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WESTERN OREGON STATE FORESTS HABITAT CONSERVATION PLAN FINAL



OREGON DEPARTMENT OF FORESTRY

FINAL

WESTERN OREGON STATE FORESTS HABITAT CONSERVATION PLAN

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Acronyms and Abbreviations

Acronym	Definition
°C	degrees Celsius
°F	degrees Fahrenheit
AIP	Aquatic Inventories Project
BLM	Bureau of Land Management
BMPs	best management practices
BOF	Board of Forestry
BOFL	Board of Forestry Lands
BOs	biological opinions
CCAA	Candidate Conservation Agreement with Assurances
CFR	Code of Federal Regulations
cfs	cubic feet per second
CSFL	Common School Forest Lands
CWA	Clean Water Act
DBH	diameter at breast height
DEQ	Department of Environmental Quality
DPS	distinct population segment
DSL	Department of State Lands
eDNA	environmental deoxyribonucleic acid
EFH	essential fish habitat
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERZ	equipment restriction zone
ESA	Endangered Species Act
ESMP	Endangered Species Management Plan
ESU	evolutionary significant unit
FIA	Forest Inventory and Analysis
FMP	Forest Management Plans
FPA	Forest Practices Act
GIS	geographic information system
GPS	global positioning service
HCA	Habitat Conservation Areas
HCP	Western Oregon State Forests Habitat Conservation Plan
HCP Handbook	Habitat Conservation Planning and Incidental Take Permit Processing Handbook
HE	high energy
HLHL	High Landslide Hazard Location
HUC	hydrologic unit code

Acronym	Definition
IP	Implementation Planning
ITP	incidental take permit
LiDAR	light detection and ranging
LSRs	Late Successional Reserves
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MBTA	Migratory Bird Treaty Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
No Surprises	Habitat Conservation Assurances
NOAA	National Oceanic and Atmospheric Administration
NTU	nephelometric turbidity units
NWFP	Northwest Forest Plan
NWI	National Wetland Inventory
OAR	Oregon Administrative Rules
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
OHV	off-highway vehicle
ORS	Oregon Revised Statutes
OSU	Oregon State University
PBR	process based restoration
PDFT	potential debris flow tracks
PPZ	process protection zone
RCAs	Riparian Conservation Areas
RMPs	resource management plans
SAPs	Strategic Action Plans
SDI	Stand Density Index
SHA	Safe Harbor Agreements
SLI	Stand Level Inventory
SSBT	Salmon, Steelhead, and Bull Trout
TPA	trees per acre
USC	U.S. Code
USC	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey

Executive Summary

The Western Oregon State Forests Habitat Conservation Plan (HCP) has been developed by the Oregon Department of Forestry (ODF) to support applications for federal Endangered Species Act (ESA) incidental take permits from the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries (collectively, referred to as the Services). This HCP describes potential effects on a suite of 15 federally listed species and others that are not yet ESA listed but may become listed during the permit term and species potentially at-risk from ODF's forest management activities, including timber harvest, stand management, habitat restoration, and construction and maintenance of recreation facilities over a 70-year permit term. The HCP also describes a conservation strategy to avoid, minimize, and mitigate any effects from those activities during that timeframe.

This Executive Summary provides an overview of the HCP and includes the following sections.

- Section ES.1, *Overview of the Planning Process*
- Section ES.2, *Scope of the Habitat Conservation Plan*
- Section ES.3, *Conservation Strategy*
- Section ES.4, *Implementation, Cost, and Funding*

ES.1 Overview of the Planning Process

In November 2018, the Oregon Board of Forestry (BOF) unanimously directed ODF staff to develop an HCP. The HCP would enable ODF to comply with the ESA when conducting land management activities on State Forests west of the Cascade Mountains. The HCP would also facilitate permit applications to the USFWS and NOAA Fisheries for incidental take¹ authorization for those activities (covered activities) and for select species (covered species) over a 70-year permit term. Between November 2018 and July 2026, ODF staff completed this final HCP in coordination with state and federal environmental and wildlife agencies and with engagement from counties, tribal governments, members of the public, and representatives from key stakeholder sectors.

Throughout the development of the HCP, ODF provided updates and briefings to the BOF to help the agency assess the ability of a potential HCP to meet ODF's ESA obligations and its Greatest Permanent Value mandate, which encompasses economic, conservation, and social outcomes. ODF implemented a structured public engagement process to facilitate an inclusive information-sharing and feedback process. BOF checkpoints were built into this process where the BOF provided direction to ODF on the approach to the HCP and the strategy for public engagement. In October 2020, the BOF unanimously voted to direct ODF staff to complete the administrative draft HCP and the National Environmental Policy Act (NEPA) assessment of the HCP. After the NEPA process and

¹ *Take* is defined as, "to harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 U.S. Code [USC] 1532). *Harm* is further defined as including "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 Code of Federal Regulations [CFR] 17.3).

federal permit decisions are complete, the BOF will determine whether to accept the offered permit issuance associated with the HCP.

ES.1.1 Habitat Conservation Plan Program Goals

ODF staff developed a set of six broad program goals for the HCP in collaboration with government agency and academic institution representatives. These program goals were used as a foundation to develop the biological goals and objectives and the conservation strategy described in Chapter 4, *Conservation Strategy*.

1. Meet the regulatory requirements of the federal and state ESA through an approved HCP, using a multi-species approach to managing forest ecosystems across the landscape.
2. Ensure active and sustainable management of state forest lands under a Western Oregon State Forests HCP and an associated Forest Management Plan designed to meet the social, economic, and environmental goals articulated in the Greatest Permanent Value Rule.
3. Increase operational certainty, cost savings, and predictability of revenue generation (including related timber harvest, jobs, and other economic values) using the HCP as a programmatic approach to comply with the federal and state ESA over the permit term.
4. Increase certainty for long-term persistence of covered wildlife species by protecting and maintaining high-quality habitats, conducting habitat-enhancement activities in areas of lower-quality habitat, and mitigating the impacts of covered activities on covered species.
5. Advance partnerships and engagement related to management approaches and outcomes associated with, but not limited to, revenue generation and economic outcomes, conservation, forest conditions and health, tribal interests and traditional cultural uses, research, monitoring, education, recreation, and the equitable enjoyment of benefits that state public forests provide.
6. Use science-based forestry to promote conditions that create sustainable, productive forests that are resilient to large fires, climate change impacts, and other disturbance events. Use an adaptive management approach to address uncertainty and change over time.

ES.1.2 Habitat Conservation Plan Planning Structure

The HCP was led by ODF and advised by a team of policy and technical experts who were organized into a Steering Committee and Scoping Team. The final decisions on the contents of the HCP were made by ODF. All other participants were engaged to provide technical and policy advice. Planning participants provided valuable input during the planning process, as described in the following subsections.

ES.1.2.1 Steering Committee

The HCP Steering Committee consists of government agency representatives. Members worked together to provide advice on how ODF can achieve a mutually acceptable outcome that satisfies, to the greatest degree possible, the interests of all participants, while still meeting all regulatory requirements of the ESA. The role of the Steering Committee was to provide overall guidance for the HCP process and to provide direction and support to the Scoping Team. The Steering Committee met approximately bimonthly during HCP development.

Member agencies of the Steering Committee are discussed in Chapter 1, *Introduction*, and include representatives from the following organizations.

- ODF (convener)
- Oregon Department of State Lands
- Oregon Department of Environmental Quality
- Oregon Department of Fish and Wildlife
- Oregon State University
- USFWS
- NOAA Fisheries

ES.1.2.2 Scoping Team

The HCP Scoping Team consists of terrestrial and aquatic biologists and technical specialists from state and federal agencies. The role of the Scoping Team was to provide technical expertise and to develop technical recommendations for the Steering Committee to consider when advising ODF in the development of a potential HCP. The Scoping Team met twice monthly during HCP development. Member agencies of the Scoping Team were the same as those for the Steering Committee. Technical experts from Oregon State University provided review of key data and work products.

The Scoping Team provided input, guidance, and feedback on development of all aspects of the HCP. This important feedback included species to be covered, how to analyze effects on those species, and the type and extent of conservation actions described in the HCP. The Scoping Team also reviewed early drafts of the HCP to support ODF's development of a legally compliant, scientifically sound, and operationally feasible planning document.

ES.1.2.3 Public Engagement

During the development of the HCP, ODF hosted public informational meetings prior to each BOF meeting to provide an opportunity for the counties, Tribes, public, stakeholders, department staff, and consultants to share feedback, provide information regarding HCP development, and explore ideas for improvement. Follow-up meetings with these entities were also scheduled upon request to further discuss the information presented during the meetings open to the public and to provide more detail on the components of the HCP.

ES.2 Scope of the Habitat Conservation Plan

This section provides a summary of the scope of the HCP, including the location of the permit area and plan area, the activities and species covered by the HCP, and the requested duration of the permit term.

ES.2.1 Permit Area and Plan Area

The location where the HCP and ESA permit would apply must be defined and is called the *permit area*. The permit area in this HCP is defined as the area where incidental take is authorized under the incidental take permit, which includes the portion of the plan area that ODF currently controls and where all covered activities will occur and where conservation measures will apply. This includes all BOF Lands acquired pursuant to Oregon Revised Statutes (ORS) Chapter 530 and Common School Forest lands owned by the Oregon Department of State Lands but managed by ODF pursuant to ORS 530.490 through 530.520. Collectively, these lands encompass 639,413 acres throughout western Oregon. Using Land Acquisition and Exchange Plans, ODF has identified an 84,206-acre buffer surrounding parts of the permit area where ODF has the potential to acquire or exchange lands with neighboring landowners in the future. An additional 10,000 acres in the vicinity of ODF lands have not yet been identified in Land Acquisition and Exchange Plans but may be acquired by ODF. Following a land exchange and associated approvals, the HCP and permits would apply to any lands newly acquired by ODF, and permits would no longer apply to any lands that ODF no longer managed.

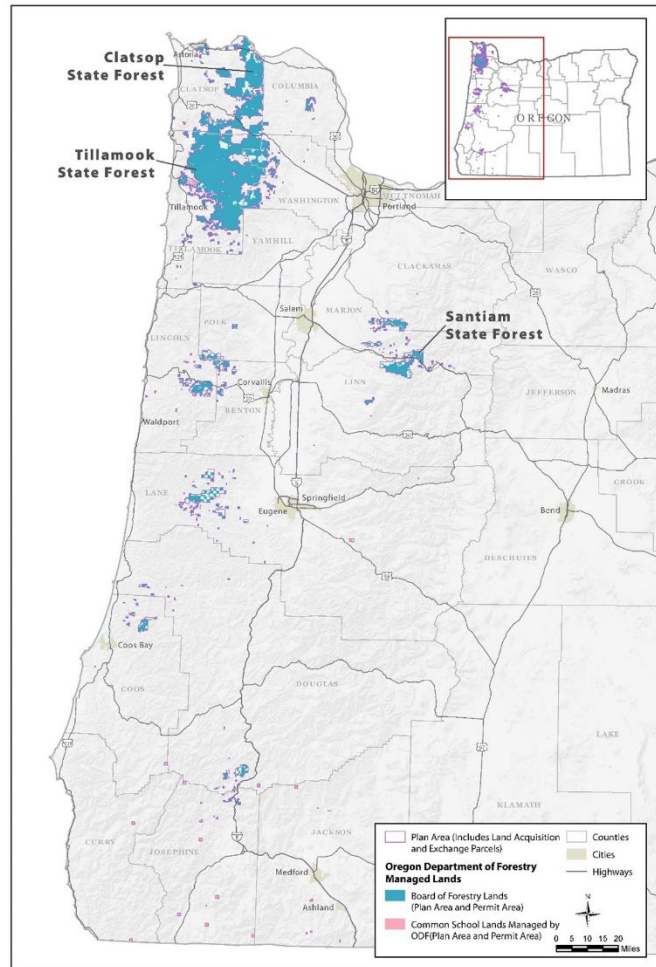


Figure ES-1. Permit Area and Plan Area

The *plan area* encompasses the permit area plus this additional 94,206-acre buffer. Table ES-1 shows the permit area and plan area for the HCP. Chapter 1, *Introduction*, provides additional details on how the permit area and plan area were defined.

ES.2.2 Covered Activities

This HCP and permits are proposed to provide incidental take authorization for ODF's land management activities in the permit area and the activities needed to carry out the conservation strategy. Covered activities must be "under the control" of the permit holder and occur within the permit term and in the permit area in order to receive take authorization. Broad categories of the covered activities are listed below; detailed descriptions of the selection process and all covered activities are provided in Chapter 3, *Covered Activities*.

- Timber harvest
- Stand management
- Road system management
- Recreation infrastructure construction, maintenance, and operations
- HCP conservation actions



ES.2.3 Covered Species

Covered species are those species for which the Services will provide take authorization to ODF to authorize take that may occur during the implementation of covered activities. Species were selected for take authorization if all four of the following criteria were met.

1. The species range overlaps with the plan area.
2. The species is currently listed under the ESA or is likely to become listed during the permit term.
3. The species or its habitat is likely to be affected by covered activities.
4. Enough scientific data exist to adequately assess the potential for covered activities to affect the species and to create a conservation strategy for the species that will adequately avoid, minimize, and mitigate the impact of any taking of the species that occurs from covered activities.

There are 15 species proposed for take authorization in the HCP: 10 fish, 2 birds, 1 salamander, and 2 mammals (Table ES-1). ODF is applying for take authorization for several species that are not yet listed under the ESA; any incidental take authorization issued by the Services for species not currently listed will only go into effect if and when the species is listed.

The list of covered species has evolved since release of the Public Draft HCP. Cascade and Columbia torrent salamanders (*Rhyacotriton cascadae* and *R. kezeri*) are no longer included as covered species. However, they remain addressed in the plan because the conservation measures are expected to benefit the species and its habitat, as described in the relevant sections.

Table ES-1. Proposed Covered Species

Species	Listing Status		Federal Agency Jurisdiction
	Federal	State	
Fish			
Oregon Coast coho (<i>Oncorhynchus kisutch</i>)	FT	FT	NOAA Fisheries
Oregon Coast Chinook (<i>O. tshawytscha</i>)	UR	UR	NOAA Fisheries
Lower Columbia River Chinook (<i>O. tshawytscha</i>)	FT	--	NOAA Fisheries
Lower Columbia River coho (<i>O. kisutch</i>)	FT	SE	NOAA Fisheries
Columbia River chum (<i>O. keta</i>)	FT	--	NOAA Fisheries
Upper Willamette River spring-run Chinook (<i>O. tshawytscha</i>)	FT	--	NOAA Fisheries
Upper Willamette River winter steelhead (<i>O. mykiss</i>)	FT	--	NOAA Fisheries
Southern Oregon/Northern California Coast coho (<i>O. kisutch</i>)	FT	--	NOAA Fisheries
Southern Oregon/Northern California Coastal Chinook (<i>O. tshawytscha</i>)	UR	UR	NOAA Fisheries
Eulachon (<i>Thaleichthys pacificus</i>)	FT	--	NOAA Fisheries
Birds			
Northern spotted owl (<i>Strix occidentalis caurina</i>)	FT	ST	USFWS
Marbled murrelet (<i>Brachyramphus marmoratus</i>)	FT	SE	USFWS
Amphibians			
Oregon slender salamander (<i>Batrachoseps wrighti</i>)	--	ST	USFWS
Mammals			
Coastal marten (<i>Martes caurina</i>) ^a	FT	--	USFWS
Red tree vole, North Oregon Coast population (<i>Arborimus longicaudus</i>) ^b	--	--	USFWS

^a The full name of the listed entity is Pacific marten, Coastal Distinct Population Segment.

^b ODF is proposing the red tree vole as a covered species under this HCP despite red tree vole not being listed as endangered or threatened under the ESA. In 2019, USFWS determined that red tree vole did not warrant listing as endangered or threatened (84 *Federal Register* 69707). In 2025, multiple conservation groups sought to vacate USFWS's not-warranted finding and remand the matter to the Service to issue a new determination regarding whether red tree vole warrants protection under the ESA as an endangered or threatened species (89 *Federal Register* 8137). ODF finds the likelihood of future listing of red tree vole to be high enough to include the species as a covered species under this HCP.

FT = Federal Threatened; UR = Under Review; SE = State Endangered; ST = State Threatened; T = Threatened; NOAA = National Oceanic Atmospheric Administration; USFWS = U.S. Fish and Wildlife Service

ES.2.4 Permit Term

The HCP and associated permits are proposed to have concurrent terms of 70 years. The 70-year permit term was selected to balance the risks associated with shorter and longer terms. A term of less than 70 years would limit ODF's ability to conduct long-term forest management practices, which are typically conducted on roughly 10-year management cycles. A shorter term would also not allow for the development of some forest stand conditions and habitats necessary to fully offset some of the authorized incidental take that will occur under the HCP. A term of more than 70 years would increase the risk that unpredictable ecological changes could adversely affect the status of the covered species in the plan area and increases the uncertainty associated with modeling those changes. Both of these items could compromise the conservation strategy.

The level of certainty associated with a 70-year term enables ODF to make long-term plans and investments with the assurance that it will be able to continue managing the forest in a manner that complies with ESA requirements. In addition, the monitoring and adaptive strategy detailed in Chapter 6, *Monitoring and Adaptive Management*, outlines how implementation of the conservation strategy will be monitored and reported and how changes will be made, if needed, in response to monitoring results, to manage in response to change. This will further allow ODF to manage uncertainty that may arise during the permit term.

ES.3 Conservation Strategy

The conservation strategy includes measures to avoid, minimize, and mitigate the impact of the taking on covered species to fully offset the effects of the taking in the management of state forestlands from covered activities. The conservation strategy relies on (1) implementing best management practices when conducting covered activities to minimize effects on covered species, (2) designating areas on the landscape that will be managed primarily for the benefit of covered species, and (3) implementing other species and habitat management activities, including through creation of a Conservation Fund and other dedicating funding, that would directly benefit covered species during the permit term.

The conservation strategy is best summarized by the biological goals and objectives for each covered species. Biological goals and objectives state the intentions of the HCP, and the measurable biological objectives are the measure by which the success of the HCP will be judged. Biological goals and objectives for covered fish and aquatic salamanders focus on continual improvement of aquatic habitat quality. Specifically, biological objectives state intentions for improving instream and riparian habitat quality through the recruitment of large wood, execution of stream-enhancement projects, removal of barriers to fish movement, protection against sediment and stream temperature increase, and other active and passive management. Biological goals and objectives for terrestrial covered species focus on increasing habitat quality and quantity during the permit term. Commitments are made to initially conserve and maintain some quantity of habitat that is currently suitable or occupied and then increase the total acres and quality of habitat over time through both passive and active management, and in the case of spotted owls, to reduce competitive threats (from barred owls) that might otherwise diminish the quality and accessibility of this habitat.

The following 13 conservation actions will be used to achieve the biological goals and objectives; they are described further Chapter 4, *Conservation Strategy*.

- Conservation Action 1: Establish Riparian Conservation Areas
- Conservation Action 2: Riparian Equipment Restriction Zone
- Conservation Action 3: Stream Complexity
- Conservation Action 4: Remove or Modify Artificial Fish-Passage Barriers
- Conservation Action 5: Standards for Road Improvement and Vacating
- Conservation Action 6: Establish Habitat Conservation Areas
- Conservation Action 7: Manage Habitat Conservation Areas
- Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas
- Conservation Action 9: Strategic Terrestrial Species Actions
- Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species
- Conservation Action 11: Road and Trail Construction and Management Measures
- Conservation Action 12: Restrictions on Recreational Facilities
- Conservation Action 13: Stay-Ahead Provision

ES.3.1 Aquatic Conservation Strategy

The centerpiece of the aquatic conservation strategy is the establishment of riparian conservation areas (RCAs), which are stream buffers designed to protect against negative effects from increased sedimentation and stream temperature. RCAs are further designed to maximize the amount of large woody debris that could be naturally recruited into aquatic systems from streamside sources and from debris flows in the upper watersheds. RCAs vary by stream type, including stream size, seasonality, and whether it is a fish-bearing stream.

Approximately 77,800 acres are proposed to be designated as RCAs (and related Equipment Restriction Zones) across the permit area. Approximately 36,700 acres of RCAs overlap with habitat conservation areas (HCAs). Activities in RCAs would be limited to only essential activities needed to implement covered activities (e.g., road construction and maintenance) or to complete stream-enhancement actions, including placement of large woody debris, process-based restoration, channel restoration, and fish barrier removal; silvicultural treatment (in the form of thinning) is expected to be limited to approximately 3,400 acres of RCAs exclusively to promote development of late-seral forest conditions, which will benefit the covered salmon and steelhead.

For additional details on covered activity occurrence within RCAs see the frequency table in Appendix E, *Effects Analysis*. Additional conservation actions create operational and design standards for roads, equipment use, and the timing of activities to minimize effects on covered species and the stream environment. Table ES-2 and Table ES-3 summarize the RCAs by stream type, and Table ES-2 illustrates their location in northwestern Oregon. For additional details on these and other aquatic conservation actions, see Chapter 4, *Conservation Strategy*, Conservation

Actions 1 through 5. In addition, some components of the terrestrial conservation strategy (such as designation of significant portions of the permit area as HCAs and retaining important habitat features on the landscape outside of HCAs and RCAs) and ODF's general forest management planning will result in areas immediately adjacent and upslope to a portion of RCAs existing in a wide range of forest age and structure conditions. This includes older forests, that provide additional benefits to the covered species with respect to reducing sediment inputs, stream temperature, and large wood delivery to streams. In other words, a portion of RCAs will not exist as isolated buffers abutting recently harvested or young forested stands.

Table ES-2. Buffer Widths (Horizontal Distance) for All Type F and Large and Medium Type N Streams

Stream Type	Minimum Management Area Width (feet) ^a	
	Type F	Type N
Large	120	120
Medium	120	120
Small	120	See Table ES-3
Seasonal ^b	120	See Table ES-3

^a Distance will be measured horizontally, which results in the implementation of larger buffers in steeper terrain.

^b Seasonal: A stream that does not have surface flow after July 15.

Table ES-3. Minimum Riparian Conservation Area Widths (Horizontal Distance) for Small Perennial and Seasonal Type N Streams

Stream Type	Minimum Management Area Width (feet) ^a	
	Within 500-foot Process Zone	Upstream of 500-foot Process Zone
Perennial small Type N	120	35
Potential debris flow track (Seasonal Type N) ^b	50	35
High energy (Seasonal Type N) ^c	50	35
Seasonal other (Type N) ^d	0 ^e	0 ^e

^a Distance will be measured horizontally, which results in the implementation of larger buffers in steeper terrain.

^b Potential debris flow tracks: Reaches on seasonal Type N streams that have the potential to deliver wood to a Type F stream.

^c High Energy: Reaches on seasonal Type N streams that have the potential to deliver wood and sediment to a Type F stream during a high-flow event.

^d Seasonal: A stream that does not have surface flow after July 15.

^e A 35-foot equipment restriction zone will apply to these streams.

