cause harmful edge effects but may improve opportunities for hunting.

Forest roads on state lands provide important access for tribal members to hunting areas, fishing sites, and places for the gathering of plants in the permit area and may be used to access tribal forestlands that may be acquired in the future. Existing roads in the permit area that facilitate access to recreational areas may also provide access to areas accessed by tribal members for hunting and fishing. Depending on timing and location, harvest activities may temporarily restrict access to portions of the forest. Because the existing road network is fully developed, expansion of the permanent road network over the analysis period is expected to be minimal. Any expansion of the existing road network to facilitate timber harvests and forest management activities could expand tribal access to fishing and hunting resources.

Alternative 2: Proposed Action

The types of effects on fish and wildlife species important to tribes and tribal access to these resources under the proposed action would be the same as described for the no action alternative but the degree of effects would vary.

The Coos Bay coho population and other species associated with streams in the management research watersheds (MRW) would experience variable effects depending on the interaction of effects between extensive and intensive management types, reserves, and width of riparian conservation areas in different areas, with many effects being similar to those described under the no action alternative.

The Tenmile and Lower Umpqua coho salmon populations and other species associated with streams in the conservation research watersheds (CRW) would benefit under the proposed action compared to the no action alternative. Restoration thinning in this area may result in short-term negative impacts; however, long-term ecological functions may improve, a hypothesis that the research program is designed to study. The type of effects on deer and elk under the proposed action would be the same as described for the no action alternative in the MRW. As under the no action alternative, clearcut openings and early-seral forest stands would be available throughout the analysis period, which would provide forest edge and opening habitats used by deer and elk. Because the area available for clearcut harvest would be less under the proposed action, these benefits would also be less. Reduction and fragmentation of habitat for hiding and concealment resulting from harvest of mid- and late-seral stands and related effects to hunting opportunities, discussed under the no action alternative, would also occur under the proposed action in the MRW in intensive areas and to a lesser extent in extensive areas; however, because this type of harvest would be reduced under the proposed action, these effects would be less.

Because harvest activity in the CRW would be limited to restoration thinning occurring primarily during the first 20 years of the analysis period, the CRW would move toward a large block of late-seral to old growth forest over the analysis period. This would increase habitat use by deer and elk for hiding and concealment but would potentially reduce edge and open habitats used for forage in these areas. The incorporation of traditional ecological knowledge by the tribes, including the use of prescribed fire to increase or maintain open forage habitats for deer and elk, would benefit these species and reduce the loss of open habitats over the analysis period. The combination of moving toward a large block of late-serial to old growth forest with management for open habitats in mid-seral forest areas would be beneficial for deer and elk available to tribal members and improve hunting opportunities.

Under the proposed action, like the no action alternative, existing roads that remain operational and new roads constructed in the permit area could provide access to areas used by tribal members for hunting and fishing. As described in Section 3.8, *Recreation and Visual Resources*, permanent road construction limits and road abandonment or decommissioning requirements could reduce public access. As such, the proposed action could adversely affect tribal access compared to the no action alternative.

Alternative 3: Increased Conservation

The types of effects on fish and wildlife species important to tribes and tribal access to these resources would be the same under Alternative 3 as described for the no action alternative, but the degree of effects would vary.

Alternative 3 would decrease harvest throughout the permit area and increase riparian protections compared to both the no action alternative and the proposed action, which would benefit fish and wildlife species of value to tribal members.

Reduced timber harvest under Alternative 3 compared to the no action and proposed action would result in reduced amount of open habitat available for deer and elk forage compared to both alternatives. Alternative 3 would include the incorporation of traditional ecological knowledge by the tribes that would benefit deer and elk as described for the proposed action.

Broader application of the no net increase in permanent road miles to the entire permit area could reduce operational roads used for tribal member access compared to the proposed action and no action alternative.

Alternative 4: Increased Harvest

The types of effects on fish and wildlife species important to tribes and tribal access to these resources would be the same under Alternative 4 as described for the no action alternative, but the degree of effects would vary.

As described in Section 3.5, *Fish and Wildlife*, overall adverse effects of Alternative 4 on fish would be similar to the no action alternative, greater than the proposed action.

Clearcut openings and early-seral forest stands would be available throughout the analysis period, which would provide forest edge and opening habitats used by deer and elk; the area available for clearcut harvest and associated benefits on these habitats would fall between the no action alternative and proposed action. The amount of habitat for hiding and concealment resulting and related effects on hunting opportunities would be similar to the no action alternative.

Adverse effects on tribal access would be similar to the proposed action, potentially greater than the no action alternative.

3.10.3.2 Availability of or Access to Plants

Alternative 1: No Action

As described in Section 3.4, *Vegetation*, timber harvest would be the primary drivers of changes in forest structure and type, which would affect the availability of plants accessed by the tribes. Over the analysis period, clearcut harvest would occur outside of the take avoidance areas for listed species throughout the permit area (Figure 3.1-1). Clearcut harvest and related ground-disturbing activities would disturb understory plants of value to tribal members and result in a patchwork of clearcuts and younger replanted stands that would be less diverse and would likely support fewer plant species of value to tribal members. Areas occupied by listed species and thus excluded from harvest would experience an increase in understory structure complexity as these areas transition to late-seral and old growth forests over the analysis period. Over time, gaps would develop in the canopy as a result of natural disturbance or timber harvest. These gaps would create opportunities for horizontal growth plants (e.g., vine maple, salal, huckleberries, and beargrass) and vertical growth plants (e.g., western hemlock and Sitka spruce seedlings), increasing availability of these plant species and other species used by tribes that are dependent on late-seral forest.

Timber harvest is unlikely to occur in wetlands. However, staging for timber harvest or other harvest-related ground-disturbing activities nearby could affect wetland vegetation and culturally important plant species. This would have an adverse effect on availability of wetland plant species used for baskets (e.g., cattails, sedges, and willows). More protective and wider riparian management areas compared to historical practices would support more opportunities for riparian-dependent plants used by tribes (e.g., salmonberry, thimbleberry) compared to existing conditions.

As described for fish and wildlife species valued by tribes, any expansion of the existing road network to facilitate timber harvests and forest management activities could expand tribal access to fishing and hunting resources over the analysis period.

Alternative 2: Proposed Action

The types of effects on plant species important to tribes and tribal access to these resources would be the same under the proposed action as described for the no action alternative but the degree of effects would vary.

The reduced area of clearcut harvest and increased areas of variable density harvest and restoration thinning compared to the no action alternative would result in a more diverse and connected forest landscape with the potential to result in a greater variety of plant species of value to tribal members.

In areas managed for restoration thinning in stands 65 years old or younger, the incorporation of traditional ecological knowledge by the tribes, including the use of prescribed fire to increase or maintain open areas, would likely improve the variety of plant species of value to tribal members compared to the no action alternative.

The acreage of wetland and riparian areas and associated potential impacts on plant species would be less under the proposed action than the no action alternative.

As described for fish and wildlife species valued by tribes, the proposed action could adversely affect tribal access compared to the no action alternative.

Alternative 3: Increased Conservation

The types of effects on plant species important to tribes and tribal access to these resources would be the same under Alternative 3 as described for the no action alternative but the degree of effects would vary.

The reduced area of clearcut harvest compared to the no action alternative and proposed action and the similar amount of variable density harvest and restoration thinning compared to the proposed action would result in a more diverse and connected forest landscape with the potential to result in a greater variety of plant species of value to tribal members compared to both the no action alternative and proposed action.

The acreage of wetland and riparian areas and associated potential impacts on plant species would be the same as the proposed action, less than the no action alternative.

Increased restrictions on the extent of the road network could increase adverse effects on tribal member access to plant resources in permit area compared to the proposed action and no action alternative.

Alternative 4: Increased Harvest

The types of effects on plant species important to tribes and tribal access to these resources would be the same under Alternative 4 as described for the no action alternative but the degree of effects would vary.

The area of clearcut harvest would be less than under the no action alternative and greater than under the proposed action, and the combined area of variable density harvest and restoration thinning would be similar to the proposed action. Therefore, the diversity and connectivity of the forest landscape and related effects on variety of plant species of value to tribal members would fall between the no action alternative and proposed action.

The acreage of wetland and riparian areas and associated potential impacts on plant species would be the same as the no action alternative.

Adverse effects on tribal access would be similar to the proposed action, potentially greater than the no action alternative.

3.10.3.3 Timber Harvest and Available Forest Products

Section 3.11, *Socioeconomics*, describes the economic effects of potential changes in timber harvest and availability of other forest products in permit area. In addition to direct jobs and labor income in the logging and milling industries, timber harvest in the permit area supports non-forestry jobs, labor income, value added, and output through indirect and induced effects. Economic activity also arises from collection of other forest products (e.g., moss, evergreen boughs, mushrooms) for commercial and non-commercial purposes. Some of this economic activity could contribute to employment and income for tribal groups. The distribution of employment impacts on tribal groups specifically (like other specific groups) depends on contractual relationships over space and time and cannot necessarily be inferred from aggregate economic effects. See Section 3.11 for more detail on economic effects under the proposed action and alternatives.

3.11 Socioeconomics

3.11.1 Methods

The proposed action and alternatives would affect socioeconomic resources in several different ways, which would occur at several geographic scales, each reflected by a different study area. The study areas capture the geography where impacts are likely to occur and where populations that are likely to experience impacts reside.

- **Income and employment**: The study area for impacts on income and employment is the regional economy, defined as southwestern Oregon, made up of Coos, Curry, Douglas, Jackson, Josephine, and Lane Counties. This area is sufficiently large to capture the flow of harvest and the economic relationships between rural and urban areas that surround Elliott State Forest. Data are provided at the county level, the smallest geography relevant for this analysis.
- **Government revenue**: The study area for impacts on government revenue is the state of Oregon, which is where timber harvest revenue and tax revenue would flow.
- **Value of ecosystem services**: The study area for assessing impacts on the supply of ecosystem services is the same as the study area for Sections 3.3, *Water Resource,* 3.4, *Vegetation*, 3.5, *Fish and Wildlife*, and 3.7, *Climate Change*. The study area for assessing impacts on the demand for and value of these services is southwestern Oregon. The analysis recognizes that demand for ecosystem services could also come from outside this study area, but the southwestern Oregon geography likely captures most of the impacts.

Each of the analyses assesses the degree of the effects of the proposed action and alternatives in terms of direction, magnitude, timing, duration, and populations affected.

- **Income and employment**: The analysis qualitatively evaluates impacts on income and employment from changes in timber harvest activities, recreation activity, collection of special forest products, and other economic activity (i.e., forest management, research and education activities) in the permit area over the 80-year analysis period. The analysis relies on estimated acreages available for harvest treatment types (Section 3.1, *Introduction*, Table 3.1-1). The analysis uses a qualitative analysis approach to facilitate comparison across alternatives of economic impacts of timber harvest activities and economic impacts of non-timber harvest activities that are difficult to quantify. For both types of impacts, data are not readily available to support quantification at a level that adds value to understanding the tradeoffs among alternatives. A qualitative analysis is sufficient to support an analysis of tradeoffs among alternatives.
- **Government revenue:** The analysis qualitatively estimates impacts on government revenue using estimated acreages available for harvest treatment types (Table 3.1-1) and regulatory guidance dictating revenue distribution at the state level. The analysis uses a qualitative approach because a quantitative approach would require data on forest harvest revenues, as well as revenues from other income-generating activities (e.g., guided fishing, collection of special forest products) that are not available. A qualitative analysis is sufficient to support an analysis of tradeoffs among alternatives.

- **Value of ecosystem services:** Ecosystem services are the goods (e.g., firewood, mushrooms) and services (e.g., clean water, carbon sequestration, spiritual meaning) the ecosystem provides that people value. This analysis qualitatively assesses impacts on the value of ecosystem services by identifying how changes in the availability and quality of these services would affect their value, and whether the proposed action and alternatives are likely to affect demand for any ecosystem good or service.

3.11.2 Affected Environment

This section provides an overview of existing socioeconomic conditions in the study area, together with projected population and demographic trends over the 80-year analysis period.

3.11.2.1 Population

Population in the study area of southwestern Oregon was approximately 900,000 in 2020, an increase of 8% compared to 2010 (Table 3.11-1). It is expected to grow to 1.1 million by 2060 (U.S. Census Bureau 2010, 2022; Portland State University 2021). Lane, Douglas, and Jackson Counties make up over 80% of the study area population as of 2020 (U.S. Census Bureau 2022). Between 2020 and 2060 the population is expected to grow in every county except Coos, with Jackson County expected to grow the most (Portland State University 2021).

Table 3.11-1. Current and Future Population Estimates in the Study Area

Geography	Population (2020)	Population (2010)	Percent Change (2010–2020)	Forecasted (2060)	Forecasted Percent Change (2020–2060)
Coos County	64,929	63,043	3%	60,974	-6%
Curry County	23,446	22,364	5%	25,397	8%
Douglas County	111,201	107,667	3%	136,327	23%
Jackson County	223,259	203,206	10%	304,414	36%
Josephine County	88,090	82,713	7%	106,073	20%
Lane County	382,971	351,715	9%	460,218	20%
Total	**893,896**	**830,708**	**8%**	**1,093,403**	**22%**

Source: U.S. Census Bureau 2010, 2022; Portland State University 2021

The largest communities nearest the Elliott State Forest are Reedsport (in Douglas County) to the north and west, connected to the study area by State Route (SR) 38 and Coos Bay-North Bend (in Coos County) to the south and west, connected to the study area by SR 241. The communities are directly connected by U.S. Highway 101 along the coast. Reedsport's population in 2020 was about 4,300. The population of Coos Bay-North Bend was about 26,000 residents in 2020.

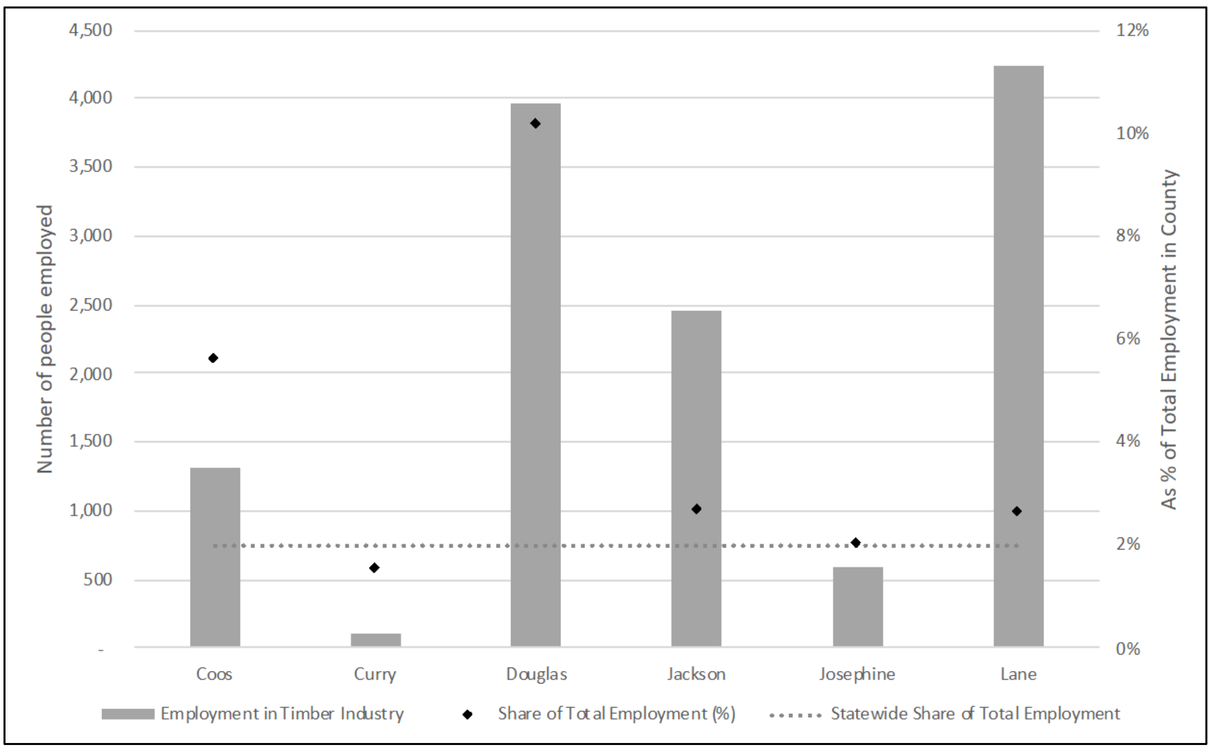
3.11.2.2 Income and Employment

Employment in Oregon grew to 2.6 million people in 2019, a 20% increase from 2010, and unemployment was low at 3.7% (U.S. Bureau of Economic Analysis 2021a, 2021b; U.S. Bureau of Labor Statistics 2021). All six counties in the study area had a higher unemployment rate than

Oregon and a lower median household income[1] than the statewide median of approximately $63,000 in 2019 (U.S. Bureau of Labor Statistics 2021; U.S. Census Bureau 2021). The COVID-19 pandemic resulted in an economic downturn that increased unemployment in Oregon. Employment in Oregon fell by 6% between 2019 and 2020 and unemployment ranged between 7.7% and 8.7% in the study area counties (U.S. Bureau of Economic Analysis 2022; U.S. Bureau of Labor Statistics 2022a, 2022b). Between 2020 and 2022, employment rates in Oregon grew and reverted to 2019 levels (Oregon Department of Administrative Services, and Office of Economic Analysis 2022).

Employment in timber and related industries (i.e., forestry and logging, wood products manufacturing, and paper manufacturing industries) is higher in Coos, Douglas, Jackson, and Lane Counties compared to the 2% statewide share as Figure 3.11-1 shows (Daniels and Wendel 2020). For Oregon workers, the average weekly wages for timber-industry employees, approximately $1,127 per week in 2019, are higher than the average weekly wages in other industries (Daniels and Wendel 2020). The COVID-19 pandemic and economic recovery had a minimal effect on employment in the forest and logging sectors in Oregon. State economists expect employment in the industry to decline by 2% over the next decade (Rooney 2021).

Figure 3.11-1. Employment in Forestry, Logging, and Wood Products Manufacturing Sector in Study Area (2019)



Source: Daniels and Wendel 2020

[1] *Median household income* captures the income level in a region where half of the households earn more while the other half earn less.

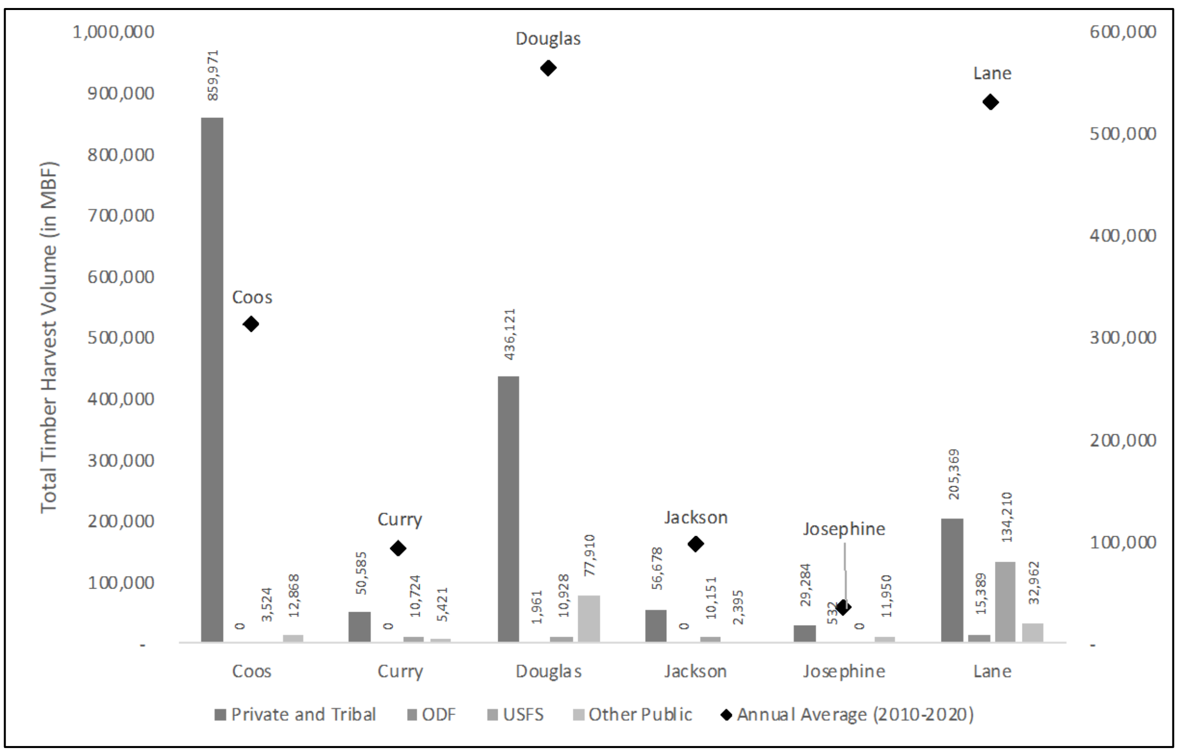
3.11.2.3 Timber Harvest

Harvest Volume

In 2020, Oregon's timber industry harvested 3,624,737 thousand board feet (MBF) of timber from federal, state, county, and private forestlands, a 12% increase from timber harvests in 2010 (University of Montana 2022). About 54% of that harvest in 2020 was in the study area, where harvest increased 52% overall compared to 2010. Timber harvests declined in Jackson and Lane Counties between 2010 and 2020 but increased in the remaining four study area counties. Coos and Douglas Counties accounted for the greatest volume of timber harvest in the study area, and most of that harvest occurred on private and tribal lands. Figure 3.11-2 shows the amount of timber harvested from forestland by ownership in southwestern Oregon in 2020.

Most of the timber harvested in Oregon is processed in Oregon. Some timber flows to adjoining states for processing (Simmons and Marcille 2020:11); from the study area the primary out-of-state destination is California. In 2017, approximately 166 primary forest product facilities like sawmills and plywood and veneer facilities operated in Oregon, 68 of which were in the study area (Simmons and Marcille 2020:3). Between 2018 and 2020, timber harvested in Coos and Douglas Counties was primarily processed in Benton, Coos, Douglas, and Lane Counties (ODF 2021).

Figure 3.11-2. Timber Harvest Volumes from Forestlands in Southwestern Oregon (2020, in MBF)



Source: University of Montana 2022

Harvest Value

Over the last 10 years, the average inflation-adjusted price for delivered logs of high-grade timber in Oregon was approximately $577 per MBF (in 2019 dollars). Wood processing mills pay a range of prices for delivered logs based on the species, grade of logs, and region where the timber sale occurs. According to Forest2Market data on delivered log prices, 10-year average prices can range between $419 and $1,076 per MBF depending on species and grade. Low-value species and grades can sell for as low as $110 per MBF. Prices of delivered logs fluctuate over time as well. After real log prices declined following the Great Recession in 2008, prices remained depressed throughout the last decade (Oregon Forest Resources Institute 2019:19). In early 2021, lumber prices hit record highs, normalized to near historical average levels mid-year and rose again in November 2021 (NASDAQ 2022). Although log prices also increased because of increasing lumber prices in some areas, the impact on prices of delivered logs was more muted (Giardinelli 2021).

3.11.2.4 Government Revenue

Common School Fund

Lands within the permit area became Common School Fund (CSF) lands in 1927. In 1955, the State began actively managing these lands, with harvest revenue contributing to the CSF, which was established in 1859 to provide funding to schools in Oregon (DSL 2022). The CSF also receives revenue from leases, property sales, gifts, and returns on investment of the fund (ORS 327.405). Until 2017, ODF managed the CSF lands in the permit area on behalf of DSL, and DSL paid for the associated operating and management expenses (ODF 2019). Since 2017, DSL has managed the land within the permit area, including the sale of standing timber.

Although the permit area supplied timber revenue to the CSF in the past, it has not been a substantial contributor to the fund in recent years. The permit area generated approximately $400 million in revenue for the CSF over the decades (DSL 2014). ODF harvested between 30 and 80 million board feet of timber from the permit area annually between the 1960s and the 1980s, but annual revenue contributions from harvests have declined since the 1990s (DSL 2014). Since 2017, the permit area has not generated timber revenue for the CSF due to uncertainty around future ownership and management plans. Table 3.11-2 presents revenues generated from sale of standing timber from CSF lands in the permit area between 2015 and 2021.

Table 3.11-2. Timber Revenue from Common School Fund Lands in Permit Area between 2015 and 2021

Time Period	Timber Revenue
FY 2015	$3,592,162
FY 2016	$3,416,945
FY 2017	$2,691,137
FY 2018	$0
FY 2019	$0
FY 2020	$0
FY 2021	$0

Source: DSL 2020a

The average annual distribution from statewide CSF lands to the CSF between 2016 and 2020 was $3.3 million. School districts in Oregon receive revenue from the CSF twice a year and the amount distributed to each district depends on the number of students enrolled in the district (Legislative Revenue Office 2020:5; DSL 2020b). School districts receive up to 3.5% of the CSF annually (DSL 2020b).

Forest Products Harvest Tax

Harvests from both public and private forestlands are subject to the Forest Products Harvest Tax. The tax is applied to the volume of timber harvested by each taxpayer in a calendar year (ORS 321.015). The first 25 MBF of the total quantity of timber harvested by each taxpayer is exempt from the tax every calendar year (Oregon Department of Revenue Research Section 2020:376). In 2022, timber purchasers pay approximately $4.92 dollars for every MBF of non-exempt timber harvested in that year (Oregon Department of Revenue 2022). Between 2019 and 2021, the Oregon Department of Revenue forecasted Forest Products Harvest Tax revenue at approximately $29.5 million (in 2021 dollars) (Oregon Department of Revenue 2022). Since the Elliott State Forest did not generate timber harvests between 2019 and 2021, it did not contribute to this revenue.

The tax has five components that fund various state programs. Of the approximately $4.92 per MBF, 13% is dedicated to the Oregon Forest Land Protection Fund, ODF's fund used to fight large fires in Oregon (ORS 321.015). A component (42%) of the tax funds ODF's administration of the Oregon Forest Practices Act on private and non-federal forests. Two components (together 22%) fund forestry research and education at the Oregon State University (OSU) College of Forestry. The final component (23%) funds the Oregon Forest Resources Institute. While the tax rate for the fire protection fund remains constant, the legislature periodically adjusts the rates for the other four components (Oregon Department of Revenue Research Section 2020:375).

Other State Taxes

Oregon applies a fuel tax on gasoline and diesel, which affects machinery and vehicles used to harvest and process timber along with other forest management activities. The weight-mile tax applies to vehicles over 26,000 pounds that are involved in commercial operations on public roads in Oregon, such as trucks used to transport timber. Haulers of logs and certain other timber-related commodities can opt to pay a flat-mileage tax in lieu of the weight-mile tax. Oregon and some cities and counties levy a lodging tax, which would apply to timber-harvest workers who stay in transient accommodations while on a job. The personal income generated by the forest management activities and timber supply chain is subject to personal income tax, while the corporate profits generated by logging and timber processing companies are subject to the corporate income tax and the corporate activity tax. The corporate activity tax is levied only on taxpayers with more than $1 million of taxable commercial activity in Oregon.

3.11.2.5 Value of Ecosystem Services

Ecosystem services refer to the types of benefits that ecosystems provide to people. Forest ecosystems produce many ecosystem services that people value, including food and fiber from plants and wildlife, a setting for recreation and spiritual experience, clean water, and flood control. Table 3.11-3 presents a summary of the types of ecosystem services the permit area forests provide across four broad categories: provisioning, regulating, cultural, and supporting services.

Table 3.11-3. Ecosystem Services in the Permit Area

Type of Service	Definition	Examples in Permit Area
Provisioning	The "products" obtained from ecosystems	Food Habitat for sensitive species Fresh water
Regulating	Benefits obtained from the regulation of ecosystem processes	Flood regulation Climate regulation Water purification
Cultural	Nonmaterial benefits obtained from ecosystems	Recreational Visual/aesthetic Spiritual Heritage Educational
Supporting	Services necessary to produce all other ecosystem services	Nutrient cycling Biodiversity Soil formation

Source: Created by ECONorthwest based on Millennium Ecosystem Assessment 2005. See also De Groot et al. 2002.

Some services are valued as an endpoint (e.g., flood regulation, avoided flood damage) while others represent necessary intermediate processes in the production of a good or service that people ultimately care about (e.g., soil formation that leads to plant growth and food production). This analysis focuses on five categories of goods and services that forests in the permit area produce and people value: special forest products (plants used for food and materials) and hunting and fishing; climate regulation through carbon sequestration; water quality regulation; habitat for sensitive species; and cultural, educational, and research services. Impacts on recreational services in the permit area are discussed in Section 3.8, *Recreation and Visual Resources*.

Value of Special Forest Products, Hunting, and Fishing

Tribes have gathered resources from forests in the permit area from ancestral to contemporary times to consume and transform into goods for personal use and trade. This relationship persists to this day for tribes and other people. Collection of special forest products can generate employment and income, strengthen social ties, contribute to households' daily diet, provide an economic safety net when participation in formal economic activity is difficult, and is frequently a major contributor to the rural lifestyle value (McLain et al. 2008).

Collection of special forest products can occur throughout the permit area for commercial, recreational, and subsistence use. Mushrooms, sword fern, salal, red huckleberry, and firewood are a few examples of special forest products that may be collected from the permit area. This activity is largely informal (i.e., non-permitted activity for which DSL has no official record). DSL currently grants 15–20 firewood permits annually and has a single 43-acre grazing lease in the permit area.

Forest structure influences the kinds of special forest products that may be available for collection. Salal, a shrub used for florist greenery, is found in early-seral to old growth forests and can increase after timber harvest or thinning (Tirmenstein 1990). Mushrooms and fungi are found in all forest ecosystems but are most commonly associated with late-seral and old growth forests and may decrease with timber harvest (Dreisbach 2002). Moss is more productive in mid- and late-seral forests, while huckleberries are most productive in mid-seral forests (Simonin 2000).

Fishing and hunting are also important activities in the permit area. Meat from wildlife can be an important source of low-cost protein for households, particularly in rural areas with limited access to affordable groceries. ODFW regulates these activities through rules that apply throughout the state, including in the permit area. DSL does not have special regulations on fishing and hunting in the permit area.

Value of Climate Regulation

Trees and soils in the permit area are important carbon sinks for the region. Trees sequester carbon in their aboveground woody material and in their roots throughout their life cycle. Soils contain decomposing plant and animal life that store carbon, particularly in cooler climates where decomposition rates are low (Melillo and Gribkoff 2021). Forest disturbance (both human-caused and natural) can lead to the release of stored carbon (Binkley and Fisher 2019). Release of greenhouse gases like carbon dioxide (CO_2) contributes to climate change and leads to adverse health outcomes, increased risks of natural disasters such as floods, lost agricultural productivity, and other (largely adverse) economic outcomes for local, national, and international populations. The most recent estimates suggest that the social value of an additional metric ton (MT) of CO_2 sequestration will increase from $76 in 2020 to $116 by 2050 (in 2020 dollars, using a 2.5% discount rate) (Interagency Working Group on Social Cost of Greenhouse Gases 2021). Like most forests, the permit area's contribution to carbon sequestration varies over time and space with variation in tree species composition, stand age, and stand density.

Value of Water Quality Regulation

Forestlands play an important role in maintaining the health of watersheds and water quality by holding soils and preventing erosion. Poor water quality can reduce the value of fishing, boating, and other instream uses of the waterway. It also creates costs for water users, such as irrigators and municipal water systems. Sedimentation and runoff can affect the costs for water treatment and distribution, especially in drinking water source areas. For example, Warziniack et al. (2017) show that every 1% increase in turbidity leads to a 0.19% increase in water treatment costs. Keeler et al. (2012) emphasize that the benefits associated with water quality also extend well beyond treatment costs to include water-related recreation values and health impacts.

The permit area is upstream of drinking water sources in the North Tenmile subwatershed (Section 3.3, *Water Resources*). Demand for water for municipal, industrial, and agricultural use is expected to remain constant in Coos County and increase only slightly in Douglas County over the analysis period (Section 3.3).

Value of Threatened and Endangered Species Habitat Protection

People value the continued existence of threatened and endangered species—even species that they have never or will never see or interact with. People can place a substantial value on protecting these species today and for future generations. For example, researchers have found that households would be willing to pay $104 per year to protect salmon and steelhead and $83 per year to preserve endangered owl populations (Richardson and Loomis 2009, converted to 2019 dollars). These values are not necessarily indicative of the value associated with specific management activities. Actions that result in substantial reductions in risk of extinction would likely be most valuable to households. Overall, this area of economic research demonstrates that people are willing to pay for actions where the primary or only outcome is to protect threatened and endangered species.

Value of Cultural, Tribal, Educational, and Research Services

Permit area forests provide several types of value related to cultural services, including aesthetic, spiritual, heritage, and educational value. Recreation is another cultural service discussed separately in Section 3.8, *Recreation and Visual Resources*. Numerous tribal groups have ancestral lands that overlap with the permit area, which have shaped their culture, spiritual experiences, and quality of life. Section 3.10, *Tribal Resources*, provides information about the potentially affected tribes and their ancestral, current, and future use of resources such as ceremonial hunting and fishing in the study area. Cultural resources, which have value for tribes and others, are located throughout the permit area (Section 3.9, *Cultural Resources*). The permit area forests are an important contributor to the maintenance of rural lifestyles, economies, and the general sense of open space. The aesthetic value of the permit area may contribute to property values and is an important component of the value of recreation experience (Section 3.8, *Recreation and Visual Resources*).

Permit area forests provide education benefits to all who visit and interact with them. Forests serve as a setting to engage curiosity and enrich personal experience. These cultural values are often intangible and can be difficult or inappropriate to quantify in monetary terms but are fundamental to sustaining healthy communities and economies. In addition to personal enrichment and employment, forestry research and education also help improve the value of commodity and non-commodity outputs and services that forests provide (National Research Council 2002:22). Better monitoring and research of various forest management practices can help forestry professionals increase forests' value for stakeholders in sustainable ways (National Research Council 2002:22).

3.11.3 Environmental Consequences

3.11.3.1 Income and Employment Levels

Alternative 1: No Action

Harvest-Related Activities

Under the no action alternative, the forest would be available for clearcut harvest, variable density harvest, and restoration thinning, which would produce timber and contribute to jobs and income in the study area.

- Approximately 30,268 acres would be available for clearcut harvests. Clearcuts would cut stands older than 60 years in harvest areas.
- Approximately 2,735 acres would be available for variable density harvests.
- Approximately 2,236 acres would be available for restoration thinning.

Harvest activities in the permit area would generate direct, indirect, and induced jobs and income in the study area. Timber harvests would generate direct jobs and income in the forestry, logging, and milling industries, supporting timber companies and mills located in southwestern Oregon. The purchase of intermediate goods and services and the eventual spending of the direct wages earned through harvest activities would also generate indirect and induced jobs and income in the communities throughout the study area and more broadly throughout Oregon and California.

Other Activities that Support Economic Activity

The forest in the permit area would continue to support employment and income directly associated with non-harvest forest management activities (e.g., species surveys), special forest product collection for commercial use, and any guided recreation (including hunting and fishing) that may occur in or adjacent to the forest. Changes in forest composition over the analysis period may vary the supply of special forest products such that any short-term decreases in supply could decrease associated commercial income. The grazing lease in the permit area, which generates $2,400 annually for DSL, would continue to support agricultural production in the Umpqua Valley. Non-commercial use of the forest for recreation and subsistence collection, hunting, and fishing would support jobs and income as visitors from outside of the study area spend money in local communities. Informal use of the forest for research and education would continue, generating economic activity from participants traveling to the forest from outside the study area. The value people receive from participating in these activities is discussed in Section 3.11.3.3, *Value of Ecosystem Services*.

Alternative 2: Proposed Action

Harvest-Related Activities

As under the no action alternative, clearcut harvests, variable density harvests, and restoration thinning would produce timber and contribute to jobs and income in the study area. The acreage under the three treatment types differs from the no action alternative, with less acreage in clearcut harvest but more acreage in variable density harvest and restoration thinning.

- Clearcut harvests would occur on approximately 14,385 acres under intensive treatment, within stands older than 60 years but younger than 65 years as of 2020. This translates to 52% less acreage of clearcut harvest than the no action alternative. Private timber companies may be less likely to bid for the harvest of younger and smaller stands with age restrictions due to lower log prices and higher harvest costs.
- Variable density harvest (extensive treatment) would occur on approximately 13,474 acres, which is approximately 393% more than under the no action alternative. Variable density harvest would produce up to 50% less timber than the timber produced through clearcut harvests.
- Approximately 16,987 acres spread across the permit area would be available for restoration thinning on stands less than 65 years of age (as of 2020). This is 660% more than the acreage treated with restoration thinning under the no action alternative. Unlike the no action alternative, the proposed action would mandate restoration thinning to improve habitat and manage the permit area for research purposes. Restoration thinning would primarily occur in the first 20 years of the analysis period.

The proposed action would produce less timber volume than the no action alternative because greater acreage would be dedicated to less productive harvest activities like restoration thinning and variable density harvests than clearcuts. Lower volumes of timber harvests would generate less revenue and support fewer direct, indirect, and induced jobs and less labor income, especially after the first 20 years of the analysis period when most restoration thinning would occur. Mills that process smaller-diameter timber would benefit more than mills that process larger logs because harvest activities would produce smaller-diameter timber on average throughout the analysis period.

Other Activities that Support Economic Activity

The proposed action would support more jobs and labor income through research and educational programs conducted in the permit area than the no action alternative. The permit area would serve as an experimental forest with the potential to draw grant funding for research from outside the study area. Grant funding would create new income by drawing new academics and researchers and support staff to the study area. Presence of top-tier researchers and research opportunities could also draw high-quality recruits to local educational institutions, increasing the labor supply in the study area (Agrawal et al. 2014:20). Influx of visitors associated with research and education to the study area would increase spending on lodging and food in communities nearest to the permit area (Reedsport and North Bend-Coos Bay), supporting more jobs and labor income in the study area relative to the no action alternative (OSU 2021:13).

Under the proposed action, the forest in the permit area would continue to support employment and income directly in the same categories as the no action alternative. The grazing lease in the permit area would continue to support agricultural production in the Umpqua Valley. Guiding Principles outlined in the Elliott State Research Forest Proposal suggest the potential for expansion in recreation and education activities in ways that would directly support local employment. Specifically, the proposal identifies that "local staff who work in the community" would manage recreational programming and any future recreational program would "leverage partnerships within the local community" (OSU 2021:11–12). Formal recreation and educational programming would likely expand visitation levels, increasing spending in local communities. The value people receive from participating in these activities is discussed in Section 3.11.3.3, *Value of Ecosystem Services*. To the extent that potential reductions in the road network in the conservation research watershed (CRW) result in decreased visitation from outside the region, the proposed action would decrease jobs and income associated with recreation relative to the no action (Section 3.8, *Recreation and Visual Resources*).

Table 3.11-4. Summary and Comparison of Activities Contributing to Economic Activity

Activities	No Action	Proposed Action	Notes	Impact Relative to No Action
Market-Based Activities				
Clearcut harvest	30,268 ac	14,385 ac	Fewer, younger, and smaller stands would be available for harvest under proposed action.	Adverse impact
Variable density harvest	2,735 ac	13,474 ac	Only 50% of volume produced by clearcut harvests would be produced under variable density harvests under proposed action.	Adverse impact
Restoration thinning	2,236 ac	16,987 ac	Assuming similar timber volume harvested per acre, more acreage harvested under proposed action.	Beneficial impact
Collection of special forest products	Present	Present	Permit-based commercial use, distinct from personal use.	No impact
Grazing	Present	Present	43-acre grazing lease	No impact

Activities	No Action	Proposed Action	Notes	Impact Relative to No Action
Non-Market Activities with the Potential for Market-Based Activity in the Future				
Research and education	Present informally	Present	While the Elliott State Forest has supported research and education for decades, creation of the Elliott State Research Forest would formalize and expand this activity.	Beneficial impact
Recreation	Present	Present	Recreation infrastructure and programming are more likely to expand under the proposed action, especially in ways that attract visitors from outside the region that support higher levels of economic activity.	Likely beneficial impact
Hunting	Present	Present	Access and supply of hunting opportunities would continue.	No impact
Fishing	Present	Present	Access and supply of fishing opportunities would continue.	No impact
Collection of special forest products	Present	Present	Access and supply of special forest products for personal use would continue.	No impact

Alternative 3: Increased Conservation

Harvest-Related Activities

As under the no action alternative, clearcut harvests, variable density harvests, and restoration thinning under Alternative 3 would produce timber and contribute to jobs and income in the study area. Under Alternative 3, the acreage available for clearcut harvest would be less than under the proposed action and no action alternative, the acreage available for restoration thinning would be greater than the proposed action and no action (restoration thinning would occur primarily in the first 20 years of the analysis period), and the acreage available for variable density harvest would be less than the proposed action but greater than the no action. Overall, timber harvest volume would be less than under both the no action and proposed action. Lower volumes of timber harvests would support fewer direct, indirect, and induced jobs and less labor income, especially after the first 20 years of the analysis period when most restoration thinning would be conducted.

Other Activities that Support Economic Activity

Under Alternative 3, jobs and labor income associated with research and educational programs would be the same as the proposed action but greater than the no action. Alternative 3 would also support similar levels of jobs and labor income as the no action and proposed action through grazing and recreation in the permit area. If decreases in the road network across the permit area reduce access for recreation in the permit area and decrease overall levels of recreation, Alternative 3 could result in adverse impacts on jobs and labor income associated with recreation in the permit area relative to the proposed action and the no action (Section 3.8, *Recreation and Visual Resources*).

Alternative 4: Increased Timber Harvest

Harvest-Related Activities

As under the no action alternative, clearcut harvests, variable density harvests, and restoration thinning under Alternative 4 would produce timber and contribute to jobs and income in the study area. The acreage available for clearcut harvest under Alternative 4 would be greater than the proposed action but less than the no action, variable density harvest acreage would be greater than both the proposed action and no action, and restoration thinning would be less than the proposed action but greater than the no action. Volumes of timber harvest and associated support for direct, indirect, and induced jobs and labor income would be similar to the no action alternative, greater than the proposed action.

Other Activities that Support Economic Activity

Jobs and labor income associated with research and educational programs under Alternative 4 would be similar to the proposed action, greater than the no action. Alternative 4 would also support similar levels of jobs and labor income as the no action and proposed action through grazing and recreation occurring in the permit area.

3.11.3.2 Government Revenue

Alternative 1: No Action

Common School Fund. Under the no action alternative, revenues from sale of standing timber in the harvest areas would be transferred to the CSF over the analysis period. Revenues would fluctuate as the forest matures and the volume of timber of harvestable age (over 60 years) changes. These fluctuations would likely be similar in scale to historical fluctuations in revenue from the permit area prior to the last 5 years (when revenue has declined to $0). DSL would manage changes in this revenue stream alongside the portfolio of other sources of revenue the CSF receives as outlined in Section 3.11.2, *Affected Environment* (DSL 2020a).

Forest Products Harvest Tax. Under the no action alternative, the State would levee a Forest Products Harvest Tax annually on the volume of timber harvested from the permit area over the analysis period and would distribute revenue to beneficiaries according to legislatively established formulas.

Other State Taxes. Fuel consumption and transportation related to forest management, timber harvest, and processing activities would generate state fuel tax and weight-mile tax revenues. Harvest-related employment and forest-related overnight visitation would contribute to lodging taxes. Income generated through forest management, harvest, visitor spending, and associated supply-chain relationships would contribute to personal income tax, corporate income tax, and commercial activity tax collections.

Alternative 2: Proposed Action

Common School Fund. Under the proposed action, the harvest in the permit area would not generate any revenue for the CSF through timber harvests. In 2022, the Governor signed legislation that officially decoupled the lands in the permit area from the CSF, in exchange for a payment of $221 million to fulfill the State's revenue obligations to the CSF (Senate Bill 1546). DSL transferred

$100 million acquired through state bond funding to the CSF in 2019 and would transfer the remaining $121 million over the analysis period (House Bill 5006).

Forest Products Harvest Tax. Timber harvests under the proposed action would produce revenue through the Forest Products Harvest Tax over the analysis period. Lower volumes of timber harvested due to less acreage available for more intensive harvest is likely to decrease the amount of tax revenue generated annually and distributed to beneficiaries relative to the no action alternative.

Other State Taxes. Forest management activities and other economic activities linked to the permit area that consume fuel, provide lodging, and generate income would generate tax revenue for state and local governments. Despite the lower timber harvest volumes under the proposed action, the permit area's contributions to overall state and local tax collections are unlikely to measurably differ from the no action given the permit area's relatively small contributions to economic activity in the region when compared to other economic activities.

Alternative 3: Increased Conservation

Effects on the CSF and other state taxes under Alternative 3 would be similar to those described for the proposed action. The permit area would not generate any revenue for the CSF, and differences in levels of economic activities between Alternative 3 and the proposed action are unlikely to produce measurable impacts on other state taxes, given the permit area's relatively small contributions to economic activity in the region when compared to other economic activities.

Similar to the proposed action and the no action, timber harvests under Alternative 3 would produce revenue through the Forest Products Harvest Tax over the analysis period. Lower volumes of timber harvested due to less acreage available for more intensive harvest compared to the proposed action and the no action would likely to decrease the amount of tax revenue generated annually and distributed to beneficiaries relative to the proposed action and the no action alternative.

Alternative 4: Increased Timber Harvest

Effects on the CSF and other state taxes under Alternative 4 would be similar to those described for the proposed action. The permit area would not generate any revenue for the CSF, and differences in levels of economic activities between Alternative 4 and the proposed action are unlikely to produce measurable impacts on other state taxes, relative to overall state tax collections and fluctuations in economic conditions.

Similar to the proposed action and the no action, timber harvests under Alternative 4 would produce revenue through the Forest Products Harvest Tax over the analysis period. Timber harvest volumes that are similar to the no action and greater than the proposed action, would likely result tax revenue similar to the no action and greater than the proposed action that is generated annually and distributed to beneficiaries.

3.11.3.3 Value of Ecosystem Services

Alternative 1: No Action

Value of Special Forest Product Collection, Hunting, and Fishing

Under the no action alternative, increase in old growth forests but decrease in late-seral forests could increase or decrease the abundance of mushrooms, fungi, moss, and berries. Timber harvest sites would continue to provide opportunities for firewood collection, although access may change over the analysis period. All forest types and associated special forest products would continue to be available, but the supply and distribution relative to existing conditions would shift as forest age and structure shift. Increases in abundance of special forest products could increase the value people derive from the study area. Decreases in the availability of products could translate into lost income for commercial users or higher travel costs to substitute collection sites for all users, including those who collect for subsistence or recreation.

Any new permanent roads developed for forest management purposes under the no action alternative would expand access to collect special forest products where maintained and open to public access. However, expansion is expected to be minimal, because the existing permanent road network is densely built out.

Adverse impacts on habitat quality for fish species in stream reaches without riparian buffers (riparian management areas [RMAs]) may adversely affect the value of subsistence and commercial fishing in the permit area if it reduces harvest or increases harvest effort (Section 3.5, *Fish and Wildlife*). A variety of habitat would be available and would support wildlife populations for hunting (Section 3.5).

Value of Climate Regulation

Based on modeling projections, net carbon sequestration—the gain in the stock of carbon in the forest—would average 26,687 MT carbon dioxide equivalent (CO_2e) per year over the analysis period under the no action alternative (Section 3.7, *Climate Change*), which would have an estimated social value of $758,887 per year (in 2020 dollars).[2]

Value of Surface Water Quality Regulation

Under the no action alternative, runoff of sediment and other contaminants from harvest and road construction would degrade local surface water quality, while road abandonment, decommissioning, and reforestation would improve water quality locally (Section 3.3, *Water Resources*). Although the permit area is upstream of the drinking water sources in the North Tenmile subwatershed, discernable changes in water quality and associated treatment costs are unlikely. Similarly, declines in water quality and associated value of water-based recreation are not likely based on expected level of water quality changes.

Value of Threatened and Endangered Species Habitat Protection

Adverse effects on coho habitat in stream reaches without riparian buffers (RMAs) could diminish the economic well-being of people who care about their survival if it affects overall species population health (Section 3.5, *Fish and Wildlife*). Avoidance of harvest in areas occupied by covered

[2] Though the International Working Group report does not provide estimates for the social cost of carbon in emissions years after 2050, we applied the current emissions year value of $51 per MT CO_2 for the entire analysis period.

terrestrial species and modeled increases in terrestrial habitat would benefit these species. Loss of complex forest structure outside occupied areas and lack of long-term monitoring and adaptive management would adversely affect these species and the economic well-being of people who value their continued survival (Section 3.5, *Fish and Wildlife*).

Value of Cultural, Tribal, Educational, and Research Services

Most forest visitors tend to prefer old growth forests that look natural and unmanaged (Shelby et al. 2005; Kearney et al. 2010). The permit area would continue to provide value to such visitors as the combined levels of late-seral and old growth forests remain consistent over the analysis period. The permit area would continue to create value for local educational institutions and students who use the permit area for small-scale research and educational activities. To the extent people use these forest settings to satisfy spiritual, tribal, and cultural values, the permit area would continue to support these values. Potential impacts on cultural and tribal resources are described in Section 3.9, *Cultural Resources*, and Section 3.10, *Tribal Resources*.

Alternative 2: Proposed Action

Value of Special Forest Products, Hunting, and Fishing

Continued availability of all types of forest structures over the analysis period would result in similar levels of collection of special forest products under the proposed action as under the no action alternative. Taken together, increased old growth and late-seral forests, decreased early- and mid-seral forests, and limitations on salvage harvests in reserve areas and riparian conservation areas would increase the supply of mushrooms and moss and decrease the supply of salal and berries relative to the no action alternative. Decrease in timber harvests would reduce opportunities for firewood collection. Under the proposed action, any additional mile of permanent road constructed must be offset by abandoning or decommissioning an existing mile of permanent road in the CRW such that the road network would not increase but could decrease in the CRW relative to the no action alternative. If the road network decreases, it would reduce access to collect special forest products in the CRW relative to the no action alternative.

The proposed action would favor species dependent on old growth and late-seral forests while reducing habitat for species dependent on early- and mid-seral forests. Continued availability of all habitat types in the permit area would limit beneficial or adverse impacts on the value of hunting. Decreases in harvest, increased road decommissioning, and increased riparian and aquatic protections would decrease adverse effects on fish and stream-dependent wildlife, which could benefit recreational fishing (Section 3.5, *Fish and Wildlife*) compared to the no action alternative.

Value of Climate Regulation

Based on modeling projections, net carbon sequestration would average 36,284 MT CO_2e per year over the analysis period under the proposed action (Section 3.7, *Climate Change*), which would have an estimated social value of $1,031,793 per year (in 2020 dollars). This is about $273,000 more annually than under the no action alternative.

Value of Water Quality Regulation

Under the proposed action, Conservation Measures 1, 2, and 3 would invest in restoration and stream enhancement, expand RCAs on Lower Millicoma River, and reduce road network in the CRW. These measures would increase protection of surface water and mitigate adverse effects from timber harvests and road activities on water quality compared to the no action alternative. The overall impact on water quality for drinking and recreational use is expected to be similar to the no action alternative.

Value of Threatened and Endangered Species Habitat Protection

Increase in habitat suitable for covered species compared to the no action alternative and the conservation strategy would minimize and mitigate this harm for the species population as a whole, and long-term monitoring and adaptive management would increase certainty that the forest habitat would meet the conservation needs of the species (Section 3.5, *Fish and Wildlife*). The resulting impact on the economic well-being of people who care about ongoing species existence would be minimal relative to the no action alternative.

Value of Cultural, Tribal, Educational, and Research Services

Projected greater increase in combined old growth and late-seral forests would result in beneficial effects on value for forest visitors with a preference for the forest type compared to the no action alternative. For example, a more diverse and connected landscape under the proposed action would provide a greater variety of plant species for tribal use (Section 3.10, *Tribal Resources*). There are no differences in impacts on cultural resources and their uses between the proposed action and the no action (Section 3.9 *Cultural Resources*). As a research forest, the permit area would create greater opportunities for research and educational programs under the proposed action relative to the no action alternative. Research on forest management activities that balance forest resource extraction with conservation would contribute to sustainable forest management in the future, particularly in the face of growing disturbances and climate change impacts. Advancements in such practices would generate value for stakeholders that rely on working forests and stakeholders that value conservation. Educational programming developed by OSU around the permit area would create value for students and academic institutions.

Alternative 3: Increased Conservation

The impacts on ecosystem services under Alternative 3 would be similar to the proposed action. Modeling projected that lower timber harvests under Alternative 3 would result in carbon storage amounting to a social value of $1,587,642 per year over the permit term (in 2020 dollars), a 109% and 54% increase compared to the no action alternative and the proposed action, respectively. Expanded RCAs may improve habitat connectivity and benefit riparian species compared to the proposed action and no action, increasing value for people who value habitat and species conservation. Increased aquatic protection would likely increase beneficial effects on water quality but is unlikely to affect treatment costs for drinking water or water quality for recreation, resulting in limited increase in the value people derive from water resources. Other ecosystem service values, such as special forest product collection, are unlikely to meaningfully differ from the proposed action.

Alternative 4: Increased Timber Harvest

The impacts on ecosystem services under Alternative 4 would be similar to the no action alternative. Modeling projected that timber harvest under Alternative 4 would result in carbon storage amounting to a social value of $721,606 per year (in 2020 dollars) over the permit term, a 5 and 30% decrease relative to the no action alternative and the proposed action, respectively. Adverse effects on fish and wildlife and value for people who value habitat and species conservation would be similar the no action, greater than the proposed action. Effects on water quality would be similar to the no action alternative and unlikely to affect treatment costs for drinking water or water quality for recreation, resulting in limited effects in the value people derive from water resources. Other ecosystem service values, such as special forest product collection, are unlikely to meaningfully differ from the no action alternative.

3.12 Environmental Justice

3.12.1 Methods

The study area for environmental justice (EJ) impacts includes all counties in southwestern Oregon. These counties overlap with the permit area and the plan area, are part of the regional economy that processes timber harvested in the permit area and interact with the ecosystem services produced by the permit area (Figure 3.12-1). The EJ study area also encompasses the study area defined for tribal resources in Section 3.10, *Tribal Resources*. This multilevel study area aligns with the intent of Executive Order (EO) 14008, EO 12898, and regulatory guidance (Federal Interagency Working Group on Environmental Justice and NEPA Committee 2016) that emphasizes investigating all pathways of potential impact and exposure to identify vulnerable populations (e.g., minority and low-income communities, pregnant women, elderly, groups with high asthma rates) that may experience potential disproportionately high and adverse impacts.

EO 12898 defines EJ populations as low-income and minority communities residing in the United States that relevant federal actions may affect. To identify EJ populations, this analysis used demographic and income data from the U.S. Census Bureau's 2016–2020 American Community Survey (ACS).[1] *Low income* is defined using the Census household poverty threshold. Geographies where the proportion of low-income or minority populations is "meaningfully greater" than the underlying geography (e.g., the county or state that contains the geography) are EJ populations. EPA's EJScreen tool was used to identify areas that EPA has mapped where high shares of minority and/or low-income populations overlap with poor environmental conditions and may be vulnerable to disproportionate and adverse environmental impacts.

An EJ impact occurs when an adverse impact disproportionately affects an EJ population. The first part of this analysis identifies the EJ populations in the study area. The second part screens the adverse impacts identified throughout this EIS for disproportionate harm to EJ populations, either because the impact is concentrated in a particular geography or on a resource that EJ populations depend on and hold value for. The EJ analysis also identifies effects that are disproportionately beneficial to EJ populations.

3.12.2 Affected Environment

3.12.2.1 Environmental Justice Counties and Census Tracts

Minority and Low-Income Counties

Minority groups make up 25% of Oregon's population (2016–2020 ACS data). Compared to the state of Oregon, the share of the minority population is lower in all counties in the study area (Table 3.12-1). Nationally, the workforce in the forestry sector is predominantly non-Hispanic white, with Hispanic and Latino workers the second largest ethnic group employed in the sector (U.S. Bureau of Labor Statistics 2021).

[1] Since 2016–2020 ACS data for census block groups has large margins of error, census tracts were chosen as the smallest geography for identifying EJ populations.

About 12% of Oregon's population reported annual household income lower than the Census poverty threshold. In the study area, all six counties have a higher share of the population below this threshold compared to the state: Coos (16%), Curry (13%), Douglas (13%), Jackson (14%), Josephine (16%), and Lane (17%) (Table 3.12-1). These counties are shown in Figure 3.12-1.

Minority and Low-Income Census Tracts

There are 223 census tracts within the study area, of which 134 (60%) meet the criteria for EJ populations, either for minority population, low-income status, or both indicators. One tract in Jackson County has a minority population above 50%. An additional 89 tracts were lower than 50%, but had higher shares of minority populations than their respective counties. Compared to county populations with annual household income lower than the Census poverty threshold, 96 census tracts are considered EJ populations for income. About 39% of the identified tracts—52 tracts—meet EJ criteria for both minority populations and income (Table 3.12-2). Tracts in Figure 3.12-1 that meet EJ criteria for minority populations are shown with dots. Tracts that meet EJ criteria for low-income populations are shown with diagonal lines. The dots and diagonal lines overlap for tracts that meet both minority and low-income criteria. The U.S. Census Bureau derives demographic data at the tract level statistically, and these estimated data are somewhat uncertain. However, inclusion of all tracts meeting threshold criteria in this analysis represents a conservative approach.

Table 3.12-1. Summary of Minority and Low-Income Populations in the Study Area

Geography	Total Population	Minority		Low-Income	
		Population	Percentage	Population	Percentage
Oregon	4,176,346	1,047,852	25%	506,558	12.36%
Coos County [a]	64,175	9,823	15.31%	10,184	16.14%
Curry County [a]	22,889	3,275	14.31%	2,941	12.95%
Douglas County [a]	110,015	13,937	12.67%	14,124	13.01%
Jackson County [a]	218,781	43,696	19.97%	29,652	13.70%
Josephine County [a]	87,097	12,404	14.24%	13,715	16.00%
Lane County [a]	377,749	70,435	18.65%	63,585	17.18%
Selected EJ Counties	880,706	153,570	17.44%	134,201	15.24%
Selected EJ Census Tracts	542,694	114,555	21.11%	102,229	18.84%

Sources: U.S. Census Bureau 2022a, 2022b

[a] (Grayed cell) Counties with percentage of low-income population greater than Oregon's.

Table 3.12-2. Counties and Census Tracts with Environmental Justice Populations

Geographies	Number of Geographies			
	Minority Only	Low-Income Only	Both	Total
Counties	0	5	0	5
Census Tracts	38	44	52	134

Environmental Justice Indexes

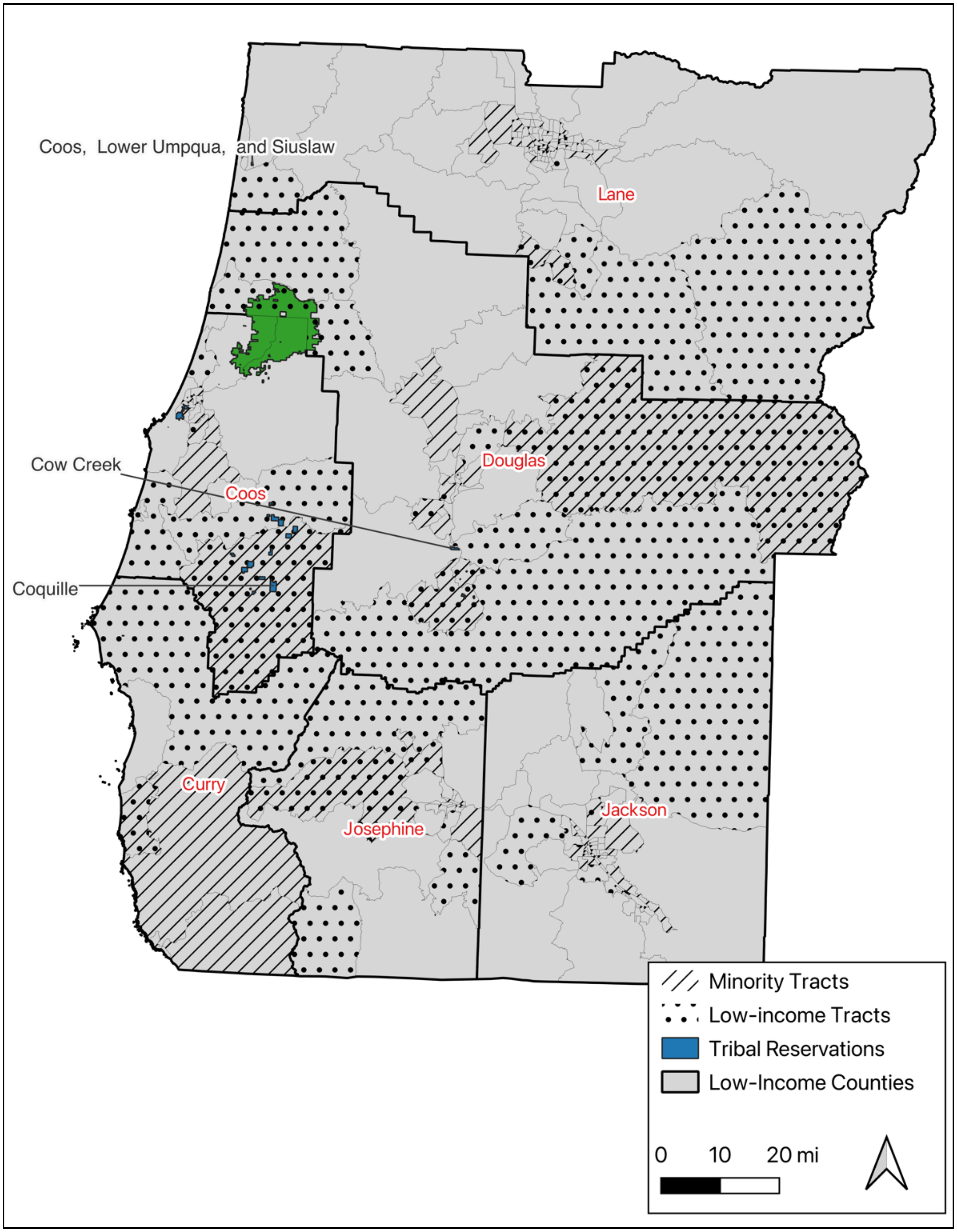
The U.S. Environmental Protection Agency's (EPA's) EJScreen is an EJ screening and mapping tool that presents data on 12 Environmental Justice Indexes (EJ Indexes) for census tracts and block groups. EJScreen combines data on demographics and environmental indicators for census geographies such that areas with high values for an EJ Index indicate large numbers of minority and/or low-income residents with higher environmental indicators (EPA 2022a). As a result, these areas correlate but do not overlap perfectly with areas where low-income and/or minority populations live in higher shares. According to the EPA, an area of potential EJ concern is an area where one or more of the 12 EJ Indexes is at or above the 80^{th} percentile in the nation and/or state (EPA 2022b). In the study area, Lane, Jackson, and Josephine Counties were the only counties with census tracts that met the 80th percentile threshold relative to Oregon. Within these counties, 15 to 23 census tracts out of a total of 194 tracts met the 80th percentile threshold relative to Oregon (Table 3.12-3).

Table 3.12-3. Number of Census Tracts with an Environmental Justice Index at or above the 80th percentile relative to Oregon

EJ Index	Lane County	Jackson County	Josephine County	Total
Lead Paint	13	9	1	23
Diesel Particulate Matter (2017)	13	9	1	23
Air Toxics Cancer Risk (2017)	13	9	1	23
Air Toxics Respiratory Hazard Index (2017)	13	9	1	23
Traffic Proximity	13	9	1	23
Wastewater Discharge	12	2	1	15
Superfund Proximity	12	9	1	22
Risk Management Plan Facility Proximity	13	9	0	22
Hazardous Waste Proximity	13	9	1	23
Ozone	13	9	1	23
Particulate Matter 2.5	13	9	1	23
Underground Storage Tanks	13	9	1	23

Note: Josephine County has 22, Jackson County has 52, and Lane County has 92 total census tracts. The other counties in the study area do not have census tracts that meet EPA's criteria.
Source: EPA 2021.

Figure 3.12-1. Counties and Census Tracts with Environmental Justice Populations



3.12.2.2 Tribal Nations

Table 3.12-4 summarizes the low-income populations in tribes that could be affected under the proposed action and alternatives.

Table 3.12-4. Summary of Low-Income Populations in Potentially Affected Tribes

Tribal Area	Geography	Total Population	Percentage below Poverty Level
Confederated Tribes of Siletz Indians Reservation and Off-Reservation Trust Land	Lincoln County	720	30.6%
Confederated Tribes of the Grand Ronde Community of Oregon	Polk, Yamhill Counties	632	42.6%
Coquille Indian Tribe Reservation	Coos County	473	31.1%
Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indians; Reservation and Off-Reservation Trust Land	Coos, Curry, Lane Counties	99	14%
Cow Creek Band of Umpqua Tribe of Indians Reservation and Off-Reservation Trust Land	Douglas County	192	18.6%

Source: U.S. Census Bureau 2022c.

3.12.3 Environmental Consequences

3.12.3.1 Alternative 1: No Action

The impact analysis for air quality and climate change (Section 3.6, *Air Quality*, and Section 3.7, *Climate Change*) did not identify any adverse impacts under the no action alternative. As a result, there are no adverse impacts associated with these resources that could have a disproportionate effect on the EJ populations identified in the study area. Adverse impacts on geology and soils, water resources, vegetation, fish and wildlife, and tribal resources (Sections 3.2, *Geology and Soils*, 3.3, *Water Resources*, 3.4, *Vegetation*, 3.5, *Fish and Wildlife*, and 3.10, *Tribal Resources*) on EJ populations in the study area are analyzed through their impacts on recreation and socioeconomic resources, specifically the value of ecosystem services, in the study area.

Recreation and Visual Resources

Under the no action alternative, the permit area would continue to support dispersed recreational activities over the analysis period (Section 3.8, *Recreation and Visual Resources*). If recreational facilities are developed in the future, seasonal restrictions near northern spotted owl and marbled murrelet habitat may delay maintenance of the facilities resulting in temporary adverse impacts on the supply of recreation in the permit area (Section 3.8, *Recreation and Visual Resources*). These adverse impacts on accessing future developed recreation sites in the permit area could result in disproportionate EJ impacts. The 2019–2023 Statewide Comprehensive Outdoor Recreation Plan for Oregon conducted a survey of Oregon residents and found low-income respondents' lack of transportation options and distance to parks presented barriers for accessing outdoor recreation (OPRD 2019). Since lower-income communities are less likely to travel farther distances to access other recreational facilities due to constraints on transportation and financial resources, the no action alternative could result in disproportionately high and adverse impacts on EJ populations that are located in the study area (Lamborn et al. 2017).

Adverse impacts on habitat quality of most fish species could adversely affect recreational fishing in the study area over the permit term (Section 3.8). Since recreational fishing—distinct from its subsistence purpose described under *Value of Ecosystem Services*—does not draw a disproportionate share of minority and low-income participants in Oregon, the impacts on EJ populations would not be disproportionately high and adverse (OPRD 2019).

Cultural Resources

Under the no action alternative, forest management activities could adversely affect cultural resources through ground disturbances or changes in setting (Section 3.9, *Cultural Resources*). Potential effects on cultural and historic resources would be similar under all alternatives. Although the precise location and timing of the activities may differ depending on the alternative, DSL would consistently follow the applicable federal and state regulations and DSL policies and practices described in Section 3.9. Potential cultural resource impacts on EJ populations would depend on the resources affected and the extent to which EJ communities engage with that resource.

Socioeconomic Resources

Income and Employment

Under the no action alternative, timber harvests in the permit area would support employment and labor income over the analysis period. Compared to existing conditions over the last 5 years where harvest largely stopped, harvest from the Elliott State Forest and associated income and employment would increase under the no action alternative. This could represent a beneficial impact on low-income EJ communities in the study area by providing jobs and labor income, depending on the geographic flow of timber from the permit area and its relative share in the timber industry as described in this section.

Harvest levels and associated income and employment are expected to fluctuate over time as forest stands mature and the acreage of stands of harvestable age changes. Harvests from state lands in total make up a relatively small proportion of harvest in the counties in the study area, with harvests from the permit area comprising only a portion of harvests from state lands (Section 3.11, *Socioeconomics*). Timber contracts may employ crews from within or beyond the study area. Logs harvested from the permit area have the potential to disperse throughout mills in the study area and outside the study area. Thus, beneficial and adverse impacts arising from harvest fluctuations are unlikely to concentrate in any single community, timber company, or mill.

Fluctuations in timber harvest in the permit area are unlikely to create substantial adverse impacts on tribal members employed in the industry and timber available for tribal enterprises (Section 3.11, *Socioeconomics*). Although increases and decreases in timber could lead to changes in direct and indirect employment and income in the study area, the permit area only makes up a small share of forestlands that supply timber to the timber industry in the study area. In the long run, disproportionate impacts arising from changes in employment and income for EJ populations are less clear and would depend on supply of timber from other forestlands. Over the analysis period, the economy will adjust to shifting trends in harvest in the study area in ways that could either amplify or minimize impacts on EJ populations, depending on underlying economic conditions.

Value of Ecosystem Services

The no action alternative would produce both beneficial and adverse disproportionate impacts for EJ populations arising from changes in forest structure that influence the supply of ecosystem goods and services.

Projected decreases in the extent of late-seral forests (Section 3.4, *Vegetation*) would decrease the productivity of some habitats and species used for subsistence by EJ communities in the study area. Other materials important for cultural and spiritual value, including medicinal and basketry materials, may also become scarcer with decreases in late-seral forests. Availability of a variety of forest types used by species like deer and elk would support hunting for commercial and subsistence use. To the extent that adverse impacts on habitat quality for fish would decrease harvest or increase harvest efforts, it would represent a disproportionate effect on some EJ populations, especially tribal populations and some rural low-income residents that disproportionately rely on subsistence resources and ways of life (Section 3.11, *Socioeconomics*).

Removal of mid- to late-seral forests and ground disturbance during harvest activities would reduce supply of some resources:

- Localized harvest disturbance would adversely affect some wetland species, berries, salal, evergreen boughs and floral greens, and other food, medicinal, and fiber resources.
- Varying levels of harvest over the analysis period would reduce the reliable and regular supply of firewood collections areas for personal and commercial use (Section 3.10, *Tribal Resources*, Section 3.11, *Socioeconomics*).

These products are harvested for subsistence, cultural tradition, and as sources of supplemental income for local lower-income communities and tribes (Section 3.11, *Socioeconomics*; OFRI 2021). While timber harvest may adversely affect supply of these products in localized areas, shifting patterns of forest composition would generally ensure a continued supply of nontimber forest products throughout the permit area. However, shifting distributional patterns could reduce access for some populations, producing disproportionate adverse impacts for those most dependent on the resource and least able to adapt to changes and increased travel costs. Adverse impacts would be particularly high for Grande Ronde, Siletz, Coos, Lower Umpqua and Siuslaw, Coquille, and Cow Creek Tribes in the Coast Range (Section 3.10, *Tribal Resources*), given that some of these resources have cultural value specific to place and tradition that is not necessarily substituted by resources from elsewhere or other types of resources.

3.12.3.2 Alternative 2: Proposed Action

Impacts on EJ populations under the proposed action related to geology and soils, air quality, cultural resources, and climate change would be the same as described for the no action alternative. This section analyzes whether adverse impacts on recreation and socioeconomic resources could result in disproportionate impacts for EJ populations.