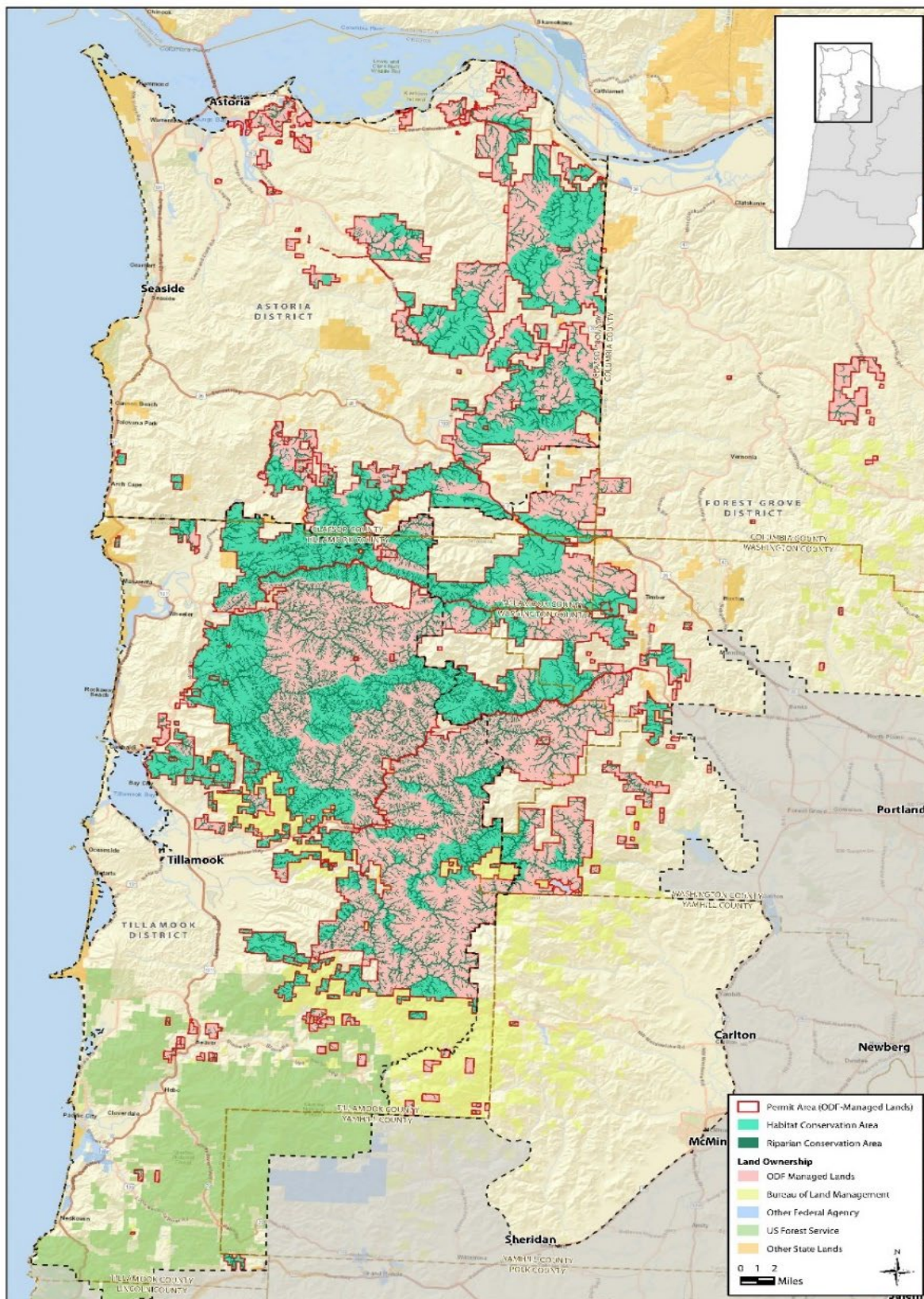


Figure ES-2. Habitat Conservation Areas and Riparian Conservation Areas in Northwestern Oregon

ES.3.2 Terrestrial Conservation Strategy

The centerpiece of the terrestrial conservation strategy is the establishment of HCAs, which are designed to conserve, maintain, and enhance habitat for the terrestrial covered species. HCAs comprise approximately 275,000 acres across the permit area to support the persistence of northern spotted owl (*Strix occidentalis caurina*), marbled murrelet (*Brachyramphus marmoratus*), red tree vole (*Arborimous longicaudus*), Oregon slender salamander (*Batrachoseps wrighti*), and coastal marten (*Martes caurina humboldtensis*). These HCAs will be conserved, maintained, and enhanced to provide habitat for covered species throughout the permit term and (along with the portion of RCAs within the HCAs) represent 43% of the permit area. The size of HCAs varies widely, due to land ownership patterns, habitat availability, and covered species needs. In locations where ODF land ownership includes large blocks (e.g., north coast), HCAs are generally larger (Table ES-2). In locations where ODF land ownership is more scattered and intermixed with private and federal landowners, HCAs are generally smaller. Smaller HCAs are found throughout the permit area, typically where ODF managed lands are smaller and more scattered. These smaller HCAs are designated to protect and enhance known species occurrence and provide connectivity between federal lands within smaller patchwork ownership patterns.

The HCAs are designed to achieve the following.

- Conserve, maintain, and enhance existing habitat for terrestrial covered species in the permit area over the permit term.
- Improve low-quality habitat for covered species and develop new habitat, where necessary and where such treatments can be implemented effectively and efficiently. Treatments will include expanding and connecting existing habitat to improve landscape-level habitat function.
- Limit management activities to those necessary and prudent to improve habitat quantity and quality over the permit term.

Within HCAs, forests will be managed to maintain and develop late-seral structure stands to improve long-term habitat values for terrestrial covered species. Both passive and active management will be used to increase habitat quality and quantity for these covered species over the 70-year permit period. Habitat for terrestrial species is estimated to increase in both quality and quantity during the permit term (Table ES-4). The new acres of suitable habitat are located primarily inside of HCAs and are the result of passive management but also targeted active management of key stands to grow habitat faster.

Active management will include treatment of Douglas-fir (*Pseudotsuga menziesii*) stands infected by Swiss needle cast and hardwood stands that are less likely to grow into habitat without intervention. Forest management prescription (e.g., thinning) will also be used to promote tree growth and understory diversity. The anticipated increase in the quality and quantity of habitat for covered terrestrial species is the primary tool used to offset the impact of the taking from continued habitat loss due to covered activities during the same period. For additional details on these and other terrestrial conservation actions, see Chapter 4, *Conservation Strategy*, Conservation Actions 6 through 9.

In conjunction with the implementation of targeted management prescriptions to increase and improve habitat inside HCAs, additional conservation actions are included to retain important habitat features on the landscape outside of HCAs and RCAs. This includes retaining habitat trees

and leaving downed wood during forest management activities. Collectively, retention of structural habitat features across the actively-managed portion of the permit area, the growth of trees in RCAs and Operationally Limited areas, and the longer (than typical industrial forest management) rotation ages employed by ODF for thinning and regeneration harvests, will result in a wide range of forest age and structure conditions—including older forests and some suitable habitats for covered species—outside of the HCAs. While the locations, amounts, and longevity of these habitats outside of HCAs will be dynamic based on ODF forest management planning, they will exist to an extent that supports connectivity and some degree of presence of covered species throughout the permit term in portions of permit area between the HCAs. Much of the impact (incidental take) to covered species anticipated from the HCP will result from the active management and dynamic conditions expected to occur in these portions of the permit area. ODF will continue to minimize effects on sites known to support covered species, specifically by imposing seasonal restrictions on operations in known nesting locations for northern spotted owl and marbled murrelet.

ES.3.3 Conservation Fund

The conservation strategy will result in an increase in habitat for all of the terrestrial covered species, but other factors may remain that limit the ability of covered species to take advantage of the new habitat and for populations to increase. The Conservation Fund, described in Chapter 9, *Costs and Funding*, will provide funding on an annual basis to address these limiting factors. The priorities for how the Conservation Fund is used may change during the permit term, but ODF will work with species experts and other state and federal partners to identify where and how Conservation Fund monies are spent. Conservation Fund monies will be derived from ODF's share of timber sale revenues, at a rate of \$5 per thousand board feet harvested. This fund will be used to implement three types of conservation projects to directly benefit the covered species: (1) aquatic habitat-enhancement projects, (2) terrestrial habitat projects, and (3) strategic initiatives. Examples of aquatic habitat-enhancement projects include placement of large wood into streams, side-channel reconnection projects, and fish-passage improvements. Terrestrial habitat enhancement includes habitat restoration in HCAs and research on covered species response to management actions in HCAs. Strategic initiatives are projects designed to speed the recovery of covered species. For example, ODF has committed to participating in regional barred owl management to increase habitat availability for northern spotted owl. Strategic initiatives may also include facilitation of research and monitoring projects designed to better understand species distribution and conservation needs and species response to conservation actions.

The creation of the Conservation Fund allows ODF to meaningfully engage with partners to implement conservation projects to benefit covered species. Funds will be accrued annually, but there will be flexibility to roll funds over year to year in order to fund larger and more complex conservation projects. Based on modeled harvest estimates the Conservation Fund is estimated to accrue on average \$1 million/year throughout the permit term. Expenditures of the Conservation Fund are expected to equally support aquatic and terrestrial species conservation needs. A more detailed description can be found in Chapter 9, *Costs and Funding*.

Table ES-4. Acres of Covered Species Habitat in Habitat Conservation Areas at the Beginning and End of the 70-Year Permit Term

Species	Habitat in HCAs at the Beginning of Permit Term	% of HCAs that are Habitat at the Beginning of Permit Term^f	Habitat Projections in HCAs at End of Permit Term^f	% of HCAs that are Habitat at End of Permit Term^g	% Increase in Habitat Acres During Permit Term
Northern spotted owl ^a	122,775 ^e	45%	230,944	84%	+39%
Marbled murrelet ^b	80,905	29%	203,621	74%	+45%
Red tree vole ^b	71,855	26%	176,005	64%	+38%
Oregon slender salamander ^c	19,200	7%	19,200 ^c	7%	0%
Coastal marten ^d	27,000	10%	27,000	10%	0%

^a Habitat includes modeled nesting, roosting, and foraging habitat.

^b Habitat includes modeled suitable and highly suitable habitat but does not include younger stands that may also contain red tree vole.

^c Habitat includes the extent of Oregon slender salamander range in the permit area. In addition to the 19,000 200 acres that will be managed as Oregon slender salamander habitat in HCAs, retention standards described in Conservation Action 8: *Conservation Actions Outside Habitat Conservation Areas and Riparian Conservation Areas*, will ensure that Oregon slender salamander can persist in areas that are subject to harvest within the species range.

^d Any portion of the permit area from northern Lane County south to the California border, west of Interstate 5 is considered habitat. The amount of habitat in the permit area will not change substantially during the permit term unless ODF acquires new lands. All of the 27,000 acres of coastal marten habitat in HCAs are expected to be improved during the permit term, resulting in habitat quality at the end of the permit term that is expected to be higher than it is at the beginning of the permit term.

^e 28 out of 31 active northern spotted owl activity centers are inside of HCAs.

^f Commitments to conserve, maintain, and enhance acres of covered species habitat are based on the assumption that at least 50% of nesting and roosting habitat or highly suitable habitat and 80% of foraging or suitable habitat modeled to grow within HCAs over the 70-year permit term can be achieved. Values rounded to nearest 100. Within HCAs, projected habitat acres beyond the committed acres are not considered excess acres that could be subject to more flexible, intensive, or revenue-driven management.

^g HCAs comprise approximately 275,000 acres. Species distribution does not cover the entire extent of HCAs so the percentage is not indicative of habitat quality. For example, Oregon slender salamander only occurs in the North Cascades, which comprises less than 15% of the permit area.

HCA = habitat conservation area

ES.3.4 Monitoring and Adaptive Management

The HCP includes a monitoring program to demonstrate that ODF is operating in compliance with the commitments made in the HCP and associated incidental take permits. The monitoring program also helps to assess whether the conservation strategy is performing as expected. Compliance monitoring will focus on whether the HCP is being implemented properly and as required by the permits. Compliance monitoring results will be summarized in an annual report to the Services. Effectiveness monitoring will be completed to track progress towards the biological goals and objectives. Effectiveness monitoring will include validation of habitat development as estimated by species habitat models and species response to changes in habitat quality. Collectively, these monitoring programs will track long-term trends in habitat quality and quantity to allow for an examination of whether the HCP is making progress towards the biological goals and objectives, or whether changes are needed through the adaptive management program. Monitoring and adaptive management are integrated processes, and monitoring will inform changes in management actions to continually improve outcomes for covered species.

The monitoring framework will be operationalized by ODF as part of each 10-year implementation planning cycle, during which ODF will assess monitoring priorities, using this framework as a guide. The adaptive management program is also generally aligned with these 10-year implementation planning cycles.

ES.4 Implementation, Cost, and Funding

ODF will oversee HCP implementation, including staffing internal positions, hiring consultants, reporting, monitoring, and maintaining all program records. ODF staff includes biologists, foresters, administrators, and other natural resource specialists who will carry out planning, monitoring, and adaptive management. ODF is also responsible for coordination with state and federal wildlife agencies during HCP implementation and providing regular reports to the Services. Implementation of the HCP will be integrated with existing State Forest Division planning cycles, grounded in the 10-year implementation planning periods associated with the forest management plan.

ES.4.1 Reporting

Reporting will occur on three timescales during implementation: (1) annual reports, (2) 5-year check-ins, and (3) 10-year comprehensive reviews. Annual reports will focus on assessing compliance with the HCP and permits. Longer term 5- and 10-year reviews will focus on assessments of the effectiveness of HCP conservation actions. The 10-year comprehensive reviews are specifically designed to inform the 10-year implementation planning process, which guides forest management planning for the State Forests Division. For more details on reporting, see Chapter 8, *Implementation*.

ES.4.2 Costs and Funding

Chapter 9, *Costs and Funding*, details the cost of administering the HCP, including implementation of the conservation strategy and monitoring program. Chapter 9 also outlines how the HCP commitments will be funded for the duration of the permit term. Income from timber revenue on

State Forests will provide the primary support for HCP implementation. There are five cost categories described in the HCP.

- Plan administration and staffing
- Conservation strategy
- Monitoring
- Adaptive management
- Remedial measures for changed circumstances

1.1 Overview

The Oregon Department of Forestry (ODF) has prepared this multi-species Western Oregon State Forests Habitat Conservation Plan (HCP) to support its request for incidental take permits (ITPs) under the federal Endangered Species Act (ESA) for Western Oregon State Forests that are managed by ODF. The HCP is a long-term plan that will support the conservation of threatened and endangered species, or those species that are likely to become listed as such, while allowing management of the forest, including ongoing timber harvest activities.

Section 9 of the ESA prohibits the taking of species listed as threatened or endangered. *Taking* is defined as, “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” (16 United States Code [USC] 1532). ODF cannot conduct forest management, road system management, and construction and maintenance of recreational facilities in state forests without removing or altering forested areas that may provide habitat for listed, proposed, or candidate species. This HCP analyzes this as take to the extent it could kill individuals.

In accordance with Section 10 of the ESA, ODF has applied to the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries (collectively referred to as the Services) for ITPs that will allow specified levels of take of listed species. The goal of this HCP is to fully offset the impacts of the taking to be authorized. To accomplish this, ODF will avoid, minimize, and mitigate taking of covered species to fully offset the effects of the taking in the management of state forest lands.

1.1.1 Habitat Conservation Plan Mission and Vision

ODF’s mission statement for this HCP is as follows.

To provide protection and conservation for selected listed species and species likely to become listed under the federal or state Endangered Species Acts during the permit term, while providing for long-term, multi-benefit management of the State’s public forestlands subject to the Western Oregon State Forests Management Plan. The HCP will support the range of economic, social, and environmental benefits that ODF is statutorily required to provide under the Greatest Permanent Value rule and will help to meet fiduciary responsibilities for Common School Fund Lands (CSFL). It will also meet specific criteria that must be satisfied before NOAA Fisheries and USFWS can issue ITPs.

ODF has the following vision for the HCP, which defines the future outcome of state forests with the HCP.

The Western Oregon HCP ensures species protection and conservation as well as increased certainty that working state forestlands will continue to benefit all Oregonians. Multi-objective forest stewardship activities provide revenue to counties, rural communities, the Common School Fund, and ODF; create jobs; support resilient forest ecosystems, clean air, and high water quality; provide high-quality habitats for native fish and wildlife; and promote educational, recreational, and other partnership opportunities to enhance enjoyment of public forest benefits.

1.1.2 Habitat Conservation Plan Program Goals

ODF staff developed a set of six broad program goals for the HCP in collaboration with the HCP Steering Committee (Chapter 1, Section 1.4.1, *Steering Committee*). These program goals were used as a foundation to develop the biological goals and objectives and the conservation strategy described in Chapter 4, *Conservation Strategy*.

1. Meet the regulatory requirements of the federal and state ESAs through an approved HCP, using a multi-species approach to managing forest ecosystems across the landscape.
2. Ensure active and sustainable management of state forest lands under an HCP and an associated forest management plan designed to meet the social, economic, and environmental goals articulated in the Greatest Permanent Value Rule.
3. Increase operational certainty, cost savings, and predictability of revenue generation (including related timber harvest, jobs, and other economic values) using the HCP as a programmatic approach to comply with the federal and state ESAs over the permit term.
4. Increase certainty for long-term persistence of covered wildlife species by protecting and maintaining high-quality habitats, conducting habitat enhancement activities, and mitigating the impacts of covered activities on covered species.
5. Advance partnerships and engagement related to management approaches and outcomes associated with, but not limited to, revenue generation and economic outcomes, conservation, forest conditions and health, tribal interests and traditional cultural uses, research, monitoring, education, recreation, and the equitable enjoyment of benefits that state public forests provide.
6. Use science-based forestry to promote conditions that create sustainable, productive forests that are resilient to large fires, climate change impacts, and other inter-related disturbance events. Use an adaptive management approach to address uncertainty and change over time.

1.1.3 State Forest Management

ODF was established in 1911, with a primary purpose to control forest fires. In 1925, the Oregon Legislature passed a law allowing the Board of Forestry (BOF) to accept gifts or donations of forestlands. The State Forests Acquisition Act of 1939 created procedures for BOF to acquire tax-delinquent forestlands from counties, manage the land, and return most net revenues from the land to the counties. Amendments to the State Forests Acquisition Act since then have adjusted the distribution of revenues and legal direction for forest management on these lands. Today, lands owned by BOF are known as Board of Forestry Lands (BOFL). The lands are managed by ODF to secure the “greatest permanent value...to the state” (Oregon Revised Statutes [ORS] 530.050) by providing “healthy, productive, and sustainable forest ecosystems that over time and across the landscape provide a full range of social, economic, and environmental benefit to the people of Oregon” (Oregon Administrative Rules [OAR] 629-035-0020). BOFL are actively managed in a sound environmental manner to provide sustainable timber harvest and revenues to the state, counties, and local taxing districts.

Some lands managed by ODF are owned by the State Land Board that oversees the Oregon Department of State Lands (DSL). The State Land Board consists of the Governor, the Secretary of State, and the State Treasurer. When Oregon became a state in 1859, the federal government

granted sections 16 and 36 of every township¹ to the new state for the use of schools. Oregon's grant included 3.5 million acres of grazing and forestlands. Eventually, much of the land was sold for the benefit of schools. The state also exchanged some lands to consolidate land into larger blocks. The remaining forestlands owned by DSL are known as Common School Forest Lands (CSFL). The State Forester is authorized to manage CSFL (ORS 530.490–530.520), consistent with the Oregon Constitution's objective of "obtaining the greatest benefit for the people of this state, consistent with the conservation of this resource under sound techniques of land management." Each land ownership has its own set of legal and policy mandates.

ODF manages state forests for multiple values including social, environmental, and economic values. Sustainable and predictable timber harvests provide revenues to counties, local taxing districts, and ODF, and jobs in rural communities. Timber production goals focus on growing stands that generate a product mix of predominately large and medium sawtimber. Prior to final harvest, young stand management and mature stand partial cutting entries provide habitat values for native wildlife species. At final harvest, retention standards for green trees, snags, and downed wood provide biological legacies for future stands. ODF provides diverse recreation, education, and interpretation opportunities for the public to enjoy state forests and learn about their ecology and management.

ODF is currently managing state forests throughout western Oregon under the 2010 Northwest Oregon State Forests Management Plan and Southwest Oregon State Forests Management Plan (Oregon Department of Forestry 2010a, 2010b), which provide management direction for all BOFL and CSFL in this area. The forest management plans present guiding principles, a forest vision, and resource management goals. The plans describe each forest resource and explain the concepts for integrated forest management and management strategies. The resource management goals and strategies are intended to balance the resources and achieve the greatest permanent value through a system of integrated management.

Currently, ODF is managing state forests consistent with their forest management plans with an intent to avoid and minimize the risk of take of any listed species (Oregon Department of Forestry 2010a, 2010b). This management approach has been increasingly costly and disruptive to ODF planning and operations given the uncertain legal and regulatory landscape, shifting or expanding species distribution, potential for new listed species, and monitoring requirements. In 2018, BOF commissioned a business case analysis that examined the costs and economic benefits of preparing a regional HCP across all BOFL in western Oregon with an assumed 50-year permit term (ECONorthwest and ICF 2018). This business case concluded that an HCP would provide economic benefits to BOF and ODF, greatly reduce uncertainty, and improve the conservation of currently listed species and species that may be listed over the permit term. As a result of this business case analysis, BOF in October 2018 unanimously directed ODF staff to pursue an HCP.

1.2 Scope of the Habitat Conservation Plan

This section describes the scope of the HCP, including the plan area, permit area, permit term, covered activities, and covered species. Collectively, these key elements of the HCP frame the scope of the analysis contained in the rest of this document. The analysis will be conducted only in the plan area on the covered activities and will be limited to the species included as covered species.

¹ A section is 640 acres, or 1 square mile. A township is a survey boundary that is typically 6 miles square, or 36 sections (23,040 acres).

1.2.1 Plan Area

The HCP plan area includes all state forest lands west of the crest of the Cascade Range that are managed by ODF (Figure 1-1). Most of these state forest lands are in northwestern Oregon in the Tillamook, Clatsop, and Santiam State Forests. Smaller blocks of state forest lands are in the central Coast Range west of Corvallis and Eugene. In southern Oregon, state forest lands are found in southern Douglas and northern Josephine Counties near the town of Glendale, and in tracts in Douglas and Coos Counties near Reedsport and Coos Bay. Smaller tracts of state forest lands are scattered throughout the plan area. State forest lands in eastern Oregon (Klamath-Lake District) are not included in this HCP.

ODF currently manages 25,826 acres of land in western Oregon on behalf of DSL. All of these lands are also included in the plan area.

To allow for possible future changes in ODF's ownership, the plan area includes areas not currently managed by ODF but that are identified in land acquisition and exchange plans published by many of the districts in the plan area. This additional area totals 84,206 acres (Table 1-1; Figure 1-1). Not all of that area will be acquired by ODF during the permit term; these lands represent a boundary in which acquisition will mostly likely occur. Net acquisitions are estimated to be on the order of 25,000 acres. Because ODF does not yet own these parcels, they are not part of the permit area. When land is added to the permit area ODF will demonstrate to the Services, in writing the level of take expected and the mitigation provided by the conservation strategy for each covered species, as described in Chapter 4, *Conservation Strategy*. Changes in the permit area should be consistent with the scope of the analysis in the HCP, environmental impact statement (EIS), biological opinions (BOs), or permit issuance documents, and if any lands proposed for addition or removal result in effects not considered, an amendment will be required. Chapter 8, *Implementation*, outlines circumstances when an amendment may or may not be required. Generally, land transactions in the plan area that do not increase or change the level or type of impact on the covered species will not require an amendment, whereas those that do will require a permit amendment.

The current land acquisition and exchange plans likely do not predict all of the acquisitions or transfers that ODF could undertake during this HCP. To account for additional shifts in land ownership, the plan area includes allowance for another 10,000 acres of forestland that could occur anywhere in the vicinity of current ODF ownership in the permit area. These areas are not shown in Figure 1-1.

The plan area includes a total of 722,676 acres (Figure 1-1), the components of which are summarized in Table 1-1.

1.2.2 Permit Area

The HCP permit area is defined as the area where incidental take is authorized under the ITPs, which include the portions of the plan area that ODF currently controls and where all covered activities will occur and where conservation measures will apply. The permit area includes a total of 639,413 acres (Figure 1-1): 613,663 acres of BOFL² and 25,750 acres of CSFL (Table 1-1). The HCP permit area includes all BOFL described previously for the plan area. These CSFL are included in the

² There are approximately 200 acres of BOFL that are used for ODF administrative purposes. No covered activities will occur on those lands; therefore, they are not included in the plan area or permit area.

permit area and covered by this HCP to provide ODF with take authorization for its activities on this land, as long as the interagency agreement that provides ODF with the authority to manage those lands remains in place. This agreement is amended occasionally and was last amended and adopted on July 8, 2024. The ITPs issued for this HCP would not provide take authorization for another land manager besides ODF to manage CSFL.

As part of its long-term planning efforts, ODF acquires or disposes of forest parcels in order to consolidate its ownership, increase public use opportunities of state forest lands, improve management efficiency, reduce adverse environmental effects, and reduce neighbor conflicts. This is primarily accomplished through land exchanges with other forest landowners. Periodically, ODF identifies and publishes maps of the specific parcels that it is interested in exchanging or acquiring from willing sellers at fair market value. Over the last 20 years, for example, ODF has disposed of 12,125 acres and obtained 13,002 acres of forest relative to the permit area, for a net change of 877 acres added to state forests in this time period (a net change of about 0.1%).

The process for adding or removing land from the permit area is described in Chapter 8, *Implementation*.

In other circumstances where covered activities occur within, but then continue outside of, the permit area (hauling, road maintenance, etc.), ODF will implement the terms and conditions of the HCP and ITPs in the permit area. If a covered activity, such as hauling, continues outside of the permit area and onto private or public land that ODF does not control, ODF will adhere to the terms and conditions of the agreement in place (e.g., easements) with the adjacent landowner(s). Notably, when the terms and conditions of the HCP and ITPs are applied to hauling in the permit area, they are being applied, by default, outside of the permit area. Essentially, if hauling is not initiated in the permit area it would not be occurring outside of it.