Recreation and Visual Resources

The projected supply of late-seral and old growth forest stands combined would increase compared to the no action alternative, which would result in lower recreational value for hunters who prefer younger and more open forests (Section 3.8, *Recreation and Visual Resources*). Users may travel to other regions in the permit area or to other parks to access younger forests to maintain their enjoyment of hunting; however, this travel is likely to generate additional costs and higher disproportionate impacts on EJ populations with financial limitations to absorb increased costs. Low-income and minority communities tend to participate less in outdoor recreation than higher-income and non-Hispanic white communities in Oregon (OPRD 2019), potentially a reflection of existing barriers faced by low-income and minority communities such as lack of transportation options, limited financial resources, and fear of racial discrimination. The additional travel costs of accessing early- to mid-seral stands would exacerbate existing financial inequality and deepen the gap in participation in outdoor recreation in Oregon.

Socioeconomic Resources

Income and Employment

Timber harvests and associated employment would decrease over the analysis period under the proposed action compared to the no action alternative (Section 3.11, *Socioeconomics*). However, jobs and income associated with restoration thinning and recreation, research, and educational programs would increase in the study area. In the long run, disproportionate impacts arising from changes in employment and income for EJ populations are not clear and would depend on the geographic flow of resources from the permit area and the overall supply of timber in the study area. Changes in the underlying economic conditions in the study area over the permit term such as shifting shares of industries in the regional economy and changing demographic composition through migration to and from the study area could either amplify or minimize adverse impacts on EJ populations.

Value of Ecosystem Services

Increased late-seral and old growth forests, decreased early- and mid-seral forests, and limitations on salvage harvests in reserve areas and riparian conservation areas would increase the supply of mushrooms and moss and decrease the supply of salal and berries relative to the no action alternative, resulting in both adverse and beneficial effects on EJ and tribal communities who rely on these products for subsistence and other purposes (Section 3.10, *Tribal Resources*, Section 3.11, *Socioeconomics*). Increased riparian protections would reduce adverse impacts for EJ communities by increasing supply of riparian plants and subsistence fishing (Section 3.10, *Tribal Resources*). Projected decreases in harvest compared to the no action alternative would decrease availability of firewood collection areas and species/resources associated with early-seral stands disproportionately affecting EJ communities. On the other hand, decreases in timber harvest levels would reduce disruption of collection of special forest products by maintaining access to specific collection sites, providing beneficial impacts on EJ communities.

3.12.3.3 Alternative 3: Increased Conservation

Impacts on EJ populations under Alternative 3 related to geology and soils, air quality, aesthetics, cultural resources, and greenhouse gas (GHG) emissions and carbon storage would be the same as described for the no action alternative. The types of impacts on recreation and socioeconomics would be the same as described for the proposed action with a few exceptions. Larger riparian conservation areas would maintain more riparian areas with complex understories increasing the supply of riparian plants used for subsistence and other purposes. This would reduce adverse impacts on EJ populations, specifically tribal members (Section 3.11, *Socioeconomics*). Increased riparian protections would also improve habitat for fish and wildlife species, potentially increasing the opportunity and success of fishing and hunting, which EJ populations disproportionately benefit from in the permit area (Section 3.11). Alternative 3 could increase adverse effects on EJ populations by further reducing access to the forest if it results in a net reduction in road miles in the permit area relative to the proposed action and no action (Section 3.8, *Recreation and Visual Resources*).

3.12.3.4 Alternative 4: Increased Timber Harvest

Impacts on EJ populations under Alternative 4 related to geology and soils, air quality, aesthetics and recreation, cultural resources, ecosystem services, and GHG emissions and carbon storage would be the same as described for the no action alternative.

Chapter 4
Cumulative Effects

4.1 Introduction

This chapter presents the analysis of potential cumulative effects of the proposed action and action alternatives on the human environment. The Council on Environmental Quality (CEQ) NEPA Regulations provide the following definition: “cumulative effects, which are the effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time” (40 Code of Federal Regulations [CFR] 1508.1(g)(3)).

4.2 Past, Present, and Reasonably Foreseeable Actions and Trends

The cumulative analysis considers those past, present, and reasonably foreseeable actions and trends, the effects of which, when added to the incremental impact of the proposed action or action alternatives on the human environment, inform the assessment of cumulative effects in the study area. The study area considered in this analysis is the same for each resource as defined in Chapter 3, *Affected Environment and Environmental Consequences,* unless otherwise noted.

The past, present, and reasonably foreseeable actions considered in this analysis and described below include forest management; barred owl management; the North Umpqua River Hydroelectric Project; resource protection, enhancement, and restoration activities; and other incidental take permits (ITPs) for covered species. The cumulative effects analysis also considers climate change, disturbance events, and land or agricultural development, which could contribute to impacts when combined with those impacts occurring under the proposed action and alternatives.

4.2.1 Forest Management

Forestland surrounds the entirety of the plan area (Figure 4-1). This land has a variety of uses including, but not limited to, timber production, vegetation management, management for habitat conditions, fire management, water development, recreational use, conservation, and grazing. These types of forest management activities have occurred in the past, are currently occurring, and are expected to continue throughout the analysis period.

Prior to state management, the majority of the plan area was managed by the U.S. Forest Service (USFS) and the rest by private landowners. The area transferred to state ownership in 1930 as part of an agreement to consolidate scattered Common School Fund Lands within federal forests into a contiguous block of state forest to be managed by the Oregon Department of Forestry (ODF), the Elliott State Forest, to be managed “as a demonstration forest, to show private landowners the value of investing in forest management” (DSL and ODF 2011). From 1930 to 2017 (87 years), Elliott State

Forest was managed by ODF on behalf of the State Land Board and under contract to DSL. In 2017, the State Land Board terminated the management contract with ODF for the Elliott State Forest. Currently, the Elliott State Forest is managed by DSL.

Surrounding the plan area, forest management has primarily included management for commercial timber harvest since the early to mid-twentieth century. Beginning in the 1930s, demand for commercial timber harvest in western Oregon increased and more land began to be managed as plantation-style forests.

At present, the primary land managers adjacent to the plan area include USFS to the north, Bureau of Land Management (BLM) to the north and east, the Oregon Board of Forestry (BOF) to the south and west, and private landowners to the east, south, and west.

Federal lands contain young forest as well as much of the late-successional forest remaining in coastal Oregon. Much of the other federal land adjacent to the plan area has been managed for conservation pursuant to the Northwest Forest Plan[1] since its adoption in 1994 (USFS and BLM 1994a, 1994b); this includes the implementation of Resource Management Plans (RMPs) for BLM lands (BLM 2016a, 2016b) and Land Management Plans (LMPs) for USFS lands. The Northwest Forest Plan and associated RMPs and LMPs designate areas of the forest for various purposes, including timber harvest, conservation, and recreation. Management and conservation under these plans include a combination of land allocations, standards and guidelines or management direction, and associated review procedures. These plans also establish allowable timber sale quantities in areas available for timber harvest. They outline conservation strategies for a wide range of terrestrial and aquatic species, including those covered under the ESRF HCP.

Until 2016, approximately 1.3 million acres of BLM lands in western Oregon were managed under the Northwest Forest Plan; since 2016, the lands have been managed under the Northwestern and Coastal Oregon RMP, which has the same land allocations as the Northwest Forest Plan (BLM 2016b). Of the BLM-managed areas bordering the Elliott State Forest, the vast majority consist of late-successional reserve areas and riparian reserve areas, which are managed primarily for conservation value. There are limited areas managed for low-intensity timber harvest and one block located adjacent to the southeastern side of the Elliott State Forest managed for moderate-intensity commercial timber harvest.

The Devil's Staircase Wilderness, established in 2019 and managed by USFS and BLM, is directly north of the Elliott State Forest separated by State Highway 38, the Umpqua River, and some private lands. This area is part of the National Wilderness Preservation System and many management activities (e.g., timber harvest) are prohibited. The Devil's Staircase Wilderness was formerly managed under the Northwest Forest Plan and associated RMPs and LMPs.

On adjacent non-federal forestland, forest management activities under other active or planned ITPs and HCPs may result in overlapping impacts with the proposed action and alternatives evaluated in this EIS. Per ESA, ITPs are supported by HCPs that are required to implement conservation strategies that demonstrate that they will, to the maximum extent practicable, minimize and

[1] The Northwest Forest Plan policy and direction is derived from two key documents, the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* and *Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl.*

mitigate the impacts of the incidental taking, and that such taking will not appreciably reduce the likelihood of survival and recovery of the species.

BOF lands adjacent to the Elliott State Forest are managed by ODF under the 2010 Northwest Oregon Forest Management Plan (FMP), which guides management practices for lands managed by ODF. BOF lands are divided into districts, each of which have individual implementation plans that provide district-level direction for implementing forest management activities in accordance with the FMP. These lands have a mix of older and recently harvested forests. The Western Oregon State Forests (WOSF) HCP (ODF 2022) and a companion FMP are in development and will replace the 2010 Northwest Oregon FMP (ODF 2010). The applicant (ODF) prepared the WOSF HCP in support of their request for ITPs that would authorize incidental take coverage for 17 terrestrial and aquatic species for their forest and recreation management activities across 639,489 acres of BOF-owned and managed lands in western Oregon. The draft WOSF HCP and EIS were issued for public comment on March 18, 2022.[2] Under this HCP, some of the adjacent BOF land would be managed for timber harvest, but other areas would be designated as habitat conservation areas (HCAs), which would be protected for habitat value and would not undergo clearcut timber harvest. The WOSF HCP's conservation strategy includes best management practices to minimize effects on covered species and designates riparian conservation areas (RCAs) for aquatic species and HCAs for terrestrial species that would be managed for the benefit of covered species. Additional conservation actions would create operational and design standards for roads, equipment use, and the timing of activities; standards for the retention of important habitat features on the landscape outside of HCAs and RCAs; and seasonal restrictions to minimize effects on known sites of covered species.

Most private lands are maintained as commercial timberlands dominated by plantations composed of relatively young, uniform Douglas-fir forest. Private and non-federal lands must be managed in accordance with the Oregon Forest Practices Act and associated Forest Practice Administrative Rules.[3] As outlined in OAR Chapter 629, the Forest Practice Administrative Rules address requirements for numerous forest management activities, including clearcut harvest, road design and construction, leave trees, chemical use, and habitat protection for certain fish and wildlife species. Some of the private forestlands adjacent to the southeast portion of the plan area are currently managed under the Weyerhaeuser-Millicoma Tree Farm HCP, which is a single-species HCP for northern spotted owl that covers 209,000 acres of privately owned forests managed for commercial timber harvest. The permittee for the ITP and the implementation of the HCP is the Weyerhaeuser Company. This HCP does not include any conservation actions or credits for lands in the ESRF HCP permit area, but the 1.5-mile radius home ranges of three northern spotted owl activity centers in the southern portion of the ESRF HCP plan area overlap with the Millicoma Tree Farm. The Weyerhaeuser Company is held to the HCP's landscape-level standards in these areas. The HCP requires the maintenance of at least 40% of the forested area as roosting and foraging habitat suitable for dispersing northern spotted owls, at least 80% of the forested area as dispersal habitat with gaps less than 0.5 mile, at least 90% of the forested area as dispersal habitat with gaps less than 1 mile, and at least 99% of the forested area as dispersal habitat with gaps less than 3 miles. The ITP for this HCP is in effect until 2045.

[2] Project updates are available on the NMFS website at the following link: https://www.fisheries.noaa.gov/action/western-oregon-state-forests-habitat-conservation-plan.

[3] Modifications to the Forest Practices Act and Forest Practice Administrative Rules are expected to occur as a result of the Private Forest Accord report (2022) and would apply to the management of non-federal forests in Oregon.

The Oregon Private Forests HCP is in development based on the agreements contained in the 2022 Oregon Private Forest Accord report and adopted into Oregon state law in Senate Bill 1501. This HCP would provide the applicant (ODF) incidental take coverage across approximately 10 million acres of state-managed and private forestlands for several amphibian and fish species, including coho salmon, over 25 and 50 years, respectively. The HCP's conservation strategy would include the designation of riparian management areas for the protection of water quality, hydrologic functions, and fish and wildlife habitat; restrictions on timber harvest on steep slopes; strategies for prioritizing and implementing road improvement projects; and measures for beaver and amphibian conservation.[4] The HCP is currently in development, and an EIS is anticipated to be prepared by the Services.[5]

4.2.2 Barred Owl Management

Barred owls were first recorded in Oregon in the 1970s and have since spread to forests throughout much of the state. They pose a significant threat to the northern spotted owl due to competition for resources and habitat. They are slightly larger and more aggressive than northern spotted owls and compete for the same habitat. Barred owls are now present in forests of the Cascades, Coast Range, Blue, Wallowa, Strawberry and Klamath mountains and are expected to continue spreading across the plan area during the analysis period.

There are ongoing survey efforts tracking the prevalence of barred owl in northern spotted owl habitat in western Oregon. Survey data collected between 1990 and 2020 on federal lands in the Coast Range study area (located north of the permit area) and between 1985 and 2020 in the Tyee Density study area (located to the southeast of the permit area) shows that barred owl presence has steadily increased in the region (FWS 2020b, 2021).

FWS began implementation of its Barred Owl Removal Experiment in 2013 to investigate the effect of barred owl removal on spotted owl population dynamics. This experiment was outlined in the 2011 Northern Spotted Owl Recovery Plan (FWS 2011) as Recovery Action 29 and included study areas in Washington, Oregon, and California consisting of federal lands occupied by both northern spotted owl and barred owl. The study areas closest to the permit area are the Oregon Coast Range study area in western Oregon north of the Elliott State Forest, and the Klamath-Union/Myrtle study area in southwestern Oregon south of the Elliott State Forest. The experiment concluded in 2020 and its results led FWS to initiate development of a management strategy to reduce barred owl populations that will identify high-priority areas for barred owl management (87 *Federal Register* 43886).

Outside of federal lands, ODF and the Weyerhaeuser Company have Safe Harbor Agreements for northern spotted owls. These agreements allow FWS access to their lands for barred owl management. They provide ODF and the Weyerhaeuser Company incidental take coverage for northern spotted owls for take from forest management at sites that become newly occupied by northern spotted owl during the permit term. FWS' barred owl management experiment on ODF and

[4] While the HCP based on the Oregon Private Forest Accord report is still in development, Oregon Senate Bill 1501 specifies that the HCP and associated changes to Oregon Forest Practices Act must be consistent with the requirements outlined in the 2022 Private Forest Accord report.

[5] Project updates can be found on the ODF website at the following link: https://www.oregon.gov/odf/Pages/private-forest-accord.aspx.

Weyerhaeuser Company lands has concluded, but their incidental take permits are valid until 2029 and 2026, respectively.

4.2.3 North Umpqua River Hydroelectric Project

The North Umpqua Hydroelectric Project is located on the North Umpqua River in Douglas County, which runs along the northern boundary of the permit area. PacificCorp holds a 35-year license with the Federal Energy Regulatory Commission (FERC) to operate the 194-megawatt project through October 31, 2038 (FERC 2022). The project is located primarily within the Umpqua National Forest on lands administered by USFS and BLM. Initially constructed between 1947 and 1956, the project's facilities include eight hydroelectric developments, each consisting of a dam, waterway (canals and flumes), penstock,[6] and powerhouse. The project includes a total of 37.3 miles of waterways (e.g., canals, flumes, penstock, tunnels). The developments use water primarily from the North Umpqua River and two of its major tributaries, Clearwater River and Fish Creek, to generate electricity (PacificCorp 2022).

The project includes a mitigation requirement that funds projects to mitigate impacts on water, habitat, and soil. Potential mitigation projects include tributary enhancement, riparian restoration, road decommissioning, and other measures to benefit aquatic and terrestrial species and habitats.

4.2.4 Resource Protection, Enhancement, and Restoration Activities

Species protection and habitat protection or restoration efforts within or adjacent to the plan area (e.g., federal, state, or tribal species recovery plans, barred owl management projects, other invasive species removal efforts) may have overlapping effects with the proposed action and alternatives to the extent that such projects contribute to maintaining and improving habitat for the covered species.

Areas adjacent to the plan area that have been or would be managed by other agencies for habitat conservation during the ESRF HCP permit term include late successional reserves in lands managed by the BLM and USFS and RCAs and HCAs on BOF lands.[7]

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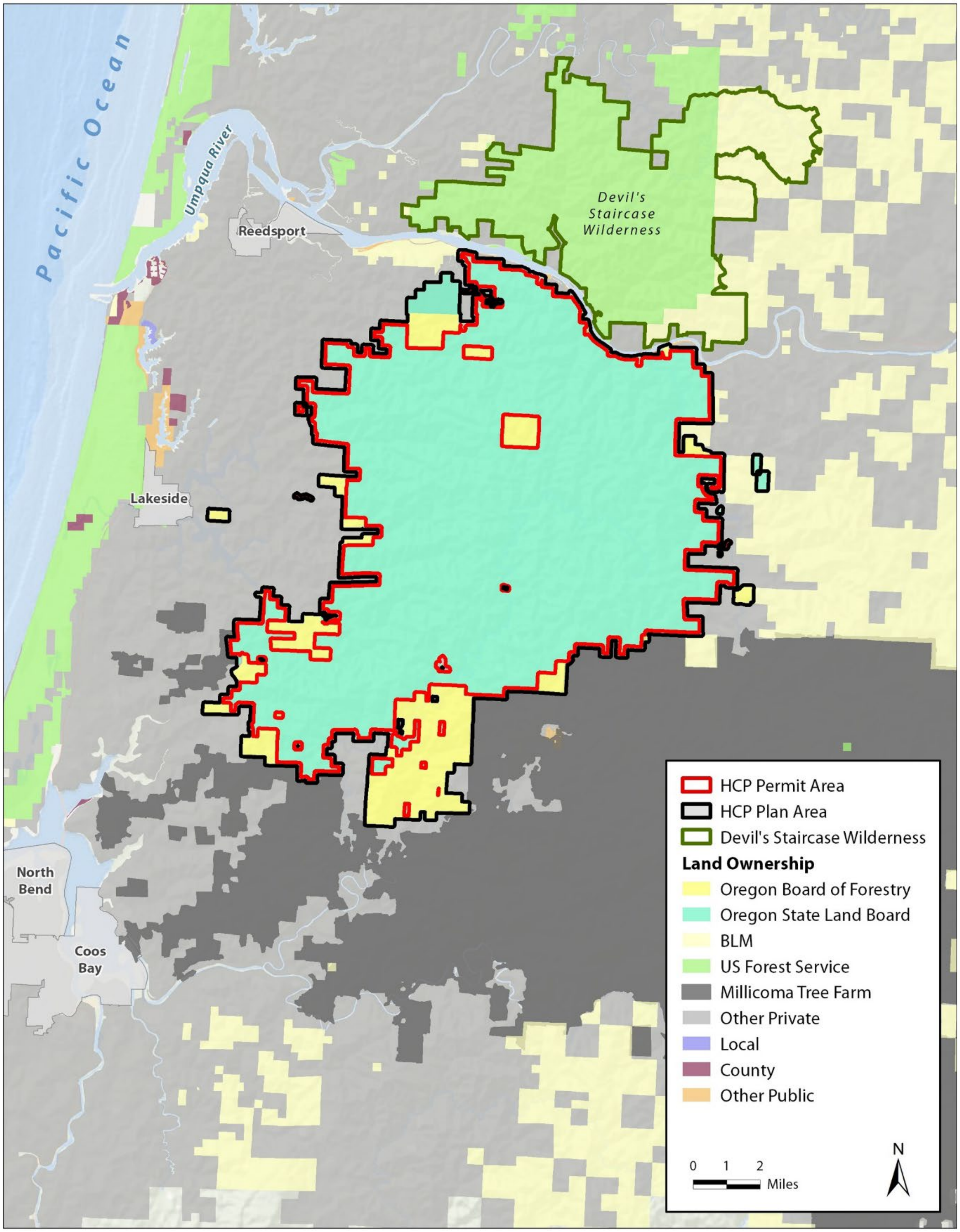
[6] A *penstock* is a sluice or gate for regulating a flow.

[7] Management of HCAs and RCAs for listed species habitat would occur pending ITP issuance for the Western Oregon State Forests HCP.

Figure 4-1. Land Ownership Adjacent to the Plan Area



4.2.5 Climate Change and Disturbance Events

See Section 3.7.2.1, *Climate Change*, for a discussion of past, present, and reasonably foreseeable effects of climate change on environmental resources in the study area.

4.2.6 Land and Agricultural Development

Past and present urban development in Coos and Douglas Counties comprises residential, commercial, industrial, and recreational uses. The largest cities (by population) in these counties are Roseburg, Coos Bay, and North Bend. The population of Coos County increased by 3% between 2010 and 2020, from 63,043 to 64,929. The population of Douglas County increased by 3.3% between 2010 and 2020, from 107,667 to 111,201 (U.S. Census Bureau 2021). By 2070, the estimated population of Coos County is expected to reach 66,949 (Chen et al. 2022a), representing a 3.1% increase from 2020. By 2070, the estimated population of Douglas County is expected to reach 119,193 (Chen et al. 2022b), representing a 7.2% increase from 2020.

Approximately 40% of the population in these counties lives outside of designated urban growth boundaries. Projections show that the share of the population living outside of urban growth boundaries will decrease over time to approximately a third of the county populations by 2072. At present, there are small parcels zoned for residential use in the unincorporated community of Ash in Douglas County along the northeastern side of the Elliott State Forest.

There is also past and potential future agricultural development in Coos and Douglas Counties, including parcels zoned for exclusive farm use (EFU). In Douglas County, the EFU parcels closest to the permit area are zoned specifically for grazing and related activities. In Coos County, EFU parcels receive a general EFU zoning designation; the zoning code does not assign a specific type of farm use. The State of Oregon has maintained a strong policy to protect agricultural land across the state (ORS 215.243). Oregon's Statewide Planning Program has carried out this policy over the years and has effectively slowed the loss of farmland in Oregon, especially those lands formally designated as EFU. It is anticipated that the State of Oregon would continue to carry out this policy; however, the conversion of rural land (i.e., land not designated EFU) to other land uses could continue to occur in the future.

At present, there are parcels zoned for agricultural use in Coos and Douglas Counties that lie adjacent to the Elliott State Forest. In Douglas County, adjacent agricultural zoning designations include "Farm Forest" and "Farm Use – Grazing" (Douglas County 2021). In Coos County, the primary adjacent agricultural zoning designation is "Exclusive Farm Use" (Coos County 2019).

4.3 Cumulative Effects

The cumulative effects analysis takes a qualitative approach because effects from the proposed action and alternatives when added to the effects of past, present, and reasonably foreseeable actions may occur over different timeframes, cover different footprints, or occur over different locations within the study area, making quantification of impacts infeasible. The sections below discuss the cumulative effects for each resource evaluated in Chapter 3, *Affected Environment and Environmental Consequences.*

The effects of climate change on the proposed action and alternatives are discussed as applicable in the affected environment sections of Chapter 3, *Affected Environment and Environmental Consequences*. The cumulative analysis of climate change (Section 4.3.6, *Climate Change*) explains how the proposed action and alternatives contribute to ongoing climate change trends. The cumulative analyses of other resources describe the potential effects of climate change on each resource that overlap with the effects of the proposed action and alternatives.

4.3.1 Geology and Soils

The cumulative impacts on geology and soils from the actions discussed above, combined with those impacts occurring under the proposed action and alternatives, include erosion, likelihood of landslide, and changes in stream geomorphology.

Climate change and disturbance events will result in increased erosion and likelihood of landslide and associated events in areas of steep slopes, especially where the soil has been disturbed, such as through forestry activities. Higher temperatures are projected to increase the frequency and severity of wildfire (Frankson et al. 2022:4), which increases frequency of landslide and associated events by increasing precipitation runoff (USGS 2017). Increased runoff will decrease slope stability through erosion, lubrication of sediments on steep slopes, and increased weight of materials on slopes.

Surrounding land uses, including forest management, land development, and agricultural development, would also cause erosion by increasing runoff through removing vegetation and expanding compacted and impervious surfaces. The North Umpqua River Hydroelectric Project may result in increased erosion from canal failure or other infrastructure vulnerabilities.

Where these past, present, and reasonably foreseeable actions increase erosion and likelihood of landslide and associated events, they would also increase sedimentation in streams and related effects on stream geomorphology. To the extent that conservation-focused forest management or other restoration projects protect riparian areas or restrict harvest on steep or unstable slopes, the likelihood of landslide and related effects such as adverse effects on stream geomorphology, would be reduced.

The incremental effects of the proposed action and alternatives, when added to the effects described above, would result in a cumulative effect on geology and soils, both adverse and beneficial as described above. The potential for adverse cumulative effects is greatest under the no action alternative and Alternative 4 due to the increased area available for more intensive harvest treatments. The potential for beneficial cumulative effects is greatest under Alternative 3 due to the increase in conservation measures.

4.3.2 Water Resources

The cumulative impacts on water resources from the actions discussed above, combined with those impacts occurring under the proposed action and alternatives, include changes in water yield, peak flows, low flows, water quality, groundwater, and flood hazard.

More frequent, more intense, and larger wildfires with climate change may increase water yield. Timber harvest and road construction on adjacent forestlands would generally increase water yield for the first 10–15 years following timber harvest and then decrease water yield as trees begin to regrow. Where adjacent forest management is focused on conservation, rather than commercial timber harvest, adverse effects on water yield would be reduced or avoided. Land or agricultural development may decrease water yield through increasing water demand or diversion. Where riparian protections apply to surrounding land management, these adverse effects would be reduced. Collectively, these actions would have mixed effects on water yield across the study area.

Climate change and disturbance events (e.g., storms, wildfire, incidence of insect and disease) and surrounding land uses, including forest management and land or agricultural development, will increase peak flows and related effects, including channel erosion, decreased water quality, decreased groundwater levels, and increased flood hazard. Where adjacent land management protects existing vegetation and where riparian protections apply, increased peak flows and related adverse effects would be reduced. The North Umpqua River Hydroelectric Project could have mixed effects on peak flows and related effects.

Prolonged drought seasons with climate change and surrounding land uses, including forest management and land or agricultural development, will decrease summer low flows, further increasing stream temperature and decreasing dissolved oxygen. Where riparian protections apply, adverse effects on low flows would be reduced. The North Umpqua River Hydroelectric Project could have mixed effects on low flows and related effects because the project affects water sources and water quality in the area, but also has mitigation measures built into its requirements for operation.

Climate change, surrounding land uses, including forest management and land or agricultural development, and the North Umpqua River Hydroelectric Project would result in decreased water quality by increasing sedimentation in streams, increasing debris flows, increasing stream temperatures, and decreasing dissolved oxygen. To the extent that adjacent land management, including conservation-focused forest management, and other restoration projects protect riparian areas, adverse effects of forest management on water quality could be reduced or avoided.

Climate change and surrounding land uses, including forest management and land or agricultural development, may decrease groundwater levels, degrade groundwater quality, and increase flood hazard. Where regulatory requirements limiting effects and riparian protections apply to surrounding land management, adverse effects on groundwater levels, groundwater quality, and flood hazard would be reduced.

The incremental effects of the proposed action and alternatives, when added to the effects described above, would result in a cumulative effect on water resources, both adverse and beneficial as described above. Generally, the no action alternative and Alternative 4 would have the greatest potential for adverse effects on water resources and Alternative 3 would have the greatest potential for beneficial effects on water resources, but the degree of localized effects would vary across alternatives depending on the timing and location of activity, primarily timber harvest.

4.3.3 Vegetation

The cumulative impacts on vegetation from the actions discussed above, combined with those impacts occurring under the proposed action and alternatives, include changes in forest age and structure, spread of invasive plant species, effects on special-status plant species, and effects on wetland vegetation.

Climate change is forecasted to decrease freezing temperatures and extend the growing season. However, it is also forecasted to cause more variable precipitation and increase annual temperatures, limiting annual snowpack, result in drought and prolonged heat waves, and increase frequency, intensity, and duration of disturbance events such as wildfires and invasive pathogens and pests. These trends will decrease vegetation growth in water-limited areas, reduce or alter riparian vegetation, and potentially result in vegetation mortality throughout western Oregon. All of these changes would affect forest stand age and type in the study area. The incremental effects of the proposed action and alternatives on forest age and type, when added to the effects described above, would result in a cumulative effect on vegetation in the study area.

Forest management and restoration activities on lands adjacent to the plan area would have similar effects as described for the proposed action and alternatives on the spread of invasive plant species, special-status plant species, and wetland vegetation and would generally be more adverse in areas managed for more intensive forms of timber harvest and less adverse in areas managed for conservation or restricted from timber harvest. Other surrounding land use, including land or agricultural development, could remove forestland, having an adverse effect on special-status plant species and increasing potential for the spread of invasive species. Land or agricultural development could also result in conversion of wetlands.

The incremental effects of the proposed action and alternatives on the spread of invasive plant species, special-status plants and wetland vegetation, when added to the effects described above, would result in a cumulative effect that could be adverse or beneficial. The potential for adverse cumulative effects is greatest under the no action alternative and Alternative 4 due to the increased area available for more intensive harvest treatments. The potential for beneficial cumulative effects is greatest under Alternative 3 due to increased conservation and restrictions on harvest.

4.3.4 Fish and Wildlife

4.3.4.1 Fish and Stream-Dependent Species

The cumulative impacts on fish and stream-dependent species from the actions discussed above, combined with those impacts occurring under the proposed action and alternatives, include effects on habitat quality and quantity.

Climate change will reduce aquatic habitat quality and quantity by increasing stream temperature, increasing bed scour, lowering summer low flows, and decreasing water quality. Flows may become so low in some headwaters that habitat is lost, and some species (amphibians) may be forced into downstream habitat and experience more competition. Oregon coast coho, a covered species under the proposed action, are evaluated as having both high sensitivity and high exposure to climate change effects (Crozier et al. 2019), putting them at high risk for climate effects. Disturbance events could adversely affect aquatic habitat quality by increasing sedimentation and decreasing large wood availability and food falling from riparian sources (e.g., insect larvae). Forest management for timber harvest adjacent to the plan area could result in decreased aquatic habitat quality by increasing stream temperature, creating lower low flows, and decreasing water quality. Agricultural development could reduce aquatic habitat quality by decreasing water availability. Land development could decrease aquatic habitat quality by increasing flashiness of high flows and floods entering streams. Both land and agricultural development could decrease water quality by increasing fine sediment and introducing nutrients, waste, and chemicals to streams. The North Umpqua River Hydroelectric Project may also contribute to reduced habitat quality for fish and stream-dependent wildlife due to changes in passage, connectivity, flow regime, in-stream habitat composition, and temperature, although mitigation requirements would help offset these effects.

Riparian protections applied through surrounding land management and restoration actions in streams and riparian areas adjacent to the project area would be expected to have long-term, beneficial effects on habitat for fish and stream-dependent wildlife, which could partially offset some of the adverse effects from climate change and adjacent land use.

The incremental effects of the proposed action and alternatives, when added to the effects described above, would result in a cumulative effect on fish and stream-dependent species, both adverse and beneficial. The potential for adverse cumulative effects on fish and stream-dependent species would be greatest under the no action alternative and Alternative 4 due to the area available for intensive harvest types and the more limited riparian protections under these alternatives. The potential for beneficial cumulative effects on fish and stream-dependent species would be greater under the proposed action (especially in the conservation research watersheds) than under the no action and Alternative 4, because there would be less area available for intensive harvest types, greater riparian protections, and additional commitments to restoration, such as large wood placement. The potential for beneficial cumulative effects would be greatest under Alternative 3, which includes the least amount of area available for intensive harvest types and provides the broadest riparian protections and additional commitments to restoration. Localized effects of the proposed action and alternatives would vary based on the layout of areas available for different harvest types. All alternatives would have the potential for both adverse and beneficial effects on fish and stream-dependent species.

4.3.4.2 Forest-Dependent Species

The cumulative impacts on wildlife species from the actions discussed above, combined with those impacts occurring under the proposed action and alternatives, include effects on habitat quality, quantity, and connectivity.

Northern Spotted Owl

Habitat loss (including fragmentation) from surrounding forest management (specifically timber harvest) and climate change and disturbance events (e.g., wildfire and insect and forest disease outbreaks) is a primary past and present factor leading to the decline of northern spotted owls (FWS 2020a) and is likely to continue to adversely affect northern spotted owls. Current studies indicate that barred owls are a recent stressor that adversely affect northern spotted owls through competition for critical resources. The rate of decline of northern spotted owl populations since 2011, particularly in Washington and Oregon (FWS 2020a), has increased the species' extinction risk.

Restoration projects and habitat protections provided by other HCPs would improve habitat conditions for the northern spotted owl by protecting, enhancing and restoring habitat. Barred owl management would result in beneficial effects on northern spotted owls by reducing competition for critical resources in those habitats and others across its range.

The incremental effects of the proposed action and alternatives, when added to the effects described above, would result in a cumulative effect on northern spotted owl, both adverse and beneficial. The potential for adverse cumulative effects on northern spotted owl would be the greatest under the no action alternative and Alternative 4 due to the greater area available for clearcut harvest, an intensive type of timber harvest, and subsequent increases in habitat loss and fragmentation. The potential for adverse cumulative effects on the northern spotted owl would be less under Alternative 3 and the proposed action because there would be more protected habitat and less area available for more intensive harvest types (i.e., clearcut and variable density harvest), resulting in greater habitat quality and connectivity across the permit area. The potential for adverse cumulative effects related to the amount of northern spotted owl habitat would be least under Alternative 3.

Marbled Murrelet

Habitat loss (including fragmentation) from surrounding forest management (specifically timber harvest) and climate change and disturbance events (e.g., wildfire and insect and forest disease outbreaks) threaten marbled murrelet populations. Offshore climate change effects could result in diminished prey availability. Conversely, restoration projects and habitat protections provided by other HCPs could improve marbled murrelet habitat conditions by protecting, enhancing, and restoring habitat.

The incremental effects of the proposed action and alternatives, when added to the effects described above, would result in a cumulative effect on marbled murrelet, both adverse and beneficial. The potential for adverse cumulative effects on marbled murrelet would be greatest under the no action alternative and Alternative 4 due to the greater area available for clearcut harvest, an intensive type of timber harvest, and subsequent increases in habitat loss and fragmentation. The potential for adverse cumulative effects on marbled murrelet would be less under Alternative 3 and the proposed action because there would be more protected habitat and less area available for intensive harvest types (e.g., clearcut and variable density harvest), resulting in greater habitat quality and connectivity across the permit area. The potential for adverse cumulative effects related to the amount of marbled murrelet habitat would be the least under Alternative 3.

Noncovered Forest-Dependent Species

Surrounding forest management and climate change would result in similar adverse and beneficial cumulative impacts as described above for northern spotted owl and marbled murrelet. The incremental effects of the proposed action and alternatives, when added to the effects described above, would result in a cumulative effect on noncovered forest-dependent species, both adverse and beneficial, depending on the species' habitat needs and the location within the permit area.

4.3.4.3 Noncovered Wildlife Species Dependent on Wetlands and Riparian Habitat

Prolonged drought with climate change will result in loss or degradation of wetland and riparian areas. Forest management does not generally remove wetland and riparian habitat (as defined in Section 3.5.2.5, *Riparian-Dependent Species*, for wildlife species, consisting primarily of willows and other deciduous vegetation at the water's edge)[8] as harvest activities do not focus in these habitat types due to regulatory requirements. However, harvest-related ground disturbance, such as for staging, could result in temporary loss and degradation of these habitat types, adversely affecting species dependent on them. Land and agricultural development result in widespread loss of wetland and riparian habitats. Restoration projects and habitat protections provided by other HCPs could improve habitat conditions by protecting, enhancing, and restoring wetlands and riparian habitat.

[8] Riparian vegetation described in Section 3.4, *Vegetation*, addresses a wider swath on either side of the stream that includes evergreen vegetation. The vegetation described as riparian in this section consists of freshwater forested/shrub wetland.