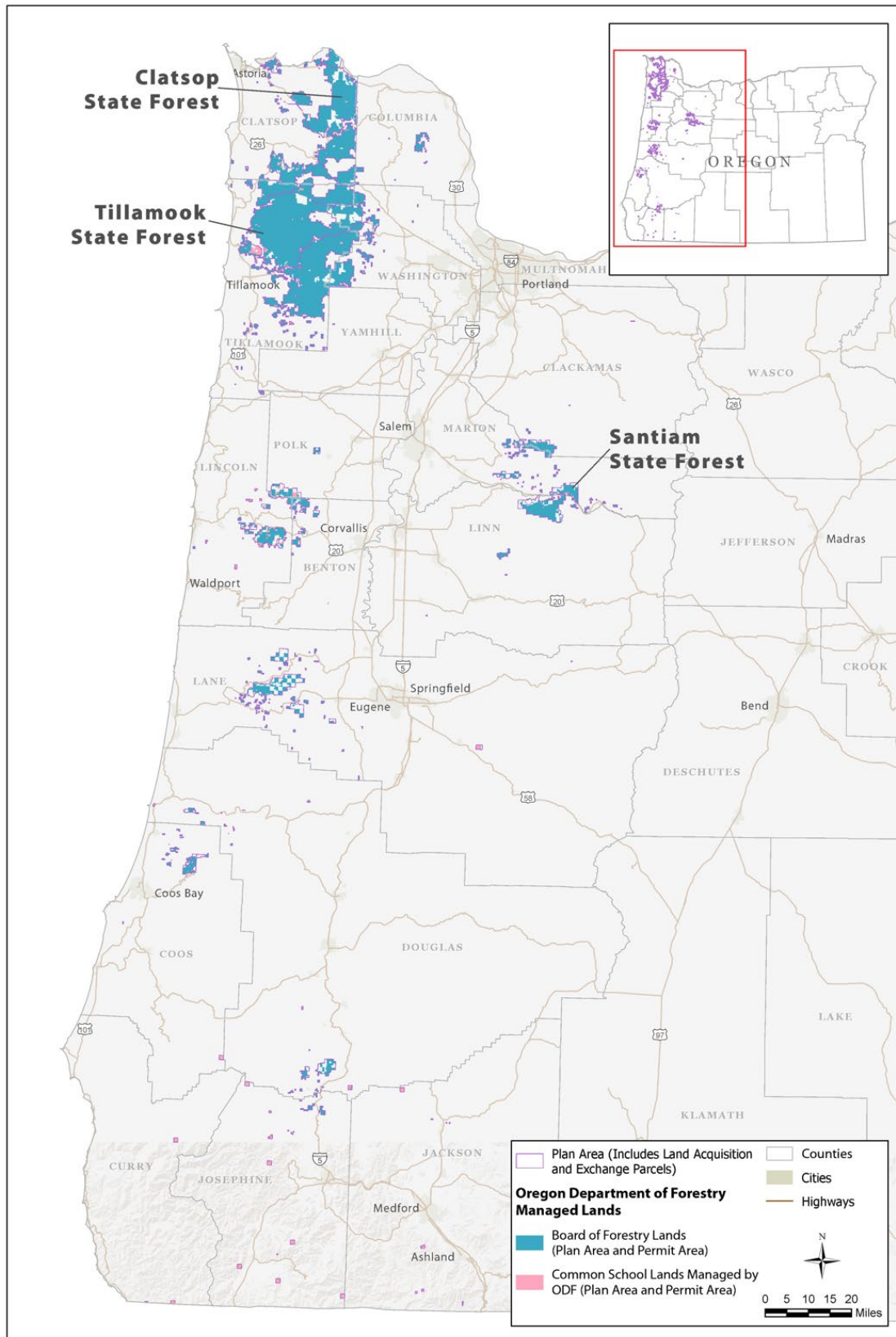


Figure 1-1. Western Oregon State Forests Habitat Conservation Plan Area and Permit Area

Table 1-1. Lands in the Plan Area and Permit Area

Land Type	Amount in Plan Area (acres)	Amount in Permit Area (acres)	Explanation
BOFL in western Oregon	613,663	613,663	In permit area as long as these lands are owned by BOF. In the event of conveyance of portions of these lands to another party, conveyed parcels will no longer be part of the permit area and this HCP will no longer apply. If this conveyance is part of a land exchange, the lands will be incorporated into the HCP as indicated below.
State of Oregon CSFL managed by ODF in western Oregon	25,750	25,750	In the permit area as long as these lands are managed by ODF. If ODF ceases to manage these lands, or in the event of conveyance of portions of these lands to another party, conveyed parcels will no longer be part of the permit area and this HCP will no longer apply. If this conveyance is part of a land exchange, the lands will be incorporated into the HCP as indicated below.
Lands identified by land acquisition and exchange plans	84,206	0	These plans identify potential exchange parcels, many of which never become involved in an actual exchange. As a result, only a fraction of this total may be added to the permit area through the HCP modification process described in Chapter 8, <i>Implementation</i> .
Additional lands in the vicinity of current ODF ownership	10,000 ^a	0	Lands not yet identified in land acquisition and exchange plans but that may be acquired by ODF. These lands may be added to the permit area through the HCP modification process described in Chapter 8, <i>Implementation</i> .
Total	733,619	639,13	--

^a Represents the best estimate of additional lands.

BOFL = Board of Forestry Lands; BOF = Board of Forestry; HCP = Western Oregon State Forests Habitat Conservation Plan; CSFL = Common School Forest Lands; ODF = Oregon Department of Forestry

1.2.3 Permit Term

The HCP and associated ITPs will have concurrent terms of 70 years. The 70-year term was selected to balance the risks associated with shorter and longer terms. A term of less than 70 years would limit ODF's abilities to conduct long-term forest management practices, which are conducted in accordance with implementation plan cycles that typically span 10-year periods. A shorter term would also not allow for the development of some forest stand conditions and habitats necessary to fully offset some of the authorized incidental take that would occur under the HCP. A term of more than 70 years would increase the risk that unpredictable ecological changes could adversely affect

the status of the covered species in the plan area and increases the uncertainty associated with modeling those changes. Both of these items could compromise the conservation strategy. The level of certainty associated with a 70-year term enables ODF to make long-term plans and investments through multiple implementation cycles with the assurance that they will be able to continue managing the forest in a manner that complies with ESA requirements. In addition, the monitoring and adaptive strategy outlined in Chapter 5, *Monitoring and Adaptive Management*, outlines how implementation of the conservation strategy will be monitored and reported, and how changes will be made, if needed, in response to monitoring results, to manage in response to change. This will further allow ODF to manage uncertainty that may arise during the permit term.

1.2.4 Covered Activities

This HCP and the associated ITPs will provide incidental take authorization for ODF's land management activities in the permit area (Figure 1-1), as well as the activities needed to carry out the conservation strategy, as described in Chapter 4, *Conservation Strategy*. Broad categories of ODF's covered activities are listed below; detailed descriptions of the selection process and covered activities are provided in Chapter 3, *Covered Activities*.

- Timber harvest
- Stand management
- Road system management
- Recreation infrastructure construction and maintenance
- HCP conservation actions

1.2.5 Covered Species

Covered species are those species for which the Services will provide take authorization to ODF to conduct the covered activities. The plan area provides habitat for a variety of species, including species listed under state and federal endangered species protection laws, and others that are not yet ESA listed, but may become ESA listed during the permit term. ODF selected the covered species for the HCP based on review of all species of conservation concern known or suspected to occur in the plan area during the permit term. These species were then screened based on the four selection criteria described in Chapter 1, Section 1.2.5.1, *Covered Species Selection Criteria*. A summary of that selection process is provided in Appendix D, *Species Considered for Coverage*. To be covered by the HCP, a species must meet all four criteria.

The list of covered species has evolved since release of the Public Draft HCP. Torrent salamanders are no longer included as covered species. However, they remain addressed in the plan because the conservation measures are expected to benefit the species and its habitat, as described in the relevant sections. If torrent salamanders, or other non-covered species, become federally listed during the permit term, ODF will follow the protocol outlined in Chapter 7, Section 7.3.3.1, *New Species Listings and Designation/Revisions to Critical Habitat* to determine whether additional measures, consultation, or permit amendment are needed to avoid unauthorized take.

1.2.5.1 Covered Species Selection Criteria

Range

Based on a review of species range, a review of scientific literature, and professional expertise, it was determined that a species does occur or can be expected to occur in the plan area. In addition, species that are not currently known to occur in the plan area but are expected to move into the plan area during the permit term (e.g., through range expansion) were considered to meet this criterion.

Status

The species should be listed or proposed for listing under the federal ESA as threatened or endangered, should be a candidate species, or in ODF's view, have a strong likelihood of being listed during the permit term. Potential for listing during the permit term is based on current listing status; consultation with experts and the Services or Oregon Department of Fish and Wildlife (ODFW) staff; evaluation of species population trends and threats; and best professional judgment.

Impact

The species or its habitat could be adversely affected by covered activities in a manner likely to result in incidental take as defined by the ESA.

Data

Enough scientific data should exist on the species' life history, habitat requirements, and occurrence in the plan area to adequately evaluate potential effects from covered activities, and to develop adequate conservation measures to avoid, minimize, and mitigate the impact of any taking of the species that occurs from covered activities.

1.2.5.2 Proposed Covered Species

The review and selection process found 15 species meeting all selection criteria (Table 1-2). For details on the selection process, see Appendix D, *Species Considered for Coverage*.

Table 1-2. Covered Species

Species	Listing Status		Federal Agency Jurisdiction
	Federal	State	
Fish			
Oregon Coast coho (<i>Oncorhynchus kisutch</i>)	FT	--	NOAA Fisheries
Oregon Coast Chinook (<i>O. tshawytscha</i>) ^a	UR	--	NOAA Fisheries
Lower Columbia River Chinook (<i>O. tshawytscha</i>)	FT	--	NOAA Fisheries
Lower Columbia River coho (<i>O. kisutch</i>)	FT	SE	NOAA Fisheries
Columbia River chum (<i>O. keta</i>)	FT	--	NOAA Fisheries

Species	Listing Status		Federal Agency Jurisdiction
	Federal	State	
Upper Willamette River spring-run Chinook (<i>O. tshawytscha</i>)	FT	--	NOAA Fisheries
Upper Willamette River winter steelhead (<i>O. mykiss</i>)	FT	--	NOAA Fisheries
Southern Oregon/Northern California Coast coho (<i>O. kisutch</i>)	FT	--	NOAA Fisheries
Southern Oregon/Northern California Coastal Chinook ^a	UR	--	NOAA Fisheries
Eulachon (<i>Thaleichthys pacificus</i>)	FT	--	NOAA Fisheries
Birds			
Northern spotted owl (<i>Strix occidentalis caurina</i>)	FT	ST	USFWS
Marbled murrelet (<i>Brachyramphus marmoratus</i>)	FT	SE	USFWS
Amphibians			
Oregon slender salamander (<i>Batrachoseps wrighti</i>)	--	ST	USFWS
Columbia torrent salamander (<i>Rhyacotriton kezeri</i>) ^d	UR	ST	USFWS
Cascade torrent salamander (<i>R. cascadae</i>) ^d	UR	--	USFWS
Mammals			
Coastal marten ^b (<i>Martes caurina</i>)	FT	--	USFWS
Red tree vole, North Oregon Coast population (<i>Arborimus longicaudus</i>) ^c	--	--	USFWS

^a This ESU includes both spring and fall run.

^b The full name of the listed entity is Pacific marten, Coastal Distinct Population Segment.

^c ODF is proposing the red tree vole as a covered species under this HCP despite red tree vole not being listed as endangered or threatened under the ESA. In 2019, the USFWS determined that red tree vole did not warrant listing as endangered or threatened (84 *Federal Register* 69707). In 2019, and again in 2025, multiple conservation groups sought an order to vacate USFWS's not-warranted finding and remand the matter to the Service to issue a new determination regarding whether red tree vole warrants protection under the ESA as an endangered or threatened species (89 *Federal Register* 8137). ODF finds the likelihood of future listing of red tree vole to be high enough to include the species as a covered species under this HCP.

^d Torrent salamanders are no longer included as covered species because they are not federally listed under the ESA and, as such, do not require incidental take authorization under this HCP. However, they remain addressed in the plan because the conservation measures are expected to benefit the species and its habitat, as described in the relevant sections.

SE = State Endangered; ST = State Threatened; FT = Federal Threatened; UR = Under Review; NOAA = National Oceanic Atmospheric Administration; USFWS = U.S. Fish and Wildlife Service

1.3 Regulatory Setting

1.3.1 Federal and State Species Laws and Regulations

1.3.1.1 Federal Endangered Species Act

The purpose of the ESA is to provide a means whereby the ecosystems upon which threatened and endangered species depend may be conserved, and to provide a program for the conservation of such species. The Services are responsible for enforcing the provisions of ESA: NOAA Fisheries for most marine and anadromous species, and USFWS for all other terrestrial and aquatic species.

Section 7

ESA Section 7 requires all federal agencies, in consultation with the Services, to ensure that any action “authorized, funded, or carried out” by any agency “is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification” of critical habitat (16 USC 1536[a][2]). Before initiating an action, the federal agency must determine whether a proposed project may affect listed or proposed species or their critical habitat. If the agency determines that a project may have an effect, it is required to consult with the Services. If the agency determines, and the Services concur, that the project is not likely to adversely affect any listed species, proposed species or not likely to adversely affect designated critical habitat, the consultation is concluded. If the agency determines that a project is likely to adversely affect a listed species, proposed species, or designated or proposed critical habitat, a formal consultation process is initiated.

During formal consultation, the Services prepare a BO in response to information provided by the action agency. The BO analyzes the effects of the proposed action on listed species and determines if the action is likely to jeopardize the continued existence of the species or destroy or adversely modify designated critical habitat. If the BO reaches a jeopardy or adverse modification conclusion, the opinion must include a “reasonable and prudent alternative.”

If the BO concludes that the project, as proposed, would result in take of a listed species, but not to an extent that would jeopardize the species’ continued existence, the BO includes an incidental take statement and specifies reasonable and prudent measures and terms and conditions to minimize the impact of the take. The incidental take statement specifies an amount of take that may occur as a result of the action. The statement may also include conservation recommendations, which are non-binding, such as identifying additional discretionary conservation measures to reduce adverse effects, or identifying additional needed studies, monitoring, or research that might assist species conservation in furtherance of ESA Section 7(a)(1). If the action complies with the BO and the incidental take statement, it may be implemented without violation of ESA, and the take is thereby exempted from the prohibitions of ESA Section 9, *Prohibited Acts*.

Section 10

Until 1982, state, local, and private entities had no means to acquire incidental take authorization. Private landowners and local and state agencies risked direct violation of the ESA no matter how carefully their projects were implemented. This statutory dilemma led Congress to amend Section 10 of the ESA in 1982 to authorize the issuance of an ITP to nonfederal project proponents upon

completion of an approved “conservation plan.” The term *conservation plan* has evolved into *habitat conservation plan*, which is in common use today.

Under Section 10(a)(2)(A), a nonfederal party (such as ODF) may apply to the Services for an ITP providing authorization to incidentally take listed species, meaning that the activity taking the species “is incidental to, but not the purpose of, otherwise lawful activities.” The application for an ITP must include an HCP that describes the impacts that are likely to result from the incidental take and the measures the applicant will carry out to minimize and mitigate such impacts to the maximum extent practicable. In addition, the HCP must demonstrate that adequate funding is available to implement these measures and include a discussion of alternative actions to take that the applicant has considered, and the reasons these alternative actions are not being used. Finally, the HCP must include “such other measures that the Secretary [of the Department of Interior or Commerce] may require as being necessary or appropriate for the purpose of the plan.” Each issuance of an ITP by the Services is subject to evaluation via the Section 7 consultation process described previously; thus, incidental take authorized pursuant to an HCP must be quantified, must not jeopardize the continued existence of the species, and must not destroy or adversely modify critical habitat.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) established a management system for national marine and estuarine fishery resources. Pursuant to Section 305(b)(2), all federal agencies are required to consult with NOAA Fisheries regarding any action permitted, funded, or undertaken that may adversely affect essential fish habitat (EFH). Effects on habitat managed under any relevant fishery management plans must also be considered. EFH is defined under the Magnuson-Stevens Act as “waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” This includes migratory routes to and from anadromous fish spawning grounds. The phrase “adversely affect” refers to the creation of any impact that reduces the quality or quantity of essential fish habitat. Federal activities that occur outside of an EFH but that may, nonetheless, have an impact on EFH waters and substrate must also be considered.

1.3.1.2 Oregon Endangered Species Act

Under the Oregon ESA (ORS 496.171 to 496.192 and 498.026), ODF must coordinate with ODFW and the Oregon Department of Agriculture when developing plans that comply with the state ESA, and that are consistent with the constitutional mandate for CSFL.

The Oregon ESA was adopted in 1987 and included both plant and animal species. The act was amended in 1995 to outline listed species protection requirements. The northern spotted owl and marbled murrelet were listed as threatened under the Oregon ESA in 1988 and 1995, respectively. For threatened or endangered species listed after 1995, or those uplisted from threatened to endangered status, the Oregon Fish and Wildlife Commission must establish quantifiable and measurable guidelines considered necessary to ensure the survival of individual members of the species. These survival guidelines may include take avoidance and measures to protect resource sites (e.g., nest sites and spawning grounds) and only apply to state-owned or state-leased land. Because the northern spotted owl and marbled murrelet were listed in, or prior to 1995, state survival guidelines were not developed for these species. ODFW published advisory survival guidelines in 2018 for marbled murrelet.

The Oregon Fish and Wildlife Commission reclassified marbled murrelet as endangered on July 15, 2021. Because of this status change, survival guidelines under the Oregon ESA have become obligatory on state lands, and ODF finalized a state Endangered Species Management Plan for marbled murrelet on January 9, 2023. Once approved, the measures in this HCP will supplant the survival guidelines and the Endangered Species Management Plan as the means of protecting this state-listed species.

1.3.1.3 National Environmental Policy Act

The National Environmental Policy Act (NEPA), established in 1969, serves as the nation's basic charter for determining how federal decisions affect the human environment (42 USC 4332). Federal agencies must complete environmental analyses pursuant to NEPA before implementing discretionary federal actions. Such analyses help ensure that the underlying objectives of NEPA are achieved: to disclose environmental information, assist in resolving environmental problems, foster intergovernmental cooperation, and enhance public participation. NEPA requires evaluation of the potential effects on the human environment related to the proposed action, reasonable alternatives to the proposed action (if any), and a No-Action Alternative.

Any federal agency undertaking a major federal action that is likely to affect the human environment must prepare an environmental assessment. If any impacts on the human environment are found to be significant and cannot be mitigated to the point of insignificance, the federal agency must then prepare an EIS. The Council on Environmental Quality regulations (40 CFR § 1508.1) define major federal actions as those actions with "effects that may be major and which are potentially subject to federal control and responsibility," including "projects and program entirely or partly financed, assisted, conducted, regulated, or approved by federal agencies."

Issuance of ITPs by the Services under the ESA Section 10(a)(1)(B) are federal actions subject to NEPA compliance. Although ESA and NEPA requirements overlap considerably, the scope of NEPA goes beyond that of the ESA by considering impacts of a federal action not only on fish and wildlife resources but also on other resources such as water quality, air quality, and cultural resources. To satisfy NEPA requirements, NOAA Fisheries as the lead agency, with USFWS among the cooperating agencies prepared a draft EIS that accompanies this HCP.

1.3.2 Other Relevant State Laws

1.3.2.1 Oregon Forest Practices Act

The Oregon Forest Practices Act and its associated rules set standards for all commercial activities involving the establishment, management, or harvesting of trees in forests in Oregon.³ The Oregon Forest Practices Act declares it public policy to encourage economically efficient forest practices that ensure the "continuous growing and harvesting of forest tree species and the maintenance of forestland for such purposes as the leading use on privately owned land, consistent with sound management of soil, air, water, fish, and wildlife resources and scenic resources in visually sensitive corridors..." (ORS 527.630(1)). BOF is granted the exclusive authority to develop and enforce rules protecting forest resources and to coordinate with other agencies concerned with state forests. The Oregon Forest Practices Act and the standards included in the act are referenced throughout the HCP.

³ Chapter 527 of the ORS and Chapter 629 of the OAR pursuant to these statutes.

1.3.2.2 Oregon Plan for Salmon and Watersheds

In 1997, the Oregon Legislature adopted the Oregon Plan for Salmon and Watersheds, which focuses on coho salmon. In 1998, the Steelhead Supplement was added to the plan. The purpose of the Oregon Plan for Salmon and Watersheds is to restore Oregon's wild salmon and trout populations and fisheries to sustainable and productive levels that will provide substantial environmental, cultural, and economic benefits, and to improve water quality. The plan addresses all factors affecting at-risk wild salmonids, including watershed conditions and fisheries, to the extent that those factors can be influenced by the state.

The *Oregon Plan for Salmon and Watersheds* (Oregon Watershed Enhancement Board 2026) is a cooperative effort of state, local, federal, tribal, and private organizations and individuals. Although the plan contains a strong foundation of protective regulations, continuing existing regulatory programs and expediting the implementation of others, an essential principle of the plan involves moving beyond prohibitions and encouraging efforts to improve conditions for salmon through nonregulatory means. This HCP was prepared to be consistent with the *Oregon Plan for Salmon and Watersheds*.

1.3.2.3 Oregon Fish Passage Statutes

Fish passage barriers are prevalent throughout the Oregon landscape. Over time, despite fish passage rules and regulations, access to native fish habitats has been blocked or impaired by the construction of impassable culverts, dams, tide gates, dikes, bridges, and other anthropogenic infrastructure. Providing passage at these artificial obstructions is vital to recovering Oregon's native migratory fish populations (Oregon Department of Fish and Wildlife 2013).

As of 2001, ODFW requires the owner or operator of any artificial obstruction located in waters where native migratory fish currently or historically occur to address fish passage when certain activities are planned. If a proposed project is within current or historic native migratory fish habitat and if a fish passage trigger identified in the law (OAR 635-412-0020) will occur, then fish passage must be addressed. Common triggers for fish passage include culvert and bridge construction, removal, replacement or major repair, or in-channel work for scour protection or grade control.

A Memorandum of Understanding between ODFW and ODF gives ODF jurisdiction over fish passage on its land so long as fish passage meets the requirements of the Oregon Forest Practices Act.

1.3.2.4 State Forest Enabling Statutes

Most northwest Oregon state forest lands are owned by BOF. The statutes governing management of BOFL are contained in ORS Chapter 530 and state that they will manage the lands "so as to secure the greatest permanent value of such lands to the state." OARs direct that these lands will be actively managed. Active management means applying practices, over time and across the landscape, to achieve site-specific forest resource goals using an integrated and science-based approach that promotes the compatibility of most forest uses and resources over time and across the landscape.

The Forest Trust Land Advisory Committee is charged with advising BOF and the State Forester "on the management of lands subject to the provisions of ORS 530.010 to ORS 530.170 and on other matters in which counties may have a responsibility pertaining to forestland." Additionally, ODF has an obligation to "consult with the committee with regard to such matters."

ORS 530 authorizes BOF to plan and carry out a land acquisition, disposal, and exchange program in accordance with the Real Estate Asset Management Plan or the Land Board's policies. BOF may acquire, by purchase, donation, devise, or exchange from any public, quasi-public, or private owner lands that by reason of their location or topographical, geological, or physical characteristics are chiefly valuable for forest crop production, watershed protection and development, erosion control, grazing, recreation, or forest administrative purposes. It is desirable that lands acquired be in the vicinity of ODF lands and be consolidated wherever possible through exchanges of land. The process for adding or removing land from the permit area is described in Chapter 8, *Implementation*.

1.3.2.5 Forestry Administration and Planning

ORS Chapter 526, Forest Administration, establishes BOF's general duties (526.016) and State Forester (526.041), and the mandate to do forest planning. ORS Chapter 530, *State Forests; Community Forests* contains the authorities specific to state forests. BOF supervises forest policy and management under its jurisdiction and ensures the State Forester enforces state forest laws relating directly to the protecting of forestland and conservation of forest resources.

The statutory mandate for forest planning is found in ORS 526.255. This law requires the State Forester to report to the Governor and legislative committees on "long-range management plans based on current resource descriptions and technical assumptions, including sustained yield calculations for the purpose of maintaining economic stability in each management region." In 1998, BOF adopted a set of administrative rules that provide further direction to the State Forester in planning for the management of these lands. OAR 629-035-0030 states the following.

In managing forestlands as provided in OAR 629-035-0020, the State Forester shall develop Forest Management Plans, based on the best available science, that establish the general management framework for the planning area of forestland. The Board may review, modify, or terminate a plan at any time; however, the Board shall review the plans no less than every ten years. The State Forester shall develop implementation and operations plans for forest management plans that describe smaller-scale, more specific management activities within the planning area.

BOF initiated a forest management plan update in June 2013. It is being prepared concurrently with this HCP and the two documents are consistent, where applicable.

1.3.2.6 Scenic Waterways

The Oregon Scenic Waterways (ORS 390) system includes 19 rivers and 1 mountain lake (Waldo Lake) that possess outstanding scenic, fish, wildlife, geological, botanical, historic, archaeologic, and outdoor recreation values of present and future benefit to the public. Activities within scenic waterways cannot affect the free-flowing character of these waters and must be consistent with the maintenance of waters in quantities necessary for recreation, fish, and wildlife uses.

Scenic waterways and adjacent lands are administered by the State Parks and Recreation Department. State Parks and Recreation consults with BOF to adopt rules for management of related adjacent lands. Management principles, standards, and plans protect or enhance the aesthetic and scenic values of the waterway and permit compatible forestry and other land uses. Forest crops adjacent to designated scenic waterways may be harvested in a manner that maintains, to the extent practicable, the natural beauty of the waterway.

There are currently four scenic water designations that occur in or within 0.25 mile of the HCP permit area: the Nehalem, Nestucca, Rogue, and Little North Santiam Rivers. Some scenic water

designations associated with these waterways require an additional set of management and policy guidelines.

1.3.2.7 Oregon Water Quality Standards

The Oregon Department of Environmental Quality uses water quality standards to assess whether the quality of Oregon's rivers and lakes is adequate for fish and other aquatic life, recreation, drinking, agriculture, industry, and other uses. The Oregon Department of Environmental Quality also uses the standards as regulatory tools to prevent pollution of the state's waters. The Clean Water Act (CWA) requires states to adopt water quality standards designating beneficial uses of the state's waters and setting criteria designed to protect those uses. States submit their standards to the U.S. Environmental Protection Agency for approval.

The HCP provides species and their critical habitat protection to comply with the ESA, not CWA. However, water temperature is a key water quality parameter for the suitability of aquatic habitat and an important limiting factor for covered species. Therefore, achieving the water quality standard for temperature is a key part of protecting habitat for covered aquatic species and the HCP requirements may also serve as steps toward achieving CWA water quality standards.

1.3.2.8 Oregon Department of Fish and Wildlife Scientific Taking Permit

Additional Oregon Scientific Taking or Collection Permits may be required to implement certain conservation measures, research, and monitoring for this HCP (e.g., upper extent of fish distribution). Those permits are not part of the federal ITPs issued under this HCP but will be obtained separately as needed.

1.4 Overview of Planning Process

The HCP was led by ODF and advised by a team of regulators and experts who were organized into a Steering Committee and Scoping Team. The final decisions on the HCP were made by BOF. All other participants were engaged to provide technical and policy advice to ODF. Planning participants provided valuable input during the planning process, as described below.

1.4.1 Steering Committee

The HCP Steering Committee consists of government agency and academic institution representatives. Members worked together to provide advice on how ODF can achieve a mutually acceptable outcome that satisfies, to the greatest degree possible, the interests of all participants, while still meeting all regulatory requirements of the ESA. The role of the Steering Committee was to provide overall guidance for the HCP process and to provide direction and support to the Scoping Team. The Steering Committee met approximately bimonthly during HCP development.

Member agencies of the Steering Committee include the following agencies.

- ODF (convener)
- DSL
- Oregon Department of Environmental Quality

- ODFW
- Oregon State University (OSU)
- USFWS
- NOAA Fisheries

1.4.2 Scoping Team

The HCP Scoping Team was composed of terrestrial and aquatic biologists and technical specialists from state and federal agencies. The role of the Scoping Team was to provide technical expertise and to develop technical recommendations for the Steering Committee to consider when advising ODF in the development of a potential HCP. The Scoping Team met twice monthly during HCP development. Member agencies of the Scoping Team were the same as those listed for the Steering Committee. Technical experts from OSU provided review of key data and work products.

The Scoping Team provided input, guidance, and feedback on development of all aspects of the HCP. This important feedback included species to be covered, how to analyze effects on those species, and the type and extent of conservation actions described in the HCP. The Scoping Team also reviewed early drafts of the HCP to support ODF's development of a legally compliant, scientifically sound, and successful document.

1.4.3 Stakeholder Engagement

During development of the HCP, ODF hosted public informational meetings prior to each BOF meeting to provide an opportunity for the public, stakeholders, department staff and consultants to share concerns regarding HCP development and ideas for improvement. Meeting presentations were posted online on ODF's HCP Initiative website.⁴ These informational meetings provided an opportunity for two-way dialogue between the public, stakeholders, department staff, and consultants to share concerns and ideas for improvement regarding conservation strategies and the overall content of the HCP. A summary of all stakeholder meetings is located in Appendix B, *Stakeholder Engagement*.

1.4.4 Document Organization

This HCP and supporting information are presented in the following chapters and appendices.

- Chapter 1, *Introduction*, discusses the background, purpose, and objectives of the HCP; reviews the regulatory setting; and summarizes the planning process.
- Chapter 2, *Environmental Setting*, describes the existing conditions of the plan area relevant to the HCP, including overview of covered species.
- Chapter 3, *Covered Activities*, describes the activities covered under the HCP.
- Chapter 4, *Conservation Strategy*, summarizes the conservation strategy and describes the specific conservation actions to be implemented to mitigate the impacts of the covered activities.

⁴ <https://www.oregon.gov/ODF/AboutODF/Pages/HCP-initiative.aspx>

The chapter also describes the specific surveys and other actions required of all covered activities to avoid and minimize impacts on covered species, consistent with federal regulations.

- Chapter 5, *Monitoring and Adaptive Management*, describes the monitoring and adaptive management program.
- Chapter 6, *Analysis of Effects and Actions that May Result in Take*, presents the impacts of the covered activities.
- Chapter 7, *Assurances*, details the administrative requirements associated with HCP implementation and the roles and responsibilities of ODF and the Services. It also describes the regulatory assurances provided to ODF as well as the procedures for modifying or amending the HCP.
- Chapter 8, *Implementation*, details the administrative requirements associated with HCP implementation and the roles and responsibilities of the permittee and Services.
- Chapter 9, *Costs and Funding*, reviews the costs associated with HCP implementation and the funding sources proposed to pay those costs.
- Chapter 10, *Alternatives to Take*, describes the alternatives considered that would reduce take on one or more of the covered species, and why those alternatives were rejected.
- Chapter 11, *References*, lists all of the sources cited in the HCP in alphabetical order.
- Appendix A, *Glossary*, provides definitions for technical terms used in the HCP.
- Appendix B, *Stakeholder Engagement*, provides summary of stakeholder engagement during the HCP development process.
- Appendix C, *Species Accounts*, provides detailed ecological accounts of all covered species, including models of habitat distribution that were developed for select species.
- Appendix D, *Species Considered for Coverage*, provides details on which species were considered for coverage, which were selected, and why.
- Appendix E, *Effects Analysis*, provides detailed modeling data/results to support the effects analysis.
 - Fish limiting factors table
 - Temperature protection memorandum
 - Frequency table
 - Terrestrial modeling Information
- Appendix F, *Habitat Conservation Area Maps*, provides detailed maps of the habitat conservation areas that will be maintained under the HCP.
- Appendix G, *Hydrologic Unit Code 10 Analysis*, provides a detailed low flow analysis by HUC 10 watershed
- Appendix H, *ODF Roads Manual*, provides guidance and standards for road management in the permit area.

- Appendix I, *Unstable Slopes Riparian Strategy*, provides detailed description for how steep slopes are assessed and managed.
- Appendix J, *Fish Passage Design Criteria*, provides fish passage design criteria.
- Appendix K, *Forest Age Structure*, provides an overview of stand age inside and outside Habitat Conservation Areas over the course of the permit term.
- Appendix L, *TerrainWorks Papers*, description of landslide and wood modeling.
- Appendix M, *Biological Goals and Objectives Crosswalk*, detailed linkages between the biological goals and objectives for each covered species, covered activities, conservation actions.
- Appendix N, *Monitoring Table*, summarizes the monitoring commitments and relationship to the biological goals and objectives.
- Appendix O, *List of Preparers*, individuals involved in HCP development.

2.1 Introduction

This chapter describes the existing conditions of the plan and permit area for the Western Oregon State Forests Habitat Conservation Plan (HCP). The plan area encompasses approximately 722,600 acres and includes all Oregon Department of Forestry (ODF)-managed lands and potential land acquisitions or exchanges in western Oregon identified by ODF district plans. The plan area spans 17 counties, generally, from north to south: Clatsop, Columbia, Tillamook, Washington, Yamhill, Polk, Marion, Clackamas, Lincoln, Benton, Linn, Lane, Douglas, Coos, Curry, Josephine, and Jackson (Table 2-1).

The plan and permit area is not evenly distributed among the 17 counties or in different regions of western Oregon. Approximately 65% of the plan area is found in only two counties: Tillamook and Clatsop. Approximately 80% of the plan area is found in only four counties: Tillamook, Clatsop, Washington, and Lane (Table 2-1 and Table 2-2).

Table 2-1. Plan Area by County and Ecoregion (approximate acres)

County	Ecoregion				Total (percent)
	Coast Range	West Cascades	Klamath Mountains	Willamette Valley	
Tillamook	312,654	--	--	--	312,654 (43.3)
Clatsop	162,492	--	--	--	162,492 (22.5)
Washington	50,363	--	--	5,641	56,004 (7.7)
Lane	40,320	833	--	1,479	42,632 (5.9)
Linn	--	27,706	--	64	27,770 (3.8)
Lincoln	25,046	--	--	--	25,046 (3.5)
Marion	--	24,610	--	4	24,614 (3.4)
Douglas	2,874	--	11,697	--	14,571 (2.0)
Polk	11,782	--	--	--	11,782 (1.6)
Benton	10,120	--	--	128	10,248 (1.4)
Coos	10,365	--	--	--	10,365 (1.4)
Clackamas	--	8,421	--	--	8,421 (1.2)
Josephine	--	--	6,489	--	6,489 (0.9)
Columbia	6,464	--	--	--	6,464 (0.9)
Jackson	--	--	1,616	--	1,616 (0.2)
Curry	189	--	1,161	--	1,350 (0.2)
Yamhill	80	--	--	--	80 (<0.1)
Total (percent)	632,750 (87.6)	61,571 (8.5)	20,963 (2.9)	7,316(1.0)	722,600

Table 2-2. Permit Area by County and Ecoregion (approximate acres)

County	Ecoregion				Total (Percent)
	Coast Range	West Cascades	Klamath Mountains	Willamette Valley	
Tillamook	302,367	--	--	--	302,367 (47.3)
Clatsop	146,832	--	--	--	146,832 (23.0)
Washington	41,256	--	--	5,368	46,623 (7.3)
Lane	23,781	532	--	944	25,257 (3.9)
Linn	--	21,187	--	41	21,227 (3.3)
Lincoln	20,001	--	--	--	20,001 (3.1)
Marion	--	18,966	--	4	18,970 (3.0)
Douglas	2,203	--	8,286	--	10,489 (1.6)
Polk	7,734	--	--	--	7,734 (1.2)
Benton	8,847	--	--	50	8,897 (1.4)
Coos	7,813	--	--	--	7,813 (1.2)
Clackamas	--	7,268	--	--	7,268 (1.1)
Columbia	6,464	--	--	--	6,464 (1.0)
Josephine	--	--	6,425	--	6,425 (1.0)
Jackson	--	--	1,616	--	1,616 (0.3)
Curry	189	--	1,161	--	1,350 (0.2)
Yamhill	80	--	--	--	80 (0.01)
Total (percent)	567,567 (89)	47,952 (7)	17,488 (3)	6,406 (1)	639,413

Ecoregions are used as an organizing principle throughout the chapter to describe the plan area. Ecoregions are defined by biotic, abiotic, terrestrial, and aquatic ecosystem components, making them a useful tool to understand the physical and biological setting in different parts of the plan area. The geology, soils, vegetation, climate, land use, amount of solar radiation, and precipitation are all factors that influence how a forest develops across western Oregon and what species it supports.

The plan area overlaps four ecoregions: Coast Range, West Cascades, Klamath Mountains, and Willamette Valley (Figure 2-1).

- **Coast Range ecoregion.** The Coast Range ecoregion includes the Oregon coastline and extends east through coastal forests to the border of the Willamette Valley and Klamath Mountains ecoregions.
- **West Cascades ecoregion.** The West Cascades ecoregion extends east of the Cascade Mountains' summit to the foothills of the Willamette, Umpqua, and Rogue Valleys, and spans the entire north-south length of the state of Oregon, from the Columbia River to the California border.
- **Klamath Mountains ecoregion.** The Klamath Mountains ecoregion covers much of southwestern Oregon, including the Umpqua Mountains, Siskiyou Mountains, and interior valleys and foothills between these and the Cascade Range.
- **Willamette Valley ecoregion.** The Willamette Valley ecoregion is an alluvial plain with scattered groups of low basalt hills that is bound on the west by the Coast Range and on the east

by the Cascade Range (Oregon Department of Fish and Wildlife 2016). The attributes of the western edge of the Willamette Valley ecoregion, where future land acquisitions or exchanges might occur, are similar to those described for the Coast Range ecoregion.

As shown in Table 2-2, the majority of the plan area (89%) occurs in the Coast Range ecoregion. Smaller fractions of the plan occur in the three other ecoregions: West Cascades (7%), Klamath Mountains (3%), and Willamette Valley (1%).

The environmental setting of the plan area summarizes the history of the forest, including pivotal natural events that have shaped the forest that exists today, along with the physical setting, forest conditions, covered species, and other species of conservation concern that may benefit from the HCP.

2.2 History of the Forests by Ecoregion

Oregon state forests were shaped by a few key natural events, in particular fire and storms. Fire and storm history not only influence the ecology of forests today, but also help explain the current patterns of forest ownership. A brief history of major fires and other natural events, and the establishment of each state forest, is provided in this section. Additional history of northwestern Oregon state forests and disturbances can be found in Appendix H of the *Northwest Oregon State Forests Management Plan* (Oregon Department of Forestry 2010a).

2.2.1 State Forest Lands in the Coast Range Ecoregion

The permit area includes 567,567 acres of lands in the Coast Range ecoregion. Like the ecoregion itself, these state forestlands span the entire north-south length of the state, from Clatsop and Columbia Counties in the north to Curry County in the south. There are two notable state forests in the Coast Range ecoregion: the Clatsop State Forest and the Tillamook State Forest. The histories of the Clatsop and Tillamook State Forests are described in more detail in Section 2.2.1.1, *Clatsop and Columbia Counties*, and Section 2.2.1.2, *Tillamook and Washington Counties*. Table 2-2 summarizes the permit area by county and ecoregion. Most of these lands are found in Clatsop and Tillamook Counties in northwest Oregon.

2.2.1.1 Clatsop and Columbia Counties

Clatsop and Columbia Counties contain approximately 153,296 acres of ODF-managed lands in the permit area. Most of the state forest lands in these two counties are part of Clatsop State Forest. The Clatsop State Forest is 98% Board of Forestry Lands (BOFL). The remaining 2% of the Clatsop State Forest is Common School Fund Lands (CSFL) owned by the Oregon Department of State Lands (DSL) but managed by ODF. All of these lands were originally privately owned and logged between 1910 and 1940, and then became tax-delinquent. A large portion of the forest in southern Clatsop County burned in one of the Tillamook Burn events (Section 2.2.1.2, *Tillamook and Washington Counties*). Clatsop and Columbia Counties foreclosed on these lands when landowners could not pay their taxes, and ownership reverted to the county. Many landowners lost their land during the Great Depression. In 1939, Clatsop County became the first county in Oregon to deed its logged and unmanaged forest lands to the Board of Forestry (the BOF) to manage as a state forest. Columbia County first deeded lands to the BOF in 1942. According to the deed agreement, ODF would replant the lands, protect them from fire, and manage the new forest.

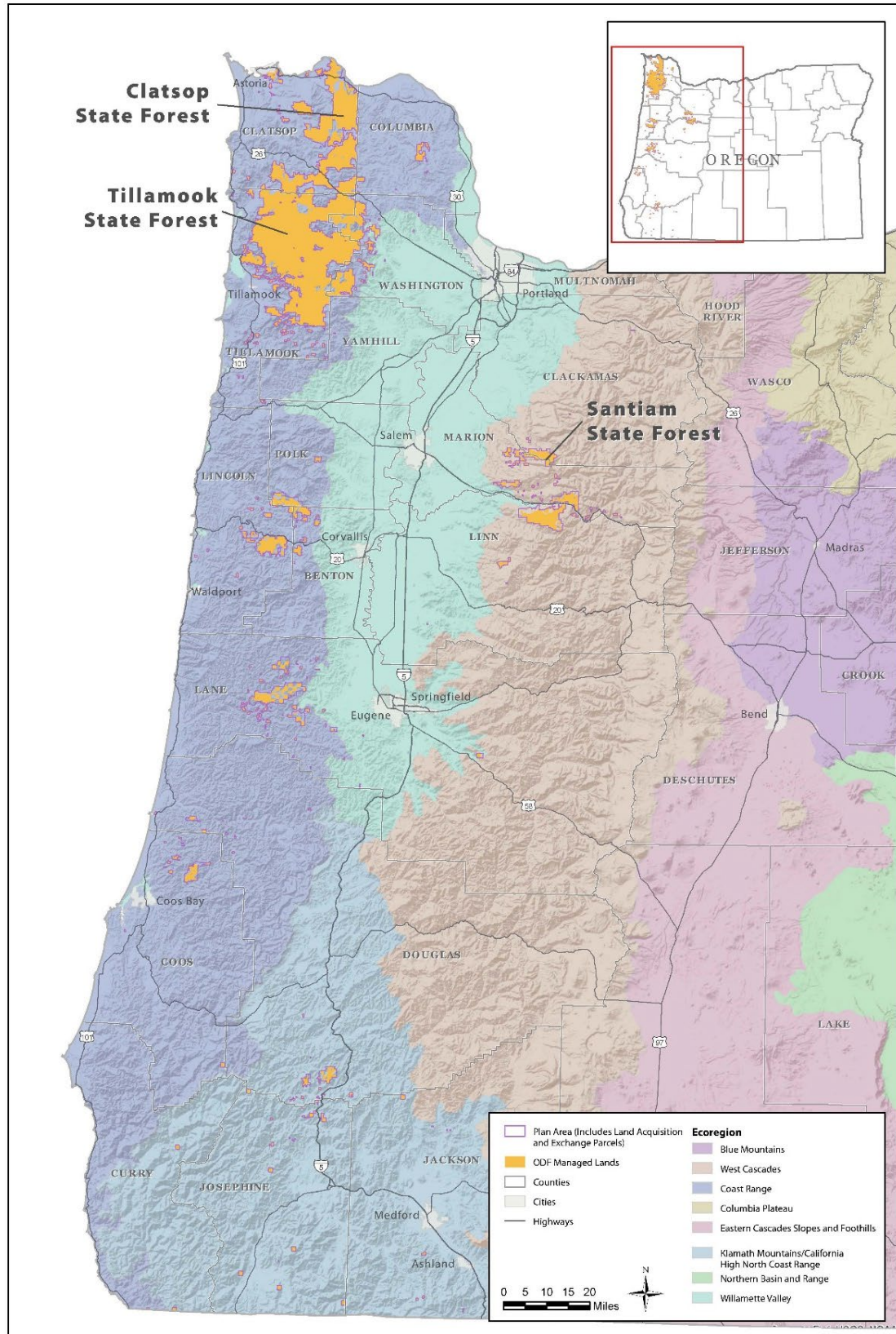


Figure 2-1. Plan Area, Permit Area, and Ecoregions

Today, Clatsop State Forest consists primarily of Douglas-fir (*Pseudotsuga menziesii*) from 40 to 80 years old. The state forest has been progressively consolidated through a land exchange program that began in the mid-1940s. District staff are still actively pursuing land exchanges, working on a priority list of mutually beneficial exchanges with several private landowners in the area.

2.2.1.2 Tillamook and Washington Counties

Tillamook and Washington Counties contain 343,623 acres of ODF-managed lands in the permit area. Nearly all of that area is associated with the Tillamook State Forest. Much of the area that is now Tillamook State Forest burned in a series of major wildfires during the twentieth century. The first and biggest Tillamook fire burned 240,000 acres of mostly old-growth forest in August 1933. This massive wildfire ignited during a logging operation and spread rapidly as a result of a strong east wind event. New fires burned across the area every 6 years after that, in 1939, 1945, and 1951. Each fire burned some previously burned area and also consumed unburned forest (Figure 2-2). By the end of 1945, 355,000 acres had been burned at least once and 13.1 billion board feet of timber were destroyed. Some areas had burned multiple times. Burned timber and snags were salvaged in an effort to reduce fuels and prevent future burns in the same area, resulting in a lack of legacy structure on the landscape. In many places the soil had been so severely burned that nothing grew there for many years. Stream habitats and native aquatic organisms in these watersheds were severely affected by the loss of forest cover and the extensive erosion that occurred after the repeated fires.

Before 1933, almost all of the land that became the Tillamook Burn was privately owned. After the fires, many landowners allowed the forest lands to be foreclosed by the counties rather than pay taxes on land that no longer generated any income from timber harvest. Counties began to deed land in the Tillamook Burn to BOF in 1940. Eventually, Tillamook and Washington Counties deeded about 255,000 acres to state ownership. Of the remaining 100,000 acres in the Tillamook Burn, most is owned by private timber companies and the Bureau of Land Management (BLM). In June 1973, the Tillamook State Forest was dedicated. The 364,000-acre Tillamook State Forest includes 255,000 acres from the Tillamook Burn (70% of the state forest), and other unburned forest land.

Salvage logging began after the 1933 fire and accelerated to meet the lumber demands of World War II. By 1948, 4 billion board feet of fire-destroyed trees had been recovered from the burn on state forest lands. An additional 3.5 billion board feet of fire-destroyed trees were removed from 1949 to 1955.

In 1948, Oregonians approved a bond issue to finance rehabilitation of the Tillamook Burn. ODF carried out a massive rehabilitation project in the burn area between 1948 and 1973. Over the next 24 years, reforestation crews planted 72 million Douglas-fir seedlings. In addition, 36 tons of Douglas-fir seeds were spread on the burn area through aerial seeding, pioneering the first use of helicopters in aerial seeding. Aerial seeding proved to be a mixed success in re-establishing Douglas-fir, with large patches of red alder (*Alnus rubra*) pioneering significant portions of the landscape where Douglas-fir did not take hold. This effort was successful overall in reforesting and growing conifers in a denuded landscape that many thought would never grow trees again.

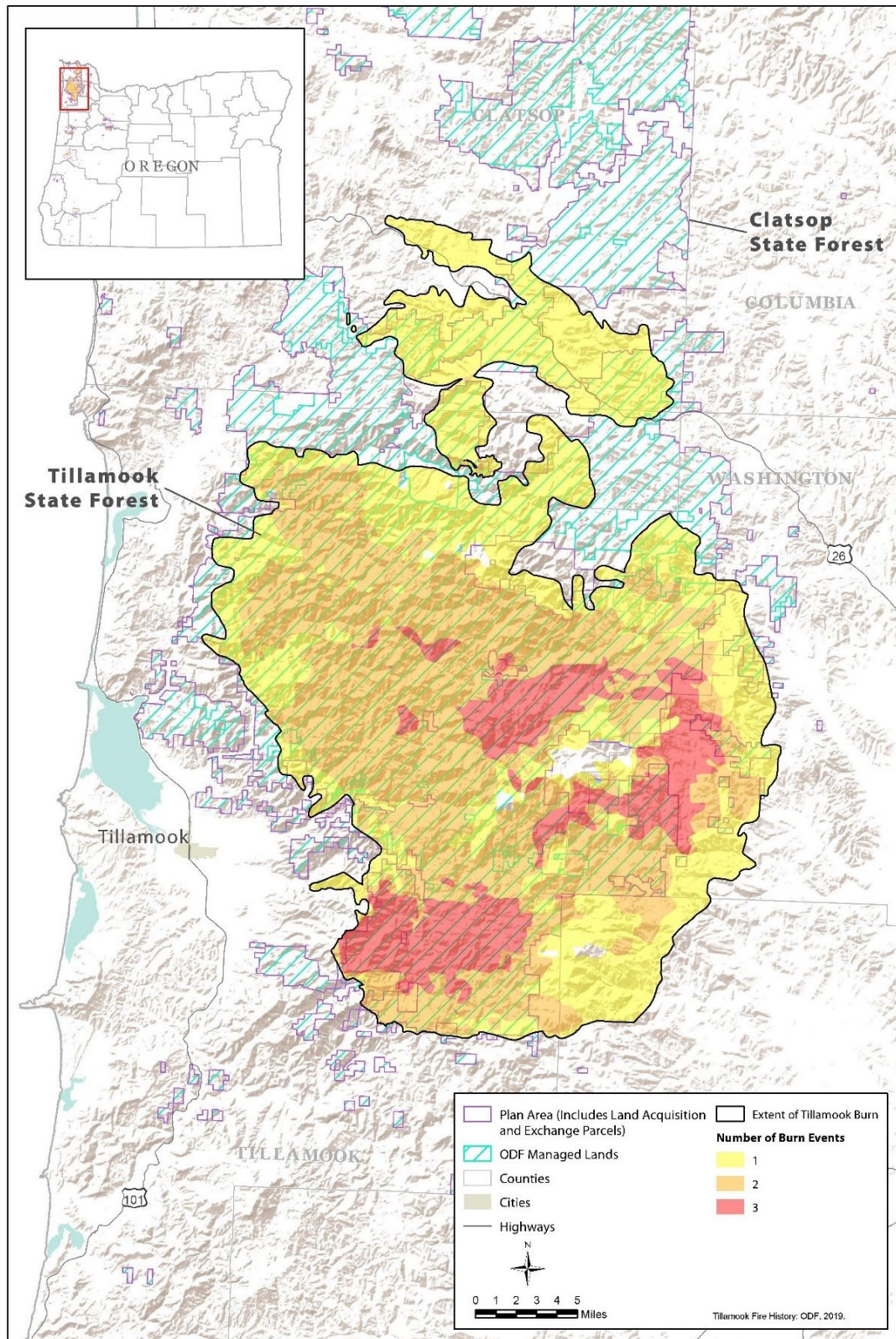


Figure 2-2. Tillamook Burn Fire History

In recent years, Swiss needle cast (*Phaeocryptopus gaeumannii*), a native fungal disease, has increasingly affected Douglas-fir stands near the coast. The reasons for this are not fully known, but it may be connected to the widespread reforestation of the burn with Douglas-fir from other areas, which introduced a near-monoculture of trees poorly adapted to wet coastal conditions. Swiss needle cast stunts the growth of trees, in both diameter and height. Additional factors including climate change and severe damage to soils and nutrient pools from the fires may exacerbate the effects of the disease. ODF currently plants Douglas-fir derived from local seed sources that is selected for its resistance to Swiss needle cast, and is also exploring management strategies such as replacing severely affected Douglas-fir with other tree species. ODF is also a member of the Swiss Needle Cast Cooperative, which conducts research and assessments to better understand the disease and potential management options.