The incremental effects of the proposed action and alternatives, when added to the effects described above, would result in an adverse or beneficial cumulative effect on noncovered wildlife species dependent on wetlands and riparian habitat. The potential for these cumulative effects would be similar under all alternatives, but the amount of potential wetland and riparian habitat loss would be greatest under the no action alternative. Potential cumulative impacts related to wetland and riparian habitat loss would be the same under the proposed action, Alternative 3, and Alternative 4.

4.3.5 Air Quality

The cumulative impacts on air quality from the actions discussed above, combined with those impacts occurring under the proposed action and alternatives, include increased emissions.

Surrounding land use, including forest management activities, land development, and agricultural development, would require heavy equipment use that would emit criteria pollutants, volatile organic compounds, and hazardous air pollutants and would create fugitive dust. However, these impacts would be reduced through compliance with state and federal laws and regulations and policies similar to the proposed action and alternatives.

Wildfires also emit criteria pollutants, volatile organic compounds, and hazardous air pollutants.

The incremental effects of the proposed action and alternatives, when added to the effects described above, would result in a negligible adverse cumulative effect on air quality.

4.3.6 Climate Change

Climate change is inherently cumulative because greenhouse gas emissions from past, present, and reasonably foreseeable actions cumulatively contribute to climate change. Section 3.7.3.1, *Effects of the Proposed Action and Alternatives on Climate Change*, describes the incremental effects of the proposed action and alternatives on climate change through GHGs emissions and carbon sequestration. As described in Section 3.7.3.1, the amount of carbon sequestered would remain well above the amount of carbon released to the atmosphere under all alternatives, resulting in a net increase in carbon sequestered from the atmosphere. The net increase would be greatest under Alternative 3 and least under the no action alternative and Alternative 4. The proposed action would fall in between Alternative 3 and the no action alternative and Alternative 4. The net beneficial incremental effect under all alternatives would result in a negligible cumulative effect on climate change.

4.3.7 Recreation and Visual Resources

4.3.7.1 Recreation

The cumulative impacts on recreation from the actions discussed above, combined with to those impacts occurring under the proposed action and alternatives, include changes in the quality and value of recreational experience and in the supply of recreation.

Disturbance events and surrounding land use, including forest management, the potential development of recreational infrastructure, and land or agricultural development, could result in adverse effects on visual resources, habitat, and water resources within the study area. Where adjacent land management restricts forested land from harvest, beneficial effects on these resources could occur. These effects, both in the plan area and in southwestern Oregon, could shift where people prefer to recreate, changing the demand for recreation in certain areas. These changes could either increase or decrease the quality of recreation experiences and the value people place on them.

Disturbance events and surrounding land use, including forest management, land development, or agricultural development, could temporarily reduce access to developed sites and dispersed recreation, reducing the supply of recreation activity across the study area.

The incremental effects of the proposed action and alternatives, when added to the effects described above, would result in a cumulative effect on recreation that could be either adverse or beneficial depending on the timing and location of activity, primarily timber harvest.

4.3.7.2 Visual Resources

The cumulative impacts on visual resources from the actions discussed above, combined with those impacts occurring under the proposed action and alternatives, include changes to visual character and quality and visual access.

Disturbance events and adjacent forest management activities (including recreational use of these areas) could cause large-scale visual changes, landscape scarring, and changes to forest structure that would degrade visual quality. These actions could also result in reduced visual access. The North Umpqua River Hydroelectric Project includes industrial features in the otherwise forested landscape, which reduces overall visual quality.

Declines in rural populations, which are interspersed with forestlands bordering the permit area, may result in the conversion of some developed lands to agricultural or forested lands or the restoration of those lands to another type of habitat, increasing the visual prominence of these landscapes within the study area. Restoration projects and habitat protections from adjacent forest management, including conservation included in other HCPs, could retain areas of undisturbed forest and provide more natural patterns of forest structure, including increasing the presence of older trees, which would have beneficial impacts on visual character and quality. The North Umpqua River Hydroelectric Project includes restoration and enhancement projects that could improve the visual quality by diversifying views within and adjacent to the study area.

The incremental effects of the proposed action and alternatives, when added to the effects described above, could result in a cumulative effect on visual resources that could be either adverse or beneficial. The potential for adverse cumulative effects on visual resources is greatest under the no action alternative and Alternative 4 due to the increased area available for more intensive harvest treatments such as clearcut. The potential for beneficial cumulative effects would be greatest under the proposed action and Alternative 3, which include the least clearcut harvest.

4.3.8 Cultural Resources

The cumulative impacts on cultural resources from the actions discussed above, combined with those impacts occurring under the proposed action and alternatives, include adverse impacts on archaeological resources due to ground-disturbing activities. Unlike the proposed action and alternatives, the actions considered in this cumulative analysis may have the potential to affect built environment resources due to either ground-disturbing activities or visual intrusions.

Forest management activities, land development, agricultural development, and resource protection, enhancement, and restoration activities have the potential to adversely affect cultural resources through ground disturbance, demolition of built environment resources, visual intrusions, and increased potential for unauthorized artifact collecting. However, cumulative effects on cultural resources are expected to be minimized through compliance with state and federal laws and regulations that protect cultural resources as well as adherence to policies, procedures, and best practices.

The incremental effects of the proposed action and alternatives, when added to the effects described above, could result in an adverse cumulative effect on cultural resources.

4.3.9 Tribal Resources

The cumulative impacts on tribal resources from the actions discussed above, combined with those impacts occurring under the proposed action and alternatives, include changes in access to fish, wildlife, and plants valued by tribal members and changes in socioeconomic impacts on tribal members.

Disturbance events and surrounding land use, including forest management and land or agricultural development, could result in changes to vegetation, water resources, and habitat in the study area. These effects could result in the loss of habitat and decreased habitat quality for fish, wildlife, and vegetation valued by tribal members. These actions could also reduce access to portions of the permit area used by tribal members for hunting and fishing. Beneficial effects on these same resources valued by tribal members could occur where surrounding land management includes conservation-focused forest management, restoration projects that protect riparian areas, or timber harvest restrictions.

Population changes from development and changes in land use within the study area could increase or decrease demand for access to fish and wildlife by nontribal members in the permit area, which could have beneficial or adverse impacts on access to these resources by tribal members. Cumulative impacts on socioeconomics (Section 4.3.10, *Socioeconomics*) related to available forest products or timber harvest could either increase or decrease employment and income for tribal groups.

The incremental effects of the proposed action and alternatives, when added to the effects described above, would result in a cumulative effect on tribal resources, both adverse and beneficial as described above.

4.3.10 Socioeconomics

The cumulative impacts on socioeconomics from the actions described above, combined with those impacts occurring under the proposed action and alternatives, include changes to income and employment, government revenue, and the value of ecosystem services.

Forest management resulting in increased timber harvest and other surrounding land use, including land and agricultural development, have the potential to increase labor income and employment in the study area by creating or maintaining timber-related jobs and income that positively affect the local or regional economies. Climate change, disturbance events, and forest management activities resulting in decreased timber harvest, restoration activities, and the implementation of HCPs have the potential to decrease labor income and employment in the study area by decreasing timber-related jobs or income which could negatively affect local or regional economies.

Forest management resulting in increased timber harvest and other surrounding land use, including land and agricultural development, have the potential to increase government revenue in the study area by contributing to the Common School Fund, Forest Products Harvest Tax, or other state tax revenue. Climate change and disturbance events, forest management resulting in decreased timber harvest, restoration activities, and the implementation of HCPs have the potential to decrease government revenue in the study area by decreasing harvest volumes and eliminating or reducing contributions to the Common School Fund, Forest Products Harvest Tax, or other state tax revenue.

Climate change and disturbance events, forest management resulting in increased timber harvest, and other surrounding land use, including land and agricultural development, have the potential to decrease the value of ecosystem services in the study area. Forest management resulting in decreased timber harvest, barred owl management, restoration activities, and the implementation of HCPs have the potential to increase the value of ecosystem services in the study area.

The incremental effects of the proposed action and alternatives, when added to the effects described above, would result in a cumulative effect on socioeconomics, both adverse and beneficial. The potential for beneficial cumulative effects on employment and income and government revenue is greatest under the no action alternative and Alternative 4 due to the increased area available for more intensive harvest treatments. The potential for beneficial cumulative effects on the value of ecosystem services is greatest under the proposed action and Alternative 3, which provide increased conservation relative to the no action alternative and Alternative 4.

4.3.11 Environmental Justice

The cumulative impacts on environmental justice (EJ) from the actions discussed above, combined with those impacts occurring under the proposed action and alternatives, include socioeconomic impacts on EJ populations related to employment and income and changes in the supply of ecosystem goods and services that EJ populations rely upon.

Climate change and disturbance events and adjacent forest management and restoration activities have the potential to reduce timber harvests in the permit area, which would have an adverse effect on income and employment that could result in disproportionately high and adverse impacts for EJ populations. Population changes from development and changes in land use could increase or decrease economic activity and opportunities for employment and income generation. Decreases in income and employment could have disproportionately adverse impacts for EJ populations.

Climate change and disturbance events, forest management, restoration activities, and the implementation of HCPs have the potential to reduce timber harvests in the permit area and associated government revenue, which could result in disproportionately high and adverse impacts on EJ populations. Population changes from development and changes in land use could increase or decrease demand for government services that EJ populations rely on, which could have beneficial or adverse impacts on EJ populations.

Forest management and associated habitat conservation activities on lands adjacent to the plan area and within the study area could change the supply of ecosystem goods and services that EJ populations rely on. This could increase or decrease EJ populations' reliance on the supply of goods and services within the plan area and their importance to EJ populations, depending on the comparative effects elsewhere. Population changes from development and changes in land use could increase or decrease demand for ecosystem goods and services that EJ populations rely on, which could have beneficial or adverse impacts.

The incremental effects of the proposed action and alternatives, when added to the effects described above, would result in a cumulative effect on EJ populations, both adverse and beneficial.

Chapter 5
Summary of Submitted Alternatives, Information, and Analyses

This chapter summarizes the alternatives, information, and analyses submitted by state, tribal, and local governments and other public commenters during the scoping process for consideration by the lead and cooperating agencies in developing the EIS (40 Code of Federal Regulations 1502.17). Comments received during scoping are summarized in Appendix 1-B, *Scoping*. The full contents of all scoping comments are available on Regulations.gov at https://www.regulations.gov/document/FWS-R1-ES-2022-0029-0001. FWS invites public comments on this summary of submitted alternatives, information, and analyses during the public review period of the Draft EIS.

Comments received during scoping included the following suggestions on alternatives.[1]

No Action Alternative: Analyze a no action alternative that includes no commercial timber harvest.

Action Alternatives: Scoping comments included the following modifications or additions to the proposed action for inclusion in action alternatives considered in the EIS.

- Shorten the permit term
- Modify the permit area to:
    - Include the East Hakki Ridge parcel
    - Align the Elliott State Research Forest HCP with the Western Oregon State Forests HCP
- Include provisions for adding additional covered species protections during the permit term
- Modify the covered activities to:
    - Increase timber harvest
    - Decrease timber harvest
    - Restrict road construction
    - Increase road decommissioning
    - Increase protections for steep slopes
    - Increase width of riparian buffers and restrict activity in riparian buffers
- Modify the research proposal to:
    - Conduct regeneration harvest–focused research
    - Identify reserves as no-take areas
    - Integrate restoration work into the HCP and research design and fully engage the restoration community with options to integrate local watershed plans and assessments

[1] These suggestions are described in further detail in Appendix 1-B, *Scoping*.

- Modify the conservation strategy to:
    - Strengthen northern spotted owl conservation measures in all northern spotted owl activity centers
    - Restrict all harvest in older forests
    - Ensure that there is no net loss of northern spotted owl habitat
    - Include barred owl management
    - Limit marbled murrelet research and implement monitoring protocols and adaptive management to minimize observable negative impacts
    - Include additional minimization measures for marbled murrelet impacts
    - Increase riparian buffers and reduce steep slope logging to minimize risk to coho salmon critical spawning areas
    - Strengthen fish passage barrier removal requirements
    - Increase protections for beavers and beaver habitat

The following supplemental information (i.e., supplemental materials or references) was submitted during scoping for consideration by the lead and cooperating agencies in developing the EIS. These materials are available to review on Regulations.gov at Docket ID FWS-R1-ES-2022-0029-0001.

- Reports *Habitat Selection and Breeding Success in a Forest-Nesting Alcid, the Marbled Murrelet, in Two Landscapes with Different Degrees of Forest Fragmentation* (2006) and *Influence of Landscape Pattern on Breeding Distribution and Success in a Threatened Alcid the Marbled Murrelet: Model Transferability and Management Implications* (2007), both prepared by Zharikov et al., providing information on the relationship between marbled murrelets and logging.
- Research paper entitled *Mass Failures and Other Processes of Sediment Production in Pacific Northwest Forest Landscapes* (1987) prepared by Swanson et al. presenting the results that landslides and road surfaces are dominant sources of increased sediment production.
- Report entitled *Range-Wide Declines of Northern Spotted Owl Populations in the Pacific Northwest: A Meta-Analysis* (2021) prepared by Franklin et al. assessing population trends of northern spotted owl and presenting information on northern spotted owl population decline, including its causes.

The following analyses were submitted during scoping for consideration by the lead and cooperating agencies in developing the EIS. These materials are available to review on Regulations.gov at Docket ID FWS-R1-ES-2022-0029-0001.

- Report entitled *Strategic Action Plan for Coho Salmon Recovery in The Coos Basin* (2022) prepared by the Coos Basin Coho Partnership presenting the results of an independent basin-wide analysis, including modeling, of habitat in the Elliot State Research Forest. The paper identifies actions to protect and restore essential functions of the forest.

Chapter 6
Other Topics Required by NEPA

Per Council on Environmental Quality regulations, this EIS must discuss any adverse environmental effects that cannot be avoided should the proposal be implemented; the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity; any irreversible or irretrievable commitments of resources that would be involved in the proposal should it be implemented; and means to mitigate adverse environmental impacts if not fully covered under 40 Code of Federal Regulations 1502.14(e) (40 CFR 1502.16(a)(2–4; 9)).

The adverse effects associated with the proposed action and alternatives are described in the *Environmental Consequences* sections in Chapter 3, *Affected Environment and Environmental Consequences*. Forest management activities are regulated by numerous state regulations to avoid, reduce, or mitigate for potentially significant adverse impacts. Unavoidable adverse effects under the proposed action and alternatives, including the no action alternative, would include those described for geology and soils (Section 3.2), water resources (Section 3.3), vegetation (Section 3.4), fish and wildlife (Section 3.5), recreation (Section 3.8), tribal resources (Section 3.10), socioeconomics (Section 3.11), and environmental justice (Section 3.12).

Forest management activities under all alternatives would involve short-term use of the environment. Impacts of this use are described in the environmental consequences sections of Chapter 3. Impacts on the long-term productivity of the environment, the ability of the forest to continue providing environmental resources (e.g., timber harvest, species habitat, and recreation, research, and educational opportunities) are also described in the Chapter 3 environmental consequences sections.

Irreversible commitments are decisions affecting nonrenewable resources or commitments that cannot be reversed. Some forest management activities would represent irreversible commitments of resources under all alternatives. The term *irreversible* describes the loss of future options and applies to the impacts of using nonrenewable resources or resources that are renewable only over a long period of time. For example, road construction is considered an irreversible action because of the long time needed for a road to revert to its preconstruction condition. Roads also require an irreversible commitment of materials such as the use of fossil fuels, rock, and gravel. Similarly, harvest of late-successional and old-growth forest is considered an irreversible action because of the long time needed for the forest to reestablish the structural complexity inherent to these stands.

Irretrievable commitments of resources refer to the long-term or permanent loss of a resource such as destruction of a cultural resource site, loss of soil productivity, or extinction of a species. These types of impacts under the proposed action and alternatives would be avoided and minimized to the extent possible. Although mortality of individual animals during covered activities could occur, the purpose of the HCP is to ensure these losses would not result in permanent changes at the population level and would not significantly alter ecosystem structure or population dynamics.

The analysis in Chapter 3 also considers best management practices that may be implemented to mitigate or reduce adverse effects on all resource areas, where applicable and in accordance with existing regulatory requirements. Nothing in this EIS is intended to limit the mitigation authorities of other agencies, should additional mitigation responsibilities be identified while planning, permitting, or carrying out individual activities.

Chapter 7
List of Preparers

Name and Organization/Entity	Project Role and Qualification
Shauna Everett, FWS	Oregon Field Office; Wildlife Biologist; MS, Wildlife and Fisheries Ecology; 20 years of experience
Kim Garner, FWS	Oregon Field Office; Forest Resources Division Manager; BS, Natural Resource Management; 15 years of experience
Kate Freund, FWS	Pacific Regional Office; Conservation Planning Branch Manager; MEM, Environmental Management; 15 years of experience
Anan Raymond, FWS	Pacific Regional Office; Regional Archaeologist and Historic Preservation Officer; MA, Anthropology; 40 years of experience
Kate Wells, NMFS	NMFS Oregon Washington Coastal Office; Willamette/(Interim) OR Coast Branch Chief; MS, Environmental Management; 15 years of experience
Kelly Burnett, NMFS	Reviewer; PhD and MS, Fisheries Science; 35 years of experience
Hova Woods, ICF	Project Director; MPA, Environmental Policy & Science, BS, Finance; 20 years of experience
Deborah Bartley, ICF	Project Manager; BA, Political Science; 22 years of experience
Lydia Dadd, ICF	Deputy Project Manager; BS, Environmental Studies; 3 years of experience
Rebecca Jost, ICF	Project Coordinator; MA, Environmental Science; 6 years of experience
Emma Brenneman, ICF	GIS; MS, Geography; BA, Environmental Geography; 4 years of experience
Diana Roberts, ICF	Geology and Soils; MA, Linguistics; 16 years of experience
Jennifer McAdoo, ICF	Water Resources; MS, Earth Resources and Environmental Engineering; 11 years of experience
Ingrid Kimball, ICF	Vegetation; MS, Earth Resources and Environmental Engineering; 11 years of experience
Greg Blair, ICF	Tribal Resources; MS, Fisheries; 30 years of experience
Jennifer Ban, ICF	Aesthetics; BLA, Bachelor of Landscape Architecture; 22 years of experience
Tait Elder, ICF	Cultural Resources; MA, Archaeology; 17 years of experience
Corey Lentz, ICF	Cultural Resources; MS, Historic Preservation; 4 years of experience
Wendy Gordon, ICF	Climate Change; Ph.D., Earth System Science; 26 years of experience.
Laura McMullen, ICF	Fish; Ph.D., Zoology; 12 years of experience
Ellen Berryman, ICF	Wildlife; MS, Biology; 36 years of experience
Kristen Lundstrom	Editing; BA, English; 15 years of experience
Christine McCrory	Editing; M.Phil., European Literature; 20 years of experience
Anthony Ha	Publications; BA, English; 16 years of experience.
Kara Kong	Public Outreach; BA, Political Science; 15 years of experience
Sarah Reich, ECO-Northwest	Socioeconomics, Environmental Justice (EJ), and Recreation lead; MA, Urban and Environmental Policy and Planning; 14 years of experience
Shivangi Jain, ECO-Northwest	Socioeconomics, EJ, Recreation Analyst; MA, Public Policy, Environmental Management; 1 year of experience

Name and Organization/Entity	Project Role and Qualification
Joel Ainsworth, ECO-Northwest	Socioeconomics Senior Advisor; MS, Applied Economics; 10 years of experience
Richard Haynes	Socioeconomics Senior Advisor; Ph.D., Forest Economics; 52 years of experience

Appendix 1-A
Glossary

Carbon sequestration: The transfer of carbon from the atmosphere to any other carbon pool.

Clearcut: A type of timber harvest that removes nearly trees in a stand.

***Debris flow*:** A fast-moving landslide, generally triggered by heavy precipitation or rapid snowmelt, and consisting of wet soil, trees, boulders, and smaller debris.

Debris torrent: A debris flow that has entered a stream channel, particularly one that is flowing, which results in the landslide materials mixing with water.

Ecosystem services: The types of benefits that ecosystems provide to people. Forest ecosystems produce many ecosystem services that people value, including food and fiber from plants and wildlife, a setting for recreation and spiritual experience, clean water, and flood control.

Evapotranspiration: The process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants.

Groundwater recharge: A hydrologic process where water moves downward from surface water to groundwater.

Incidental take: Take of any federally listed wildlife species that is incidental to, but not the purpose of, otherwise lawful activities.

Incidental take permit: An incidental take permit (ITP) is a federal exemption to the take prohibition of Section 9 of the ESA; an ITP is issued by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service pursuant to Section 10(a)(1)(B) of the federal Endangered Species Act. An ITP is also referred to as a Section 10 Permit or Section 10(a)(1)(B) Permit.

Mass wasting: Includes landslides, debris flows, and related movements of rock and soil.

National Environmental Policy Act: The National Environmental Policy Act (NEPA) was signed into law in 1969. NEPA requires all federal agencies to consider and analyze all significant environmental impacts of any action proposed by those agencies; to inform and involve the public in the agency's decision-making process; and to consider the environmental impacts in the agency's decision-making process.

Riparian area: Land directly influenced by permanent water.

Salvage harvest: Salvage cutting is the utilization of standing or down trees that are dead, dying, or deteriorating, for whatever reason, before the timber values are lost.

Seasonal stream: A stream with surface flow only part of the year. In the Oregon Forest Practices Act, defined as a stream that normally does not have summer surface flow after July 15.

Seral stages: Developmental stages that succeed each other as an ecosystem changes over time; specifically, the stages of ecological succession as a forest develops. Early-seral forest stands are generally between 0 and 30 years of age; mid-seral forests are between 30 and 80 years of age, but can be as old as 120 years; late-seral forest stands are between 91 and 199 years; and old growth forests are 200 years and over.

Shallow-rapid landslide: Landslides typically initiated by intense rainfall or rapid snowmelt, occurring within the forest rooting zone (generally less than 10 feet deep).

Stream geomorphology: Describes stream systems, including physical shape, water and sediment transport processes, and the landforms that the streams create and alter. Encompasses processes that create, alter, and maintain structure across whole watersheds.

Take: To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (Section 3(18) of the federal Endangered Species Act). Federal regulations provide the same taking prohibitions for threatened wildlife species (50 Code of Federal Regulations 17.31(a)).

Upwelling: Where warmer surface water is pushed away from an area, allowing colder deep water to rise up and replace it.

Wetland: As defined in Oregon's Forest Practice Rules in Oregon Administrative Rules 629-24-101 (77), wetlands are "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."

Appendix 1-B
Scoping

Introduction

Scoping is an early and open process for determining the scope of the issues for analysis in an environmental impact statement (EIS), including identifying the significant issues and eliminating non-significant issues from further study (40 Code of Federal Regulations [CFR] 1501.9). Through this process, the public, organizations, and agencies assist in the development of the EIS by identifying important issues and alternatives to the proposed action that should be considered in the EIS. This report describes the public noticing and engagement efforts undertaken by the U.S. Fish and Wildlife Service (FWS) during the scoping period and summarizes comments received during the scoping period. The full text of comments received during scoping are available at the following web address: https://www.regulations.gov/document/FWS-R1-ES-2022-0029-0001/comment.

EIS Chapter 5, *Summary of Submitted Alternatives, Information, and Analyses,* summarizes the alternatives, information, and analyses submitted by state, tribal, and local governments and other public commenters during the scoping process for consideration by the lead and cooperating agencies in developing the EIS (40 CFR 1502.17).

Public Notices and Distribution of Notices

Notice of Intent

The Notice of Intent (NOI) was posted to the FWS website and published in the *Federal Register* (FR) on May 5, 2022 (https://www.federalregister.gov/documents/2022/05/05/2022-09671/notice-of-intent-to-prepare-an-environmental-impact-statement-for-the-elliott-state-research-forest). The NOI provides background information on the proposed federal action, the habitat conservation plan (HCP), and the federal Endangered Species Act and National Environmental Policy Act (NEPA) processes, as well as information on how to participate in the EIS scoping process. The NOI is available on the FWS website at https://www.fws.gov/project/elliott-state-research-forest-habitat-conservation-plan. Additionally, the Oregon Department of State Lands (DSL) posted the NOI on its project website: https://www.oregon.gov/dsl/Land/Pages/Elliott.aspx

Email Notifications

FWS distributed notice by email to interested parties on May 3 and 4, 2022, in advance of the publication of the NOI in the FR. The email notice announced the opportunity to provide comments on the scope of the EIS and included a brief description of the proposed action, a link to the FWS website, information on the virtual public meeting, and instructions on submitting comments. The email notifications were sent to representatives of federal, state, and local governments; elected officials; tribes; nongovernmental organizations; environmental organizations; businesses; and others who have expressed interest in the HCP and NEPA processes.

Additionally, DSL distributed two email notices about the NOI and the virtual public meeting on May 4 and June 2, 2022, to its stakeholders.

Media Notifications

FWS distributed a public scoping news release to the media announcing the availability of the NOI, the opportunity to attend a virtual public meeting, and explained how provide comments on May 4, 2022. The media release was made available to the public online at: https://www.fws.gov/press-release/2022-05/input-requested-elliott-state-research-forest-proposed-hcp. FWS posted a link to this press release via Twitter (@USFWSPacific) on May 4, 2022.

U.S. Fish and Wildlife Service Website

Prior to the virtual public meeting, the FWS website provided a summary of the proposed action, information on how to join the virtual public meeting, information about how to provide comments and a link to www.Regulations.gov, a link to the FR notice, the public scoping news release, and links to general information on habitat conservation plans and the NEPA process. Following the virtual public meeting, a link to a closed-captioned recording of the virtual public meeting was posted on the FWS website https://www.fws.gov/project/elliott-state-research-forest-habitat-conservation-plan.

Virtual Public Scoping Meeting

FWS held one virtual public scoping meeting on May 16, 2022, from 6 to 8 p.m. The meeting was held using Zoom as the webinar platform and included a presentation by FWS, a presentation by DSL, and a question-and-answer session. The purpose of the meeting was to provide information to the public about the NEPA process and the proposed action (DSL's proposed HCP), and to allow participants to ask questions about the NEPA process and proposed HCP.

Jennifer Piggott, facilitator with ICF, a third-party contractor, opened the meeting and provided an overview of the agenda, basic functions of how to participate on the virtual meeting platform, and how to turn on closed captioning and join by phone if needed. Shauna Everett, FWS project lead, described the project background, the meeting purpose, and the federal agency's proposed action. She also introduced the NEPA process and the purpose of scoping. Geoffrey Huntington, HCP project manager for DSL, provided a presentation on the proposed HCP, which included an overview of the HCP process, the proposed covered species, covered activities, conservation strategy, and ongoing stakeholder engagement led by DSL as part of the HCP development. Deborah Bartley, EIS project manager with ICF, described the public scoping process, the purpose of scoping, how to provide scoping comments, and the next steps in the NEPA process.

Following the presentations, FWS provided meeting participants the opportunity to ask clarifying questions. The virtual public meeting was attended by 11 individual stakeholders and 10 questions were asked. All questions were answered live during the webinar by members of the presentation team.

During the virtual public meeting, FWS did not solicit, collect, or record oral public comments. Participants were provided detailed explanations on how to submit written comments online via www.Regulations.gov or via mail to FWS headquarters. Participants were reminded that all comments are treated equally regardless of submission method.

Summary of Public Scoping Comments Received

During the scoping period a total of 70 comments were received: 1 from a federal agency, 1 from a county, 9 from nongovernmental organizations and businesses, and 59 from members of the public. As noted above, copies of all comments are available online at: https://www.regulations.gov/document/FWS-R1-ES-2022-0029-0001/comment. Additionally, Chapter 5 of this EIS provides a summary of the alternatives, information, and analyses submitted by state, tribal, and local governments and other public commenters during scoping.

Below is a summary of all comments received, by topic.

HCP

Commenters requested the following modifications or additions to the HCP.

- General
  - Include research on the impacts of logging on species and their associated habitat
  - Provide information on effects of the HCP to carbon storage and sequestration
- Covered species
  - Include other listed species or species that could be listed during the permit term as covered species (e.g., coastal marten)
  - Address effects on coastal marten and include a no-take protocol for coastal marten
- Covered activities
  - Provide additional definition of thinning activities included in the HCP
  - Consider research needs for regenerative timber harvest and log volume
- Conservation strategy
  - Northern spotted owl
    - Protect all northern spotted owl activity centers
    - Maintain all existing habitat within activity centers that do not meet habitat thresholds (i.e., maintaining 50% suitable habitat in core use areas and 40% suitable habitat in home ranges)
    - Include barred owl management
    - Include strategies to improve habitat conditions in all research allocations
    - Include strategies to protect newly discovered northern spotted owl nesting sites
  - Marbled murrelet
    - Use existing marbled murrelet survey data to update the HCP's habitat layers
    - Require surveys prior to harvest in marbled murrelet habitat

    - Identify replacement habitat prior to harvest in marbled murrelet habitat
    - Require retention of at least 80% of the basal area in a logging unit when harvesting in occupied marbled murrelet habitat
    - Require protection of areas that develop into marbled murrelet habitat during the research project
  - Oregon coast coho
    - Modify the methodology for identifying steep slope protections to better protect coho habitat and stream function
- Effects analysis
  - Provide more detail regarding anticipated take of covered species and associated protection and mitigation
  - Include additional analysis on the importance of streams in the Elliott State Forest to the Coos Basin coho population and on the role of habitat in the plan area in the context of anticipated climate change
- Monitoring and implementation
  - Modify the marbled murrelet monitoring strategy to include evaluation of the impacts of occupancy, nesting success, and nest predation rates in the affected occupied habitat and adjacent occupied habitat and control study areas
  - Create a team of northern spotted owl experts to advise on northern spotted owl habitat management throughout the permit term

General Support or Opposition

Multiple commenters expressed support for the HCP, stating that they believe the HCP would represent an improvement from existing forest management practices and provide improved protections for older forests, and species and their habitat.

Other commenters expressed opposition to the HCP, including the following specific concerns: level of protection for species; preservation of the forest does not go far enough; the HCP should not allow for any take; opposition to removing old-growth trees; opposition to building roads; and overall concern that the HCP will repeat mistakes made in prior HCPs.

NEPA Process

Commenters requested that the NEPA process include a 60-day public comment period for the Draft EIS.

Approach to EIS Analysis

Commenters made the following suggestions regarding the approach to the EIS analysis.

- Consider cumulative effects of the HCP on all applicable resource areas.
- Include a discussion of a monitoring program designed to assess implementation of the HCP over time and measure its effectiveness in achieving its conservation goals.

Purpose and Need

A commenter suggested that FWS include effective conservation and recovery of the covered species in its purpose and need statement.

Alternatives

Commenters suggested that the following alternatives or elements of alternatives be analyzed in the EIS.

No Action Alternative

- Analyze a no action alternative that includes no commercial timber harvest.

Action Alternatives

Scoping comments included the following modifications or additions to the proposed action for inclusion in action alternatives considered in the EIS.

- Modifications to Permit Term
  - Shorten the permit term to accommodate uncertainty in climate change and species impacts
- Modified Permit Area
  - Integrate the East Hakki Ridge parcel into the permit area
  - Align the Western Oregon State Forests HCP with the Elliott State Research Forest HCP to maximize habitat continuity
- Modified Covered Species
  - Include provisions for adding additional species protections, such as for the coastal marten, during the permit term
- Modified Covered Activities
  - Timber Harvest
    - Further restrict timber harvest in older stands (i.e., stands over 65 or 80)
    - Set a target for annual harvest of 40 million board feet to maintain forest growth
    - Increase timber harvest to alleviate effects of high inflation, reduction in timber availability due to wildfires, and lack of affordable housing
    - Prohibit hardwood conversion treatments in reserves
    - Manage the conservation research watersheds (CRW) as a carbon reserve
  - Road System Management
    - Place additional restrictions on road building
    - Create a more aggressive road decommissioning plan to improve aquatic and riparian health
    - Remove or relocate roads within 100 feet of fish-bearing streams to outside of RCAs

- Complete an inventory and assessment of hydrological impacts from roads and commit to reducing roads within the CRW
- Steep Slopes
  - Increase erosion protections for steep slopes
  - Increase protection for steep slopes and landslide initiation areas in research management watersheds
  - Reduce steep slope logging to reduce probable harm to coho salmon in critical spawning areas (i.e., Palouse Creek)
  - Expand prohibition of harvest on steep slopes
- Riparian Buffers
  - Increase protection for riparian buffers on perennial and intermittent steams in research management areas
  - Expand riparian buffers on perennial non-fish-bearing and seasonal streams
  - Restrict thinning in riparian and adjacent conservation areas
- Research:
  - Allow OSU flexibility to manage the forest during its research to evaluate the impacts of forest management on endangered species and other resources
  - Conduct regeneration harvest-focused research
  - Identify reserves as no-take areas
  - Integrate restoration work into the HCP and research design and fully engage the restoration community with options to integrate local watershed plans and assessments

- Modified Conservation Strategy
  - Strengthen protections for northern spotted owl, coastal coho, and marbled murrelet
  - Modify northern spotted owl conservation strategy by:
    - Strengthening northern spotted owl conservation measures
    - Restricting all harvest in older forests
    - Protecting all northern spotted owl activity centers and allowing no take of northern spotted owl
    - Require the FWS thresholds for protection of northern spotted owl core areas and home ranges and ensure that there is no net loss of northern spotted owl habitat
    - Controlling barred owls to reduce competition with northern spotted owl
  - Modify marbled murrelet conservation strategy by:
    - Limiting marbled murrelet research acreage and instead implementing monitoring protocols and adaptive management to minimize observable negative impacts
    - Adding minimization measures for marbled murrelet impacts:

        - Assessing the project areas according to FWS standard monitoring protocols, ensuring sufficient funds for this effort
        - Limiting harvest in marbled murrelet habitat to 500 acres, unless it is demonstrated that harvest will benefit marbled murrelets
        - Restricting marbled murrelet research project to a one-time-only effort within the permit term
        - Creating and maintaining a buffer around any occupied tree(s)
        - Requiring the identification of replacement marbled murrelet habitat prior to management in existing marbled murrelet habitat
        - Restricting any timber harvest in marbled murrelet habitat
- Modify aquatic conservation strategy by:
    - Increasing riparian buffers and reducing steep slope logging to minimize risk to coho salmon critical spawning areas
    - Strengthening fish passage barrier removal requirements:
        - Proactively removing or replacing known impassible and partial barriers to coho migration
        - Modifying timeline for removal of fish barriers to be more aggressive
        - Requiring removal of all fish passage barriers
- Modify beaver habitat management strategies by:
    - Limiting thinning of shade trees along streamline and increasing beaver protections
    - Prohibiting hunting and trapping in the permit area
    - Surveying for beaver dams, maintained and in disrepair, to identify potential habitat
    - Promoting beaver dispersal with beaver dam analogs
    - Partnering with beaver relocation groups
    - Facilitating beaver relocations to appropriate vacant sites in the permit area

Environmental Resource Areas

Water Resources

Commenters made the following suggestions on the water resources analysis.

- Evaluate cumulative effects related to water quality and aquatic life.
- Include information on acreages and channel lengths, habitat types, values, and function of waters for all affected waters, including the nature of impacts and potential pollutants likely to affect those waters.
- Include waterbodies potentially affected by the project that are listed on the State of Oregon U.S. Environmental Protection Agency-approved 303(d) list and describe how the project would meet Clean Water Act (CWA) antidegradation provisions.

- Include existing restoration and enhancement efforts for the potentially affected waters and how the project would coordinate with these ongoing efforts, including any mitigation or compensatory mitigation that would be required under the CWA.
- Analyze whether the project would result in discharge of dredged or fill materials into surface waters and permit requirements associated with the activity, along with a description of the permit application processes and recommended measures to protect aquatic resources.
- Include a discussion of floodplain impacts and actions to minimize these impacts.
- Explain how the Services' actions are maintaining spatial temperature patterns important to the recovery of protected species.

Vegetation

Commenters made the following suggestions on the vegetation analysis.

- Compile a list of indigenous herbaceous plant species of Coos County and include an analysis of effects on these plant species.
- Analyze the effects of herbicide use on vegetation.
- Study the effects of regenerative harvest on terrestrial species habitat and recovery.