The first timber sale by ODF in the former Tillamook Burn, a commercial thinning, took place in 1983. Beginning a few years prior to adoption of the *Northwest Oregon State Forests Management Plan* in 2001, ODF has employed a variety of silvicultural strategies to improve both timber production and habitat. As the forest stands on this landscape continue to grow, there will be increasing opportunities to use silvicultural techniques to develop a diversity of stand structures for forest products, wildlife habitat, and other ecosystem services.

Today, ODF-managed lands in Tillamook and Washington Counties are predominantly Douglas-fir, from 60 to 80 years old.

2.2.1.3 Polk, Lincoln, and Benton Counties

Currently, there are approximately 36,582 acres of land in Polk, Lincoln, and Benton Counties managed by ODF as the West Oregon District. Of that total, approximately 82% is BOFL and 18% is CSFL.

During the Great Depression, most isolated farms in these three counties were abandoned to the counties in place of back taxes. Some more desirable parcels of land were bought by T. J. Starker, John Thompson, and others who saw the lands' value for timber production. By the late 1930s, however, Benton, Lincoln, and Polk Counties had many parcels of land that the owners could not sell or manage. Between 1938 and 1948, most of this land was deeded to the BOF. During that same decade, several small parcels were also purchased by ODF. Between 1947 and 2011, ODF completed several land exchanges with private landowners. Today, ODF-managed lands in Polk, Lincoln, and Benton Counties are predominantly Douglas-fir, with a large component of stands from 20 to 60 years old and a wide distribution of stands from 70 to almost 200 years old.

2.2.1.4 Lane County

The Nelson Mountain Fire was one of many large fires in 1910 that motivated the state of Oregon to create ODF. The fire burned most areas that are now state forest lands in western Lane County. Large fires burned again in western Lane County in 1917 and 1922. In 1929, a number of large fires burned much of the central Coast Range in Lane County, covering nearly 80,000 acres. The fires burned some previously burned areas and some forests for the first time. With the timber gone, the Great Depression starting, and the land being unsuitable for homesteading, many landowners allowed their land to revert to county ownership in place of having to pay back taxes. Lane County deeded its timberlands to BOF between 1942 and 1958, to be managed as the Western Lane District.

The land base remained constant for the next 50 years except for four small land exchanges in the 1950s and one in 1962. In the early 1990s, two larger exchanges reshaped state forest lands in the Western Lane District by exchanging 25% of the acres. These exchanges increased the land base by 10% and started to consolidate state forest lands. Today, the 23,781 acres of state forest lands in the Western Lane District are mostly covered by a 70- to 90-year-old forest dominated by Douglas-fir, with some older stands ranging from 100 to 300 years old.

2.2.1.5 Douglas and Coos Counties

There are currently 10,016 acres of ODF-managed lands in the permit area in western Douglas and northern Coos Counties, mostly in scattered parcels around CSFL that comprise the Elliott State Forest, which is owned and managed by DSL. Douglas and Coos Counties donated some of their forest lands to the state.

Land exchanges have helped consolidate some of these lands around the original exchanged Common School Forest Lands that comprised the Elliott State Forest. ODF no longer manages Common School Forest Lands in the Elliott State Forest, but still seeks to consolidate (block up) remaining BOFL in Douglas and Coos Counties for more efficient management. State forest lands in these counties have been shaped by fire and wind. The principal wildfire event in this area occurred from September 15 to October 20, 1868. A high-intensity fire began a few miles northeast of Scottsburg, Oregon, and burned the coast from Lakeside to south of Coos Bay. The fire left few intact old-growth stands on the forest, although scattered residual trees and large stumps from this fire are still locally abundant and contribute to forest structure in the post-1868 stands. Today, ODF-managed lands in Douglas and Coos Counties are predominantly Douglas-fir, with the majority of forests ranging in age from 30 to 60 and 80 to 174 years old.

2.2.2 State Forest Lands in the West Cascades Ecoregion

2.2.2.1 Clackamas, Marion, Linn, and Lane Counties

There are 47,952 acres of ODF-managed lands in the permit area in Clackamas, Marion, and Linn Counties. Much of the land now in the Santiam State Forest used to be owned by large timber companies who typically also owned railroad assets for the transportation of logs and wood products. Some individuals and families also owned forest land. From about 1880 until 1930, most lands were logged. These lands were of little value to the owners once the timber was removed, so they were left unmanaged after clear-cuts. As a result, forest fires burned large areas of young, dense forests that developed following the extensive logging. During the Great Depression, many landowners allowed their forest lands to be seized by Marion, Clackamas, and Linn Counties in place of having to pay back taxes.

The counties eventually deeded these lands to BOF. State forest lands in Linn County were acquired by BOF between 1939 and 1949, Marion County lands were acquired between 1940 and 1953, and Clackamas County lands between 1942 and 1950. Some land was also acquired from individuals through both charitable donations and purchases between 1943 and 1952. There were additional land exchanges completed between 1945 and 1968 in Linn and Marion Counties. Lands in these counties are managed by the North Cascade District.

Natural regeneration successfully reforested most of the Santiam State Forest. However, a fire in 1951 burned nearly half of the forest, and ODF replanted the most damaged areas. The Santiam State Forest was dedicated in 1974.

Today, ODF-managed lands in Clackamas, Marion, Linn, and Lane Counties are a mix of Douglas-fir and mixed conifer, generally from 60 to 90 years old but with some stands older than 90 years.

2.2.3 State Forest Lands in the Klamath Mountains Ecoregion

2.2.3.1 Curry, Josephine, Jackson, and Douglas Counties

There are 17,488 acres of ODF-managed lands in the permit area in Curry, Josephine, Jackson, and southern Douglas Counties. The lands in southern Douglas and northern Josephine Counties are known as the Glendale block and comprise most of the plan area in these counties. Oregon counties sold forest lands to private timber companies or individuals to keep them on the tax rolls, or kept them to be managed as county forests. Later, parcels of private lands were purchased or donated to become state forests. In 1944, the Windy Creek property near the town of Glendale was deeded to BOF, along with a few other parcels, for a total of about 3,600 acres.

The remaining acreage is in small, scattered parcels throughout the counties. In southwest Oregon, ODF has a goal to consolidate state forests in the Glendale block through land exchanges or purchases.

Historically this area experienced low-intensity, high-frequency burns. Through fire suppression the area burned by these frequent fires was greatly reduced, increasing the amount of available fuels on the forest floor. As a result of these suppression efforts, fuels management is a primary concern in managing these lands to reduce the potential for large-scale fires. Today, ODF-managed lands in Curry, Josephine, Jackson, and Douglas Counties are a mix of Douglas-fir and mixed conifer that are predominantly 80 to 120 years old.

2.2.4 State Forest Lands in the Willamette Valley Ecoregion

There are approximately 6,406 acres (1%) of ODF-managed lands in the permit area in the Willamette Valley ecoregion (Table 2-2) scattered in small parcels in five counties: Benton, Lane, Linn, Marion, and Washington. The majority of these lands are along the western border of the Willamette Valley ecoregion adjacent to the Coast Range ecoregion. The remaining acres are along the eastern border of the Willamette Valley ecoregion, adjacent to the West Cascades ecoregion. ODF-owned lands are predominantly Douglas-fir that are 60 to 80 years old. These lands were acquired during the same time periods as described for the counties in previous sections.

2.2.5 Oregon Forests Regional Planning

Several Habitat Conservation Plans (HCPs) and other regional conservation plans are being implemented in western Oregon. These HCPs and conservation plans are potential sources of conservation actions and provide conservation context for the goals, objectives, and strategies included in this HCP. In addition, this plan may, during implementation, overlap with these HCPs and other conservation plans if they share covered species and occur on nearby lands.

2.2.6 Oregon Plan for Salmon and Watersheds

The mission of the *Oregon Plan for Salmon and Watersheds* (State of Oregon 1997) is to restore native fish populations and the aquatic ecosystems that support them to productive and sustainable levels, which will provide substantial environmental, cultural, and economic benefits. The Oregon Plan for Salmon and Watersheds organizes specific actions around factors that contribute to the decline in fish populations and watershed health, and focuses on improvement of water quality and quantity and habitat restoration. Private citizens, community organizations, special interest groups, and all levels of government may organize, fund, and implement the measures in this plan.

The *Oregon Plan for Salmon and Watersheds* (State of Oregon 1997) includes the following four elements.

- Voluntary restoration actions by private landowners.
- Coordinated state and federal agency and tribal actions.
- Monitoring watershed health, water quality, and salmon recovery.
- Strong scientific oversight by the plan's Independent Multidisciplinary Science Team.

2.2.7 Oregon Conservation Strategy

The Oregon Conservation Strategy is a statewide program managed by the Oregon Department of Fish and Wildlife (ODFW) that identifies key conservation issues, priorities, and strategies to maintain healthy fish and wildlife populations (Oregon Department of Fish and Wildlife 2016). Information in the Oregon Conservation Strategy was used as an initial filter for covered species' selection. It was also used to inform the following species-specific strategies.

- Ecoregions used in the Oregon Conservation Strategy were used as the geographic basis for conservation planning in the HCP.
- Species and habitat conservation needs were identified and applied as applicable in developing goals, objectives, and conservation actions for the HCP.

2.2.8 Northwest Forest Plan

The 1994 U.S. Forest Service (USFS) Northwest Forest Plan (NWFP) (United States Department of Agriculture and United States Department of Interior 1994) drew from best available science at the time (Thomas et al. 1990) and included strategies for conservation and restoration on federal lands, as well as mechanisms for subsequent research, learning, and adaptive management. Key elements of the NWFP include adoption of an ecosystem management approach, land use designations, an emphasis on effective consultation with over 70 federally recognized tribes and consideration of treaty rights, new monitoring programs, and adaptive-management measures. The following section describes management under the NWFP, which does not apply to state forest lands.

2.2.8.1 Northwest Forest Plan Land Allocations

The NWFP structure includes the creation of a regional set of land allocations, each with associated management standards and guidelines. The allocation includes a network of Late-Successional Reserves (LSRs) designed to meet the habitat requirements of the northern spotted owl (*Strix*

occidentalis caurina), marbled murrelet (*Brachyramphus marmoratus*), and other species closely associated with late-successional forest, and Riparian Reserves to meet the habitat requirements of salmonids. Of particular importance to this HCP is that no federal lands or associated LSRs or Riparian Reserves are located in the northern portion of the Oregon Coast ecoregion, meaning that state forest lands are of more importance to the persistence of covered species in this area than in other parts of coastal Oregon where these federal reserve lands are designated. Other portions of the permit area are adjacent to federal lands, so the conservation strategy has been developed to align with federal conservation efforts under the existing NWFP in these areas.

Under the standards and guidelines of the NWFP, a management assessment is prepared for each large LSR (or group of smaller LSRs) before habitat manipulation activities can be designed and implemented. These LSR assessments were considered when evaluating this HCP's conservation strategy near LSRs.

2.2.8.2 Northwest Forest Plan Effectiveness Monitoring

The effectiveness monitoring program initiated by the NWFP is used to assess progress toward meeting habitat requirements for species associated with late-successional forest, including northern spotted owl and marbled murrelets. Because the NWFP is a major component of recovery strategies for species to be covered under the HCP, effectiveness monitoring provides important information that was used to determine the extent and area-specific needs for this HCP.

The 2018 NWFP Science Synthesis (Spies et al. 2018) summarizes the results of effectiveness monitoring and provides a comprehensive overview of the science accumulated in the 24 years since the NWFP was first implemented. The purpose of the NWFP Science Synthesis is to provide resource managers with a scientific basis for assessment and updates to forest plans in the NWFP area. The NWFP Science Synthesis was prepared by request to inform the revision of land and resource management plans for 17 national forests in the footprint of the NWFP in Washington, Oregon, and northern California.

The conservation strategy of the HCP was greatly informed by the science presented in the science synthesis, including information related to the biological needs, threats, and management recommendations for covered species, particularly covered fish, marbled murrelet, and northern spotted owl.

2.2.9 Bureau of Land Management Resource Management Plans

Management actions on BLM lands were formerly guided and directed by the 1994 NWFP. However, in 2016, the BLM Deputy Director signed the Records of Decision for the resource management plans (RMPs) for western Oregon (Bureau of Land Management 2016a, 2016b), providing updated management direction on BLM lands within the NWFP area. The BLM RMPs guide management across approximately 2.5 million acres of public lands and outline conservation for a wide range of terrestrial and aquatic species, including those covered under this HCP.

RMPs include the following key objectives.

- **Sustainable use.** Provide predictable and sustainable timber harvests, recreation, and tourism opportunities.

- **Conservation.** Contribute to the conservation and recovery of threatened and endangered species by preserving large areas of late-successional forests and maintaining older conifer forests with complex structures.
- **Science-based management.** Incorporate new science, policies, and technologies to improve land stewardship.

2.2.10 Elliott State Research Forest Habitat Conservation Plan

The Elliott State Research Forest HCP was developed by DSL and incidental take permits (ITPs) were issued in May 2025. The Elliott State Research Forest consists of former CSFL (84,120 acres) that are overseen by the Oregon State Land Board and managed by DSL. There are 8,868 acres of BOFL in and around the Elliott State Research Forest that have been overseen by BOF and managed by ODF. The Elliott State Research Forest HCP plan area includes CSFL and BOFL. The Elliott State Research Forest HCP and the associated ITPs cover DSL's land management activities, which include activities similar to those addressed in this HCP. BOFL in and around the Elliott State Research Forest are addressed in this HCP.

The Elliott State Research Forest HCP includes three covered species, all of which are proposed as covered species under this plan: Oregon Coast coho salmon (*Oncorhynchus kisutch*), northern spotted owl, and marbled murrelet.

2.2.11 Weyerhaeuser-Millicoma Tree Farm HCP

The Weyerhaeuser-Millicoma Tree Farm HCP includes covered lands in Coos and Douglas Counties, covering 208,000 acres, and was established in February 1995 under a 50-year permit. The Weyerhaeuser-Millicoma Tree Farm HCP is adjacent to the Elliott State Research Forest and some ODF lands. This HCP provides protection for existing northern spotted owl nesting sites while also allowing for tree harvest in northern spotted owl home ranges. Under this HCP approximately 17,000 acres of land may be harvested in northern spotted owl nesting habitat, though with a greater amount of land being maintained in spotted owl dispersal habitat. This plan protects existing northern spotted owl nesting sites and dispersal habitats over a large landscape.

2.2.12 Candidate Conservation Agreement with Assurances for the Fisher in Oregon

A programmatic/template Candidate Conservation Agreement with Assurances (CCAA) was established in April 2017, for the fisher (*Pekania pennanti*) in western Oregon between the U.S. Fish and Wildlife Service (USFWS) and voluntarily participating non-federal landowners and managers. The enrollment areas cover the West Coast distinct population segment (DPS) of fisher in Oregon over a 30-year permit term. On September 27, 2019, ODF enrolled approximately 183,932 acres of BOFL within the fisher's range; the permit expires June 20, 2048. ODF will implement the CCAA conservation measures on all enrolled lands to meet the CCAA standard. This CCAA aims to expand understanding of fisher distribution, densities, and forest-management activities; promote conservation measures and remove threats to the species; provide a voluntary recovery effort; and provide enrolled landowners assurances that they will not be held responsible for additional conservation measures if the fisher becomes listed according to the Endangered Species Act (ESA).

2.3 Physical Setting

This section describes the physical setting of the plan area including topography, geology, soils, hydrology, climate and watersheds by ecoregion. The physical setting descriptions are from the Northwest Oregon State Forests Management Plan (Oregon Department of Forestry 2010a) and the Southwest Oregon State Forests Management Plan (Oregon Department of Forestry 2010b) unless otherwise cited. Table 2-3 summarizes the physical setting of the plan area.

2.3.1 Physical Setting Overview

2.3.1.1 Geology and Topography

The geologic history and formations of western Oregon continue to shape environmental conditions upon which forests grow. Topography, including elevation, slope, and aspect, have a major influence on forest growth and can affect temperature, sun exposure, soil moisture, and precipitation.

Topography also affects the costs and feasibility of timber sales, as steeper slopes can increase costs or even make timber harvest commercially or environmentally infeasible.

2.3.1.2 Soils

Soil is a complex material made of decomposed and fragmented mineral rock, water, plant nutrients, organic material, and air and other gases in the spaces between mineral grains. The organic material consists of living, dead, and decomposed plants and animals. Forest site productivity is controlled by soil depth, porosity, biology, and the availability of nutrients in the soil. All these factors are influenced by soil type.

Dynamic processes such as forest succession, tree and shrub species composition and abundance, wind, and fire affect the accumulation of organic matter in the soil. The amount and composition of organic matter affect soil fertility. Small materials such as needles and twigs have the highest concentration of nitrogen. Large materials such as downed trees are important because they influence soil accumulation, nutrient availability, and soil moisture.

Landslides are the dominant erosional process in the mountainous terrain of the northwestern state forests in the Coast Range and Klamath Mountains. Large, deep-seated slides can alter huge expanses over long time periods and may be influenced by a few of this HCP's covered activities. Shallow, rapidly moving landslides, known as debris flows, are the most frequent and noticeable type of slide. They can originate in headwalls or elsewhere on mountain slopes when soils on steep slopes become saturated and lose strength. Slides can occur in areas with no forest-management activity, although slide frequency can increase due to recent harvest, natural disturbances, or road construction and drainage.

Table 2-3. Summary of Physical Setting in the Plan Area

Province	Geology	Soils	Climate	Hydrology
Coast Range	Steep to gentle slopes; periodic slope failures/slides.	Sandstone, siltstone, weathered basalts and breccias. Generally potential for highly productive soils. Intense fires have affected productivity in some areas. Reforestation may be difficult on steep slopes.	The wet and mild maritime climate supports highly productive temperate rainforests. Rain-dominated with 50–200 inches of precipitation annually.	Drains to Pacific Ocean and the Willamette and Columbia Rivers. Steep in headwaters and flat in lower reaches. High stream density (2–3 miles of stream/square mile); 8,220 acres of wetlands (75% riverine, 13% freshwater forest/shrub) and 8,759 miles of streams in the plan area (26% fish-bearing, and 96% of Type F streams have perennial flow). Combination of shallow soils and rain-dominated precipitation leads to rapid runoff with high flows during winter storms and low flows during the summer dry season.
West Cascades	Steep slopes with volcanic soils. Less dissected slopes than the coast. Less likelihood of slides than the coast, but still subject to slope failures.	Mostly derived from weathering of extrusive igneous rocks.	Snow-dominated with 80–300 inches of precipitation annually.	High-gradient streams that drain to Willamette, Santiam, Sandy, and Clackamas rivers. Stream densities range from 1.5- to 2-mile stream per square mile. Approximately 20% of the 491 miles of streams in the plan area are fish-bearing and 79% of those have perennial flow; 373 acres of wetlands (75% riverine, 13% freshwater forest/shrub). Hydrology strongly influenced by climate and soils. At higher elevations much of the precipitation falls as snow and a significant portion filters into highly permeable soil and rock.
Klamath	Mountainous. Metamorphic mosaic; serpentine bedrock containing heavy metals.	Weathered soils interspersed with peridotite or serpentine, which are unproductive for tree growth.	Mediterranean climate with hot dry summers and moderate rainfall in winter; 25–118 inches of precipitation annually.	Rugged terrain with 190 miles of stream in the plan area. Of these, 10% of identified streams are fish-bearing and 99% of type F streams are perennial. 366 acres of wetlands (97% riverine).
Willamette	Broad, lowland valley.	Relatively deep alluvium, colluvium and glaciolacustrine deposits that overlie basalt and sandstone. Soils are productive.	Mediterranean climate with warm dry summers and mild wet winters; 35–63 inches of precipitation annually.	Surface water dominated by large rivers with a wide variety of ecosystems and habitats; 70 miles of streams in plan area with 36% of streams identified as fish-bearing. Virtually 100% of type F streams are perennial; 70 acres of wetlands (98% riverine).

2.3.1.3 Climate and Climate Change

Temperatures across much of the plan area are moderated by coastal influence, especially for portions of the plan area on the west slope of the Coast Ranges. Summer temperatures are higher for the eastern slope of the Coast Ranges, Willamette Valley, and western slope of the Cascades and markedly higher for portions of the plan area in the Klamath Mountains ecoregion (Figure 2-3).

During the twentieth century the average annual temperature in western Oregon has increased by 1.6 degrees Fahrenheit (°F) (0.9 degrees Celsius [°C]), with winter experiencing the greatest increase of 3.3°F (1.8°C) (Reilly et al. 2018). Oregon is projected to continue to warm between 7.6 and 9°F (4.2 and 5°C) by 2100, with an increase in hot days per year across most of the state (Mote et al. 2018; Fleishman et al. 2025). Oregon's coastal areas are expected to warm about 0.4°F (0.2°C) per decade, the rest of western Oregon around 0.7°F (0.4°C) per decade (Mote et al. 2018). Warming is projected to occur across all seasons, with the greatest increase occurring during summer months (Reilly et al. 2018).

Climate is fairly consistent across the plan area except for precipitation, which varies considerably from north to south and west to east (Figure 2-4) and creates a dramatic influence on forest conditions (Reilly et al. 2018) and habitat value for covered species. In addition to general regional variation in precipitation, summertime storm activity is distinctly different, with the northern Coast Range receiving relatively little lightning activity compared to the Klamath and West Cascades Mountains.

The variation in rainfall across the plan area is expected to increase over time with increasing climate change. Projected changes in precipitation are uncertain (Reilly et al. 2018), but models generally project an increase in winter precipitation falling as rain instead of snow and a decrease in summer precipitation (Mote et al. 2018). Extreme precipitation may change more in eastern Oregon than western Oregon by mid-century. Heavy precipitation from warming and shifts in seasonal patterns, as well as rain-on-snow events, can shift the timing of seasonal stream flows and increase flooding (Reilly et al. 2018). Previously snow-dominated regions are likely to see an increase in winter flooding as a result of rapid rain runoff and reductions in summer flows (by up to 50%) due to the reduction in spring snowmelt (Mote et al. 2018). Additionally, the western United States is likely to experience longer, larger, more frequent, and more severe atmospheric river events as global temperatures rise (Rhoades et al. 2021).

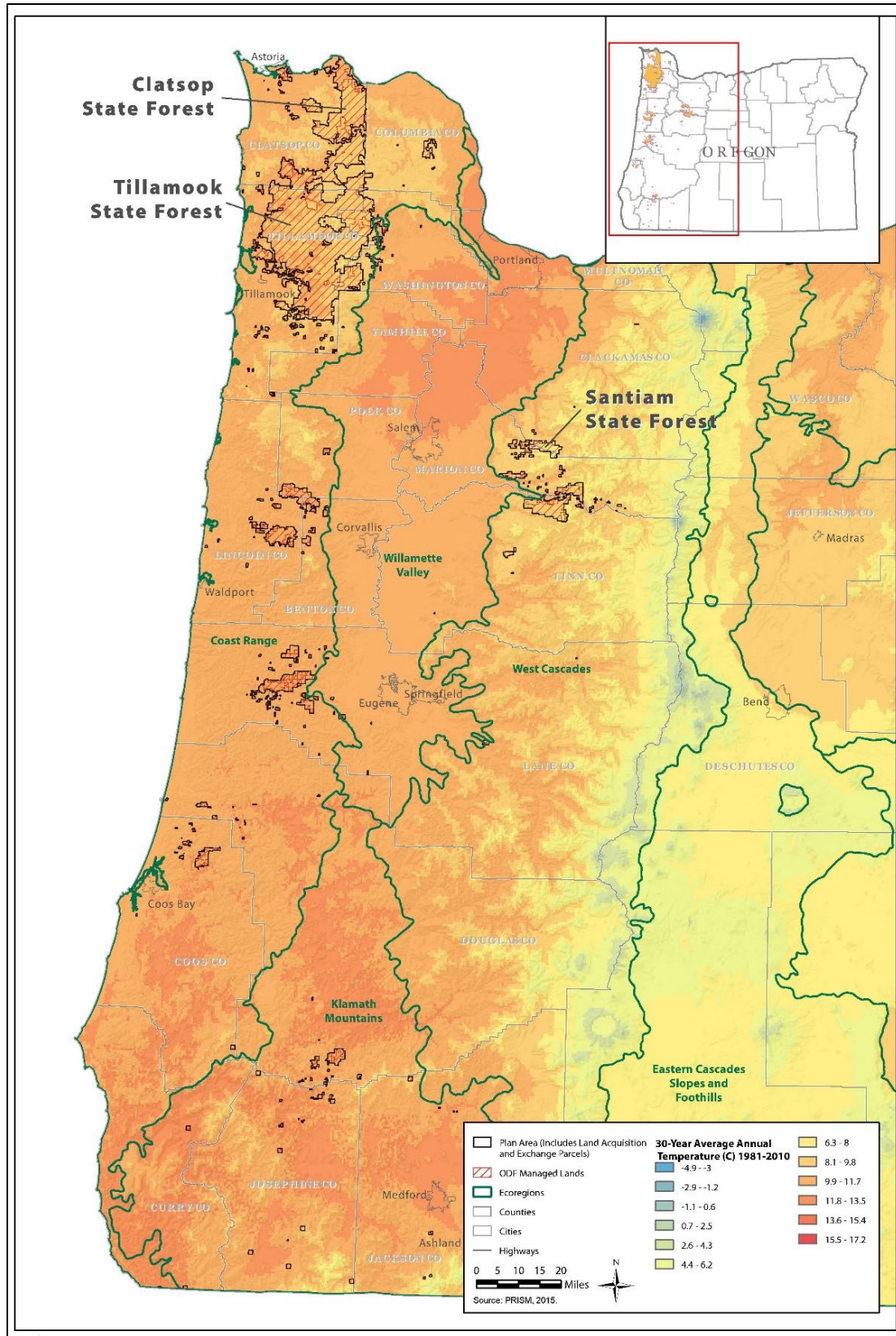


Figure 2-3. 30-Year Average Annual Air Temperature in Plan Area

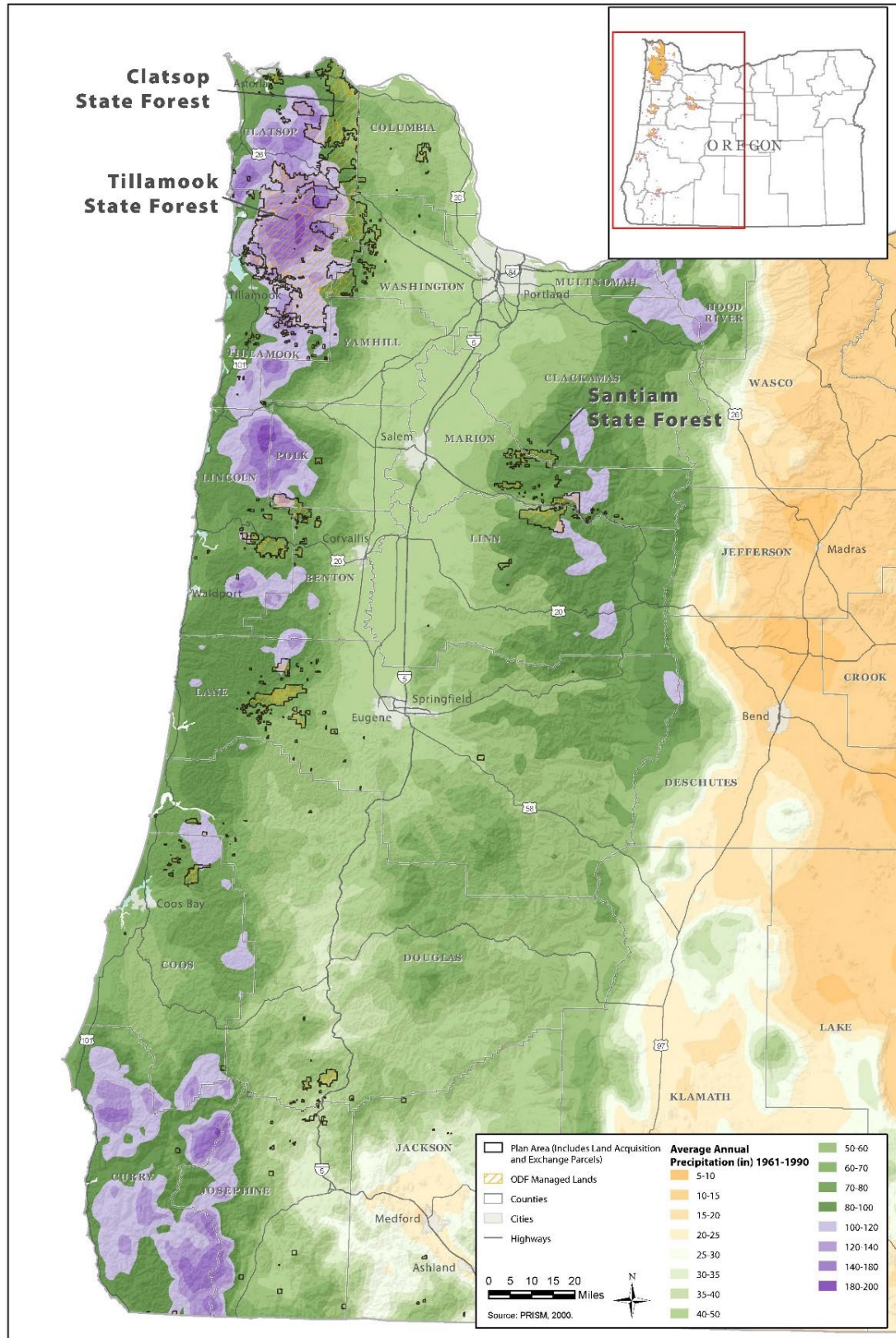


Figure 2-4. Average Annual Precipitation in Plan Area

Temperature and precipitation differences result in different moisture recovery rates for forest fire fuels, especially during summer and early autumn. In addition to this general regime, daytime and nighttime temperature differences between the ocean and eastern Oregon desert create strong, dry afternoon and evening east winds from early to mid-autumn. This can delay nighttime moisture recovery in forest fuels that might be expected in the absence of these winds. These differences in both temperature and precipitation produced starkly contrasting wildfire regimes prior to European settlement. The Coast Range fire regimes tended to vary some areas were characterized by infrequent wildfire events, allowing forest fuel loads to build to levels that supported stand-replacing events over very large areas, while others experienced frequent, low to moderate severity burns. Fire regimes in the West Cascades and Klamath Mountains ecoregions were more frequent, preventing fuel buildup, with less risk of stand-replacing events. Table 2-4 shows the wildfire hazard in the plan area; Figure 2-5 shows the predicted wildfire hazard in the plan area.

Table 2-4. Wildfire Hazard in the Plan Area

Wildfire Risk Level	Proportion of Plan Area (%)
No data	0
Low	5
Moderate	89
High	6
Total	100

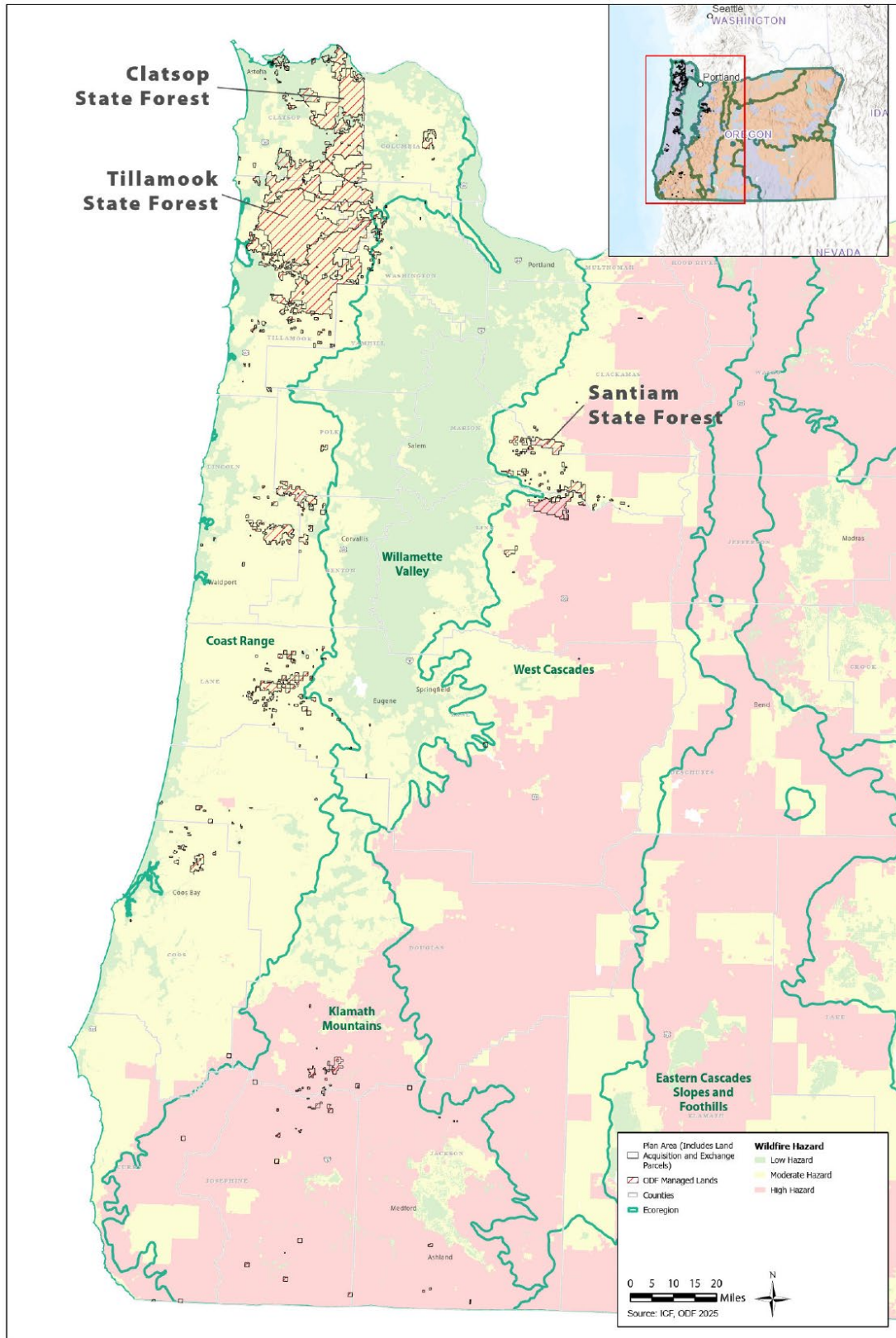


Figure 2-5. Plan Area, Ecoregions, and Wildfire Hazards

Climate change could directly and indirectly alter vegetation. The response of tree growth to climate change would vary by species and factors limiting their growth (Reilly et al. 2018). Overall, indirect effects such as frequency, severity, and extent of disturbance (e.g., drought, fire, pathogens) are expected to cause greater change than direct effects (e.g., carbon dioxide and climate on vegetation [Reilly et al. 2018]). The southern portion of the plan area in the West Cascades and coastal and inland areas of the Klamath Mountain ecoregions have the greatest vulnerability to climate change due to the greatest projected increase in the water-balance deficit¹ (Reilly et al. 2018). The northern portion of the plan area, particularly near the coast, may be more vulnerable to high wind events during the summer months (Reilly et al. 2018).

Insects and disease are expected to play an increasing role in tree mortality throughout coastal areas as trees are exposed to greater drought-related stress and some pathogen and insect ranges are expanded by climate change (Reilly et al. 2024). Warmer, wetter conditions may promote both native and nonnative pathogen activity near the coast, especially Swiss needle cast (Reilly et al. 2018), which is projected to increase in the Oregon Coast Range (Reilly et al. 2024). The range of some insect species, like the mountain pine beetle (*Dendroctonus ponderosae*), are expected to expand into previously unsuitable habitat due to warmer winters and hotter droughts (Reilly et al. 2024).

2.3.1.4 Major River Basins

The United States Geological Survey (USGS) has adopted a classification system for water resources over the continental United States. This system defines a nested series of *hydrologic units* that range from a larger *region* (21 total in the United States) to a smaller *subwatershed*. Each hydrologic unit is identified by a unique hydrologic unit code (HUC). Using this scheme, the plan area falls within four subregions (HUC-6): Lower Columbia, Northern Oregon Coastal, Southern Oregon Coastal, and the Willamette (Figure 2-6). Streams within these subregions drain directly into either the Pacific Ocean, Columbia River, or Willamette River.

The plan area occurs in the North Coast, Mid Coast, South Coast, Willamette, Umpqua, and Rogue basins. Within each basin there are smaller subbasins or HUC areas, which are further described in Section 2.3.2, *Physical Setting of the Plan Area by Ecoregion*.

¹ The water-balance deficit is the difference between the atmospheric demand for water from vegetation and the amount of water actually available to use.

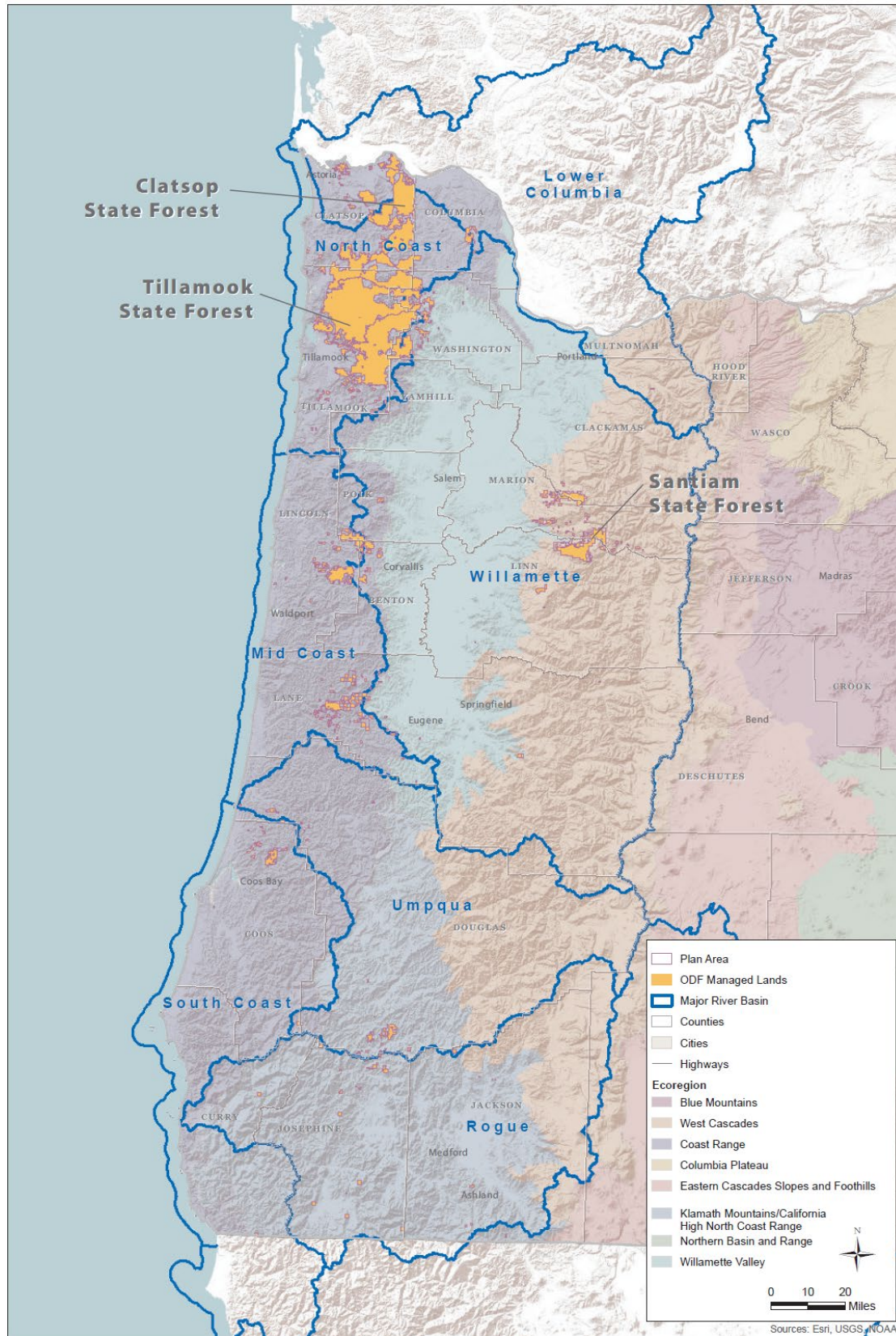


Figure 2-6. Plan Area, Permit Area, Ecoregions, and Major River Basins

2.3.1.5 Hydrology and Water Quality

Streams in Oregon are grouped by the 1970 Oregon Forest Practices Act into the following categories based on their beneficial use (Oregon Administrative Rules [OAR] 629-600-0100 and 629-635-0200): fish use, size, and flow duration.

Fish Use

Streams are classified based on fish or domestic water use.

- **Type F.** Type F streams are fish-bearing streams and waterbodies known to be used by fish or meet the physical criteria to be potentially used by fish. Fish-bearing streams may or may not have flowing water all year; they may be perennial or seasonal. Type F streams also include a subcategory of “SSBT use” designation, which means a stream with salmon, steelhead, or bull trout present or otherwise used by salmon, steelhead, or bull trout at any time of the year as determined by the State Forester (Rule 629-600-0100 Definitions).
- **Type D.** Type D streams are not fish-bearing streams but they are near a domestic water use intake with an approved water right issued by the Oregon Water Resources Department.
- **Type N.** Type N streams are not fish-bearing or domestic water use streams.

Stream Size

Streams are further classified by size as small, medium, or large based on estimated average annual flow.

- **Small.** Average annual flow of 2 cubic feet per second (cfs) or less.
- **Medium.** Average annual flow greater than 2 cfs, but less than 10 cfs.
- **Large.** Average annual flow of 10 cfs or greater.

Flow Duration

- **Perennial streams.** Perennial streams normally have surface flow after July 15. They are streams that have flow year-round and may have spatially intermittent dry reaches downstream of perennial flow.
- **Seasonal streams** Seasonal streams normally do not have summer surface flow after July 15. They are streams that do not have surface flow during at least some portion of the year.

Water that flows through state forest lands sustains ecosystems and provides for out-of-stream uses such as irrigation, domestic use, and municipal use. The Oregon Water Resources Department monitors stream flows, issues permits for water withdrawals from streams, and regulates water rights. Forest-management activities influence water supply by affecting the age, species, and density of tree cover and other vegetation; the location and condition of roads; and the condition of the soil.

ODFW (2019a) examined the status and trends of physical instream habitat conditions across major land ownerships in western Oregon, including BOFL, from 1998 to 2018. The results of ODFW’s assessment elucidated habitat trends on BOFL and helped to inform the aquatics analysis. The

analysis compared trends on private forest land, agricultural land, and federal forest land, with trends on state forest lands across the following variables.

- Active channel width.
- Pool frequency.
- Fine sediment and fine sediment in riffles.
- Coho winter parr capacity (modeled—Habitat Limiting Factors Model).
- Substrate (% distribution): Silt, sand, gravel, cobble, and bedrock.
- Channel morphology and pool habitat: % secondary channel, % pool, % deep pools.
- Wood pieces: Volume, distribution, diameter, length, number of pieces, number of key pieces.
- Riparian: Channel shade, density of conifers and hardwoods by size class.

Surface waters that flow through state forest lands sustain ecosystem processes and services and also provides for beneficial uses such as irrigation, domestic use, and municipal use. The Oregon Water Resources Department monitors stream flows, issues permits for water withdrawals from streams, and regulates water rights. In the past, ODF has occasionally drawn water from state forest streams associated with firefighting, pesticide application, road construction, and dust abatement. ODF has generally drawn water from small pools behind culverts and artificial ponds.

Water quality is measured by the chemical, physical, and biological properties of water. Aquatic species such as salmonids need high-quality water, as well as suitable habitat. In forests, the water quality parameters most likely to be affected by forest-management activities are dissolved oxygen, fine sediment, temperature, and nutrient levels. Chemicals are not usually a water quality concern in forested environments but could be if any chemical contamination occurred, such as a fuel spill or improper use of pesticides.

In general, water quality limiting factors for the aquatic covered species include increased water temperature, diminished dissolved oxygen, and increased sedimentation (Appendix C, *Species Accounts*, provides the species accounts and limiting factors by covered species). Currently, 156 miles of streams in the permit area are listed as 303(d) impaired or threatened for dissolved oxygen, water temperature, and/or sedimentation by the Oregon Department of Environmental Quality (DEQ), meaning they do not meet the standards set by DEQ for native cold-water aquatic communities (Table 2-5). Eighty percent of these streams are 303(d) listed for water temperatures; 12% for dissolved oxygen and temperature; 7% for dissolved oxygen; 1% for dissolved oxygen, sedimentation, and temperature; and less than 1% for sedimentation.

Impacts from climate change are increasing air and stream temperatures, prolonging the summer dry season, and changing precipitation patterns in the Pacific Northwest. Temperature and precipitation are discussed in Section 2.3.1.3, *Climate and Climate Change*, and for each ecoregion in Section 2.3.2, *Physical Setting of the Plan Area by Ecoregion, Climate*. Based on climate change model scenarios, water temperature in streams and rivers can be expected to increase on average by 2°F and 3.5°F (0.73°C and 1.4°C) by 2040 and 2080, respectively (Isaak et al. 2017).

Degraded water quality, especially elevated stream temperature (National Oceanic Atmospheric Administration Fisheries 2013, 2014; Oregon Department of Fish and Wildlife and National Oceanic

Atmospheric Administration Fisheries 2022), is one of the primary threats to many of the covered aquatic species.

Torrent salamanders are sensitive to forest practices in riparian areas that degrade microhabitats through sediment deposition and elevated stream temperatures due to reduced stream shading (Vesely and McComb 2002; Russell et al. 2004). Stream temperatures in the permit area are expected to increase due to changing climate conditions over the course of the permit term, which may affect covered fish and amphibian species that use stream and riparian habitats.

Table 2-5. Total Impaired River Miles and Percent of Total Miles of Streams Listed as 303(d) for Dissolved Oxygen, Temperature, and/or Sedimentation within the Range of Covered Fish and Amphibians in the Permit Area, Summarized by Ecoregion

Ecoregion	Total Impaired River Miles in the Permit Area (Percent of Total)					Total River Miles Impaired in Permit Area
	Dissolved Oxygen	Sediment	Temp	Dissolved Oxygen/Temp ^a	Dissolved Oxygen/Sediment/Temp ^a	
Coast Range	7.81 (5%)	0.77(0.5%)	125.13(84%)	13.71 (9%)	1.16(1%)	148.58
Klamath Mountains	0	0	0	0	0	0
West Cascades	0	0	0.03 (1%)	4.24(99%)	0	4.27
Willamette Valley	2.74(100%)	0	0	0	0	2.74
Total permit area	10.55(7%)	0.77(0.5%)	125.16(80%)	17.94(12%)	1.16(1%)	155.58

^a Stream reaches with multiple impairments combined are included in these columns.

2.3.2 Physical Setting of the Plan Area by Ecoregion

This section describes the physical setting of the plan area including location, topography, geology and soils, hydrology, climate and watersheds by ecoregion. The physical setting descriptions are from the Northwest Oregon State Forests Management Plan (Oregon Department of Forestry 2010a) and the Southwest Oregon State Forests Management Plan (Oregon Department of Forestry 2010b) unless otherwise cited. Table 2-3 summarizes the physical setting of the plan area. Figure 2-6 shows the overlay of ecoregions and major river basins in the plan area.

2.3.2.1 Coast Range Ecoregion in the Plan Area

Geology and Topography

Topography in the Coast Range ecoregion is moderately steep to gentle with frequent evidence of medium- to large-scale ancient slide features. The Tillamook State Forest is particularly steep, with almost half of state lands in that area greater than 60% slope (Oregon Department of Forestry 2025). Earthflows, slumps, and rock block slides are scattered through the landscape. There is also a wide distribution of low-strength decomposed rock material that serves to produce potential landslide slip surfaces. There is moderately high potential for debris slides originating from headwalls and other points, especially in areas of predominantly sedimentary rock.

Soils

Soils in the Coast Range ecoregion are derived from sandstones, siltstones, weathered basalts, and volcanic breccias. Soils have developed in residual, colluvial, and alluvial materials and range from deep, rock-free materials to shallow, stony soil profiles.

The Coast Range soils vary from highly productive (Site Class I)² for Douglas-fir to moderate potential productivity (low Site Class III), depending largely on profile depth, stoniness, topographic position, and to some extent, soil parent material. However, in general, the parent materials of these soils all provide a potential basis for highly productive soils.

In areas where severe fires burned previous forests, as in 70% of the Tillamook State Forest, the productive potentials of some soils are likely degraded due to burning, loss of organically rich forest floors, and extended exposure to erosion. In places where the loss of organic materials and topsoil resulted from fires of 50 to 100 years ago, productive potentials may still be limited because soil-forming processes are not rapid enough to have rebuilt soils to productive states.

Climate

The Coast Range ecoregion has a maritime climate that is influenced by cool, moist air from the ocean, and is the wettest and mildest in the state. The ecoregion's mild, moist climate creates conditions for highly productive temperate rainforests. Precipitation occurs mainly as rainfall, averaging between 50 and 90 inches annually along the coast and east of the Coast Range crest, but totaling as much as 200 inches at higher elevations in the mountains (Beschta et al. 1995). The plan area within the Coast Range ecoregion occurs at all elevations, so it experiences the full range of average annual rainfall, from 50 inches to almost 200 inches at the highest elevations.

Major River Basins

The Coast Range ecoregion includes three major basins (Figure 2-6): the North Coast, Mid Coast, and South Coast basins.