Aquatic Species

Commenters made the following suggestions on the aquatic species analysis.

- Explain the importance of stream temperatures and their effects on covered aquatic species, with ample consideration to climate change and explanation of how the Services' actions are maintaining spatial temperature patterns important to the recovery of protected species.
- Analyze the effects of HCP's proposed riparian buffers, riparian thinning strategy, sedimentation, water quality and stream temperatures, fish migration barriers, road networks, and beaver management activities, in relation to coast coho salmon survival and recovery to evaluate if the proposed measures proposed in the draft HCP are sufficient.
- Assess the impacts of herbicide use in vegetation management and associated runoff on juvenile salmonid streams.

Terrestrial Species

Commenters made the following suggestions on the analysis of terrestrial species in the EIS.

- Analyze the effects of the HCP's proposed thinning strategy for terrestrial species (e.g., effects of creating snags instead of felling thinned trees).
- Analyze the effect of hardwood removal treatments on habitat quality.

Greenhouse Gases and Air Quality

A commenter recommended that the EIS include a discussion of ambient air conditions (baseline and existing), national ambient air quality standards, criteria pollutant nonattainment areas in the plan area, an estimation of criteria pollutant emissions and a discussion of timeframe and identification of applicable mitigation measures if needed. A commenter requested that the EIS analyze effects on carbon storage, including an analysis of how different timber harvest and thinning intensities would affect carbon storage.

Climate Change

A commenter recommended the EIS include a discussion of reasonably foreseeable effects that changes in climate may have on the proposed project, and what impacts the proposed project would have on climate change consequences, to better inform the development of climate resiliency measures for the project.

Recreation

Commenters made the following suggestions for the recreation analysis:

- Consider forms of recreation in the project area as a take due to their impacts on respective species and habitat; increase monitoring to reduce these impacts.
- Conduct more timber harvest and use revenue to fund recreation and research expenses.

Cultural Resources

A commenter suggested that the EIS should discuss how adverse effects on the physical integrity, accessibility, or use of cultural resources and/or archaeological sites, including traditional cultural properties, would be minimized throughout the project area. The commenter encourages FWS to append any Memoranda of Agreement to the EIS, after redacting specific information about these sites that is sensitive and protected under the National Historic Preservation Act (NHPA). The commenter also recommends providing a summary of consultation with state and federal agencies on potential effects on NHPA resources and developing a Cultural Resource Management Plan.

Tribal Resources

Commenters made the following suggestions regarding the tribal resources analysis:

- Incorporate input from tribes on HCP development and summarize tribal consultation in the EIS, including issues raised during the consultations and how those issues were addressed.
- Disclose any impacts on tribal, cultural, or other treaty resources.
- Conduct tribal consultation and describe the process and outcomes of tribal coordination in the EIS.
- Identify whether any potentially affected sacred sites exist in the project area and discuss how the EIS would ensure the proposed action would avoid, or mitigate, impacts on the physical integrity, accessibility, or use of sacred sites.

Socioeconomics

Commenters suggested that the EIS utilize portions of forest for logging to reduce log and lumber prices, reduce inflation in the lumber market, and increase available housing.

Environmental Justice

A commenter made the following suggestions regarding the environmental justice analysis.

- Incorporate the Executive Order 13985 definition of equity.
- Use the U.S. Environmental Protection Agency's EJSCREEN tool to identify potentially affected environmental justice communities and discuss information for the block group(s) which contains the proposed action(s) in a 1-mile radius around those areas.
- When assessing large geographic areas, consider the individual block groups within the project area.
- Consider additional information in an environmental justice analysis to supplement EJSCREEN outputs.
- Apply methods from "Environmental Justice Interagency Working Group Promising Practices for EJ Methodologies in NEPA Reviews" report, or the Promising Practices Report, to this project.
- Characterize project site(s) with specific information or data related to environmental justice concerns.
- Describe potential environmental justice concerns for all environmental justice indexes at or above the 80th percentile in the state and/or nation.
- Describe block groups which contain the proposed action.
- Describe individual block groups within the project area in addition to an area-wide assessment.
- Supplement data with county-level reports and local knowledge.
- If communities with environmental justice characteristics exist in the project area, the EIS should discuss whether these communities would be potentially affected by individual or cumulative actions of the proposed project and address whether alternatives would cause any disproportionate adverse impacts.
- Describe in the EIS measures taken by FWS to address any disproportionate impacts on environmental justice communities and identify potential mitigation measures.
- Clearly identify a monitoring and adaptive management plan to ensure mitigation is effective and successful.

Appendix 2-A
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Appendix 3.1-A
Regulatory Environment

This appendix provides information on the regulatory context for the EIS resource analyses.

Geology and Soils

Law, Regulation, or Program	Description
State	
Oregon Forest Practices Act (OAR Chapter 629)	Governs forest management on all state-owned and private lands in the state. The Board of Forestry has the responsibility to interpret the Oregon FPA and set rules for forest practices. ODF enforces the requirements of the Oregon FPA, which are set by the Board of Forestry. Requirements relevant to geology and soils include stream buffer widths to limit sediment transport to water channels; standards for the distribution of leave trees, including along streams, and for replanting forests following harvest; and practices to minimize erosion and landslide minimization from road construction and harvest.
Oregon Administrative Rules Chapter 629, Division 623	Describes shallow, rapidly moving landslides and public safety. Its purpose is to reduce the risk of serious bodily injury or death caused by shallow, rapidly moving landslides directly related to forest practices. The rules contained in this division consider the exposure of the public to these safety risks and include appropriate practices designed to reduce the occurrence, timing, or effects of shallow, rapidly moving landslides.
Oregon Revised Statute 527.710	Directs the Board of Forestry to adopt rules to reduce the risk of serious bodily injury or death caused by a rapidly moving landslide directly related to forest practices.

Oregon FPA = Forest Practices Act; OAR = Oregon Administrative Rules

Water Resources

Law, Regulation, or Program	Description
Federal	
Clean Water Act (33 USC 1251 et seq.)	Authorizes EPA to establish the basic structure for regulating discharges of pollutants into waters of the United States and regulates water quality standards for surface waters. Elements of the CWA specifically applicable to water resources include the following: Section 303 of the CWA addresses the development of water quality standards and implementation plans for interstate waters by individual states; Section 303(d) includes requirement for states to identify and list waters where current water pollution control regulations and controls alone cannot meet the water quality standards set for those waters.

Law, Regulation, or Program	Description
	Section 401 of the CWA requires Water Quality Certification from the state for activities requiring a federal permit or license to discharge pollutants into a water of the United States. Certification attests the state has reasonable assurance the proposed activity will meet state water quality standards. Section 402 establishes the NPDES program, under which certain discharges of pollutants into waters of the United States are regulated. Section 404 regulates the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands. Section 404 exempts certain forestry activities, including the maintenance of forest roads, from the permitting process for discharges of dredged or fill material in wetlands, streams and/or other jurisdictional waters of the United States.
Coastal Zone Management Act (16 USC 1451)	Protects water quality in coastal areas through Section 6217, which requires states with a coastal zone management program to develop and implement a coastal nonpoint pollution control program.
Section 10, Rivers and Harbors Act of 1899 (33 USC 403)	Applies to activities that could affect navigable waters of the United States.
Flood Plain Management Criteria for Flood-Prone Areas (44 CFR 60.3(d)(3))	Requires FEMA to review any construction within a mapped floodway to ensure that the work will not increase flood levels. Any actions taken within a designated floodway area require a rise analysis, with review and approval by FEMA.
Executive Order 11988/13690, Floodplain Management	Requires federal agencies to avoid, to the extent possible, adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative (42 FR 26951). FEMA is responsible for enforcement.
State	
OAR 141-085 and ORS 196.795–990	Governs removal and fill permits. Ensures the protection and the best use of Oregon's water resources for home, commercial, wildlife habitat, public navigation, fishing, and recreational uses.
OAR 340-041	Sets forth plans for managing water quality in the state, including standards for beneficial use designations, policies, and water quality criteria for attainment, antidegradation, and cold water protection.
ORS 568.900 to 568.933; ORS 561.191	Serves as the Oregon Department of Agriculture authority for water quality.
Water Rights Act, ORS 537.010 et. seq.	Provides that all water within the state belongs to the public and establishes state regulation of appropriation of water for beneficial use consistent with the act.
ORS Chapter 527	Requires forest operations to comply with Environmental Quality Commission rules and standards relating to water pollution control, the Department of State Lands on removal and fill programs, Oregon Health Authority on the Federal Safe Drinking Water Act, and Water Resources Department on water resource programs prior to adopting rules that establish standards for forest practices. 527.765 requires the Board of Forestry to adopt best management practices, and 527.770 protects forest operators who comply with Board of Forestry best management practices from being found in violation of water quality standards.

Law, Regulation, or Program	Description
ORS 468B.030, 468B.035	Acknowledges that the State of Oregon is responsible for implementing the NPDES program under the CWA.
Ground Water Act of 1955 (ORS 537.505–537.795)	Provides for state regulation of groundwater.
Water Protection Rules of the Forest Practices Act (OAR 629, Divisions 635, 642, 645, 650, 655, 660)	Protects, maintains, and improves the functions and values of streams, lakes, wetlands, and riparian management areas.
Forest Practices Act (OAR 629, Division 620)	Prevents and controls leaks and spills of chemicals, including pesticides, herbicides, and fungicides, fertilizers, and other petroleum products.
Forest Practices Act (OAR 629, Division 625)	Reduces impacts of road construction and maintenance on water resources and flood hazard. The Oregon FPA does not apply to legacy roads (roads built and abandoned prior to passage of FPA and not in use post-FPA).
Forest Practices Act (OAR 629, Division 630)	Reduces hillslope, landslide, and channel disturbance and erosion and prevents sediment and other contaminants from reaching streams.
Forest Practices Act (OAR 629, Division 635)	Describes water protection rules, including riparian management areas and water quality protection measures.
Forest Practices Act (OAR 629, Division 642)	Provides for vegetation retention along streams.
Forest Practices Act (OAR 629, Divisions 645–660)	Provides rules for protecting lakes, wetlands, stream channels, and natural obstructions.
Umpqua Basin TMDL	Provides surrogate measures to translate nonpoint source allocations for temperature to perennial and fish-bearing streams in the Umpqua Basin.
Tenmile Lakes Watershed TMDL	Sets 50% reduction in annual sediment load target relative to reference streams, within 25 years of TMDL publication in 2007.
Oregon Groundwater Quality Protection Act of 1989 (ORS 468B.150–190)	Sets a goal for Oregon to prevent contamination of Oregon's groundwater resource, to conserve and restore it, and to maintain quality for present and future uses. All state agencies' rules and programs are to be consistent with the goal. ODEQ is primarily responsible for implementation.
Water Distribution Rules, OAR 690, Division 250	Guides the administration of Oregon water laws related to regulatory actions.

BMP = best management practice; CWA = Clean Water Act; ODEQ = Department of Environmental Quality; EPA = U.S Environmental Protection Agency; FEMA = Federal Emergency Management Agency; FR = Federal Register; NFIP = National Flood Insurance Program; NPDES = National Pollutant Discharge Elimination System; ORS = Oregon Revised Statute; OAR = Oregon Administrative Rules

Vegetation

Law, Regulation, or Program	Description
Federal	
Clean Water Act (33 USC 1251 et seq.)	Authorizes EPA to establish the basic structure for regulating discharges of pollutants into the waters of the United States and regulates water quality standards for surface waters.

Law, Regulation, or Program	Description
	Section 404 exempts certain forestry activities, including the maintenance of forest roads, from the permitting process for discharges of dredged or fill material in wetlands, streams and/or other jurisdictional waters of the United States. The CWA regulates many activities in surface waters, including vegetated components.
Endangered Species Act (16 USC 1531–1544)	The ESA of 1973, as amended, provides for the conservation of species listed as threatened or endangered and the habitat upon which they depend. Section 7 of the ESA requires federal agencies to consult with FWS and/or NMFS to ensure a federal action is not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of designated critical habitat.
State	
Oregon Endangered Species Act Consultation (ORS 496.002–496.192)	Consultation with ODFW is required for activities on state lands, which may affect state-listed threatened and endangered species. Consultation is usually held in conjunction with federal Section 7 consultation under the ESA.
Removal-Fill Law (ORS 196.800–196.990)	Requires private landowners and public agencies planning to remove or fill material from a wetland or waterway to obtain a permit for such activities from the Oregon Department of State Lands.
Oregon Forest Practices Act (OAR Chapter 629)	Governs forest management on all state-owned and private lands in the state. The Board of Forestry has the responsibility to interpret the Oregon FPA and set rules for forest practices. The Oregon Department of Forestry enforces the requirements of the Oregon FPA, which are set by the Board of Forestry. Requirements relevant to vegetation include specific guidelines for tree harvesting; road design and construction; and protection of wildlife habitat, riparian vegetation, wetlands, and slopes.
Oregon Weed Control Policy (ORS Chapter 569)	Establishes noxious weed control boards, which designate certain plant species as noxious weeds. Authorizes the management, control, and/or elimination of noxious weed populations in the state.

CWA = Clean Water Act; EPA = U.S. Environmental Protection Agency; ESA = federal Endangered Species Act; FPA = Forest Practices Act; FWS = U.S. Fish and Wildlife Service; NMFS = National Marine Fisheries Service; OAR = Oregon Administrative Rules; ODFW = Oregon Department of Fish and Wildlife; ORS = Oregon Revised Statute; USC = United States Code

Fish and Stream-Dependent Wildlife

Law, Regulation, or Program	Description
Federal	
Endangered Species Act (ESA) (16 United States Code 531 et seq.)	Provides for the conservation of species listed as threatened or endangered and their critical habitat. Section 10 of the ESA provides for permitting of incidental take of listed species with an approved HCP.
Magnuson-Stevens Fishery and Conservation Management Act	Primary law governing marine fisheries management in U.S. federal waters, and provisions for essential fish habitat including freshwater for anadromous species.
State	

Law, Regulation, or Program	Description
Oregon Sensitive Species Rule (OAR 635-100-0040)	Designates sensitive fish and wildlife species and focuses fish and wildlife conservation, management, research, and monitoring activities on identified sensitive species.
Oregon Endangered Species Act (ORS 496.002–496.192)	Triggers internal state consultations when activities taken by state agencies on state lands may affect state-listed threatened or endangered species.
Oregon Forest Practices Act (February 2021) (OAR 629-665-0210)	Provides requirements for protection of fish habitat and interim requirements for timber operations near streams.
Oregon Fish Passage Laws (ORS 509.580 to 509.910)	Requirements for fish passage and crossings as well as establishment of a Fish Passage Task Force.

ORS = Oregon Revised Statutes; OAR = Oregon Administrative Rules; HCP = Habitat Conservation Plan

Forest, Wetland, and Riparian–Dependent Wildlife

Law, Regulation, or Program	Description
Federal	
Endangered Species Act (16 USC 531 et seq.)	Provides for the conservation of species listed as threatened or endangered and their critical habitat. Section 10 of the Endangered Species Act provides for permitting of incidental take of listed species with an approved HCP.
Migratory Bird Treaty Act (16 USC 1361 et seq.)	Prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service.
Bald and Golden Eagle Protection Act (16 USC 668-668d)	Prohibits anyone, without a permit issued by the Secretary of the Interior, from “taking” bald or golden eagles, The act defines *tak*e as to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."
State	
Oregon Sensitive Species Rule (OAR 635-100-0040)	Designates sensitive fish and wildlife species and focuses fish and wildlife conservation, management, research, and monitoring activities on identified sensitive species.
Oregon Endangered Species Act (ORS 496.002–496.192)	Triggers internal state consultations when activities taken by state agencies on state lands may affect state-listed threatened or endangered species.
Survival Guidelines for Marbled Murrelet (OAR 635-100-0137)	Provides measures to minimize potential for unauthorized take of marbled murrelets. Guidelines are preempted by any more protective measures required by the federal Endangered Species Act.
Oregon Forest Practices Act (OAR 629-665-0210)	Provides requirements for protection of wildlife habitat and interim requirements for timber operations near northern spotted owl nesting sites.

USC = United States Code; ORS = Oregon Revised Statutes; OAR = Oregon Administrative Rules; HCP = Habitat Conservation Plan

Climate Change

Law, Regulation, or Program	Description
Federal	
Council on Environmental Quality, Executive Office of the President, Christina Goldfuss	Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews. August 1, 2016. Per Executive Order 13990 and a subsequent Federal Register Notice (86 *Federal Register* 10252), CEQ will review, revise, and update the guidance; in the interim agencies should use the 2016 CEQ greenhouse gas guidance as appropriate and relevant.

CEQ = Council on Environmental Quality

Visual Resources

Law, Regulation, or Program	Description
Federal	
National Scenic Byways (60 FR 96)	Designates roadways as National Scenic Byways or All-American Roads based on six criteria of scenic, historic, recreational, cultural, archaeological, and/or natural intrinsic qualities.
National Wild and Scenic Rivers Act (16 USC 1271–1287)	Establishes a National Wild and Scenic Rivers System for the protection of certain rivers as designated as wild, scenic, or recreational.
State	
Oregon Scenic Waterways Act (ORS 390.805–390.940; Oregon Wild 2022)	Designates state scenic rivers that are free-flowing, provides scenic quality as viewed from the river, and offers sustainable natural and recreation resources.
Oregon Scenic Byways and Bikeways (Oregon Tourism Commission and Oregon Department of Transportation 2018; Oregon State Parks 2019)	Designates scenic byways and bikeways that meet key criteria.

FR = Federal Register; ORS = Oregon Revised Statute; USC = United States Code

Recreation

Law, Regulation, or Program	Description
Federal	
National Wild and Scenic River Act (16 USC 1271 et seq.)	Preserves designated rivers with outstanding natural, cultural, and recreational values in free-flowing condition for enjoyment of present and future generations.
National Scenic Byways (86 FR 13337)	Designates roadways as National Scenic Byways or All-American Roads based on six criteria of scenic, historic, recreational, cultural, archaeological, and/or natural intrinsic qualities.
Applicable National Scenic Byway Corridor Management and Interpretive Plans	Establishes strategies for the management and protection of scenic corridors.

Law, Regulation, or Program	Description
State	
Oregon Statewide Comprehensive Outdoor Recreation Plan	Provides guidance to federal, state, and local units of government, as well as the private sector, in delivering quality outdoor recreation opportunities to Oregonians and out-of-state visitors.
Oregon State Parks Master Plans	Provides planning guidance for management of resources and activities within individual state parks in Oregon.
Designated Scenic Waterways (ORS 390.826)	Designates specific lakes, rivers, segments of rivers and adjacent land as scenic waterways in Oregon.
Oregon Scenic Waterway Program (OAR 736-40)	Provides management guidance for activities within 0.25 mile of the bank of designated state scenic waterways. Rules specify protections and allowances for recreation activity within these corridors.
Oregon Statewide Recreation Trails Plan 2016–2025 (Oregon Parks and Recreation Department 2016)	Oregon's 10-year plan for recreation trail management, guiding the Recreation Trails Program and All-Terrain Vehicle funds. Provides information and recommendations to private entities and local, state, and federal governments in making policy and planning decisions.
Oregon Scenic Byways and Bikeways (Oregon Tourism Commission and Oregon Department of Transportation 2018)	Designates scenic byways and bikeways that meet key criteria.

FR = Federal Register; OAR = Oregon Administrative Rules; ORS = Oregon Revised Statute; USC = United States Code

Cultural Resources

Law, Regulation, or Program	Description
Federal	
Protection of Historic Properties (36 CFR 800)	Contains the regulations for Section 106 of the NHPA. Outlines procedures for NHPA consultation related to historic properties.
Indian Sacred Sites (Executive Order 13007)	Enacted in 1996, protects and preserves Indian religious practices, orders agencies managing federal lands to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites. Where appropriate, the agency is to maintain the confidentiality of sacred sites.
NHPA of 1966	As amended through 2000, authorizes the Secretary of the Interior to expand and maintain a National Register of Historic Places, establishes and defines the responsibilities of the State and Tribal Historic Preservation Officers and the Advisory Council of Historic Preservation, and pledges federal assistance to preservation efforts of state and local groups. Serves as the primary mandate governing projects under federal jurisdiction that might affect cultural resources. Section 106 of the NHPA, codified in 36 CFR 800, requires federal agencies to consider the effects of federal undertakings having the potential to affect any district, site, building, structure, or object that is listed in, or eligible for listing in, the NRHP. Under Section 106, the lead federal agency must provide an opportunity for the State Historic Preservation Officer, affected tribes, and other stakeholders to comment.

Law, Regulation, or Program	Description
State	
Conservation Easement (ORS 271.715–271.795)	Outlines the State of Oregon's process for designating conservation easements and scenic preservation easements.
Indian Graves and Protected Objects (ORS 97.740–97.760)	Describes prohibited and permitted actions related to actions with the potential to encounter native Indian burial sites.
Administrative Rules for Archaeological Permits for Public and Private Lands (OAR 736-051-0000 through 0090)	Describes the requirements related to archaeological permits on public and private lands.
Archaeological Objects and Sites (ORS 358.905–358.961)	Outlines requirements related to the discovery of archaeological objects and sites located on public lands.

CFR = Code of Federal Regulations; NHPA = National Historic Preservation Act; OAR = Oregon Administrative Rules; ORS = Oregon Revised Statute; USC = United States Code

Tribal Resources

Law, Regulation, or Program	Description
Federal	
United States Constitution, Article II and Article VI (1787)	Authorizes the federal government to make treaties and regulate commerce with Indian tribes.
Treaty with the Kalapuya, etc. (1855), as restored by the Grand Ronde Restoration Act of 1983 (Public Law 98-165) and the Grand Ronde Reservation Act of 1988 (Public Law 100-425) (as amended)	The Treaty with the Kalapuya, etc., also known as the Kalapuya Treaty or the Treaty of Dayton, established federal recognition for bands of the Kalapuya tribe, the Molala tribe, the Clackamas, and several others in the Oregon Territory via treaty with the United States in 1855. Federal recognition was lost in 1954. The Grand Ronde Restoration Act of 1983 restored federal recognition but not reserved treaty rights of the Confederated Tribes of Grand Ronde.
Western Oregon Termination Act (Public Law 588, August 13, 1954)	Terminated federal supervision over the trust and restricted property of Indian bands and tribes located west of the Cascade Mountains in Oregon.
Siletz Indian Tribe Restoration Act (Public Law 95-195, November 1977)	Restores federal recognition of the Confederated Tribes of Siletz Indians of Oregon.
Cow Creek Band of Umpqua Tribe of Indians Recognition Act (Public Law 97–391, December 1982)	Restores federal recognition of the Cow Creek Band of Umpqua Tribe of Indians.
Grand Ronde Restoration Act (Public Law 98-165, November 1983)	Restores federal recognition of the Confederated Tribes of the Grand Ronde Community of Oregon.
Coos, Lower Umpqua, and Siuslaw Restoration Act (Public Law 98-481, October 1984)	Restores federal recognition of the Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians.
Coquille Restoration Act (Public Law 101-42, June 1989)	Restores federal recognition of the Coquille Indian Tribe.
Executive Order 12875, Enhancing the	Establishes regular and meaningful consultation and collaboration with state, local, and tribal governments.

Law, Regulation, or Program	Description
Intergovernmental Partnership (1993)	
Secretarial Order 3206 (1997)	Clarifies the responsibilities of the Department of the Interior and Department of Commerce to ensure that Indian tribes do not bear a disproportionate burden for the conservation of listed species.
Executive Order 13175, Consultation and Coordination with Indian Tribal Governments (65 FR 67249) (2000)	Charges federal departments and agencies with establishing regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, strengthening government-to-government relationships with Indian tribes, and reducing the imposition of unfunded mandates upon Indian tribes.
Presidential Memorandum, Tribal Consultation (2009)	Reaffirms EO 13175, Consultation and Coordination with Indian Tribal Governments (65 FR 67249) and charges executive departments and agencies with engaging in consultation and collaboration with tribal officials in the development of federal policies that have tribal implications.
Secretarial Order 3317 (2011)	Updates, expands, and clarifies Department of Interior policies on consultation with tribes and provisions for conducting consultation in compliance with EO 13175.
Commerce Department Administrative Order (DAO 218-8) (2012)	Implements EO 13175, Consultation and Coordination with Indian Tribal Governments, and describes the actions to be followed by the Department of Commerce concerning tribal self-government, trust resources, treaty, and other rights.
Secretarial Order 3335 (2014)	Reaffirms the Federal Trust Responsibility to Federally Recognized Indian Tribes and Individual Indian Beneficiaries.
U.S. Fish and Wildlife Service Native American Policy (January 20, 2016)	Updates Native American policy providing a framework for government-to-government relationships, addressing the United States' and the Department of the Interior's trust responsibility to federally recognized tribes to protect, conserve, and use tribal reserved, treaty guaranteed, or statutorily identified resources.
Western Oregon Tribal Fairness Act (Public Law 115-103, January 2018)	Transfers federal land to the Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians and Cow Creek Band of Umpqua Tribe of Indians. Amended the Coquille Restoration Act to remove the requirement that Department of Interior manage the land transferred to the Tribe.
NOAA Fisheries and National Ocean Service Guidance and Best Practices for Engaging and Incorporating Traditional Ecological Knowledge in Decision-Making (2019)	Provides guidance on the inclusion of traditional ecological knowledge in the line offices' environmental science, policy and decision-making process, to facilitate consultations as required by EO 13175, understand environmental justice concerns as directed by EO 12898, inform agency decision making, and build partnerships with indigenous people.
NOAA Procedures for Government-to-Government Consultation with Federally Recognized Tribal Governments (2021)	Provides guidance on obtaining meaningful and timely input from tribes into the NOAA decision-making process on policies that have tribal implications.
DOI/USDA Joint Secretarial Order 3403, Joint Secretarial Order on Fulfilling the Trust Responsibility to Indian Tribes	Establishes how DOI and USDA will fulfill their obligations to federally recognized Indian Tribes to ensure decisions by the departments relating to federal stewardship of federal lands, waters, and wildlife under their jurisdiction include the consideration of how to safeguard

Law, Regulation, or Program	Description
in the Stewardship of Federal Lands and Waters (2021)	the interests of any Indian Tribes such decisions may affect, to make agreements with Indian Tribes to collaborate in the co-stewardship of federal lands and waters under the departments' jurisdiction, to support opportunities to consolidate tribal lands and empower stewardship of tribal land resources, and to complete a preliminary legal review of current land, water, and wildlife treaty responsibilities and authorities that can support co-stewardship and tribal stewardship.
State	
Confederated Tribes of Siletz Indians v. State of Oregon, Civil No. 80-433 (D. Or. 1980).	Defines tribal hunting, fishing, trapping, and animal gathering rights of the Confederated Tribes of Siletz Indians via agreement among the State of Oregon, the United States of America and the Confederated Tribes of Siletz Indians.
Confederated Tribes of Grand Ronde Community of Oregon v. State of Oregon, Civil No. 86-1620, D. Or. 1987).	Defines tribal hunting, fishing, trapping, and animal gathering rights of the Confederated Tribes of Grand Ronde via agreement among the State of Oregon, the United States of America and the Confederated Tribes of the Grand Ronde Community of Oregon.
Executive Order EO-96-30; State/Tribal Government to Government relations, May 22, 1996	Establishes formal government-to-government relationships between Oregon's Indian tribes and the State of Oregon to establish a process that can assist in resolving potential conflicts, maximize key intergovernmental relations, and enhance an exchange of ideas and resources.
Relationship of State Agencies with Indian Tribes (ORS 182.162–182.168), 2019 Edition	Directs Oregon state agencies to develop and implement agency policies on relationship and cooperation with tribes.
Tribal	
The Confederated Tribes of the Grand Ronde Community of Oregon Fish and Wildlife Ordinance (2015)	Regulates hunting, fishing, and gathering rights of the Confederated Tribes of the Grand Ronde Community of Oregon, including hunting and fishing defined in the 1986 Consent Decree with the State of Oregon.
Cow Creek Band of Umpqua Tribe of Indians hunting rules and regulations (2019)	Regulates hunting, fishing, and gathering rights under the authority of the Cow Creek Band of Umpqua Tribe of Indians Tribal Board.
Confederated Tribes of Siletz Indians of Oregon Hunting, Fishing, and Gathering Ordinance (Siletz Tribal Code Section 7.001)	Regulates hunting, fishing, and gathering rights of Confederated Tribes of Siletz Indians of Oregon, including hunting and fishing defined in the 1980 Consent Decree with the State of Oregon.

EO = Executive Order; FR = *Federal Register*; NOAA = National Oceanic Atmospheric Administration; DOI = U.S. Department of the Interior; USDA = U.S. Department of Agriculture; ORS = Oregon Revised Statutes

Environmental Justice

Law, Regulation, or Program	Description
Federal	
EO 14008, Tackling the Climate Crisis at Home and Abroad (January 27, 2021)	Emphasizes the need to prioritize environmental justice in agency missions and address disproportionately high and adverse human

Law, Regulation, or Program	Description
	health, environmental, climate-related and cumulative impacts on disadvantaged communities.
EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (February 16, 1994)	Requires agencies to identify and address disproportionate human health and environmental impacts on low-income and minority populations.
Environmental Justice Guidance Under the National Environmental Policy Act (CEQ 1997)	CEQ has oversight of the federal government's compliance with EO 12898 and NEPA. CEQ, in consultation with EPA and affected agencies, developed this guidance to effectively address environmental justice concerns.
MOU on Environmental Justice and EO 12898 (2011)	This interagency MOU reaffirms the importance of EO 12898 and creates interagency processes to provide research and guidance on best practices for implementing environmental justice policies.
Promising Practices for environmental justice Methodologies in NEPA Reviews (Federal Interagency Working Group on Environmental Justice 2016)	Describes procedures and recommends specific methodologies to identify environmental justice populations based on racial/ethnic background and income levels.
Technical Guidance for Assessing Environmental Justice in Regulatory Analysis (EPA 2016)	This technical guidance, prepared by EPA with input from the EPA Science Advisory Board and public, recommends revised methods, best practices, and analytic principles to identify and assess threats to environmental justice populations.

CEQ = Council for Environmental Quality; EO = Executive Order; EPA = U.S. Environmental Protection Agency; MOU = memorandum of understanding

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Appendix 3.2
Geology and Soils Technical Supplement

This appendix describes existing conditions for geology and soils in the study area that relate to shallow-rapid landslides and debris flows/debris torrents.

Soils

Soils vary considerably with their susceptibility to landslides and erosion depending on their texture, depth, and other qualities. The Natural Resources Conservation Service has mapped soils and identified soil characteristics in the permit area. Tables 1 and 2 provide information relevant to evaluating soil erosion hazard.

Table 1 shows erosion hazard for both off-road and road in the permit area.[1] This table shows that a substantial majority of the permit area, approximately 84,000 acres, is at severe or very severe risk of erosion in off-road soil disturbance conditions, e.g., logging. Approximately 87,000 acres in the permit area are at severe risk of erosion if unsurfaced roads were constructed in this area. Table 2 shows poor suitability in approximately 85,000 acres of the permit area for log lands and roads with a natural surface, e.g., not enhanced with gravel. In these substantial areas, there is a hazard of soil loss due to harvest activities and road and log landing construction and use. Results in these two tables suggest that forestry activities could result in erosion.

Table 1. Erosion Hazard, Off-Road and Off-Trail and Road and Trail, in the Permit Area

	Off-Road and Off-Trail [a]		Road and Trail [b]	
Erosion Rating	**Acres**	**Percent (%)**	**Acres**	**Percent (%)**
Very Severe	22,049	24	n/a	n/a
Severe	62,366	68	86,924	94
Moderate	2,513	3	18	0.02
Slight	1,206	1.3	1,192	1.3
Not rated	4,220	5	4,220	5
Total	92,354	100	92,354	100

Source: NRCS 2021.

[a] The ratings indicate the hazard of soil loss from off-road (and off-trail) areas after disturbance activities that expose the soil surface. The ratings are based on slope, an erosion factor, and an index of rainfall erosivity. The soil loss is caused by sheet or rill erosion in off-road (or off-trail) areas where 50 to 75% of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance.

[b] The ratings indicate the hazard of soil loss from unsurfaced roads (and trails). The ratings are based on slope, an erosion factor, and content of rock fragments. A rating of *slight* indicates that little or no erosion is likely; *moderate* indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and *severe* indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed. There is no rating of *very severe* for this soil characteristic.

n/a = not applicable

[1] Erosion hazard for off-road/off-trail evaluates the hazard of soil loss from off-road and off-trail areas after soil disturbance that exposes the soil surface in areas where 50% to 75% of the surface has been exposed by logging and other activities (NRCS 2022). Erosion hazard for road/trail evaluates the hazard of soil loss from unsurfaced roads and trails.

Table 2. Soil Suitability for Log Landings and Roads in the Permit Area

	Log Landings [a]		Roads [b]	
Soil Suitability Rating	**Acres**	**Percent (%)**	**Acres**	**Percent (%)**
Well suited	0	0.00	0	0.00
Moderately suited	2,324	3	2,324	3
Poorly suited	85,810	93	85,810	93
Not rated	4,220	4.6	4,220	4.6
No data	0	0	0	0
Total	92,354	100	92,354	100

Source: NRCS 2021.

[a] This rating shows the suitability of soils for use as log landings in forested areas. Ratings are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification of the soil, depth to water table, ponding, flooding, and the hazard of soil slippage.

[b] This rating shows the suitability of soils for use for natural-surfaced roads. The ratings are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification of the soil, depth to water table, ponding, flooding, and the hazard of soil slippage.

Shallow-Rapid Landslide

Conditions Conducive to Shallow-Rapid Landslide

The geologic origin, topography, soils, and climate in the study area represent conditions favorable to initiation of shallow-rapid landslides, namely bedrock with low porosity, high precipitation rates, steep slopes, and coarse soils on steep slopes (Liu et al. 2021:1).[2] Landslides in the study area are frequently associated with debris flows and debris torrents (DSL and ODF 2011:2-25, 2-44, 2-46).

As described in HCP Chapter 2, *Environmental Setting*, the bedrock Tyee sandstone/siltstone formation underlies most of the study area. Sandstone beds may be more than 50 feet thick, alternating with siltstones and mudstones up to several feet thick. The Tyee Formation in the study area generally has low primary porosity, meaning that it does not hold much water. However, the formation is moderately jointed and fractured, which provides some space for groundwater (DSL and ODF 2011:2-43).

The climate in the study area has a strong maritime influence from the nearby Pacific Ocean. As a result, rainfall is high. Rainfall varies from about 65 inches per year at lower elevations on the western edge of the forest to 115 inches per year on the high, interior ridges, to 90 inches per year on the eastern side of the study area. Snowfall in the forest is normally light to moderate, both in amount and duration. There is no residual snowpack (DSL and ODF 2011:2-19).

The topography of the study area is generally rugged and highly dissected with steep, narrow canyons, although the southeast part of the forest is less steep. Across the forest, slopes face in all directions, with no predominant aspect. Elevations range from near sea level to 2,100 feet above sea

[2] This analysis does not consider deep-seated landslides. Some forest management activities can affect deep-seated landslides, in particular those that make large-scale modifications to topography, including quarrying, aggregate stockpiling, placement of large fill, and construction of large road cuts, especially at the base along the toe of the landslide. However, shallow-rapid landslides and associated debris torrents are the predominant ground failure characteristics that shape the landscape.

level. The major rivers and streams are in narrow valleys, bordered by steep side slopes. The gradients on the side slopes commonly exceed 65%. The valley bottoms were formed by alluvial deposits and are gently sloping. Steep colluvial basins are common. The colluvial materials include soil and debris that have been moved downslope by gravity and biological activity (DSL and ODF 2011:2-43 to 2-44).