- **North Coast basin.** The North Coast basin extends from the Columbia River to the southern Tillamook County line and is bound by the Pacific Ocean to the west and the crest of the Coast Range to the east. The basin consists of six watersheds: Necanicum, Nehalem, Tillamook Bay, Nestucca, Netarts/Sand Lake, and Neskowin. The three largest bays in the basin are Tillamook, Nehalem, and Netarts. The outflow from rivers with headwaters in the Coast Range form estuaries along the North Coast. The North Coast basin drains to the Pacific Ocean and is within the Coast Range ecoregion.
- **Mid Coast basin.** The Mid Coast basin encompasses four subbasins on Oregon's central coast: Alsea, Siletz-Yaquina, Siltcoos, and Siuslaw. The basin encompasses approximately 9,458 square

² Site class is a measure of an area's relative capacity for producing timber or other vegetation. It is measured through the site index. The site index is expressed as the height of the tallest trees in a stand at an index age (King 1966). In this document, an age of 50 years is used. The five site classes are as follows:

Site Class I = 135 feet and up

Site Class II = 115–134 feet

Site Class III = 95–114 feet

Site Class IV = 75–94 feet

Site Class V = Below 75 feet

miles. It is bound by the North Coast basin to the north, the crest of the Coast Range to the east, the South Coast basin to the south, and the Pacific Ocean to the west. The Mid Coast basin drains to the Pacific Ocean and is within the Coast Range ecoregion. The Coast Range ecoregion also includes the western portion of the Umpqua basin, which also includes portions of the West Cascades and Klamath Mountains ecoregions. The basin comprises approximately 5,063 square miles of southwest Oregon. It is bound on the east by the Cascades and extends west to the Pacific Ocean. Three subbasins are contained within the Umpqua Basin: North Umpqua, South Umpqua, and Mainstem Umpqua/Smith. The headwaters of the North Umpqua River are in the Umpqua National Forest and they flow generally west until they meet the South Umpqua River downstream from Roseburg. The South Umpqua River also has headwaters in the Umpqua National Forest, and generally flows west. It flows north after its confluence with Cow Creek, a major tributary. Downstream from the confluence with the North Umpqua River is the Umpqua mainstem, which flows generally west until it meets the Smith River at the Umpqua-Smith estuary before emptying into the Pacific Ocean. The mainstem of the Umpqua River is within the Umpqua subbasin, which receives drainage from the other two subbasins as well as from smaller tributaries. It includes the drainages of the South Umpqua River, North Umpqua River, mainstem Umpqua River, and Smith River.

- **South Coast basin.** The South Coast basin is in southwestern Oregon. The basin encompasses over 2,973 square miles and consists of four subbasins—Chetco, Coos, Coquille, and Sixes—as well as a portion of the Smith subbasin. These subbasins are on the west side of the Siskiyou Mountains. At the northern end of the basin, the Coos and Coquille Rivers headwater in the Coast Range and flow across relatively flat, low gradient, marine terraces to the Pacific Ocean. In the southern portion of the basin, numerous coastal frontal streams headwater primarily in the Klamath Mountain Province and discharge directly to the ocean (Oregon Department of Environmental Quality 2013). The outflow from rivers with headwaters in the Coastal Ranges, which form estuaries along the South Coast. The South Coast basin is within the Coast Range ecoregion.

Hydrology and Water Quality

Coast Range ecoregion streams and rivers generally have steep gradients in their headwater sections and very flat gradients in their lower reaches. Stream densities are high in this region, ranging from 2 to 3 miles of stream per square mile of land. Streams originating on the west slopes generally flow into the Pacific Ocean, and streams that drain the east slopes are tributaries to the Willamette River. On the North Coast, several streams drain north directly into the Columbia River. The combination of shallow soils and rain-dominated precipitation leads to flashy, rapid runoff with high flows during winter storms and low flow during the summer dry season.

There are approximately 8,759 miles of streams in the plan area of the Coast Range ecoregion. Of those, approximately 1,338 miles are fish-bearing (15%; Type F) streams with 96% of these Type F streams having perennial flow, meaning they contain water throughout of the year, except during infrequent periods of severe drought. There are approximately 3,850 miles of non-fish-bearing streams (Type N) in the plan area. These streams do not meet the physical criteria of Type F streams but still provide downstream salmonid habitat values by contributing large wood, cold water through shading, and food resources, as well as habitat for other aquatic species, including torrent salamanders. The stream type of the remaining 3,571 miles is unknown.

There are approximately 8,220 acres of wetlands that occur in the plan area of the Coast Range ecoregion. Using the National Wetland Inventory (NWI) classifications, the majority acreage is represented by riverine (75%), which includes all wetlands and deepwater habitats contained within a channel and are analogous with the streams described previously. The remaining acreage is composed largely of freshwater forested/shrub (13%) where trees are the dominant life form, with at least 30% overall coverage. This wetland type occurs only in the Palustrine and Estuarine systems and normally possesses an overstory of trees, an understory of young trees or shrubs, and an herbaceous layer (Federal Geographic Data Committee 2013). Forested and smaller stream-associated wetlands are not as well documented in the NWI, but they are identified and protections are established in the planning phases of management activities.

Currently, there are approximately 149 river miles of streams in the Coast Range ecoregion of the permit area that are listed as 303(d) impaired or threatened for dissolved oxygen, water temperature, and sedimentation by DEQ, meaning they do not meet the standards set by DEQ for native cold-water aquatic communities (Table 2-6). Eighty-four percent of these streams are 303(d) listed for water temperatures, 9% for dissolved oxygen and temperature, 5% for dissolved oxygen, 1% for dissolved oxygen, sedimentation and temperature, and less than 1% for sedimentation. Impaired miles in the Coast Range ecoregion make up 96% of the total impaired miles in the permit area.

2.3.2.2 West Cascades Ecoregion in the Plan Area

Geology and Topography

The topography of the West Cascades ecoregion has been shaped dramatically by its volcanic past. Geologically, the West Cascades ecoregion has two distinct areas: the younger volcanic crest (approximately 3 million years old) and the “old Cascades” west of the crest (at least 30 million years old). The West Cascades ecoregion is long and linear, following the north–south axis of the mountain range. The topography is steep and has somewhat less dissected slopes than the Coast Range mountains. The probability of debris slides is less than the Coast Range ecoregion. There are rock block slides, deep-seated, large-scale landslides, and block slides, slump blocks, slump earthflows, and some very large earthflows scattered over the landscape. Fill loading and slope undercutting due to waste area fills, road and landing excavation, and filling can trigger renewed movement in these features. However, the risk of slope instability associated with timber harvest and road building is less than that of the Coast Range ecoregion.

Soils

Soils of the Santiam State Forest, which is where the bulk of the plan area occurs in the West Cascades ecoregion, are mostly derived from ancient andesites and their alluvial deposits. Other volcanic deposits may cap some soils. The soils are mostly gravelly with clay, clay loam, and sandy loam textures. They vary from shallow and skeletal on some slopes to deep and moderately well developed on gentle terrain. Rock volumes of 40 to 60% are common.

Site quality varies from high Site Class II for Douglas-fir to Site Class V for both Douglas-fir and western hemlock (*Tsuga heterophylla*). Forest stands may range from being relatively windfirm to being highly susceptible to windthrow, depending on steepness of slopes and soil depth.

Reforestation may be difficult on some steep slopes. Silvicultural and harvesting systems must be thoughtfully designed and implemented to ensure the long-term productivity of these sites.

Climate and Climate Change

The western slopes of the Cascades receive most of their precipitation as snow, from November through March. At higher elevations, up to 300 inches of precipitation may fall annually, and the lower slopes get at least 80 inches annually (Beschta et al. 1995). Temperatures in the West Cascades ecoregion are still influenced by the ocean but are more varied than the Coast Range ecoregion. The plan area is in the western portion of the West Cascades ecoregion and extends from mid-to-high elevations and experiences higher precipitation levels associated with these higher elevations.

Major River Basins

The West Cascades ecoregion is part of the Umpqua basin, which also includes portions of the Coast Range and Klamath Mountains ecoregions (Figure 2-6). The basin comprises approximately 5,063 square miles of southwest Oregon and is described in more detail in Section 2.3.2.1, *Coast Range Ecoregion in the Plan Area*. The North Santiam River Basin is on the western slopes of the Cascade Range. The river flows west from Mount Jefferson to the Willamette River, draining 766 square miles. The basin contains the main stem North Santiam River, its major tributaries: Breitenbush River, Blowout Creek, French Creek, and the Little North Santiam River.

Hydrology and Water Quality

West Cascades ecoregion streams and rivers usually have high gradients. Stream densities range from 1.5 to 2 miles of stream per square mile of land (Beschta et al. 1995). West Cascades ecoregion streams west of the crest flow westward and eventually join one of the major rivers draining the area (Santiam, Sandy, Willamette, and Clackamas). The hydrology of the West Cascades is strongly influenced by elevation, climate and soils. At higher elevations much of the precipitation falls as snow, and a significant portion filters into highly permeable soil and rock.

There are approximately 600 miles of streams in the plan area of the West Cascades ecoregion. Of those, approximately 67 miles are fish-bearing (11%; Type F) streams with the majority (79%) having perennial flow, meaning they contain water throughout of the year, except during infrequent periods of severe drought. There are approximately 533 miles of non-fish-bearing streams (Type N) in the plan area.

There are approximately 373 acres of wetlands that occur in the plan area of the West Cascades ecoregion. Using the NWI classifications, the majority acreage is represented by riverine (75%), which includes all wetlands and deepwater habitats contained within a channel and are analogous with the streams described previously. The remaining acreage is composed largely of freshwater forested/shrub (13%). Forested and smaller stream-associated wetlands are not as well documented in the NWI, but are identified, and protections established, in the planning phases of management activities.

Currently, there are approximately four river miles of streams in the West Cascade ecoregion of the permit area that are within the range of covered fish or amphibians listed as 303(d) impaired or threatened for water temperature or dissolved oxygen and temperature (Table 2-6). Ninety-nine percent of these streams are 303(d) listed for dissolved oxygen and temperature and 1% for water temperatures. Impaired miles in the Coast Range ecoregion make up approximately 3% of the total impaired miles in the permit area.

2.3.2.3 Klamath Mountains Ecoregion in the Plan Area

Geology and Topography

ODF-managed lands in the Klamath Mountain ecoregion are mountainous, with little land located on the valley floors. The underlying bedrock is metamorphic on most of the lands and includes some of the oldest rock formations in Oregon.

The Klamath Mountain ecoregion has not been significantly shaped by volcanism. The geology of the Klamath Mountains can be better described as a mosaic rather than the layer-cake geology of most of the rest of the state. In the Klamath Mountains, serpentine mineral bedrock has weathered to a soil rich in heavy metals, including chromium, nickel, and gold, and in other parts, mineral deposits have crystallized in fractures (Oregon Department of Fish and Wildlife 2016).

Soils

Upland soils in the western half of the Klamath Mountains ecoregion are moderately deep reddish-brown silt loam or silty clay loam underlain by silty clay (Franklin and Dyrness 1988). These soils are interspersed with scattered areas of peridotite or serpentine, which are shallow and stony and underproductive for tree growth. There is a variety of valley soils, mostly dark-colored, well-drained silt loam underlain by a silty clay loam subsoil. Poorly drained streamside soils also occur.

In the eastern part of the ecoregion, principal upland soils are dry for most of the year and are generally reddish-brown with bedrock within approximately 3 feet of the surface (Franklin and Dyrness 1988). The texture tends to be loam underlain by clay loam subsoils. Shallow, gravelly soils of low fertility occur but are less widespread. Soils on flood plains and alluvial fans in the eastern half of the Klamath Mountains are principally well-drained prairie soils.

Climate and Climate Change

The Klamath Mountains ecoregion has a Mediterranean climate that is typified by hot, dry summers and moderate rainfall occurring abundantly in the winter months, making it unique from the rest of western Oregon. Snow occurs mostly above the 3,000-foot elevation and is generally short-lived. In general, average annual precipitation varies from 25 inches per year (near the towns of Rogue River and Shady Cove) to 118 inches per year (near Cave Junction). Nearly 80% of the precipitation occurs in the winter months. Temperatures range from 9°F to 116°F (-13°C to 47°C). Part of the plan area is the central portion of the Klamath Mountains ecoregion and experiences lower precipitation levels associated with this dryer portion of the state.

Major River Basins

State forest lands within the Klamath Mountains ecoregion are located within the Rogue and Umpqua River Basin (Figure 2-6). The Rogue River basin contains 5,156 square miles in southwestern Oregon and northern California while the Umpqua River basin contains 3,440 square miles in southwestern Oregon. The Rogue River basin includes five subbasins: Lower Rogue River, Middle Rogue River, Upper Rogue River, Illinois, and Applegate. The basin is bound by the Siskiyou Mountains to the south and the Cascade Mountains to the east. The hydrology of the basin is strongly influenced by the climate and the soils. At higher elevations much of the precipitation falls as snowfall and a significant portion infiltrates into the highly permeable soil and rock. As a result, higher flows are seen in May due to snow melt. In contrast, the flow of the Illinois River is more

typical of the Coast Range where most of the precipitation falls as rainfall and shallow soils lead to rapid runoff with high flows during winter storms and low flows during the summer dry period. The Rogue basin is within the Coast Range and Klamath Mountains/California High North Coast Range ecoregions. The Umpqua basin is described in Section 2.3.2.1, *Coast Range Ecoregion in the Plan Area, Major River Basins*.

Hydrology and Water Quality

Southwest Oregon state forest lands occur in the Klamath Mountains hydrologic region, which occupies most of southwestern Oregon and extends southward into northern California. They are rugged, have 2,000 to 5,000 feet of relief, and can receive more than 120 inches of precipitation annually in wetter parts near the Oregon-California border and Siskiyou Mountains (McFarland 1983). The southwest Oregon state forests are in the Rogue and Umpqua drainage basins. The Rogue and Umpqua drainage basins are significant watersheds that are directly influenced by state forest lands in southwest Oregon.

There are approximately 186 miles of streams in the plan area of the Klamath Mountains ecoregion. Of those, approximately 13 miles are fish-bearing (7%; Type F) streams with almost all (99%) having perennial flow, meaning they contain water throughout the year, except during infrequent periods of severe drought. There are approximately 172 miles of non-fish-bearing streams (Type N) in the plan area. These streams do not meet the physical criteria of Type F streams but do provide habitat for other aquatic species including torrent salamanders.

There are approximately 366 acres of wetlands that occur in the plan area of the Klamath Mountains ecoregion. Using the NWI classifications, almost all of the acreage is represented by riverine (97%), which includes all wetlands and deepwater habitats contained within a channel and are analogous with the streams described previously. The remaining acreage is composed of freshwater forested/shrub. Forested and smaller stream-associated wetlands are not as well documented in the NWI, but are identified, and protections established, in the planning phases of management activities.

Currently, no streams in the Klamath Mountains ecoregion of the permit area that are within the range of covered fish or amphibians are listed as 303(d) impaired or threatened.

2.3.2.4 Willamette Valley Ecoregion in the Plan Area

Geology and Topography

The Willamette Valley ecoregion is mostly a rolling, broad, lowland valley. Elevations range from about 20 feet to over 1,970 feet on higher peaks, which are along the western and eastern borders of the ecoregion. Landforms consist of terraces and floodplains that are interlaced and surrounded by rolling hills (Griffith 2010). The limited lands in the plan area are outside of the valley floor along the eastern and western borders of the Willamette Valley ecoregion.

Soils

Soils in the Willamette Valley ecoregion include relatively deep alluvium, colluvium, and glacio-lacustrine deposits that overlie Miocene volcanic basalt and marine sandstone. Soils along the valley floor are productive, have a mesic temperature regime, and have a variety of texture and moisture

characteristics (Griffith 2010). Soils associated with the plan area, which is situated in the foothills outside of the valley floor, consist of Ultisols and Alfisols.

Climate and Climate Change

The Willamette Valley ecoregion has a Mediterranean-type climate, with warm, dry summers and mild, wet winters. Average temperatures range from 50°F to 55°F (10°C to 13°C). The frost-free season is 5 to 7 months long. Average annual precipitation is 48 inches. In the mountainous foothills, which is where the plan area is located, precipitation ranges from 35 to 63 inches (Griffith 2010).

Major River Basins

State forest lands in the Willamette ecoregion are in the Willamette River Basin (Figure 2-6). Draining an area greater than 11,200 square miles, the Willamette basin is the state's largest. The basin begins south of Cottage Grove and extends approximately 187 miles to the north where the Willamette River flows into the Columbia River. It encompasses 12 subbasins: Lower Willamette, Tualatin, Molalla-Pudding, Yamhill, Clackamas, South Santiam, North Santiam, Middle Willamette, McKenzie, Coast Fork Willamette, Middle Fork Willamette, and Upper Willamette. The basin contains the broad Willamette River valley, which is flanked by the forested slopes of the Coast and Cascade mountain ranges. The Willamette River and its tributaries support a wide variety of ecosystems and habitats. The Willamette River stretches nearly 300 miles from its headwaters at Waldo Lake near Eugene to the confluence with the Columbia River in North Portland (Oregon Department of Environmental Quality 2020 and U.S. Army Corps of Engineers 2017). The Willamette basin is within the Willamette Valley ecoregion.

Hydrology and Water Quality

Surface water in the Willamette Valley ecoregion is dominated by large rivers and numerous streams flowing from the adjacent mountainous regions (Griffith 2010). Large rivers in the ecoregion include the Willamette, McKenzie, Santiam, Sandy, Mollala, Clackamas, Tualatin, Yamhill, Luckiamute, and Long Tom. There are also numerous seasonal wetlands and ponds along with a few reservoirs.

There are approximately 89 miles of streams in the plan area of the Willamette Valley ecoregion. Of those, approximately 12 miles are fish-bearing (13%; Type F) streams with almost all (100%) having perennial flow, meaning they contain water throughout the year, except during infrequent periods of severe drought. There are approximately 77 miles of non-fish-bearing streams (Type N) in the plan area.

There are approximately 70 acres of wetlands that occur in the plan area of the Willamette Valley ecoregion. Using the NWI classifications, almost all the acreage is represented by riverine (98%), which includes all wetlands and deepwater habitats contained within a channel and is analogous with the streams described previously. The remaining acreage is composed of freshwater forested/shrub and freshwater emergent. Freshwater emergent wetlands maintain the same appearance year after year and are dominated by perennial plants (Federal Geographic Data Committee 2013). Forested and smaller stream-associated wetlands are not as well documented in the NWI, but are identified, and protections are established, in the planning phases of management activities.

Currently, there are approximately 3 river miles of streams in the Willamette Valley ecoregion of the permit area that are within the range of covered fish or amphibians listed as 303(d) impaired or threatened (Table 2-6). All of these river miles are impaired or threatened for dissolved oxygen. Impaired miles in the Willamette Valley ecoregion make up approximately 2% of the total impaired miles in the permit area.

2.4 Forest Conditions

This section describes the history of past disturbances in the permit area and associated forest conditions, including forest type, age, structure, and health. The 2010 Forest Management Plans (Oregon Department of Forestry 2010a, 2010b) and 2018 Forest Resource Assessment (Magby et al. 2018) describe forest conditions in the plan area and served as the basis of the following discussion, except as otherwise cited. Table 2-6 summarizes the ecological setting of the permit area.

2.4.1 Forest Data

ODF's stand level inventory (SLI) data characterize forest composition and structure in the permit area. Inventory data include site-specific data on trees, snags, downed woody debris, and understory vegetation. These data are based on a field-measured sampling of selected forest stands. The number of stands sampled varies from year to year, depending on budgets and specific needs. Overall, approximately 50% of stands have been measured since 2001. Data from measured stands are used to extrapolate inventory information to stands that do not have field-measured data. ODF regularly maintains and updates inventory data, which serve as the information source on forest conditions for all lands managed by the State Forests Division. ODF uses inventory data to inform forest-management analyses, assessments, activity planning, and status reporting. Data presented in the HCP used the 2017 SLI version that was updated in 2020.

2.4.2 Forest Conditions Overview

2.4.2.1 Historic Context

The forests in the plan area have been greatly influenced by historic landscape-scale disturbance events, as well as forest management. These overriding and important factors are summarized here.

Fires and Storms

- **Large fires.** The fires of the Tillamook Burn (1933 to 1951) greatly influenced the soil and forest trees of the Tillamook and Clatsop State Forests. This series of massive fires led to large-scale loss of timber and subsequent salvage harvest of what remained. Similar large-scale fires and subsequent salvage harvest occurred in Lane County with the Nelson Mountain Fire (1910), in the Santiam State Forest (1951), and in Douglas and Coos Counties (1868). The 2020 Labor Day fire event was the largest single fire event in a century in western Oregon. This infrequent east wind-driven event left a mosaic of burn severity on the landscape and burned over 25,000 acres of ODF management lands. As of 2025, ODF is still engaged in short-term post-fire harvest activities to address public safety concerns, recover economic value, and actively reforest burned areas on a portion of the affected landscape. This work is being done with greater sensitivity than large-scale salvage efforts of the past, with a focus on strong retention standards

in riparian areas and for legacy forest components generally. ODF is also developing a long-term restoration strategy to continue restoration activities and develop monitoring to more fully understand the influence that the event had on the forest and how it responds to various restoration management pathways in the future.

- **Fire suppression.** Fire-suppression activities have been prevalent since the early part of the twentieth century. This, along with a lack of fuels management (e.g., prescribed burning) on large portions of the landscape in the permit area has led to large accumulations of high fuel loads that would have historically experienced a variety of fire frequencies and severities. This management paradigm on large portions of the landscape, coupled with other factors—including extended drought conditions, increased public use, and encroachment by development—increases the risk of large, catastrophic fires.
- **Windstorms.** The plan area, primarily in the Coast Range ecoregion, is subject to winter storms from the Pacific Ocean. Severe storms occasionally feature high wind velocities, the effects of which can be exacerbated by heavy rainfall that saturates soils, reducing tree resistance to windthrow. In northwest Oregon, periodic severe windstorms typically occur between October and March. Both the Hanukkah Eve Storm of 2006 and the Great Coastal Gale of 2007 exhibited extreme wind speeds and durations and blew down large stands of timber, resulting in the salvage of 17 million and 35 million board feet of timber on the Astoria District, respectively. Approximately 10,000 acres were salvaged from 2007 through 2009 as a result of this event. These acres did not include younger stands or smaller pockets of timber in these salvage operations. On October 12, 1962, the Columbus Day storm heavily affected the plan area. The Astoria and Tillamook Districts were generally less affected because the age of the timber in these areas was younger than stands in the Western Lane, North Cascade, and West Oregon Districts. Impacts were not limited to ODF-managed lands, and approximately 17 billion board feet were blown down across Oregon and Washington across numerous landowners. Wind speeds associated with the storm are shown in Figure 2-7. Other major windstorms in the last 150 years occurred on January 9, 1880, in northern Oregon; December 4, 1951, in western Oregon; and the winter of 1995 to 1996 in western Oregon. The winters of 1949 to 1952 and 1955 to 1956 also had heavy winds.
- **Winter rainstorms.** Western Oregon, especially the Coast Range, has frequent, intense winter rainstorms. Severe floods usually result from rain-on-snow events, when heavy rain falls on low elevation snow, swelling the streams with melted snow and rain. Heavy rains also increase soil water levels, particularly where other disturbances such as fires or timber harvest have removed forest canopy and exposed the ground. The soils can give way in a landslide and start debris flows. Floods are more common in the cool, wet periods of climate cycles. Debris flows and major flooding cause small, localized disturbances that are important for forest regeneration and habitat creation.

Harvest

- **Historic timber boom.** Logging for timber production has occurred in Oregon beginning with early settlement and trade activities in the early to mid-1800s. Much of the forestlands now managed by ODF was inaccessible to these early activities, but the development of railroads around the turn of the twentieth century allowed for access and logging of mountainous areas on an industrial scale. In the early decades of the twentieth century, significant portions of what are now the Tillamook and Clatsop State Forests were logged using railroads and steam-

powered yarding equipment. By the 1940s, forest roads and log trucks replaced railroads, chainsaws replaced crosscut saws, and diesel-powered yarding equipment replaced steam donkeys. Logging practices over the last century combined with extensive fires have resulted in few remaining old-growth forests.

In recent decades, timber harvest has been the primary agent of change in the plan area. Based on historic timber sale records from July 1979 to June 2018, approximately 150,000 acres of regeneration harvest and 215,000 acres of partial cut harvest have occurred in the plan area.

- **Increased forest management.** Plantation forestry began in Oregon on a very limited scale as early as 1901 but was only employed on 49,000 acres statewide over the next 40 years. Artificial reforestation was first encouraged by the Oregon Forest Conservation Act of 1941, with the recognition that Oregon forest lands should continuously grow timber into the future. Over the next 30 years, reforestation through the planting of seedlings became more economically feasible. Many of Oregon's largest reforestation efforts (both planting and seeding) were conducted on lands under ODF's management, primarily focused on rehabilitating lands deforested by wildfire and early industrial logging. The 1971 Oregon Forest Practices Act strengthened the mandate for reforestation after harvest, and modern plantation forestry centered on Douglas-fir became standard practice. There are now many acres of uniform stands, mostly of the commercially valuable Douglas-fir.