The soils in the study area are composed of several different types: approximately 83% of the forest soils are residual soils, approximately 16% are alluvial soils found in valley bottoms, and the remaining 1% includes agricultural land, rock outcroppings, lakes, ponds, and rivers (DSL and ODF 2011). On steeper slopes, away from channels and colluvial basins, soil depth typically varies from 1 to 3 feet. These soils tend to be gravel and sand dominated, contain less silt and clay-sized particles than other locations, and are usually well drained (DSL and ODF 2011:2-45).

Projected Harvest Acreage

The likelihood of shallow-rapid landslide increases with increased disturbance of forest floors, including harvest (Benda and Miller in prep.:5; Cover et al. 2010:1596). Clearcut harvest has a greater likelihood of triggering landslide than thinning harvest, but because both involve destabilizing events, both have potential to trigger landslides, depending on the extent of thinning (Burton et al. 2016:247) and location of the harvest activity. Table 3.1-1 in Section 3.1, *Introduction*, shows the modeled harvest acreages by alternative.

Study Area Susceptibility to Landslide

The Oregon Department of Geology and Mineral Industries has mapped landslide areas in Oregon with the Statewide Landslide Information Database for Oregon (Oregon Department of Geology and Mineral Industries 2021a). Table 3 shows the acreage within and percentage of the study area that has low, moderate, high, and very high susceptibility to landslides. As shown in Table 3, 91% of the study area has high or very high susceptibility to landslides.

Table 3. Susceptibility of the Study Area to Landslides (acres and percent)

	Low		Moderate		High		Very High	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Study area	89	<1	6,777	8	75,179	91	463	<1

Source: Oregon Department of Geology and Mineral Industries 2021a.

Roads

As described in HCP Chapter 5, *Conservation Strategy*, construction, maintenance, and use of forest roads are an integral part of actively managing state forest lands. Roads provide essential access for forest management activities, fire protection, a variety of recreational uses, and research. At the same time, roads can be a major source of disturbance, increasing the likelihood of landslides, erosion, and scouring and sedimentation in streams (Cristan et al. 2016:133; Guthrie 2001:273; Nunamaker et al. 2017:1; Benda and Miller in prep.:17). Road location mid-slope on steep slopes is a factor in increasing frequency of landslide (Sessions et al. 1987). Proper road system planning, design, construction, and maintenance can prevent or minimize these impacts.

Many existing road miles in the study area are on ridge tops, which are generally stable (Table 2). However, a substantial proportion of road miles are more than 20 feet from a ridgeline, in an area where road management has greater potential to increase the likelihood of a landslide. Table 4 shows the road miles in the study area and their location with respect to slope in the following categories: ridge (on or within 20 feet of a ridgeline); steep slope (over 65% slopes and over 20 feet from the ridgeline); and moderate slopes (under 65%) or flat areas.

Table 4. Roads on Steep Slopes in the Study Area (miles and percentage)

Road Location	Miles	Percent (%)
Ridge [a]	204	41
Steep slope [b]	236	47
Moderate slopes or flat areas [c]	57	12
Total	**497**	**100**

Sources: USGS 2013, Oregon Department of Geology and Minerals 2021b, ODF 2015.
[a] On or within 20 feet of a ridgeline.
[b] Over 65% slope up to 20 feet or less from a ridgeline.
[c] Slopes under 65%.

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Appendix 3.3
Water Resources Technical Supplement

Affected Environment

Surface Water

Peak Flows

The main drivers of peak flow rates in the study area are summarized in Table 1 and are based on a U.S. Geological Survey (USGS) statistical analysis of 15 watershed characteristics and 376 stream gages in western Oregon. Soil permeability and soil capacity play a significant role in governing peak flows in the Coastal Range. Soil capacity is the maximum volume of water a soil can hold; it is the product of its porosity and its depth. Soil permeability is the rate at which water can infiltrate the soil.

Table 1. Peak Flow Drivers by Hydrologic Zone

Hydrologic Zone	Factors Driving Peak Flows	Factors Sensitive to Climate Change
Zone 1: Coastal Range watersheds	• Drainage area • 24-hour, 2-year precipitation intensity • Soil permeability • Soil storage capacity • Mean maximum January temperature	• 24-hour, 2-year precipitation intensity • Mean maximum January temperature

Source: Cooper 2005:35

Based on Cooper's results, annual peak flows may increase in the study area under climate change as 24-hour and 2-year precipitation intensity increases. Under climate change, precipitation intensity is expected to increase in western Oregon and extreme precipitation intensity events are expected to increase in frequency. By 2070, precipitation events that had a 20% annual exceedance probability up to 2011, may shift to the 50% return interval (Easterling et al. 2017:219). In other words, the 5-year event may become the 2-year event. The change in number of days below freezing is projected to decrease in all areas of western Oregon by 2050. Higher elevations are projected to lose 50 to 70 days of freezing temperatures (Vose et al. 2017:199).

The Natural Resources Conservation Service (NRCS) Curve Number method for estimating peak flow changes for smaller drainages depends on the amount of precipitation, degree of vegetative cover, and soil infiltration rate (NRCS 1986). Higher vegetative cover is inversely related to runoff according to this method. NRCS categorizes soil infiltration into hydrologic groups from high infiltration (A) to low infiltration (D). Percentages of the study area by hydrologic soil group and subwatershed are summarized in Table 2. Subwatersheds with higher proportions of lower infiltration soils are more susceptible to changes in peak flows. For example, Hayes Inlet has 90% Type D hydrologic soil, indicating high susceptibility to changes in peak flows due to reduction in vegetation cover. Rainfall intensity, runoff from snowmelt, or rain on frozen ground are not estimated using the NRCS Curve Number method.

Table 2. Percent of Study Area by Hydrologic Soil Group and Subwatershed

Subwatershed	A	A/D	B	C	C/D	D	No Data
Coos Bay	0	0	57	0	0	43	0
Dean Creek-Umpqua River	0	0	10	8	0	71	10
East Fork Millicoma River	0	0	61	0	0	39	0
Glenn Creek	0	0	62	16	0	22	0
Haynes Inlet	0	0	6	3	0	90	0
Little Mill Creek-Umpqua River	0	0	0	10	0	54	37
Loon Lake-Mill Creek	0	0	17	20	0	26	37
Lower Camp Creek	0	0	0	60	0	14	26
Lower Lake Creek	0	0	31	65	0	4	0
North Tenmile Lake	0	1	15	4	0	81	0
Scholfield Creek	4	0	11	61	0	25	0
Tenmile Lake-Tenmile Creek	0	0	21	0	0	79	0
West Fork Millicoma River	0	0	53	3	0	43	1

Source: NRCS 2019

The Grant et al. (2008) method for detecting change in peak flows from forest management activities includes an assessment of drainage efficiency. Higher stream and road density, along with shallower depth to bedrock and steeper slopes, and lower permeability bedrock, indicate increasing drainage efficiency. The more efficiently a watershed drains, the faster streamflow reaches peak flow and the larger those peak flows are. Watersheds with higher drainage efficiency are more susceptible to increases in peak flows caused by changes in vegetation cover and increases in soil compaction. Table 3 summarizes the average stream and road density, slope, depth to bedrock, and subwatershed area in the study area.

Table 3. Physiographic Characteristics of the Permit Area

Subwatershed	Stream Density (miles per acre)	Road Density (percent of subwatershed) [a]	Number of Water Crossings	Mean Slope (%)	Mean Depth to Bedrock (inches)	Drainage Area (sq km)
Coos Bay	0.0001	3.9	10	24	23	0.72
Dean Creek-Umpqua River	0.0086	1.9	177	27	20	49.34
East Fork Millicoma River	0.0002	4.6	19	17	21	0.74
Glenn Creek	0.0069	6.0	403	18	26	11.88
Haynes Inlet	0.0052	1.7	47	24	27	21.38
Little Mill Creek-Umpqua River	0.0002	1.6	0	29	7	0.92
Loon Lake-Mill Creek	0.0193	3.2	478	25	22	27.85
Lower Camp Creek	0.0001	6.0	6	21	9	0.16
Lower Lake Creek	0.0014	5.3	183	18	37	7.48
North Tenmile Lake	0.0107	2.3	156	25	28	30.17

Subwatershed	Stream Density (miles per acre)	Road Density (percent of subwatershed) [a]	Number of Water Crossings	Mean Slope (%)	Mean Depth to Bedrock (inches)	Drainage Area (sq km)
Scholfield Creek	0.0089	2.4	59	25	33	19.30
Tenmile Lake-Tenmile Creek	0.0117	2.4	238	26	25	50.45
West Fork Millicoma River	0.0192	3.4	1,482	22	26	113.65

[a] Assumed average disturbed road width of 40 feet.
Sources: ODF 2015; USGS 2018; NRCS 2019; OSU 2020

Surface Water Quality

Table 4 summarizes the extent of the impaired waters in the study area by subwatershed.

Table 4. Miles of Impaired Rivers/Coastlines, Streams, and Acres of Impaired Waterbodies in the Study Area

Subwatershed	Rivers/Coastline (miles)	Streams (miles)	Waterbodies (acres)
Coos Bay	1	8	10,010
Dean Creek-Umpqua River	15	3.2	1,253
East Fork Millicoma River	Not listed	Not listed	13
Glenn Creek	Not listed	Not listed	Not listed
Haynes Inlet	4	13	2,632
Little Mill Creek-Umpqua River	11	4	Not listed
Loon Lake-Mill Creek	0.01	Not listed	Not listed
Lower Camp Creek	15	Not listed	Not listed
Lower Lake Creek	24	Not listed	Not listed
North Tenmile Lake	6	10	827
Scholfield Creek	4	3	776
Tenmile Lake-Tenmile Creek	6	16	1,147
West Fork Millicoma River	31	21	8

Source: ODEQ 2022

Tables 5 through 8 summarize the impairment causes and impaired uses in the study area by subwatershed. All impaired waterbodies in the study area are outside of the permit area. In most cases, they are downstream of the permit area, except for Pony Creek, Upper Pony Creek Reservoir, and Lake Merritt, which flow into Coos Bay from the south and would, therefore, be unaffected by the proposed action and alternatives.

Table 5. Impairment Causes for Streams and Rivers[a] in the Study Area by Subwatershed

Subwatershed	River Impairment Cause	Miles
Coos Bay	Shellfish toxins	0.3
	Fecal coliform	0.7
	Temperature–year-round	8.3
Dean Creek-Umpqua River	Dissolved oxygen—spawn	3.7
	Temperature–year-round	2.7
	Methylmercury–human health toxics; harmful algal blooms; flow modification; fecal coliform; temperature–year-round	6.4
	BioCriteria	5.1
Haynes Inlet	Fecal coliform; temperature–year-round	4.1
	Temperature–year-round	12.7
Little Mill Creek-Umpqua River	Temperature–year-round	0.01
	Methylmercury–human health toxics; harmful algal blooms; flow modification; fecal coliform; temperature–year-round	11.3
	BioCriteria	4.4
Loon Lake-Mill Creek	Temperature–year-round	0.00
	Temperature–year-round; BioCriteria	0.01
Lower Camp Creek	Temperature–year-round	0.7
	Temperature–year-round; BioCriteria	14.2
Lower Lake Creek	Temperature–year-round	24.0
North Tenmile Lake	Temperature–year-round; dissolved oxygen–spawning; dissolved oxygen–year-round; sedimentation	6.1
	BioCriteria; dissolved oxygen–spawning; dissolved oxygen–year-round; pH; temperature–year-round	4.0
	Dissolved oxygen–spawning; dissolved oxygen–year-round; pH; sedimentation	4.7
	Dissolved oxygen–year-round	0.8
Scholfield Creek	Sedimentation	3.6
	BioCriteria	3.0
Tenmile Lake-Tenmile Creek	Temperature–year-round; dissolved oxygen–spawning; dissolved oxygen–year-round; sedimentation	5.0
	BioCriteria; dissolved oxygen–year-round; pH; sedimentation	3.7
	Dissolved oxygen–spawning; dissolved oxygen–year-round; sedimentation	8.3
	pH; dissolved oxygen–year-round	3.7
	Dissolved oxygen–year-round	0.5
West Fork Millicoma River	Temperature–year-round	42.6
	Iron (total)- Aquatic Life	9.1

[a] The Oregon Department of Environmental Quality defines *streams* as fourth-order streams or lower and *rivers* as fifth-order streams and higher. The uppermost channel in a drainage network, with no upstream tributaries, is a first-order stream. Second-order streams are formed below the confluence of two first-order streams, and so on. A second-order stream conjoining a first-order stream is still a second-order stream, and so on.

Table 6. Impairment Causes for Waterbodies in the Study Area by Subwatershed and Waterbody

Subwatershed	Waterbody	Impairment Cause	Acres
Coos Bay	Coos Bay	E. coli, Fecal Coliform, Dissolved Oxygen- year_round, Temperature- year_round, Arsenic, Inorganic- Human Health Toxics	8,944
		E. coli, Fecal Coliform, Temperature- year_round	333
		Fecal Coliform	135
		Fecal Coliform, Temperature- year_round	434
	Lake Merritt[a]	Fecal Coliform, Temperature- year_round	27
	Pony Creek[a]	Fecal Coliform, Temperature- year_round	26
	Upper Pony Creek Reservoir[a]	Fecal Coliform	111
Dean Creek-Umpqua River	Umpqua River	Fecal Coliform	1,484
		Fecal Coliform, Temperature- year_round	1253
East Fork Millicoma River	Coos Bay	Fecal Coliform, Temperature- year_round	13
Haynes Inlet	Coos Bay	E. coli, Fecal Coliform, Dissolved Oxygen- year_round, Temperature- year_round, Arsenic, Inorganic- Human Health Toxics	1,424
		E. coli, Fecal Coliform, Temperature- year_round	366
		Fecal Coliform	424
		Fecal Coliform, Temperature- year_round	418
North Tenmile Lake	North Tenmile Lake	Chlorophyll-a, Dissolved Oxygen- year_round, Methylmercury- Human Health Toxics, Harmful Algal Blooms, Aquatic Weeds, Sedimentation	827
Scholfield Creek	Umpqua River	Fecal Coliform, Manganese- Human Health Toxics	774
		Fecal Coliform, Temperature- year_round	2
Tenmile Lake-Tenmile Creek	North Tenmile Lake	Chlorophyll-a, Dissolved Oxygen- year_round, Methylmercury- Human Health Toxics, Harmful Algal Blooms, Aquatic Weeds, Sedimentation	2
	Tenmile Creek	Chlorophyll-a, Dissolved Oxygen- year_round, Dissolved Oxygen- spawn	7
	Tenmile Lake	Chlorophyll-a, Dissolved Oxygen- year_round, Dissolved Oxygen- spawn, Methylmercury- Human Health Toxics, Harmful Algal Blooms	1,138
West Fork Millicoma River	Coos Bay	Fecal Coliform, Temperature- year_round	8

Source: ODEQ 2022

[a] Pony Creek, Upper Pony Creek Reservoir, and Lake Merritt are neither inside the permit area nor downstream; they contribute to Coos Bay from the south.

Table 7. Impaired Uses for Rivers in the Study Area by Subwatershed

Coos Bay	Miles
Fishing	18.1
Water Contact Recreation	0.7
Dean Creek-Umpqua River	
Fish and Aquatic Life	4.6
Fishing; Private Domestic Water Supply; Public Domestic Water Supply; Water Contact Recreation; Livestock Watering; Fish and Aquatic Life	31.3
Haynes Inlet	
Water Contact Recreation; Fish and Aquatic Life	7.2
Little Mill Creek-Umpqua River	
Fish and Aquatic Life	4.7
Fishing; Private Domestic Water Supply; Public Domestic Water Supply; Water Contact Recreation; Livestock Watering; Fish and Aquatic Life	31.3
Loon Lake-Mill Creek	
Fish and Aquatic Life	37.7
Lower Camp Creek	
Fish and Aquatic Life	16.9
Lower Lake Creek	
Fish and Aquatic Life	46.7
North Tenmile Lake	
Fish and Aquatic Life	12.1
Scholfield Creek	**3.6**
Fish and Aquatic Life	3.6
Tenmile Lake-Tenmile Creek	
Fish and Aquatic Life	11.4
West Fork Millicoma River	
Fish and Aquatic Life	60.9

Source: ODEQ 2020

Table 8. Impaired Uses for Waterbodies in the Study Area by Subwatershed

Subwatershed	Waterbody Impaired Use	Acres
Coos Bay	Fish and Aquatic Life; Fishing	433.5
	Fish and Aquatic Life; Water Contact Recreation; Fishing	8,944.3
	Fishing	134.8
	Water Contact Recreation	111.2
	Water Contact Recreation; Fish and Aquatic Life	53.6
	Water Contact Recreation; Fishing; Fish and Aquatic Life	332.8
Dean Creek-Umpqua River	Fish and Aquatic Life; Fishing	1,253.3
	Fishing	1,484.4
East Fork Millicoma River	Fish and Aquatic Life; Fishing	12.9
Haynes Inlet	Fish and Aquatic Life; Water Contact Recreation; Fishing	1,423.8
	Fishing	424.2
	Fishing; Fish and Aquatic Life	418.1
	Water Contact Recreation; Fishing; Fish and Aquatic Life	365.8
North Tenmile Lake	Fish and Aquatic Life; Aesthetic Quality; Fishing; Private Domestic Water Supply; Public Domestic Water Supply; Boating	827.3
Scholfield Creek	Fish and Aquatic Life; Fishing	1.5
	Fishing	774.4
Tenmile Lake-Tenmile Creek	Aesthetic Quality; Fish and Aquatic Life	7.0
	Fish and Aquatic Life; Aesthetic Quality; Fishing; Private Domestic Water Supply; Public Domestic Water Supply; Boating	1.9
	Fish and Aquatic Life; Aesthetic Quality; Fishing; Private Domestic Water Supply; Public Domestic Water Supply; Water Contact Recreation; Livestock Watering	1,138.5
West Fork Millicoma River	Fish and Aquatic Life; Fishing	7.9

Roads are a major contributor of sediment in timberlands, which adversely affects water quality. Roads also represent a permanent loss of riparian shade and changes groundwater recharge and flow paths, which increases stream temperature. Table 9 summarizes the number of road miles within 50 feet and 150 feet of water.

Table 9. Miles of Road near Streams[1] in the Permit Area

HUC12 Name	Miles of Road within 50 feet of Water	Miles of Road within 150 feet of Water
Little Mill Creek-Umpqua River	0.0	0.0
Lower Lake Creek	5.5	12.3
Lower Camp Creek	0.3	0.4
Loon Lake-Mill Creek	15.4	30.9
Dean Creek-Umpqua River	5.8	16.2

[1] Based on OSU stream network, which includes 0 order streams

HUC12 Name	Miles of Road within 50 feet of Water	Miles of Road within 150 feet of Water
Scholfield Creek	1.9	8.5
Glenn Creek	11.7	25.8
East Fork Millicoma River	0.5	1.1
West Fork Millicoma River	46.8	113.6
Haynes Inlet	1.7	7.6
Coos Bay	0.3	0.7
North Tenmile Lake	4.8	15.6
Tenmile Lake-Tenmile Creek	7.1	25.5
Total	**101.8**	**258.3**

Source: ODF 2015; Carlson and Miller 2021

Surface Water Supply

Because most precipitation falls in the winter months, which are outside of the growing season, surface water rights are fully allocated in late summer in almost all study area watersheds, whereas very small areas have fully allocated water rights during winter months (OWRD 2017). Coos and Douglas Counties are projected to experience near zero changes in agricultural and municipal water demand by 2050 (OWRD 2017).

Groundwater

Aquifers and Recharge Areas

Table 10 shows the recharge potential associated with the rock type and aquifer underlying the permit area. Table 11 describes the typical depth to water, well yield, and principal water use of principal aquifers by county. Table 11 summarizes the acres of groundwater drinking water source areas in the study area.

Table 10. Aquifer Names and Rock Types in the Study Area

Aquifer Name (USGS 2000)	Rock Types (USGS 1994)	Percentage of Permit Area	Recharge Potential
Other rocks	Pre-Miocene rocks	100	Low

Source: USGS 1994, 2000

Table 11. Types of Aquifers Used for Water Supply and Types of Human Water Uses

Permit Area Counties	Principal Aquifer [a]	Typical Well Depth (feet below land surface)	Depth to Water (feet below land surface)	Range of Well Yields (gallons per minute)	Principal Water Use [b]
Curry	Ud	20–150	10–110	50–250	DC, A
Douglas	Ud, pM	80–120	<10–25	50–250	PS, DC, A, I

Source: USGS 1994

[a] Aquifer: Ud, unconsolidated deposits; pM, pre-Miocene rocks

[b] Water use: A, agricultural; I, industrial; DC, domestic and commercial; PS, public supply

Low groundwater–surface water interaction can exacerbate the effects of precipitation events and seasonal change, making streams more susceptible to higher peak flows and lower low flows (Moore and Wondzell 2005). Higher runoff and higher flow path diversion from road construction can adversely affect groundwater recharge to drinking water source areas.

Table 12. Acres of Groundwater Drinking Source Area in the Study Area

HUC 12 Subwatershed	Groundwater Drinking Water Source Area
Little Mill Creek-Umpqua River	36
Loon Lake-Mill Creek	252
Dean Creek-Umpqua River	126
West Fork Millicoma River	8
Haynes Inlet	207
Coos Bay	683

Regulations

ODEQ implements the CWA by designating basin-specific criteria, including beneficial uses by basin and detailed beneficial fish usages (OAR 340-041-0101 through OAR 340-041-0101), and setting corresponding biologically based water quality criteria for those uses applicable to all basins. For stream temperature specifically, streams with temperatures colder than the criteria for their designated uses (340-041-0028 (4)) are protected under rules protecting cold water (OAR 340-041-0028 (11)). This rule limits stream temperature increase to 0.3°C where salmon, steelhead or bull trout are present, unless the activity qualifies for an exception under the rule (OAR 340-041-0028 (11)(c)):

> The cold water protection narrative criteria in subsection (a) do not apply if:
>
> > (A) There are no threatened or endangered salmonids currently inhabiting the water body;
> >
> > (B) The water body has not been designated as critical habitat; and
> >
> > (C) The colder water is not necessary to ensure that downstream temperatures achieve and maintain compliance with the applicable temperature criteria.

Stream temperatures that exceed temperature criteria due to maximum air temperatures or low flows are not considered violations (OAR 340-041-0028 (12)).

For streams listed as impaired, the ODEQ develops total maximum daily loads (TMDLs), which further specify and limit pollutant load allocations. The Umpqua Basin Temperature TMDL allows a cumulative 0.1°C increase at the points of maximum impact for all perennial and fish-bearing streams in the Umpqua Basin that are not otherwise simulated in the TMDL (ODEQ 2006). The Tenmile Lakes Watershed Water Quality Management Plan (ODEQ 2007) sets a 50% reduction in annual sediment load target relative to reference streams, within 25 years of the TMDL's publication in 2007.

The OAR also protects against degradation by the Antidegradation Rule (OAR 340-041-0004), which follows OAR 340-041-0028 (11) and (12) for temperature and sets out additional exceptions. For example, riparian restoration activities intended to restore geomorphology or riparian vegetation are exempt from antidegradation review so long as ODEQ determines that there is a net ecological benefit to the restoration activity.

The Addendum to Antidegradation IMD Clarifying Procedures When Allowing a Lowering of Water Quality (ODEQ 2018) refers to the Oregon Forest Practices Act (OAR 629-635-0000 through 629-660-0060) for forestry operations, which include standards and best management practices on vegetation and ground disturbance during harvesting. Standards are quantitative, such as diameter at breast height for trees to retain, number of trees to retain per 1,000 linear feet, and distances from streams where activity is allowed. Best management practices are management approaches such as where to avoid ground-based harvesting.

Analysis Methods

The following information supports the water resource effects analysis.

Forest Stand Age Projections

Table 13 presents the percent area of each subwatershed covered by each treatment allocation. Tables 14 through 16 present analysis results of subwatershed equivalent clearcut area over time, represented by trees aged 0 to 15 years old, which are used to analyze the effects of timber treatment allocations on water yield and peak flows. Table 14 shows the maximum percent area of each subwatershed covered by approximate average tree age less than 15 years old, based on 10-year intervals. This age class corresponds to elevated average annual water yield and increased peak flows for subwatersheds with over 20% (Stednick and Troendle 2016) and 45% (Grant et al. 2008) in the age class, respectively. Stands with an average age of 65 years old or greater were considered 100% harvested in clearcut treatments and 50% harvested in variable density harvest treatments. Stands with an average age less than 60 years old in 2020 were considered 25% harvested in restoration thinning treatments. The area harvested under restoration thinning was assumed to remain age 0 throughout the permit term, because the purpose of restoration thinning is to reduce stand density.

Approximately 5 to 15 years after harvest, summer low flow levels drop below the low flow levels in old growth stands, where trees are greater than 100 years old (Perry and Jones 2017; Gronsdahl et al. 2019; Moore et al. 2004; Moore et al. 2020; Segura et al. 2020). Thus, for a low-flow analysis, the percent area of the subwatershed where stands over 100 years old on average would be harvested are summarized (Table 15). These areas are expected to experience a low-flow deficit of 5 to 15 years after harvest through the end of the permit term. Table 16 subtracts the percent area of the subwatersheds old growth harvest from the percent area converted to old growth and restored by thinning. This difference indicates where fewer young trees and more old growth trees may offset summer low-flow deficits caused by vigorously growing trees aged 15 up to potentially 100 years old.

Table 13. Approximate Percent Area of Subwatersheds by Harvest Allocation

Subwatershed Name	Alternative	No Harvest	Restoration Thinning	Variable Density Harvest	Clearcut Harvest	Total[a]
Coos Bay	No Action	0.3	0.0	0.0	0.1	0.5
	Proposed Action	0.0	0.0	0.1	0.4	0.5
	Alternative 3	0.1	0.0	0.0	0.3	0.5
	Alternative 4	0.0	0.0	0.1	0.4	0.5
Dean Creek-Umpqua River	No Action	22.6	0.4	0.0	10.5	33.5
	Proposed Action	21.7	9.7	1.3	0.7	33.5
	Alternative 3	24.9	7.5	0.6	0.6	33.5
	Alternative 4	16.7	3.5	5.5	7.8	33.5
East Fork Millicoma River	No Action	0.7	0.0	0.0	0.0	0.7
	Proposed Action	0.3	0.0	0.0	0.3	0.7
	Alternative 3	0.3	0.1	0.0	0.2	0.7
	Alternative 4	0.2	0.1	0.0	0.3	0.7
Glenn Creek	No Action	7.7	1.4	0.6	16.2	26.0
	Proposed Action	3.7	3.1	14.3	4.9	26.0
	Alternative 3	5.7	4.4	11.7	4.1	26.0
	Alternative 4	2.9	2.6	14.7	5.9	26.0
Haynes Inlet	No Action	12.5	0.4	0.8	6.3	20.0
	Proposed Action	10.5	0.7	3.5	5.1	20.0
	Alternative 3	12.9	1.5	1.9	3.8	20.0
	Alternative 4	7.2	2.2	5.4	5.2	20.0
Little Mill Creek-Umpqua River	No Action	0.6	0.0	0.1	0.1	0.8
	Proposed Action	0.5	0.0	0.0	0.4	0.8
	Alternative 3	0.5	0.0	0.0	0.3	0.8
	Alternative 4	0.4	0.0	0.0	0.4	0.8
Loon Lake-Mill Creek	No Action	43.4	0.9	3.5	21.9	69.8
	Proposed Action	31.6	5.1	14.3	18.8	69.8
	Alternative 3	40.6	10.9	6.3	12.0	69.8
	Alternative 4	22.0	7.7	19.1	21.0	69.9
Lower Camp Creek	No Action	0.1	0.0	0.1	0.1	0.3
	Proposed Action	0.0	0.0	0.0	0.3	0.3
	Alternative 3	0.0	0.2	0.0	0.1	0.3
	Alternative 4	0.0	0.0	0.0	0.3	0.3
Lower Lake Creek	No Action	0.3	0.1	0.0	5.3	5.7
	Proposed Action	0.3	0.3	3.7	1.5	5.7
	Alternative 3	0.8	0.6	3.0	1.3	5.7
	Alternative 4	0.0	0.4	3.8	1.5	5.7

Subwatershed Name	Alternative	No Harvest	Restoration Thinning	Variable Density Harvest	Clearcut Harvest	Total[a]
North Tenmile Lake	No Action	24.0	1.2	2.1	12.7	39.9
	Proposed Action	25.3	14.2	0.0	0.0	39.9
	Alternative 3	28.6	11.3	0.0	0.0	39.9
	Alternative 4	18.6	4.8	4.8	11.7	39.9
Scholfield Creek	No Action	20.1	1.1	2.6	9.8	33.6
	Proposed Action	15.5	18.1	0.0	0.0	33.6
	Alternative 3	19.4	14.2	0.0	0.0	33.6
	Alternative 4	14.0	3.8	1.8	14.1	33.6
Tenmile Lake-Tenmile Creek	No Action	30.1	1.1	0.0	15.3	46.6
	Proposed Action	28.0	14.3	2.5	1.6	46.6
	Alternative 3	32.5	11.3	1.5	1.3	46.6
	Alternative 4	22.3	5.3	7.1	11.9	46.6
West Fork Millicoma River	No Action	41.9	2.9	3.7	31.8	80.3
	Proposed Action	24.3	9.3	20.5	26.1	80.3
	Alternative 3	36.1	15.0	10.5	18.7	80.3
	Alternative 4	14.6	10.6	24.9	30.3	80.4

[a] Constituents may not sum to total exactly due to rounding errors.

Table 14. Approximate Maximum Percent Area Where Average Tree Age Would Be Less than 15 Years Old Resulting in Temporary Increase in Flows

HUC 12	No Action	Proposed Action	Alt 3	Alt 4
Little Mill Creek-Umpqua River	0.18	0.36	0.29	0.38
Lower Lake Creek	3.51	2.44	2.07	2.56
Lower Camp Creek	0.16	0.26	0.09	0.26
Loon Lake-Mill Creek	10.14	12.57	8.16	21.74
Dean Creek-Umpqua River	5.42	3.15	1.10	10.20
Scholfield Creek	8.77	4.52	0.71	14.65
Glenn Creek	8.81	7.87	7.09	8.26
East Fork Millicoma River	0.00	0.26	0.17	0.27
West Fork Millicoma River	13.69	17.32	11.78	24.81
Haynes Inlet	3.96	4.49	3.70	5.81
Coos Bay	0.11	0.26	0.25	0.26
North Tenmile Lake	9.18	3.56	0.58	16.67
Tenmile Lake-Tenmile Creek	9.41	5.35	1.89	13.59

Table 15. Percent Area to Be Harvested Where Initial Stand Age Is Over 100 Years Old on Average Resulting in Low Flow Deficits[2] after 15 Years through End of Analysis Period

HUC 12	No Action	Proposed Action	Alt 3	Alt 4
Little Mill Creek-Umpqua River	0.01	0.01	0.00	0.02
Lower Lake Creek	0.35	0.25	0.19	0.26
Lower Camp Creek	0.00	0.00	0.00	0.01
Loon Lake-Mill Creek	3.84	2.49	0.19	5.10
Dean Creek-Umpqua River	3.13	0.28	0.00	2.13
Scholfield Creek	0.87	0.00	0.00	0.6
Glenn Creek	0.34	0.08	0.00	0.25
East Fork Millicoma River	0.00	0.00	0.00	0.00
West Fork Millicoma River	5.11	3.08	0.05	5.07
Haynes Inlet	1.13	0.56	0.01	1.15
Coos Bay	0.00	0.00	0.00	0.00
North Tenmile Lake	3.47	0.01	0.00	1.89
Tenmile Lake-Tenmile Creek	3.52	0.39	0.00	2.24

Table 16. Difference Between Area Converted from Plantation to Old Growth, Area Harvested Using Restoration Thinning, and Area Harvested from Old Growth Indicating Balance of Impact on Low Flows at End of the Permit Term[a]

HUC 12	No Action	Proposed Action	Alt 3	Alt 4
Little Mill Creek-Umpqua River	0.05	-0.01	0.05	-0.01
Lower Lake Creek	-0.24	1.63	1.72	1.67
Lower Camp Creek	0.07	0.00	0.16	-0.01
Loon Lake-Mill Creek	-1.89	3.43	12.00	-0.01
Dean Creek-Umpqua River	-2.80	2.51	7.56	-1.35
Scholfield Creek	1.19	4.52	14.00	-0.12
Glenn Creek	1.14	7.75	9.81	7.06
East Fork Millicoma River	0.00	0.00	0.03	0.02
West Fork Millicoma River	-2.01	6.49	16.45	2.94
Haynes Inlet	-0.60	0.84	2.13	0.54
Coos Bay	0.00	0.03	0.03	0.03
North Tenmile Lake	-2.23	3.55	11.15	-1.17
Tenmile Lake-Tenmile Creek	-2.76	4.04	12.02	-0.68

[a] Positive numbers indicate an increase in low flows. Negative numbers indicate a decrease in low flows.

[2] Level of detection of change in low flow at the subwatershed scale is 25% (Coble et al 2020).

Positive numbers in Table 16 indicate that the area of stands left to grow old is greater than the area where old stands were harvested and where regenerated stands are vigorously growing. This means that the deficit in low flows caused by the harvesting of old growth would be offset by the conversion of younger trees to very young trees. The scientific literature is unclear regarding what percent of the watershed must be converted from old trees to detect an effect on low flows at the subwatershed scale.

Surface Water

The following sections provide details of effect mechanisms and the magnitude and duration estimates.

Water Supply

This section provides additional details on changes described in the EIS section. In rain-dominated drainages, increases in water yield have ranged from 2 to 6 millimeters (mm) per percentage of basin harvested (Moore and Wondzell 2005; Brown et al. 2005). Increases in annual water yield can diminish rapidly in the first 3 to 10 years after forest cover regrows (Moore and Wondzell 2005), but smaller effects can persist from 10 to 30 years in rain-dominated drainages (Moore and Wondzell 2005). Estimates made in the EIS section were based on a 6-mm increase per percentage change in average age class.

The magnitude of change in water yield and the duration of the change depends on the aspect of the catchment (Brown et al. 2005; Goeking and Tarboton 2020), degree of soil compaction (Brown et al. 2005), characteristics of post-disturbance vegetation regrowth (Brown et al. 2005; Goeking and Tarboton 2020), and amount of water coming from fog drip (Moore and Wondzell 2005). Catchments with northern aspects had nearly three times the water yield increase as those with southern aspects (Brown et al. 2005). As the stand regenerates, transpiration may exceed preharvest levels for a period, thereby causing a decrease in water yield relative to the preharvest condition, especially if the recovering vegetation has high leaf area and high transpiration rates (Brown et al. 2005; Goeking and Tarboton 2020). Where fog drip is a significant water input, water yield can decrease in the first years after timber harvest, until the canopy regenerates (Moore and Wondzell 2005). As long as the stand does not undergo a permanent change in vegetation community or significant soil compaction, water yield is expected to return to its preharvest condition over time (Brown et al. 2005).

Soil Moisture

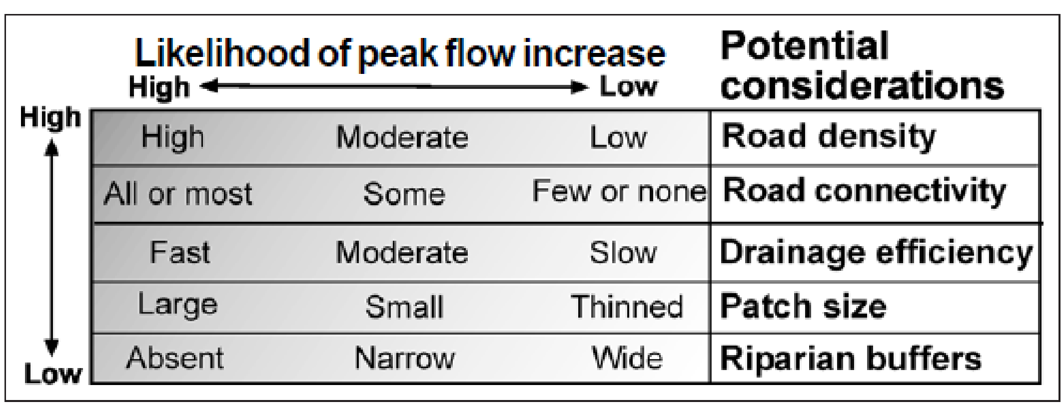
Historically in the United States, increasing water yield has been an objective of forest management. In the face of climate change, many forest managers are attempting to manage forests to increase recovery and resilience to disturbances such as drought, wildfire, and insect- and disease-related die-off. To achieve resilience goals, the objective is to improve soil moisture during the growing season by maximizing snow retention (Goeking and Tarboton 2020). In areas where average winter temperatures are above freezing, moderate thinning may optimize snow retention by providing solar shading while also minimizing longwave radiation (Goeking and Tarboton 2020) and likely increases the volume of snow reaching the ground.

Peak Flows

This section provides additional detail on the thresholds for timber harvest effects on peak flows. Peak flows typically increase as a result of timber harvest and tend to occur earlier in disturbed areas than in nondisturbed areas, although there is some variability in peak flow response depending on severity and extent of disturbance, solar radiation, and post-disturbance vegetation recovery (Goeking and Tarboton 2020). In a set of coastal watersheds in the Pacific Northwest, peak flows increased by 13 to 40% following timber harvest. In most studies of coastal watersheds, the magnitude of changes to peak flow decreases with event magnitude (Moore and Wondzell 2005). This means that the larger the peak flow, the smaller the effect in coastal watersheds. In rain-dominated and transition regions, these effects are only detectable up to the 6-year storm (Grant et al. 2008) and are therefore not a concern for flood flows (Grant et al. 2008; Moore and Wondzell 2005).

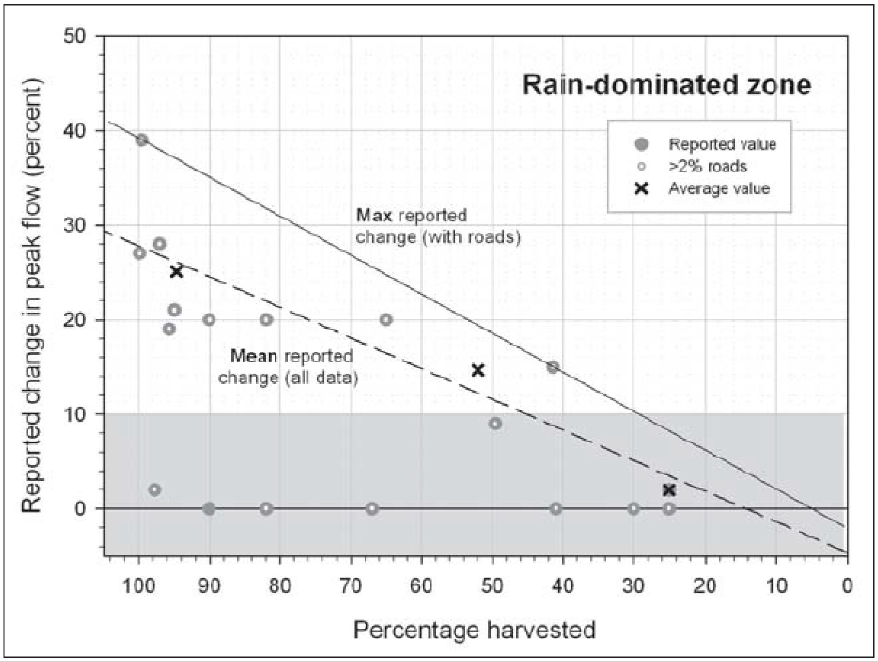
Figures 1 and 2 depict the relationship between watershed conditions, management considerations, and percentage area harvested on peak flow. Figure 1 depicts the relationship between factors other than forest cover removal. Based on these relationships, Dean Creek-Umpqua River, Glenn Creek, Loon Lake-Mill Creek, Lower Camp, North Tenmile, Tenmile Lake-Tenmile Creek, and West Fork Millicoma River subwatersheds may be more susceptible to increases in peak flows due to a combination of high road and stream density, road-stream connectivity, steep slopes, shallow depth to bedrock, and low soil infiltration (Grant et al. 2008).

Figure 1. Conditions Affecting Peak Flow Increase



Source: Grant et al. 2008
Note: Considerations are listed from high to low likelihood of effect.

Figure 2. Peak Flow Response to Harvest in Rain-Dominated Areas



Source: Grant et al. 2008
Note: Gray shading indicates limit of detection.

Low Flows

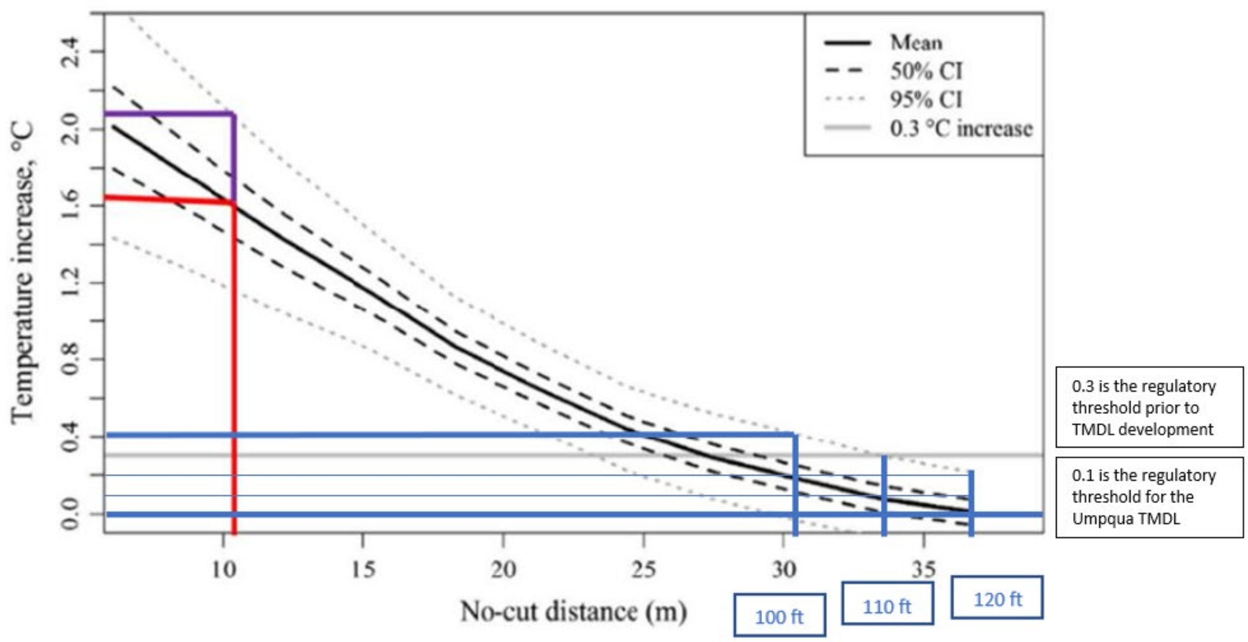
Dry season low flows typically increase as a result of harvest (Goeking and Tarboton 2020; Moore and Wondzell 2005). Multiple studies in western Oregon (Segura et al. 2020; Coble et al. 2020; Perry and Jones 2017) found that summer flows in basins with trees ages 25 to 45 years were 25–50% lower than basins with trees older than 100 years old. In addition to age, density, successional stage, and species composite may also affect low flows, where the older stands were also less dense (Segura et al. 2020). Summer baseflows are more sensitive to increasing transpiration than winter flows in western Oregon because evapotranspiration is highest in summer and precipitation is at its lowest (Brown et al. 2005). Because almost all precipitation occurs during the winter, decreases in summer low flows are a concern for fish habitat, stream temperature, and surface water users who do not have sufficient capacity to store winter flows (Perry and Jones 2017). For larger-scale catchments, approximately 25% of the catchment must be converted to younger, discrete age classes before effects on low flow are observed (Coble et al. 2020).

Based on these studies, the percent area where restoration thinning takes place represented an increase in low flows, by reducing the density and number of younger trees. The percent area where stands younger than 100 years at the start of the permit term were allowed to grow beyond 100 years are also considered to increase low flows. Flows decrease in areas where trees over 100 years are harvested.

Water Quality

The riparian buffer width needed to maintain shading takes place within about 150 to 200 feet for old growth conifers in the Pacific Northwest (Moore et al. 2005). Groom et al. (2011a) reported that 68 to 75% of post-harvest shade in western Oregon streams were accounted for by increased basal area, tree height, and downed large wood within 100 feet of the stream (Groom et al. 2011b). Yonce et al. (2021) found that effects on stream shade approached zero after 177 feet. As shown in Figure 3, Groom (2018) found that buffers had to be at least 110 feet wide to meet the regulatory threshold of 0.3°C for streams that do not have a TMDL, within a 95% confidence interval (Leinenbach 2021) (blue lines are author's emphasis). Although riparian buffers protect water temperature warming from timber harvest, they are unlikely to fully compensate for the additional effects of climate change on water temperature (Yonce et al. 2021).

Figure 3. Stream Temperature Response to Various Slope Distance Riparian Width Conditions Relative to Regulatory Thresholds



Source: Groom 2018 as reproduced in Leinenbach 2021.

Further protecting and restoring diverse tree age class, large wood recruitment, stream enhancement, and restricting soil disturbance in aquatic and riparian areas may mitigate the effects of climate change on surface water temperature (Yonce et al. 2021; Groom et al. 2011b). Large wood mitigates the effect of timber harvest on water temperature by increasing shade and improving hyporheic exchange with groundwater. Large wood also creates pools, which tend to stay cooler, provides additional shading to streams, and aids conifer establishment in the riparian area (Naiman et al. 2002).

Lakel et al. (2010) support the common recommendation for stream management zone widths of 50 feet, in which partial timber harvest may occur. However, they found that sediment trapped within the stream management zone was not significantly different across treatment widths ranging from 25 to 100 feet wide. The Rashin et al. (2006) study suggests that buffers or equipment limitation zones of 30 feet would be sufficient to protect against most sediment delivery. They state that sediment more than 30 feet from the channel is unlikely to be delivered unless it is routed via concentrated drainage, which can be caused by channels, cable-yarding, and skidder trails. A 30-foot buffer is more susceptible to windthrow, and so the long-term effectiveness would be less than a wider buffer.

Environmental Consequences

The following sections provide additional information on effects on water resources from the proposed action and alternatives.

Surface Water

Controlled Burning

Controlled burning can increase stream flows by reducing understory vegetation and slash material. The duration of the effect depends on the age of the vegetation burned. Typically, controlled burning is used to manage younger understory plants, because burning medium-sized trees poses the risk of starting a crown fire, which is difficult to control (Allen et al. 2019). Therefore, the effect may last on the order of 10 years. More importantly, controlled burns may reduce the likelihood of severe fire (Kolden 2019; Prichard et al. 2021), which can replace decades-old stands and cause soil to repel water. This can significantly increase peak flows and sediment delivery to streams and consequently cause changes to channel structure, which can negatively affect habitat, water quality, groundwater recharge, and water supply systems (Moody et al. 2013). Controlled burns also reduce the need to use equipment, which avoids soil compaction and mitigates the effect of runoff. Controlled burns in riparian areas can temporarily increase stream temperature and nutrient concentrations, elevating biological oxygen demand and reducing dissolved oxygen (Ice et al. 2004). Streams already impaired by temperature and dissolved oxygen would be most vulnerable to this effect. The majority of impaired streams in western Oregon are impaired by temperature or dissolved oxygen, and they are widespread.

Groundwater

Controlled Burning

Controlled burns can temporarily increase shallow water tables by removing vegetation and thereby decrease transpiration while maintaining surface roughness and infiltration rates. With their potential to mitigate reasonably foreseeable catastrophic fire (Fernandes 2015; Kolden 2019; Prichard et al. 2021), controlled burns can prevent decreases in soil storage capacity caused by severely burned soils, which repel water (Seibert et al. 2010).

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Appendix 3.4
Vegetation Technical Supplement

This technical supplement discusses forest structure; provides details on special-status plant species documentation, habitat requirements, and likelihood of occurrence; and describes current wetland regulations for forest practices under state and federal law.

Forest Structure

This section describes general forest structure by seral forest stage and old-growth forests based on Carey (2007) unless otherwise noted.

Early-Seral Stage

Early-seral forest stands are young forests, between 0 and 30 years of age, where the overstory has been removed through either harvest or natural disturbance. Early-seral stands have varying biodiversity and structural complexity and generally fall into ecosystem reorganization and competitive exclusion. Ecosystem reorganization occurs following natural disturbance or harvest and, in managed forests, consists of a period of revegetation. Stands in this phase may consist mostly of a few dominant species (e.g., if the stand is managed for harvest) or have a more diverse blend of species (e.g., if a stand is being managed to promote habitat characteristics). Simple early-seral forests have little legacy structure, low tree species diversity, little shrub or herbaceous vegetation, and little downed wood. Complex early-seral forests have greater retention of remnant overstory trees and snags, a regenerating tree cohort with multiple native species at low to moderate density, and moderate to abundant shrub and herbaceous vegetation.

The competitive exclusion phase occurs after ecosystem reorganization and consists of competition between vegetation species for light, water, and nutrients. Stands in this phase have more canopy closure and may lack understory species and shorter trees. Dominant and codominant trees may self-thin, with surviving trees being able to maintain relatively healthy crown ratios.[1] Where self-thinning does not occur, overstory trees may become tall and spindly, with poor crown and height-to-diameter ratios. Complex structure in the competitive exclusion phase is limited due to resource competition. Over time, openings around legacy structures or brushy patches help maintain understory shrubs and herbaceous vegetation. Young tree species with different growth rates and shade tolerance allow canopy diversification, and legacy structures (large trees, snags, and downed wood) contribute to structural complexity.

Mid-Seral Stage

Mid-seral forest stands are generally 30–80 years old, but can be as old as 120 years, depending on disturbance history and stand density. They vary in structural diversity and their development is influenced by small-scale natural disturbance events. Stages in mid-seral stand development include biomass accumulation, understory reinitiation, and understory development.

[1] The *crown ratio* is the percent of total tree height that supports live foliage.

The biomass accumulation phase includes the development of woody biomass within relatively young mid-seral stands. Simple mid-seral stands in the biomass accumulation phase have canopy closure and limited understory vegetation. Complex mid-seral stands have reduced diversity compared to the competitive exclusion stage, but generally maintain dominant tree species diversity, and legacy structures provide openings for understory vegetation.

In the understory initiation and development phases, a mid-seral stand begins to develop understory plant cover. Simple stands in this phase contain an overstory of uniformly spaced codominant trees with little species diversity. Complex stands in understory reinitiation contain overstory canopy heterogeneity, legacy components that contribute to patchiness, species competition in the midstory, and little vertical layering. Simple stands in understory development have more gaps in the canopy and more understory species than simple stands in understory reinitiation. Complex stands in understory developments can have varying degrees of canopy closure and a varied understory. These stands have begun to have vertical canopy layering and structure that supports nesting and roosting.

Late-Seral Stage

In the Pacific Northwest, late-seral Douglas-fir stands are generally between 80 and 200 years of age (Spies and Franklin 1991). Structural characteristics vary among late-seral stands depending on previous management and natural disturbance. Large trees are present, downed wood has begun to accumulate, and a diverse, vertically layered understory has emerged. Stands are more likely to be comprised of a mix of tree species as both shade and shade intolerant tree species are established. Natural tree thinning occurs from competition for nutrients and space or as seedlings are shaded out. Understory reinitiation expands, compared to mid-seral forests, as the overstory ages out, creating gaps in the canopy for regrowth of the understory (Powell 1996). Late-seral Douglas-fir stands are typically less dense with larger-diameter trees at a variety of heights. Large logs are more present as legacy trees or large snags fall to the forest floor (Spies and Franklin 1991). As late-seral stands develop, natural and management-related disturbances create new openings for understory and tree seeding and move large wood from upslope to riparian areas.

Old Growth Forests

In the Pacific Northwest, old growth stands are 200 years or older (Franklin and Spies 1991). Typical characteristics of old growth include moderate to high canopy closure; a patchy, multilayered, multispecies canopy with trees of several age classes, dominated by large overstory trees with a high incidence of large living trees, some with broken tops and other indications of old and decaying wood; numerous large snags; and heavy accumulations of downed wood (Carey 2007; Spies and Franklin 1991). The incidence of complex features such as broken tops or snags with natural cavities are three times more likely to be present in old growth Douglas-fir stands when compared to mature or young seral Douglas-fir stands. In addition, shade-tolerant seedling species are more present in the understory (Spies and Franklin 1991). Coastal Douglas-fir are known to be especially long lived with subclimax stands aged between 350 and 700 years old. If left undisturbed, these stands give way to more shade-tolerant coniferous species such as western hemlock (*Tsuga heterophylla*), western redcedar (*Thuja plicata*), and Pacific silver fir (*Abies amabilis*) over time. However, it could take up to 1,000 years for Douglas-fir stands to be fully replaced (Uchytil 1991).

Seral Forest Stage by Alternative

Table 1 presents changes in extent of seral forest stage under the proposed action and alternatives during the analysis period along with a percent comparison to the no action alternatives.

Table 1. Projected Seral Stages of Forest Stands in the Study Area Over the Analysis Period for the Proposed Action and Alternatives

		Extent of Seral Forest (Analysis period)														
		Year 0			Year 20			Year 40			Year 60			Year 80		
Seral Stage	Alternative	Acres	Percent	Change from No Action	Acres	Percent	Change from No Action	Acres	Percent	Change from No Action	Acres	Percent	Change from No Action	Acres	Percent	Change from No Action
Early-seral	No Action	8,556	10	--	20,225	25	--	17,095	21	--	5,895	7	--	20,023	24	--
	Proposed Action	8,556	10	0	7,511	9	-16	9,212	11	-10	9,585	12	4	9,255	11	-13
	Alternative 3	8,556	10	0	4,568	6	-19	7,019	9	-12	5,915	7	0	6,843	8	-16
	Alternative 4	8,556	10	0	27,620	34	9	5,931	7	-14	28,191	34	27	10,669	13	-11
Mid-seral	No Action	33,660	41	--	26,534	32	--	26,162	32	--	29,526	36	--	12,371	15	--
	Proposed Action	33,660	41	0	35,650	43	11	26,718	32	1	13,445	16	-20	14,690	18	3
	Alternative 3	33,660	41	0	36,940	45	13	26,755	33	1	12,010	15	-21	8,738	11	-4
	Alternative 4	33,660	41	0	18,612	23	-10	35,897	44	12	10,670	13	-23	30,303	37	22
Late-seral	No Action	39,837	48	--	35,034	43	--	36,476	44	--	31,203	38	--	18,142	22	--
	Proposed Action	39,837	48	0	38,608	47	4	43,660	53	9	42,428	52	14	24,625	30	8
	Alternative 3	39,837	48	0	40,264	49	6	45,816	56	11	46,821	57	19	30,513	37	15
	Alternative 4	39,837	48	0	35,623	43	1	37,927	46	2	28,378	34	-4	11,879	14	-8
Old growth	No Action	266	<0.5	--	509	1	--	2,570	3	--	15,679	19	--	31,766	39	--
	Proposed Action	266	<0.5	0	530	1	0	2,709	3	0	16,840	20	1	33,729	41	2
	Alternative 3	266	<0.5	0	530	1	0	2,712	3	0	17,556	21	2	36,208	44	5
	Alternative 4	266	<0.5	0	498	1	0	2,598	3	0	15,113	18	-1	29,502	36	-3

Special-Status Plant and Fungus Species Tables

Table 2 lists the names and federal and state status of special-status plants and fungus in Douglas and Coos Counties and the Coast Region. Table 3 lists these species' habitat, range, and likelihood of occurrence in the study area.

Table 2. Known Occurrences of Threatened, Endangered, and Species of Concern Plants and Fungus in Counties in Douglas and Coos Counties and the Coast Region

Common Name	Scientific Name	Federal Status[a]	State Status[a]	Conservation Status
Pink sand verbena	*Abronia umbellata* var. *breviflora*	SOC	LE	S3
Mountain tall bugbane	*Cimicifuga elata* var. *alpestris*		C	S4
Tall bugbane	*Cimicifuga elata* var. *elata*		C	S3?
Umpqua swertia	*Frasera umpquaensis*		C	S3
Fungus	*Glomus pubescens*			S1
Whorled marsh pennywort	*Hydrocotyle verticillata*			S1
Fungus	*Hydropus marginellus*			S2
California globe-mallow	*Iliamna latibracteata*			S2
Western lily	*Lilium occidentale*	LE	LE	S1
Howell's montia	*Montia howellii*		C	S3
Northern bog clubmoss	*Lycopodiella inundata*			S2
Coast microseris	*Microseris bigelovii*			S2
Indian tobacco	*Nicotiana quadrivalvis*			S1
Adder's-tongue	*Ophioglossum pusillum*			S1
Coffee fern	*Pellaea andromedifolia*			S2
Silvery phacelia	*Phacelia argentea*	SOC	LT	S2
Fungus	*Phaeocollybia lilacifolia*			S1
California sword-fern	*Polystichum californicum*			S2
Water clubrush	*Schoenoplectus subterminalis*			S2
Henderson's sidalcea	*Sidalcea hendersonii*			S1
Coast checker bloom	*Sidalcea malviflora* ssp. *patula*	SOC	C	S1
Leach's brodiaea	*Triteleia hendersonii* var. *leachiae*		C	S3
Humped bladderwort	*Utricularia gibba*			S1
Columbia water-meal	*Wolffia columbiana*		C	S1

Source: Oregon Biodiversity Information Center 2019

[a] LE = Listed as Endangered; LT = Listed as Threatened; SOC = Species of Concern; C= Candidate; S1 = critically imperiled, S2 = imperiled, S3 = rare

Table 3. Elevation, Habitat, and Geographic Range of Listed Threatened, Endangered, and Species of Concern Plants and Fungus Known to Occur or Potentially Occur in Counties in the Study Area

Common Name	Scientific Name	Elevation Range	Habitat	Geographic Range	Occurrence Relative to Plan Area
Pink sand verbena	*Abronia umbellata* var. *breviflora*	Below 328 feet	Occurs along broad beaches or mouths of creeks and rivers along the northern range and fine sand beaches, between high-tide and driftwood wrack lines, within moving sand, along the southern portion.	Vancouver Island to Northern California.	Documented in Coos and Curry Counties. Does not occur in study area based on habitat type.
Mountain tall bugbane	*Cimicifuga elata* var. *alpestris*	1,100 to 5,500 feet	Occurs in high-elevation forest along with true fir species, Douglas-fir, and incense cedar. Is not found with hardwood species.	Jackson and Douglas Counties, Oregon	Documented in Douglas County. Does not occur in study area based on habitat type.
Tall bugbane	*Cimicifuga elata* var. *elata*	100 to 2,250 feet	Occurs in low- to mid-elevation Douglas-fir forests with big leaf maple.	Northern Oregon into British Columbia	Likely to occur. Documented in Douglas County and within forestland similar to the study area.
Umpqua swertia	*Frasera umpquaensis*	4,500 to 6,500 feet	Occurs in at meadow edges between meadows and true fir forests.	Central-west portion of the Cascades Mountains in Oregon	Most populations documented between the Rogue and Umpqua Rivers in Douglas and Jackson Counties. Does not occur based on range.
Fungus	*Glomus pubescens*	--	Occurs in mixed stands on decaying wood.	Coast Range in Coos and Douglas Counties.	Documented in Coos and Douglas Counties. Likely to occur in study area based on habitat type and needs.
Whorled marsh pennywort	*Hydrocotyle verticillata*	Below 1,400 feet	Occurs in marshes, shores of rivers and lakes, or wetland forests.	Widespread across southern America, extending north to Oregon, Missouri, and New York	Likely to occur. Documented in a small portion of the western boundary of study area. Forest management activities unlikely to occur where habitat type is present.

Common Name	Scientific Name	Elevation Range	Habitat	Geographic Range	Occurrence Relative to Plan Area
Fungus	*Hydropus marginellus*	Below 3,200 feet	Occurs in coniferous forests and is associated with Douglas-firs, western redcedars, and big leaf maples.	Ranges from Humboldt County, California to Whatcom County, Washington	Documented in Coos and Douglas Counties. Likely to occur in study area based on habitat type.
California globe-mallow	*Iliamna latibracteata*	195 to 6,560 feet	Occurs in damp, often shaded, areas such as stream sides in coniferous forests but seems to prefer areas of open canopy.	Range from northwest California to southwest Oregon	Documented in Coos and Curry Counties. Likely to occur in the study area. Threats to this species include road maintenance and logging.
Western lily	*Lilium occidentale*	Just above sea level to 400 feet	Occurs in freshwater fens, bog edges, coastal prairies, and scrubs. Rarely occurs in spruce forests but do not thrive.	Pacific coastline from Coos County south to Humboldt County.	Documented in Coos and Curry Counties. Does not occur based on elevation and habitat type.
Howell's montia	*Montia howellii*	33 to 2,752 feet	Occurs in moist to wet lowlands, including vernal pools and meadows.	Pacific coastline from northwest California to Vancouver, British Columbia, extending west of the Cascade Mountains	Documented in Douglas County. Unlikely to occur in study area based on habitat type.
Northern bog clubmoss	*Lycopodiella inundata*	Up to 6,500 feet	Occurs in sphagnum bogs, marshes, swampy ground, wet sandy ground, and wetlands adjacent to lakes.	Patchy distribution throughout America	Documented in Coos and Douglas Counties. Does not occur in study area based on habitat type.
Coast microseris	*Microseris bigelovii*	Below 1,722 feet	Occurs in coastal sandy soils, dunes and sometimes found in rocky areas, coastal islands, headlands, and bluffs.	Ranges from southwestern British Columbia to California; now extirpated in Washington	Documented in Coos County. Does not occur in study area based on habitat type and elevation range.
Indian tobacco	*Nicotiana quadrivalvis*	Below 4,900 feet	Occurs in various habitats in America. In the northwest it largely occurs in open, well-drained washes and slopes.	Distributed between California, north to Washington, and east to Idaho.	Documented in Douglas County. Unlikely to overlap where forest management activities would occur.

Common Name	Scientific Name	Elevation Range	Habitat	Geographic Range	Occurrence Relative to Plan Area
Adder's-tongue	*Ophioglossum pusillum*	40 to 3,200 feet	Occurs in periodically flooded wet meadows, stream sides, or lake margins in lowland and montane zones.	Patchy distribution throughout America; rare in Oregon, Washington, and British Columbia	Documented in Coos and Douglas Counties. Unlikely to occur in study area based on habitat type.
Coffee fern	*Pellaea andromedifolia*	162 to 7,834 feet	Occurs in rocky or dry areas.	Distributed throughout California up to southwestern Oregon	Documented in Coos and Douglas Counties. Unlikely to overlap where forest management activities would occur.
Silvery phacelia	*Phacelia argentea*	Below 65 feet	Occurs in coastal areas on sand above the high tide line, sand dunes, and coastal bluffs.	Coast in Coos County, Oregon south to Del Norte, California.	Documented in Coos County. Does not occur in study area based on habitat type and elevation range.
Fungus	*Phaeocollybia lilacifolia*	--	Occurs in old growth and mature forests, especially spruce, true fir species, and western redcedar	Northern California and coastal Washington as well as scattered sites along the Cascade Range	Only occurs in a few isolated pockets in Oregon. Unlikely to occur based on associated vegetation and distribution.
California sword-fern	*Polystichum californicum*	800 to 1,000 feet	Occurs in a range of sun exposures and moisture regimes. Found mostly in crevices of cliffs or rock outcrops but may also occur along stream banks.	Ranges from California to southern British Columbia and west of the Cascade crest.	Only occurs in a few isolated pockets in Oregon in Douglas and Coos Counties. Unlikely to occur based on distribution or overlap where forest management activities would occur.
Water clubrush	*Schoenoplectus subterminalis*	Below 7,546 feet	Often grows in shallow water in moist to wet habitat; can be entirely submerged.	Patchy distribution through northern America	Documented in Coos and Douglas Counties. Forest management activities unlikely to occur where habitat type is present.
Henderson's sidalcea	*Sidalcea hendersonii*	--	Occurs in coastal tideland and marshes.	Range from Douglas County, Oregon north to British Columbia.	Documented in Coos and Douglas Counties. Does not occur in study area based on habitat type.

Common Name	Scientific Name	Elevation Range	Habitat	Geographic Range	Occurrence Relative to Plan Area
Coast checker bloom	*Sidalcea malviflora* ssp. *patula*	Below 2,300 feet	Occurs in open, coastal coniferous forests and bluffs.	Range from to northern coast of California to the southwest coast of Oregon.	Documented in Coos County, few occurrences in Oregon are located within the Siskiyou National Forest. Does not occur in study area based on range.
Leach's brodiaea	*Triteleia hendersonii* var. *leachiae*	--	Occurs in wooded or open slope habitats ranging from meadow edges, oak woodlands, to road cuts.	Foothills of the Siskiyou Mountains in Curry, Coos, and Josephine Counties.	Documented in Coos County. Does not occur in study area based on range.
Humped bladderwort	*Utricularia gibba*	6 to 7,504 feet	Occurs in moist to wet habitats from forested wetlands to shallow pools or ponds.	Distributed throughout regions of North America.	Documented in Coos and Douglas Counties. Forest management activities unlikely to occur where habitat is present.
Columbia water-meal	*Wolffia columbiana*	Below 1,640 feet	Occurs in freshwater lakes, ponds, and slow-moving streams.	Distributed throughout regions of North America.	Documented in Douglas County. Unlikely to occur in study area based on elevation and habitat type.

Source: Chambers 2012; CNPS 2022; Goldenberg 2017; Helliwell 2011; Kirkpatrick et al. 2012; NatureServe 2022; ODA 2014; Oregon Flora 2019; PFAF 2010; Preston and Lincoln 2012; Titus 1995; WA DNR 2013a, 2013b, 2013c

Wetlands

This section discusses forest management requirements in wetlands as required under federal and state regulations.

Under Oregon Administrative Rules (OAR) 629-642, Water Protection Rules Vegetation Retention Along Streams, would apply to the riverine wetlands in the study area. OAR 629-655, Water Protection Rules: Protection Measures for "Other Wetlands," Seeps, and Springs, would be applicable to all other wetlands in the study area. Under this regulation, forest management activities within wetlands larger than 0.25 acre must protect soil and understory from any disturbance that results in "reduced water quality, hydraulic function, or soil productivity" or accelerates wetland conversion to upland. In addition, habitat features such as snags or downed trees must remain in place unless deemed a fire hazard. Wetlands smaller than 0.25 acre largely follow the same measures as above with less guidance on treatment of snags and downed trees.

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Appendix 3.5-A
Fish Technical Supplement

This appendix discusses the approach and results of screening fish and stream-dependent wildlife species that occur in the study area to determine which special-status fish and stream-dependent wildlife species may be affected under the proposed action and alternatives. Native species not of special status, but ecologically or culturally important, were also considered.

Various designations are used by federal and state agencies to indicate the status of species that are of special concern. Federally listed wildlife species, candidate species, and designated critical habitats under the Endangered Species Act (ESA) that may occur in the study area were identified through the U.S. Fish and Wildlife Service (FWS) Information for Planning and Consultation (IPaC) map tool (FWS 2022). IPaC identifies occurrences of listed species, critical habitat, migratory birds, and other natural resources under FWS jurisdiction that may be affected by the proposed action and alternatives. The National Oceanic and Atmospheric Administration (NOAA) Threatened and Endangered species webpage (NOAA 2022) was also consulted to identify fish species under NOAA jurisdiction in the project area.

The state of Oregon also separately maintains a list of threatened and endangered native wildlife species under Oregon Revised Statutes (ORS) 496.171-496.192 (ODFW 2021a) and a sensitive species list (ODFW 2021b). The Oregon Conservation Strategy (ODFW 2016) and the Oregon Explorer Wildlife Viewer (Institute for Natural Resources 2022) provided information on distribution, life history, habitat use, and threats for special status vertebrate and invertebrate species that are known to occur in the Coast Range ecoregion.

Additional information on special status species was obtained from the Oregon Biodiversity Information Center (2022), NatureServe Explorer Pro (2022), and published literature for vertebrate and invertebrate taxa. Species that have not been documented in the study area or adjacent similar habitats in Douglas and Coos Counties were assumed to not occur in the study area and are not otherwise analyzed in the environmental impact statement (EIS).

Special-status species that were identified as potentially occurring in the Coast Range ecoregion, in which the study area is located, were screened according to the following two criteria.

- Is the species likely to occur in the study area?
- Is the species likely to be affected by the proposed action?

Species that met both criteria are addressed in the EIS and are listed in Tables 1 and 2 of this appendix.

Table 1. Federally Listed Species that Occur in the Study Area

Common Name	Scientific Name	Status [a]	Occurs in Study Area [b]
Oregon Coast coho	*Oncorhynchus kisutch*	Federal threatened Critical habitat State endangered	Yes

[a] Status definitions:

- Federal threatened: A species listed as threatened by FWS under the ESA (IPaC: FWS 2022).
- Critical habitat: A species for which critical habitat has been designated under the ESA.
- State endangered or threatened: A species listed as endangered or threatened by Oregon Department of Fish and Wildlife

[b] Documented observations in the study area or known range and habitat use encompasses the study area, or possibly present but in need of additional surveys.

Table 2. Other Federal and State Special-Status Species that May Occur in Study Area

Common Name	Scientific Name	Status [a]
Fish		
Eulachon	*Thaleichthys pacificus*	Federal threatened State threatened
Oregon Coast steelhead	*Oncorhynchus mykiss*	State Sensitive
Oregon Coast Chinook salmon	*Oncorhynchus tshawytscha*	State Sensitive
Pacific Coast chum	*Oncorhynchus keta*	State Sensitive
Coastal cutthroat trout	*Oncorhynchus clarki*	State Sensitive
Umpqua chub	*Oregonichthys kalawatseti*	State Sensitive
Pacific lamprey	*Entosphenus tridentatus*	Federal species of concern State sensitive
Oregon western brook lamprey	*Lampetra richardsoni*	State sensitive
Western river lamprey	*Lampetra ayresi*	State sensitive
Sculpin (coast range, reticulated, riffle, prickly)	*Family Cottidae*	N/A
Dace (speckled, longnose)	*Rhinichthys (spp.)*	N/A
Millicoma dace	*Rhinichthys cataractae*	Federal species of concern State sensitive
Additional native fish (redside shiner, largescale sucker, threespine stickleback, rainbow trout, brown bullhead)	*Richardsonius balteatus* *Catastomus macrocheilus, Gasterosteus aculeatus, Oncorhynchus mykiss, Ictalurus nebulosus*	N/A
Amphibians		
Coastal tailed frog	*Ascaphus truei*	Federal species of concern State sensitive
Southern torrent salamander	*Rhyacotriton variegatus*	State sensitive

[a] Status definitions:

- Sensitive species: A species listed as an Oregon Sensitive Species. Sensitive refers to wildlife species, subspecies, or populations that are facing one or more threats to their populations, habitat quantity, or habitat quality or that are subject to a decline in number of sufficient magnitude such that they may become eligible for listing on the state Threatened and Endangered Species List (ODFW 2021a).
- Bird of conservation concern: A species listed on the FWS Birds of Conservation Concern list. These species warrant special attention in the study area per IPaC report (FWS 2022).

[b] Documented observations in study area, or known range and habitat use encompass study area, or possibly present but in need of additional surveys

[c] Species not documented in study area but likely occurs, because the species occurs in the Coast Range in habitat that also occurs in the study area.

N/A = not applicable

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Appendix 3.5-B
Wildlife Technical Supplement

This appendix discusses the approach and results of screening wildlife species that occur in the study area to determine which special-status wildlife species may be affected under the proposed action and alternatives.

Various designations are used by federal and state agencies to indicate the status of species that are of special concern. Federally listed wildlife species, candidate species, and designated critical habitats under the Endangered Species Act (ESA) that may occur in the study area were identified through the U.S. Fish and Wildlife Service (FWS) Information for Planning and Consultation (IPaC) map tool (FWS 2022). IPaC identifies occurrences of listed species, critical habitat, migratory birds, and other natural resources under FWS jurisdiction that may be affected by the proposed action and alternatives.

The state of Oregon also separately maintains a list of threatened and endangered native wildlife species under Oregon Revised Statutes (ORS) 496.171-496.192 (ODFW 2021a) and a sensitive species list (ODFW 2021b). The Oregon Conservation Strategy (ODFW 2016) and the Oregon Explorer Wildlife Viewer (Institute for Natural Resources 2022) provided information on distribution, life history, habitat use, and threats for special status vertebrate and invertebrate species that are known to occur in the Coast Range. Additional information on special status species was obtained from the Oregon Biodiversity Information Center (2022), eBird (2022) for birds, AmphibiaWeb (2022) for amphibians, NatureServe Explorer Pro (2022) and VertNet (2022) for other vertebrate species, and published literature for vertebrate and invertebrate taxa. Species that have not been documented in the study area or adjacent similar habitats in Douglas and Coos Counties were assumed to not occur in the study area and are not otherwise analyzed in the environmental impact statement (EIS). Association with forested habitats was determined by referring to online databases and published literature. For most species, this review used the online databases listed above, and wildlife–habitat relationships described in Olson et al. (2001).

Special-status species that were identified as potentially occurring in the Coast Range ecoregion, in which the study area is located, were screened according to the following two criteria.

- Is the species likely to occur in the study area?
- Is the species likely to be affected by the proposed action?

Species that met both criteria are addressed in the EIS and are listed in Tables 1 and 2.

About 191 wildlife species are associated with forest and riparian habitats of the Oregon Coast Range (Martin 1998; Johnson and O'Neil 2001;Veseley and McComb 2003; Cushman and McGarrigal 2003; Olson and Rugger 2007; Institute for Natural Resources 2022), although only a fraction of these are special-status species. A number of bird and amphibian species were detected in the study area during field surveys performed for the Elliott State Forest Watershed Analysis Report (Biosystems et al. 2003). Forest species include those that have an obligate relationship with forest habitats for all or part of their life history, as well as other more generalist species that occur in the forest matrix but also occur in other nonforest types. Species that are addressed in the EIS have a strong primary relationship with forest habitats such that forest modifications as planned under the proposed action would have the potential to affect the occurrence, habitat, and abundance of the species. Table 1 lists federal and state protected species that are included in the EIS, consistent with the two criteria listed above. Table 2 lists special-status species that are included in the EIS, consistent with the two criteria listed above.

In addition to species listed under federal and state threatened and endangered species lists, the state and federal wildlife agencies recognize special status species for the purpose of conserving wildlife, including species that are considered to be of greatest conservation need. FWS recognizes birds protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act as those that warrant special attention. The state of Oregon recognizes sensitive species and conservation strategy species that have declining populations, are at-risk, or are of management concern. Species that meet the two criteria above are listed in Table 2.

Table 1. Federally Listed Species that Occur in the Study Area

Common Name	Scientific Name	Status [a]	Occurs in Study Area [b]	Relationship with Forest and Riparian Habitats and Special Habitat Needs [c]
Marbled murrelet	*Brachyramphus marmoratus*	Federal threatened Critical habitat State endangered	Yes	Late-successional conifer forest with specific nest tree characteristics, including large branches sufficient to support nest platform; forest fragmentation may increase risk due to predation
Northern spotted owl	*Strix occidentalis caurina*	Federal threatened Critical habitat State threatened	Yes	Structurally complex late-successional conifer forest; forest fragmentation may affect occupancy

[a] Status definitions:

- Critical habitat: A species for which critical habitat has been designated under the ESA.
- Federal threatened: A species listed as threatened by FWS under the ESA (IPaC: FWS 2022).
- State endangered or threatened: A species listed as endangered or threatened by Oregon Department of Fish and Wildlife

[b] Documented observations in the study area or known range and habitat use encompasses the study area, or possibly present but in need or additional surveys.

Table 2. Other Federal and State Special-Status Species that May Occur in Study Area

Common Name	Scientific Name	Status [a]	Occurs in Study Area [b]	Relationship with Forest and Riparian Habitats and Special Habitat Needs [c]
Clouded salamander	*Aneides ferreus*	Sensitive species	Yes	Mature conifer forest habitats but also recent clearcuts; requires moist woody debris or rock crevices
Coastal tailed frog	*Ascaphus truei*	Sensitive species	Yes	Highly aquatic species; cold, well-shaded streams typical of old growth habitats
Northern red-legged frog	*Rana aurora*	Sensitive species	Yes	Slow-moving aquatic habitats and adjacent riparian and upland forest habitats

Common Name	Scientific Name	Status [a]	Occurs in Study Area [b]	Relationship with Forest and Riparian Habitats and Special Habitat Needs [c]
Southern torrent salamander	*Rhyacotriton variegatus*	Sensitive species	Yes	Headwater streams and riparian areas
Evening grosbeak	*Coccothraustes vespertinus*	Bird of conservation concern	Yes	Second-growth conifer and mixed conifer-deciduous forest
Olive-sided Flycatcher	*Contopus cooperi*	Bird of conservation concern, Sensitive species	Yes	Open mature conifer forest; riparian areas, forest openings, forest edges
Rufous hummingbird	*Selasphorus rufus*	Bird of conservation concern	Yes	Forest edges
California myotis	*Myotis californicus*	Sensitive species	Yes	Variety of forest types; limited by snag availability
Northwestern pond turtle	*Actinemys marmorata*	Sensitive species	Wetlands: Aquatic.	Northwestern pond turtle
Fisher	*Pekania pennanti*	Sensitive species	No[c]	Forests and riparian corridors with moderate to dense canopy cover and diverse structure
Fringed myotis	*Myotis thysanodes*	Sensitive species	Yes	Forest habitat with snags and boulders
Hoary bat	*Lasiurus cinereus*	Sensitive species	Yes	Late-successional conifer forest
Long-legged myotis	*Myotis volans*	Sensitive species	Yes	Late-successional conifer forests
Coastal marten	*Martes caurina humboldtensis*	Sensitive species	No [c]	Late-successional conifer forest; low survival in fragmented forests
Red tree vole	*Arborimus longicaudus*	Sensitive species	Yes	Late-successional conifer forest; forest fragmentation may affect occupancy
Ringtail	*Bassariscus astutus*	Sensitive species	Likely [c]	Late-successional forest with large-diameter snags and logs; riparian areas
Silver-haired Bat	*Lasionycteris noctivagans*	Sensitive species	Yes	Late-successional conifer forests

[a] Status definitions:

- Sensitive species: A species listed as an Oregon Sensitive Species. Sensitive refers to wildlife species, subspecies, or populations that are facing one or more threats to their populations, habitat quantity or habitat quality or that are subject to a decline in number of sufficient magnitude such that they may become eligible for listing on the state Threatened and Endangered Species List (ODFW 2021a)
- Bird of conservation concern: A species listed on the FWS Birds of Conservation Concern list (FWS 2021). These species warrant special attention in the study area per IPaC report (FWS 2022).

[b] Documented observations in study area, or known range and habitat use encompass study area, or possibly present but in need of additional surveys.

[c] Species not currently documented in study area but may occur in the future within the 80-year analysis period.

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Appendix 3.9
Cultural Resources Technical Supplement

Cultural Setting Context Statement

Geographic Context

Climate

Located near the Pacific Ocean with elevations up to 2,100 feet A.S.L., the Elliott State Forest has a mild maritime climate, moderate temperature fluctuations, abundant rainfall of 65 to 115 inches per year, and summer fog. Consequently, vegetation is thick. Conifers, including Douglas-fir, western hemlock, western red cedar, Sitka spruce, and grand fir dominate. Hardwoods, including red alder and big-leaf maple, line the streams and occur along roads (DSL and ODF 2011). The understory is choked with hazel, elderberry, salmonberry, willow, ash ocean spray, vine maple, nettle, ferns, and mosses, as well as invasive scotch broom and Himalayan blackberry. In all but the driest summer months the flat ground near the streams is saturated. That, along with the dense tangle of underbrush, makes travel difficult and cultural sites, if present, difficult to find.

Dense vegetation can hide cultural sites and bury them in leaf litter. Constant plant growth and reproduction will churn and upset the integrity of the soil matrix containing cultural material. And, the perpetually moist environment quickly decomposes organic material, including cultural material. In summary, the wet climate and dense vegetation of the permit area makes it difficult to find culture resources sites, and if present, the sites decompose quickly.

Geomorphology

The topography of the permit area is typical of the Coast Range: mountainous and steep. The flanks of highly dissected ridgelines drop into tight V-shaped canyons that are drained by swift narrow streams. The gradients on the side slopes of the mountains often exceed 65%. Only 4,480 acres of the permit area have slopes that are less than 20%. And only 1,200 acres contain slopes with a steepness of 10% or less. Almost all of the relatively flat topography in the permit area coincides with stream corridors, beyond which the slope gradient makes the landscape largely inaccessible (Curtis et al. 2016).

While they are relatively flat, the stream corridors in the permit area are especially subject to mass wasting, including landslides and debris flows. The Tyee geologic formation, composed of thick, minimally fractured beds of weakly cemented sandstone, underlies the surface of the permit area. The shallow, low porosity soils cannot absorb the abundant rainfall. The saturated soils will slide down the slopes of the permit area as rapidly moving debris flows. The debris flows concentrate and converge in stream corridors as “debris torrents.” Thus, the only flat places in the permit area—stream corridors—commonly sustain dramatic episodes of landform alteration from landslides and debris torrents (DSL and ODF 2011). Any potential cultural resources along stream corridors are likely altered, if not erased, by erosion, sedimentation, and mass wasting.

Precontact Context

Archaeological evidence for the human habitation of western Oregon dates back at least 11,500 years (Davis et al. 2011). The early evidence of humans in this region is limited, likely at least in part because habitation and use sites along the coast were inundated by eustatic sea-level rise and other geological processes following the end of the Pleistocene epoch (McLaren et al. 2019). However, early Paleolithic sites in the Northern Great Basin area of eastern Oregon and Cooper's Ferry, Idaho suggest that the larger region has been occupied for more than 16,000 years (Smith et al. 2019; Jenkins et al. 2012). Numerous sites in western Oregon have contained projectile points characteristic of the Paleo-Indian culture, which was thought to have prioritized hunting large mammals (Connolly 1994). As climatic change at the end of the Pleistocene saw western Oregon become warmer and drier, people in the region turned to broad-spectrum hunting, fishing, and plant gathering in what became known as the Archaic era. By 8,000 years before present, archaeological evidence shows that people could be found across western Oregon, primarily living along the lower Columbia River, in the river valleys, and around coastal estuaries. Around 3,000 years before present, the mobile, broad-spectrum resource gathering and foraging pattern was largely replaced by a more sedentary, collector strategy with a heavy emphasis on riverine and streamside resources (Cox 2016). By 2,000 years before present, the collector pattern was widespread and pit house villages were established at fishing sites along inland rivers, while plank house villages were built along the coast (Byram 2006; Pullen 1996). Plant food processing tools such as mortars, metates, and pestles indicate the significance of plant food resources, while projectiles, scrapers, and a variety of flaked stone tools show a continued emphasis on hunting upland mammals. This pattern continued to persist into the historic past and is characteristic of the ethnographic lifeways of the diverse groups living in western Oregon at the time of historic contact.

Ethnographic Context

For thousands of years the Indigenous people of the southern Oregon Coast (Siletz, Umpqua Tribes, Coos, Siuslaw, and Coquille) have lived, raised families, and gathered resources in and around the permit area. Curtis et al. (2016) blends information from Beckham and Minor (1980), Beckham et al. (1982), Zenk (1990), Phillips (1997), and others, and presents a summary of Native American archaeology, ethnography, and history in and near the permit area.

The permit area occurs within the traditional territory of the Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians and their ancestors, particularly the Lower Umpqua Kalawatset (who spoke a dialect of Siuslaw) and Hanis-speaking Coos. The Coos, Lower Umpqua, and Siuslaw lived in dozens of large autonomous villages on the coast, in ocean bays, and along estuaries of Siuslaw, Umpqua, Coos and Coquille Rivers outside the permit area. From these permanent villages the people traveled in the summer to the uplands, such as those within the permit area, for eel fishing, deer and elk hunting, camas harvesting, and berry picking. Most of these visits were temporary and designed to provision the villages on the coast.

Within the permit area, Hanis Coos territory includes the watershed of the West Fork of the Millicoma River (Stepp 1998). A historic-period Coos village occurred at the mouth of Marlowe Creek on the East Fork of the Millicoma River immediately south of the permit area boundary (Youst 1992; Mahaffy 1965 in Curtis et al. 2016:95).

In the permit area, Lower Umpqua territory spanned the Umpqua River to the north, the Scholfield Creek watershed to the west, and Mill Creek and Lost Lake in the east (Stepp 1998). According to

Winterbotham (1994), two historic-period Lower Umpqua villages may have been located in the permit area (Curtis et al. 2016:95). Early twentieth century Indian allotments were in the permit area and appeared to be steep, heavily forested parcels and generally not practical for residential use (Curtis et al. 2016).

Curtis et al. (2016) explain that compared to the lower reaches of the principal Coast Range rivers, the steep, dense, and wet forests of the permit area were not heavily settled by the Coos, Umpqua, and Siuslaw Indians and their ancestors. The Elliot State Forest does not offer many good places that were suitable for a large settlement or other activities that would leave an archaeological trace, such as camps, villages, or sizable hunting and gathering stations. Nevertheless, the place offered a bountiful array of resources that the Indians used for food, clothing, medicine, and tools. It is clear the people accessed these resources, particularly in the summer. Curtis et al. (2016) provide a detailed ethnobotany of the principal plants in the permit area still used by the indigenous people of the southern Oregon Coast Range.

Historic Context

In the late nineteenth and early twentieth centuries, logging activities left an enduring mark on the landscape of western Oregon. The state's first lumber mills were established in the Willamette Valley in the 1830s and 1840s. The California Gold Rush, which began in the late 1840s, created a large demand for timber in the western United States. A national demand for the state's timber emerged after the completion of the Northern Pacific transcontinental railroad, which arrived in Portland in 1883. At this same time, the timberlands in Michigan, Minnesota, and Wisconsin were rapidly diminishing. In the twentieth century, logging activity extended into new parts of the state, due to new railroads and, somewhat later, the development of logging trucks. The state's wood products market nearly collapsed during the Great Depression but returned at the outset of World War II. The postwar logging industry has been marked by increasingly mechanized logging practices, the consolidation of forestland in a smaller number of hands, and new environmental protections. As a result, logging continues to play a role in the state's economy, but it is an industry that operates on a sharply reduced labor base and one that has declined in economic importance over the years (Robbins 2021).

The Oregon Department of State Lands (DSL) is the administrative agency of the State Land Board (SLB), which was established by the Oregon Constitution in 1859 and is composed of the Governor, Secretary of State, and State Treasurer. The Oregon Admission Act of 1859 included a provision granting Oregon 3.4 million acres of federally owned land, approximately 6% of the state's total land area, to finance public education through its management or sale, which formed the basis of the state's Common School Fund (CSF) for K–12 education. DSL was established in 1967 as the operational staff of the SLB, taking on all the SLB's responsibilities except those related to general policy making and reviews. Though only approximate 737,000 acres of that original acreage remains under the administration of DSL, the agency continues to manage state land and other resources dedicated to the CSF (DSL 2022a).

Elliott State Forest

The first Euro-American forays into the permit area occurred in the early 1900s (Curtis et al. 2016). These ventures entailed small scale logging, grazing, and reuse of Native American travel corridors. Elliott State Forest was established in 1930 as Oregon's first state forest, most of which comprised Common School Fund land (DSL 2022b). SLB began actively managing the Elliott State Forest in

1955, with timber harvest revenue contributed to the CFS and used to cover the cost of forest management (DSL 2022b).

The Civilian Conservation Corps (CCC) set up a timber management program in the permit area in the 1930s, but the local CCC operation center, Camp Walker, was located just outside, and northeast, of the permit area boundary (Curtis et al. 2016). CCC as well as other early and mid-twentieth century settlement and logging operations would have left potential cultural resources in the permit area such as camps, homesteads, roads, landings, and associated artifacts.

Commercial logging in the permit area began in earnest in the 1950s, and over 50% of the permit area has been clearcut since then (OSU 2021). In combination with earlier timber harvests and catastrophic wildfires, the entire Elliott State Forest and permit area is composed of timber stands and associated land surfaces that are less than 150 years old. In other words, the permit area contains very few acres of unharvested, undisturbed landscapes that contain old-growth forest (OSU 2020). Modern timber harvest operations tend to disturb if not erase the archaeological remains of earlier homesteads, logging camps, and other historic-period and Native American archaeological sites. In 2022, the Oregon Legislature passed Senate Bill 1546, which designated Elliott State Forest as a publicly owned state research forest and established the Elliot State Research Forest Advisory Committee, an independent public agency responsible for managing the forest in partnership with Oregon State University (DSL 2022b).

Recent Land Disturbances

The study area has sustained significant disturbances from fire, wind, and timber harvest in the recent historic period era. Ninety percent of the permit area was completely burned in 1868 by the Coos Bay Fire leaving few residual living trees (Phillips 1997:7; DSL and ODF 2011:1-4). The Columbus Day storm of 1962 blew down 100 million board feet of timber in the permit area. Most of it was salvaged by commercial loggers in the following 3 years (Phillips 1997).

Individual and small timber harvests occurred throughout the permit area in the early 1900s. Commercial-scale logging commenced with fervor after 1955. Since then 50% of the Elliott State Forest has been clearcut. Thus, about 50% of the permit area contains forest stands under 65 years of age and have regenerated after a clearcut. Foresters have managed and thinned these stands into Douglas-fir plantations. The other 50% of the permit area contains forest stands older than about 65 years but younger than 150 years. These stands have regenerated naturally, mostly after localized landslides and following the catastrophic Coos Bay Fire in 1868 (DSL and ODF 2011).

The permit area contains 550 miles of logging roads. The majority of the roads follow ridgelines that, along with streams, offer the only relatively flat and somewhat open terrain in the permit area. If pre-contact cultural sites or trails were ever present on ridgelines in the permit area, they may have been disturbed or altered by road building (DSL and ODF 2011).

Fires, windstorms, and commercial logging can alter cultural resource sites that occur within their footprint. Clearcuts and road building will have direct impacts on any cultural resources that lie within their path. Clearcuts and road building also contribute to soil instability, exacerbating the natural tendency of permit area soils to slide down-hill and into streams. The resulting debris torrents can dramatically erode or aggrade the relatively flat stream corridors and damage or erase any associated cultural resources sites.

Cultural Resources Records Search Tables

Table 1. Previously Conducted Archaeological Investigations

Investigation Type/NADB #	Author/Date	Title	Cultural Resources in Plan Area
Survey Report; #00191	Dow Beckham and Ross 1976	*Units 3 & 4 Cultural Resources Based Upon a Literature Search*	None
Survey Report; #05543	Pullen 1983	*Loon Lake Hydro-Electric Project*	None
Survey Report; #17296	Connolly 2000	*Charlette Creek-Luder Creek Passing Lane Section, Umpqua Highway (OR38), Douglas County*	None
Survey Report; #18638	Tasa and Bland 2003	*Archaeological Resource Evaluation of Area 3, Oregon State Parks, 2001/2002 Surveys*	None
Survey Report; #20061	Bourdeau 2005	*West Fork Millicoma Substrate Retention III Project*	None
Survey Report; #20098	Baxter 2005	*Report of the Subsurface Archaeological Reconnaissance of Charlotte Creek-Luder Creek Fish Passage, between MP 10.67-11.79, Hwy 38*	None
Survey Report; #24096	Castronuevo 2010	*Brandy Bar Landing Inc. Channel Dredging*	None
Survey Report; #24772	Jones and MacClyment 2011	*Cultural Resource Survey Elkton Fiber Optic Project*	None
Survey Report; #25729	Butler et al. 2013	*Cultural Resources Inventory Report for the NW Natural Mid-Willamette Feeder Pipeline Project, Phase IIIA Segment, Polk and Benton Counties, Oregon*	Three precontact resources (Null Trinomial)
Survey Report; #28417	Curtis et al. 2016	*A Cultural Resource Inventory of the Elliott State Forest*	35CS 00310 35DO 01513 35DO 01514
Survey Report; #28829	Baxter 2017	*Pedestrian Survey of the OR38 Charlotte Creek Quarry Expansion, Douglas County*	None
Survey Report; #28847	O’Neill and Knowles 2017	*Cultural Resources Inventory of Nine Culverts in the OR38/US101 Small and Large Culvert Upgrade Project, Douglas and Coos Counties*	35DO 01549

Table 2. Cultural Resources Sites with no Archaeological Evidence (Curtis et al. 2016)

Type	Description
Historic	A pioneer and Coos Tribal cemetery. Confederated Tribes of Coos has older documentation of the cemetery
Historic	Pheasant Cabin
Historic	Old Mutt and Nellie Allen House
Historic	Family Homestead
Historic	Jack and Jean Cornell's Homestead
Historic	Sukurski - Lane - Chard Homestead The only evidence of the site was a bamboo grove.
Historic	McCullouch Homestead
Historic	Trail Butte Lookout
Historic	School Teachers Cabin
Historic	Pioneer Home and Sawmill
Historic	An Indian Family Home
Historic	Charles Seistreem Cabin
Pre-contact	Indian site identified per SHPO map, Winterbotham (1994, and Curtis et al. (2016). Likely outside and north of the study area.
Pre-contact	"Indian Trail?" identified per SHPO map, GLO map
Pre-contact	Coos village (Youst 1992:215) Outside of the study area. Not surveyed.

The cultural resources sites presented in Table 2 are reported to occur in the study area by Phillips (1997) and Stepp (1998). Curtis et al. (2016) attempted to locate them. In each case intensive field survey of reported and potential locations of the sites failed to locate cultural material or other tangible cultural evidence of them. There are no site records for these possible sites.

Table 3. Previously Documented Cultural Resources Sites in the Study Area

Trinomial Site Number	Site Type	Description	Site Record?	In Study Area?	Reference
35CS 310	Historic	Vaughan Sawmill Complex, refuse scatter, wigwam burner.	Yes	Yes	Curtis et al. 2016
35DO 1513	Historic	Leach Homestead, structural remains and refuse scatter.	Yes	Yes	Curtis et al. 2016
35DO 1514	Historic	Big Creek Road segment	Yes	Yes	Curtis et al. 2016
35DO 1549	Historic	Brick septic tank, determined not eligible to the NRHP	Yes	Yes	O'Neill and Knowles 2017
None	Historic	Eleven machine-cut nails	Yes	Yes	Curtis et al. 2016

NRHP = National Register of Historic Places

All sites presented in Table 3 except 35DO1549 remain unevaluated for eligibility for listing in the National Register of Historic Places.

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Appendix 3.10
Tribal Resources Technical Supplement

Terms and Definitions

The following provides terms and definitions used in this environmental impact statement (EIS) related to the tribes and federal trust responsibilities.

Ceded lands: Treaty tribal-ceded lands are lands formerly occupied by tribes and later ceded to the United States by treaty, whether or not ratified by the United States Senate. Some claims of sovereignty and loss of ceded lands made by tribes remain unawarded, requiring their recognition as a federally recognized Indian tribe to address these claims.

Federal recognition**:** The U.S. Department of the Interior Office of Federal Acknowledgement sets up a process and review for unrecognized Indian tribes and communities to gain federal recognition. It is important for a tribe to be recognized as eligible for the special programs and services provided by the United States to Indians because of the former agreements the tribes made with the federal government under treaties and established case law. Tribes can achieve federal recognition status through treaties, acts of Congress, presidential executive orders or other federal administrative actions, or federal court decisions. This status is automatically conferred on members of treaty tribes but does not automatically designate Indian communities whose treaties were not ratified by Congress, that were not treaty signers, or who lost their lands and social-cultural identity because they were struggling for their own survival and tribal social-cultural integrity over the past 150 years. Those tribal communities each must apply for and be granted this status to be listed as federally recognized tribes. There are five tribes in the study area that were federally recognized through legal means other than treaties: (1) the Confederated Tribes of the Grand Ronde Community of Oregon, (2) the Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians, (3) the Confederated Tribes of Siletz Indians, (4) the Coquille Indian Tribe, and (5) the Cow Creek Band of Umpqua Tribe of Indians.

Traditional ecological knowledge: This term is used to describe the knowledge held by the tribes about their immediate environment and the cultural practices that build on that knowledge. traditional ecological knowledge includes knowledge of plants, animals, and the development and use of appropriate technologies to increase or maintain suitable conditions for species of cultural value to local tribal communities.

Treaty**:** Ratified federal treaties refer to formal agreements between the federal government and Native American tribes under Article II, Section 2 of the United States Constitution, approved by the president and subsequently ratified by the United States Senate. A treaty is a constitutionally recognized agreement between sovereign nations. These legally binding agreements are protected under the United States Constitution, which states that, like the United States Constitution, they are the "supreme law of the land." Under these treaties, tribes ceded millions of acres of land while reserving certain rights, such as fishing, hunting, and gathering, as well as rights to determine use of reserved land and its resources. Some treaties reserved the rights to usual and accustomed grounds and stations. These are locations on and off reservations where treaty tribes hold certain treaty-granted usage rights, based on ancestral use. As discussed for the five tribes in the study area, treaties were prepared but never ratified.

Treaty tribe: A Native American tribe that formally negotiated a treaty with the United States government between 1855 and 1868 that was subsequently ratified by Congress in the United States Senate. There are three treaty tribes in Oregon: (1) Confederated Tribes of the Umatilla Indian Reservation (Treaty with the Walla Walla, Cayuse, etc., 1855), (2) Confederated Tribes of Warm Springs Reservation (Treaty with the Tribes of Middle Oregon, 1855), and (3) the Klamath Tribes (Klamath Tribes Treaty of 1864). The Umatilla and Warm Springs have treaty-reserved fishing rights on the Columbia River. These two treaty tribes have co-management responsibilities with the states (primarily Oregon, Washington, and Idaho) for the management of fish. The Columbia River Inter-Tribal Fish Commission is a tribal organization that provides coordination and technical assistance to these tribes in regional, national, and international efforts.

***Tribe*:** As defined in Section 1(b) of Executive Order 13175, a tribe is an Indian or Alaska Native federally recognized tribe, band, Nation, pueblo, village, or community that the Secretary of Interior acknowledges to exist as an Indian tribal entity pursuant to the Federally Recognized Indian Tribe List Act of 1994, 25 United States Code (USC) 479a and annual update to the Department of the Interior list of Indian Entities Recognized by and Eligible to Receive Services from the United States Bureau of Indian Affairs, published in the *Federal Register* (FR) (87 FR 4636). Several of the nine federally recognized tribes in Oregon are confederations of multiple tribes.

Trust doctrine: The trust doctrine is a source of federal responsibility to Native Americans requiring the federal government to support tribal self-government and economic prosperity, duties that stem from the government's promise to protect Native American tribes and respect their sovereignty.

***Unratified federal treaties*:** Unratified federal treaties are treaties negotiated but not ratified by the United States Senate. Unratified treaties were negotiated with the Lower Chinook, Clatsop, Clackamas, Tillamook, Umpqua, Siletz, and Rogue River Tribes of the Oregon–Washington coast and other groups who established claims against the government for wrongful taking of their lands. Reservations established on the Oregon coast were all terminated by United States Congress, House Resolution No. 108 in 1954, which took effect in 1956. Executive orders have since restored reservations at Grand Ronde and Siletz in Oregon.

Supporting Information on Affected Tribes

This section describes the history and context for each of the five tribes in the study area including, but not limited to, the tribe's organization, its federal recognition, ratified and unratified treaties, ceded lands, treaty reserved rights, case law, federal trust doctrine, and noted use of resources in the study area such as fishing and hunting agreements with the State of Oregon and United States of America.

Confederated Tribes of the Grand Ronde Community of Oregon

The Confederated Tribes of the Grand Ronde Community of Oregon is a federally recognized Indian tribe consisting of 30 tribes and bands with ancestral ties to western Oregon and southwestern Washington (Confederated Tribes of the Grand Ronde Community of Oregon 2022). The original Grand Ronde Reservation was 61,000 acres established by executive order on June 30, 1857, in the headwaters of the Yamhill River watershed. The General Allotment Act of 1887 removed the original reservation lands from federal trust status to private ownership and transferred reservation lands to tribal members and subsequently sold to private ownership. In 1901, the federal government declared 25,791 acres of the reservation lands "surplus" and sold them.

Federal recognition of the Tribe ended on August 13, 1954, when Congress passed the Western Oregon Termination Act. Passage of the Grand Ronde Restoration Act (Public Law 98-165) reestablished federal recognition in 1983. The Grand Ronde Reservation Act (25 USC 713f note; 102 stat. 1594), signed on September 9, 1988, established 9,811 acres of the original reservation. The Tribe has acquired additional trust lands since gaining federal recognition and the total community land base is currently 10,773 acres in Yamhill and Polk Counties (BIA 2019). The number of enrolled members is approximately 5,567 (Oregon Blue Book 2021).

A Consent Decree among the State of Oregon, the United States of America, and the Confederated Tribes of the Grand Ronde Community of Oregon permanently defines tribal hunting, fishing, trapping, and animal gathering rights. The Confederated Tribes of the Grand Ronde Community of Oregon Fish and Wildlife Ordinance (Chapter 801) regulates subsistence and ceremonial hunting and fishing by tribal members defined in the Consent Decree. Hunting and fishing pursuant to the Consent Decree occur in the Trask Management Unit. The Trask Unit includes portions of the Tualatin and Yamhill watersheds flowing into the Willamette River and portions of the Nestucca, Wilson, Trask, and Salmon watersheds flowing westward into the Pacific Ocean.

The Tribe's Natural Resources Department manages reservation lands for timber, recreation, and fish and wildlife. Pursuant to the Consent Decree, the Tribe receives an allocation of hunting tags for the Trask Unit and the Tribe issues fishing licenses for tribal members to fish within the Trask Unit. The Tribe may establish its own tribal hunting and fishing programs on tribal lands.

Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians

The Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians is a federally recognized confederated tribe made up of three tribes: Coos Tribes, Lower Umpqua Tribe, and Siuslaw Tribe (Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians 2022). Their ancestral lands include the south-central coast of Oregon.

A treaty was drafted in 1855 with the Coos, Lower Umpqua, and Siuslaw Indians and the United States of America providing compensation to the Tribe in terms of food, clothing, employment, education, and health benefits in exchange for ceded lands. As with many other western Oregon tribes, the United States Senate never ratified the treaty. A small privately held 6-acre parcel in Coos Bay was donated to the Tribe to establish a reservation to be held in trust by the Bureau of Indian Affairs (BIA).

Federal recognition of the Tribe ended on August 13, 1954, when Congress passed the Western Oregon Termination Act. The Tribe never sold the small parcel in Coos Bay and instead maintained it to provide services to tribal members. Passage of the Coos, Lower Umpqua, and Siuslaw Restoration Act (Public Law 98-481) reestablished federal recognition on October 17, 1984. The tribal community and tribal government services encompass Coos, Curry, Lincoln, Douglas, and Lane Counties. The number of enrolled members is approximately 1,297 (Oregon Blue Book 2021).

Title II of the Western Oregon Tribal Fairness Act (Public Law 115-103, January 2018) transferred 14,472 acres of federally owned lands to the Tribe to be held in trust by the BIA. The parcels are in Lane, Douglas, and Coos Counties (Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians Forestry Department 2021).

Confederated Tribes of Siletz Indians

The Confederated Tribes of Siletz Indians is a federally recognized confederated tribe made up of many different tribes: Clatsop, Chinook, Klickitat, Molala, Kalapuya, Tillamook, Alsea, Siuslaw/Lower Umpqua, Coos, Coquelle, Upper Umpqua, Tututni, Chetco, Tolowa, Takelma, Galice/Applegate, and Shasta (Confederated Tribes of Siletz Indians 2022).

Federal recognition of the Tribe ended on August 13, 1954, when Congress passed the Western Oregon Termination Act. Passage of the Siletz Indian Tribe Restoration Act (Public Law 95-195) reestablished federal recognition in 1977.

The Tribe has acquired additional trust lands since gaining federal recognition and the total community land base is currently 3,745 acres in Lincoln County (BIA 2019). Trust lands include a few contiguous parcels and scattered parcels east of Siletz, Oregon in the Siletz River watershed. The number of enrolled members is approximately 5,080 (Oregon Blue Book 2021).

A Consent Decree among the State of Oregon, the United States of America, and the Confederated Tribes of Siletz Indians permanently defines tribal hunting, fishing, trapping, and animal gathering rights. The Confederated Tribes of Siletz Indians Hunting, Fishing and Gathering Ordinance regulates subsistence and ceremonial hunting and fishing by tribal members defined in the Consent Decree (Siletz Tribal Code 7.001). Hunting and fishing pursuant to the Consent Decree occur in the Stott Mountain Management Unit and the north portion of the Alsea Management Unit. This includes portions of the Alsea, Siletz-Yaquina, and Yamhill watersheds. The Consent Decree identifies three cultural fishing sites on tributaries of the Siletz River.

Coquille Indian Tribe

The Coquille Indian Tribe is a federally recognized tribe in southwestern Oregon (Coquille Indian Tribe 2022).

Federal recognition of the Coquille Indian Tribe ended on August 13, 1954, when Congress passed the Western Oregon Termination Act. Passage of the Coquille Restoration Act restored federal recognition on June 28, 1989.

The Tribe does not have an agreement with the State of Oregon and the United States of America establishing hunting and fishing rights for tribal members. However, the Tribe is seeking recognition of rights to hunt, fish, gather, and practice cultural traditions and ceremonies at their usual and accustomed places (Coquille Indian Tribe 2019).

The Tribe has acquired additional trust lands since gaining federal recognition. The Coquille Forest was created in 1996 (Public Law 104-208). This act restored 5,410 acres to the Coquille Indian Tribe, as the Coquille Forest. The Coquille Forest is located in Coos County. The total community land base is currently 6,132 acres in Coos County (BIA 2019). The number of enrolled members is approximately 1,113 (Oregon Blue Book 2021).

Cow Creek Band of Umpqua Tribe of Indians

The Cow Creek Band of Umpqua Tribe of Indians is a federally recognized tribe in southwestern Oregon (Cow Creek Band of Umpqua Tribe of Indians 2022). Their ancestral lands are between the Coast Range and Cascade Range of Oregon along the South Umpqua River and Cow Creek. The Cow Creek Tribe signed a treaty with the United States of America on September 19, 1853. The United

States Senate ratified the treaty on April 12, 1854. However, the treaty did not permanently secure land for a reservation in exchange for ceded lands.

Federal recognition of the Cow Creek Tribe ended on August 13, 1954, when Congress passed the Western Oregon Termination Act. Passage of the Cow Creek Band of Umpqua Tribe of Indians Recognition Act (Section 1 of Public Law 97–391) restored federal recognition on December 29, 1982.

Title I of the Western Oregon Tribal Fairness Act (Public Law 115-103, January 2018) transferred 17,519 acres of federally owned lands to the Cow Creek Tribe to be held in trust by the BIA. This plus other lands held in trust by BIA since gaining federal recognition total 22,308 acres in Douglas County (BIA 2019). Trust lands include a few contiguous parcels and scattered parcels south and east of Roseburg, Oregon, in the South Umpqua watershed. In 2000, the Tribe purchased K-Bar Ranches and has since purchased additional properties throughout the Umpqua River valley (K-Bar Ranch 2022). In 2013, the Tribe expanded the ranch into the Rogue River valley with the purchase of the Rogue River Ranch near Central Point, Oregon. At present, the Tribe, including the K-Bar Ranches, manages approximately 5,500 acres.

The number of enrolled members is approximately 1,760 (Oregon Blue Book 2021).

Correspondence

Attachment 1 to this appendix includes letters the U.S. Fish and Wildlife Service sent to tribes offering government-to-government consultation.

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