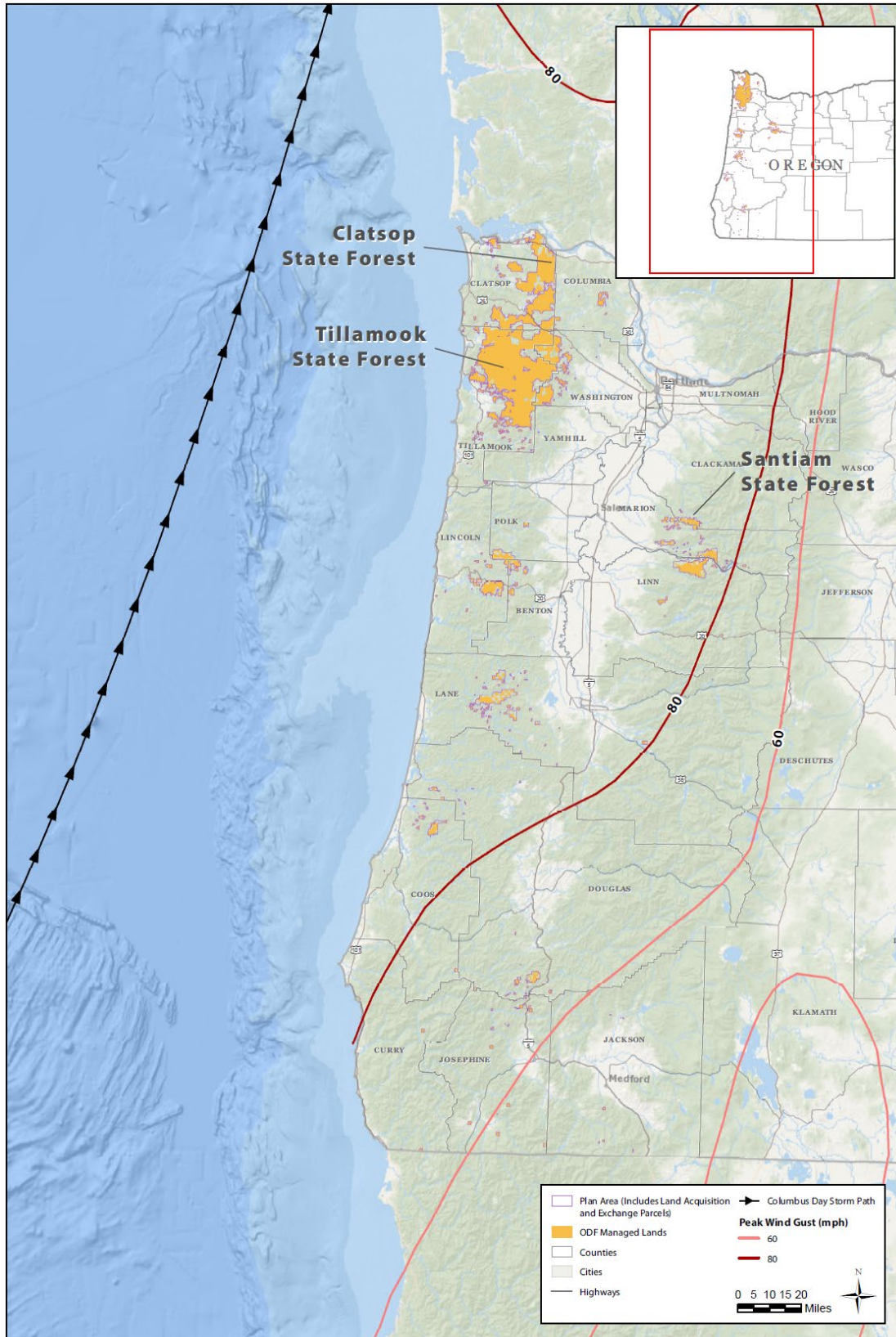


Figure 2-7. Columbus Day Storm

- **Reforestation.** Most reforestation has included planting Douglas-fir because of its relatively high commercial value and ability to rapidly grow in even-aged stands. Tree improvement programs and nursery technology advanced rapidly for Douglas-fir, so it also became the easiest and least expensive tree to plant and manage. The long-term effect, particularly in the Coast Range, was an increase in the quantity and density of Douglas-fir, often from non-local seed sources in the early years of restoration. Current ODF reforestation practices include the predominant use of Douglas-fir that has been improved through selective breeding for a variety of conditions at local and landscape scales. In addition to Douglas-fir, current planting regimes also incorporate other native conifers and hardwoods, including western hemlock, western redcedar (*Thuja plicata*), Sitka spruce (*Picea sitchensis*), and red alder. Sites are closely evaluated for an appropriate mix of these other species to include, based on physical site characteristics, such as soil moisture and elevation. As regenerating trees grow and begin to compete with each other, pre-commercial thinning is used to maintain tree growth and vigor. As stands continue to mature, thinning prescriptions tend to favor opening stands up more, encouraging more reinitiation and development of both tree and non-tree vegetation in the understory.

Insects and Disease

A comprehensive inventory of pest and disease agents active in the plan area is presented in the 2010 Forest Management Plans (Oregon Department of Forestry 2010a, 2010b). Several diseases have reached noticeable levels of damage in recent decades and are discussed in this section. Climate change introduces additional uncertainty around the potential future extent of insects and disease. For instance, increased summer drought stress makes trees more vulnerable to these agents, and a lack of hard winter freezes may disrupt natural regulation of insect populations.

Most insect damage on state forests is caused by the Douglas-fir bark beetle (*Dendroctonus pseudotsugae*), which tends to affect low-vigor trees weakened by other factors. Beetle population buildup occurs on freshly downed Douglas-fir trees after significant disturbance events, which damage healthy trees. Outbreaks typically last 2 to 4 years, though they can be prolonged when conditions are favorable.

Swiss needle cast, a native fungal disease, has increasingly affected Douglas-fir stands near the coast. The reasons for this are not fully known, but it may be connected to the widespread reforestation of the burn with Douglas-fir seed from other areas, which introduced trees poorly adapted to coastal conditions. Swiss needle cast causes premature dropping of needles, with severely infected trees retaining only the current year's needle growth. This reduces tree growth. The combination of off-site seed, Swiss needle cast and other factors has stagnated tree growth, particularly height growth. The geographic scope and severity of the disease complicates forest-management activities due to reduced harvest volume and poor response to prescriptions intended to enhance habitat and stand growth.

Laminated root rot (*Phellinus weirii*), a native disease of conifers, has damaged Douglas-fir on some sites, but current management practices can stabilize or reduce unwanted effects of this disease. Black stain root disease (*Leptographium wageneri*) has reached epidemic proportions in some locations in southwest Oregon, and now can be found at low levels throughout young Douglas-fir stands in northwest Oregon forests. Armillaria root disease (*Armillaria* sp.) is far less abundant and damaging than laminated root rot but occasionally causes significant damage in young Douglas-fir

plantations. Root disease surveys have shown that in the northwest Oregon state forests, armillaria is widely scattered and occurs in very small patches, usually affecting only a few trees.

Disease and insects combine with wind damage to create patchy stands. The interactions of wind, root disease, and bark beetles create canopy gaps, mix soils during tree uprooting, and increase structural and biological diversity in stands. Recent incorporation of multiple species into tree-planting efforts may help decrease the impact of insects and disease in monocultures.

Legacy Forest Roads

Legacy road conditions from historical logging practices, including hauling and skid roads that were built before current Best Management Practices were in effect, have increased the probability of slope failure in some locations. The Tillamook State Forest has legacy road conditions throughout the forest. In some areas, legacy conditions pose serious threats to water quality, fish, and aquatic habitats.

2.4.2.2 Forest Types

Grouping stands into forest types based on species composition is a useful tool that facilitates the observation of natural patterns that are exhibited across a complex landscape. These forest types provide information about a stand's potential future condition, and stand age and management history can reveal where a stand lies on its developmental curve. The forest stands are predominantly conifer, although some portions of the landscape are dominated by hardwood stands, and many stands across the landscape have some hardwood component.

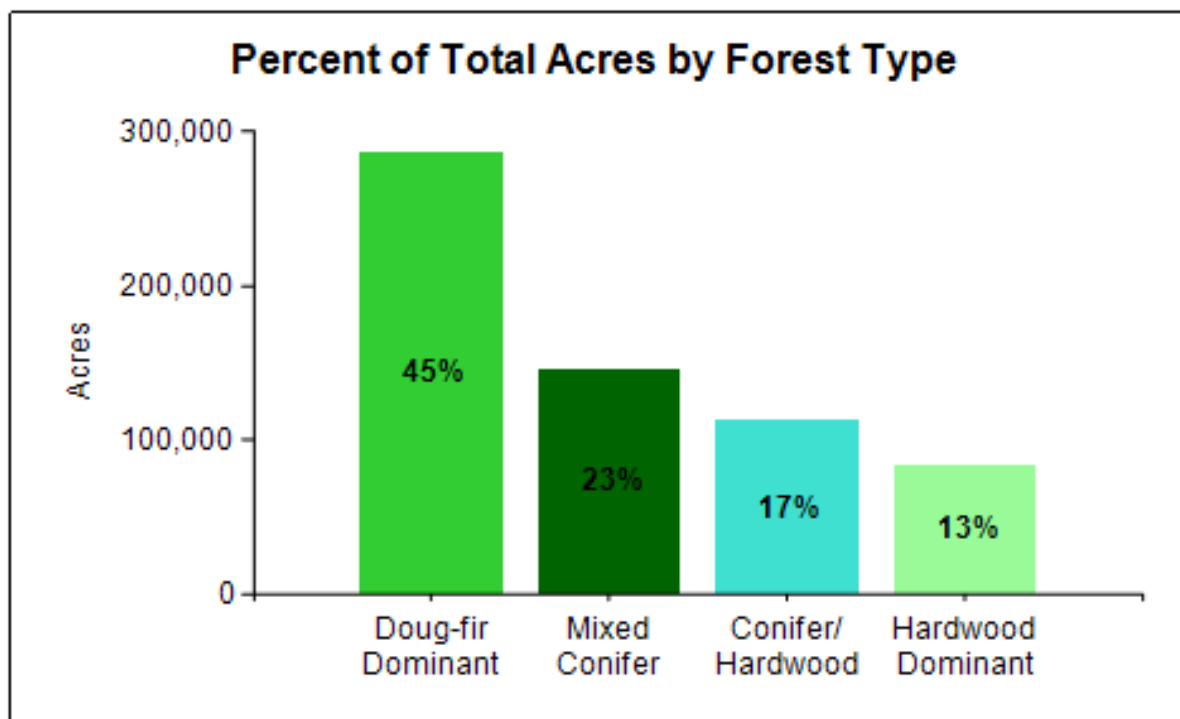
Forest types can be broadly classified into the following four categories.

- **Douglas-fir-dominant stands.** Douglas-fir accounts for more than two-thirds of the standing volume on Oregon state forests (Figure 2-8). Overall, less than half of the total state forest acreage fits the definition of a single-species Douglas-fir-dominant stand.
- **Mixed conifer stands.** Mixed conifer stands typically include some combination of western hemlock, Douglas-fir, western redcedar, Sitka spruce, and noble fir (*Abies procera*).
- **Hardwood-dominant stands.** Hardwood-dominant stands are usually dominated by either red alder or bigleaf maple (*Acer macrophyllum*).
- **Conifer-hardwood mix stands.** Conifer-hardwood mix stands are most commonly Douglas-fir or western hemlock mixing with red alder.

These forest types vary from one another with respect to their potential for wildlife habitat development. Complex forest habitat conditions uniquely benefit many native wildlife species and increase resiliency to disturbances. Compositional diversity, structural complexity, and spatial heterogeneity that benefit native wildlife are provided in forest stands with a diversity of tree species; an understory of trees, shrubs, and herbs; and ample amounts of snags and downed wood.

On Oregon state forests roughly 25% of the mixed conifer acres currently provide complex forest structure, as compared with less than 10% of the Douglas-fir-dominant acres. By definition, mixed conifer stands tend to be multi-species stands that are more amenable to developing layered canopies. For similar reasons, the conifer-hardwood mix forest type also contributes disproportionately to the total acres with complex forest habitat conditions. Due to a variety of

geographic and historic factors, these four forest types are not distributed evenly across the plan area.

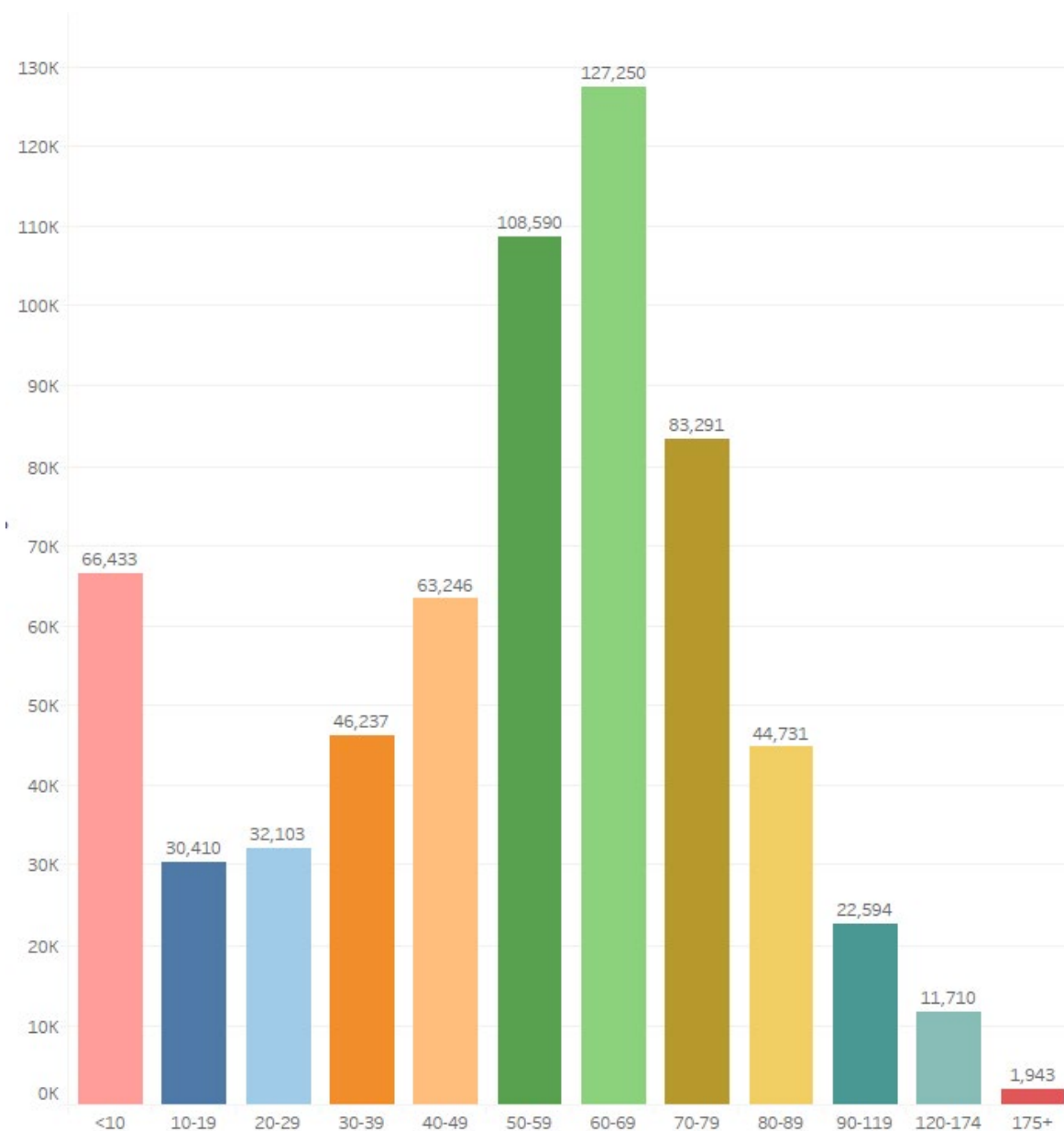


Source: ODF file information.

Figure 2-8. Overview of Western Oregon Forest Types in the Permit Area Only

2.4.2.3 Forest Age

Forest age generally refers to the time elapsed since the last major disturbance that eliminated much of the previous forest and allowed regeneration of a new stand. As a result of their history of large fires, extensive logging prior to state ownership, and subsequent forest management, the current age distribution of Oregon state forests lands is not uniform (Figure 2-9). Stand age is a major indicator of current forest condition and this non-uniform age distribution has significant implications related to forest-management planning. Forest stands in the 50- to 79-year-old range are the most abundant across the plan area and account for half of the total acreage and more than 60% of the standing volume. On portions of the Tillamook and Forest Grove Districts, these acres coincide with periods of aggressive salvage logging and subsequent reforestation efforts that occurred after the Tillamook Burn. However, stand age is not the only factor that influences a current stand's condition. Site productivity, past management practices, and disturbance history have all interacted with one another to produce the forests that ODF manages today.



Source: ODF file information.

Figure 2-9. Acres of Forest by Age Class in the Permit Area

2.4.2.4 Forest Structure

In addition to age, forests can be described in terms of structure. Forest structure refers to the vertical and horizontal distribution of trees, presence of snags (standing dead) and logs (downed dead), structural diversity and spatial heterogeneity in the understory, and structural complexity of trees. Structure complexity of trees includes factors such as whether they have broken tops, large secondary limbs, cavities, and other features. Stand structural characteristics are important components for all of the species covered under this HCP. Northern spotted owl (*Strix occidentalis*), marbled murrelet (*Brachyramphus marmoratus*), slender salamander (*Batrachoseps wrighti*), coastal marten (*Martes caurina*), and red tree vole (*Arborimus longicaudus*) use these structures

directly for habitat for nesting or other essential functions. These components also contribute to properly functioning aquatic and riparian habitats that benefit the covered fish, in addition to torrent salamanders (*Rhyacotriton* sp.). More detail on these species' life histories and habitat relationships is provided in Appendix C, *Species Accounts*.

The permit area has a broad range of forest stand and structure types. The forest stands are predominantly conifer, although some portions of the landscape are dominated by hardwood stands, and many stands across the landscape have some hardwood component. Forest stands typically move through different structural stages as they age. ODF uses various silvicultural strategies to influence the development of forest stands and achieve desired forest structure across the landscape.

Forest structure types that occur in the permit area are classified as follows.³

Early Seral Forest Structure

Early seral forests are young forests where the overstory has been removed through either harvest activity or natural disturbance. They begin at stand initiation and continue into canopy closure and subsequent suppression mortality. The degree of biodiversity and structural complexity in these stands varies greatly, depending on pre-disturbance conditions, the degree of post-disturbance legacy structure that remains, species diversity, and landscape context. Early seral stands generally fall into the stages of ecosystem reorganization and competitive exclusion as described by Carey (2007).

Ecosystem Reorganization

- Simple early seral forests have little legacy structure, low tree species diversity, little shrub or herbaceous vegetation, and little downed wood. Clear-cuts that have received intensive site preparation and planted to a high-density monoculture are a prime example. Conditions across the stands are relatively homogeneous.
- 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. Downed wood retained from the prior stand, or from retention of hard logs from harvested trees, may exist in various sizes and decay classes. Spatial heterogeneity in vertical and horizontal complexity and diversity are higher relative to more simplified stand conditions.

Competitive Exclusion

- Simple forest structure results from high tree stocking and intense competition for light, water, and nutrients. Dominant trees achieve full crown closure and shade out understory species and shorter trees. Shade-tolerant trees and shrubs may persist below the dominant canopy, but not show significant growth. Dominant and codominant trees may self-thin, with surviving trees able to maintain relatively healthy crown ratios. Where self-thinning does not occur, overstory trees may become tall and spindly, with poor crown and height-to-diameter ratios.

³ The use of seral stage to define forest structure is a new approach by ODF and differs from what is described in the 2010 Forest Management Plans (Oregon Department of Forestry 2010a, 2010b).

- Complex forest structure in this stage is still limited, as sapling and pole-size trees compete for resources. Spatial heterogeneity provided by openings around legacy structures or brushy patches help maintain a greater degree of understory shrubs and herbaceous vegetation. Multiple young tree species with different growth rates and shade tolerance allow for greater canopy diversification, which may result in a greater variety of diameters and heights across the stand. Legacy structures (large trees, snags, and downed wood) contribute to structural complexity.

Mid-Seral Forest Structure

Mid-seral stands are generally 30 to 80 years old, but can be as old as 120 years, depending on disturbance history and stand density. They can vary greatly in structural diversity, depending on their site conditions, silvicultural entries, and self-thinning. Several prescriptive options exist for stands in this general age range (e.g., rotation harvest, multiple commercial entries, variable retention harvest), and stand trajectories are heavily influenced by small-scale natural disturbance events. Structural stages for these stands fall in the biomass accumulation, understory reinitiation, and understory development (Carey 2007).

Biomass Accumulation

- Simple forest structure results from the competitive exclusion stage, where codominant trees continue to fully occupy the site and accumulate wood biomass. Inter-tree competition is high, and understory vegetation is further reduced, primarily due to a lack of sunlight penetrating the fully closed canopy.
- Complex forest structure also has reduced diversity compared to the competitive exclusion stage, as dominant tree crowns reduce understory species growth. Dominant tree species diversity is generally maintained. Legacy structures still provide some openings that allow for persistence of understory vegetation.

Understory Reinitiation

- Simple forest structure typically consists of an overstory of uniformly spaced codominant trees with little species diversity. Uniform self-thinning has left the site fully occupied, and the understory is reduced to shade-tolerant species such as salal (*Gaultheria shallon*) and sword fern (*Polystichum munitum*).
- Complex forest structure is marked by overstory canopy heterogeneity produced by variable density thinning or small-scale natural disturbance. Legacy components continue to contribute to this patchiness across the stand, which allows for a more diverse suite of understory species to persist. Conifer species that will eventually form a midstory compete with other trees and shrubs in the understory, but there is little vertical layering in the canopy.

Understory Development

- Simple forest structure is defined by an increase in understory species, where self-thinning of larger trees creates more persistent gaps that allow sunlight to reach the forest floor. These gaps are still relatively uniform throughout the stand, and little vertical diversity has developed in the understory or tree canopy layering.

- Complex forest structure has heterogeneous canopy closure, resulting from management or natural disturbance that has created and maintained a variable density of dominant and codominant trees. This horizontal diversity allows for a rich and varied understory, which has begun to develop vertically, with species such as vine maple growing several feet high. Where gaps in the forest canopy are large enough, additional tree species begin to seed in naturally. Vertical canopy layering has begun, with shade-tolerant species having deeper crowns than their shade-intolerant codominant neighbors. Breakage in treetops, loss of larger limbs, and other damage agents begin to produce cavities and other nesting and roosting structures.

Late-Seral Forest Structure

Forest stands begin to move into a late-seral condition between 80 and 120 years old, where many of the habitat components for covered species may be present, but the abundance or quality of those components are not equivalent to old-growth stands (i.e., ≥ 175 years old). The structural characteristics of these stands vary greatly, depending on previous management activity and exposure to natural disturbance events. Localized, within stand disturbance events and individual tree mortality likely has occurred to some degree by this time, resulting in damage at the tops or in the boles of some trees, creating potential sites for cavity nesting. Large trees are present, and significant downed woody debris has begun to accumulate. Very large trees, snags, and downed logs associated with old growth are not yet present, but develop over time as the stand continues on a late-seral pathway. A diverse understory has vertical development sufficient to meet the lower crown of shade-tolerant tree species in some places. This phase is referred to as *niche diversification* (Carey 2007) and has the necessary structural and species diversity to support a variety of wildlife species.

As these stands persist, disturbance (either natural or through active management) begins to play a larger role in maintaining diversity in the stand. This “gap dynamics” phase (Carey 2007) includes small-scale, high-intensity disturbances such as debris flows that create new openings for understory and tree seeding, and move large wood from upslope to riparian areas. Larger collections of downed trees create denning sites for larger mammal species, and increased biomass and biological diversity in general affords increased foraging opportunities for many bird species. The forest floor is diverse and supports healthy herbaceous and fungal communities.

2.4.2.5 Adjacent Ownership

Land ownership and management of parcels adjacent to the permit area have the potential to affect conditions in the permit area. Adjacent ownership, by ecoregion, is characterized below and depicted in Figure 2-28a through Figure 2-28s at the end of this chapter.

2.4.3 Forest Conditions by Ecoregion

This section describes forest conditions by ecoregion. Table 2-6 summarizes forest type, age, structure and adjacent ownership, by ecoregion.

Table 2-6. Summary of Ecological Setting by Ecoregion

Ecoregion	Forest Type	Forest Age	Forest Structure	Adjacent Ownership
Coast	Dominated by conifers, especially Douglas-fir, along with a variety of hardwoods.	Dominated by 50- to 69-year-old trees, with approximately 220,000 acres in this age range. Approximately 70,000 acres under ODF management in this ecoregion are 80 years and older.	Mostly mid-seral stands with developing understories. Significant layering of tree crowns has not yet developed but many stands have good potential for increasing structural diversity. Some older stands may already have high structural diversity.	Approximately 1,539 miles of adjoining land ownership perimeter. The primary adjoining landowner type is private.
West Cascades	Almost entirely coniferous and dominated by Douglas-fir.	More even spread across age classes compared to the Coast Range ecoregion, with the highest proportion occurring in 60- to 89-year-old trees.	Mid-seral stands similar to other ecoregions.	Approximately 251 miles of adjoining land ownership perimeter. The primary adjoining landowner type is private.
Klamath	Almost entirely coniferous and dominated by Douglas-fir.	Generally range between 20- and 119-year-old trees.	Mid-seral stands similar to other ecoregions.	Approximately 145 miles of adjoining land ownership perimeter. BLM is the primary adjoining landowner.
Willamette	Almost entirely coniferous and dominated by Douglas-fir.	Dominated by 60- to 69-year-old trees.	Mid-seral stands similar to other ecoregions.	Approximately 63 miles of adjoining land ownership. The primary adjoining landowner type is private.

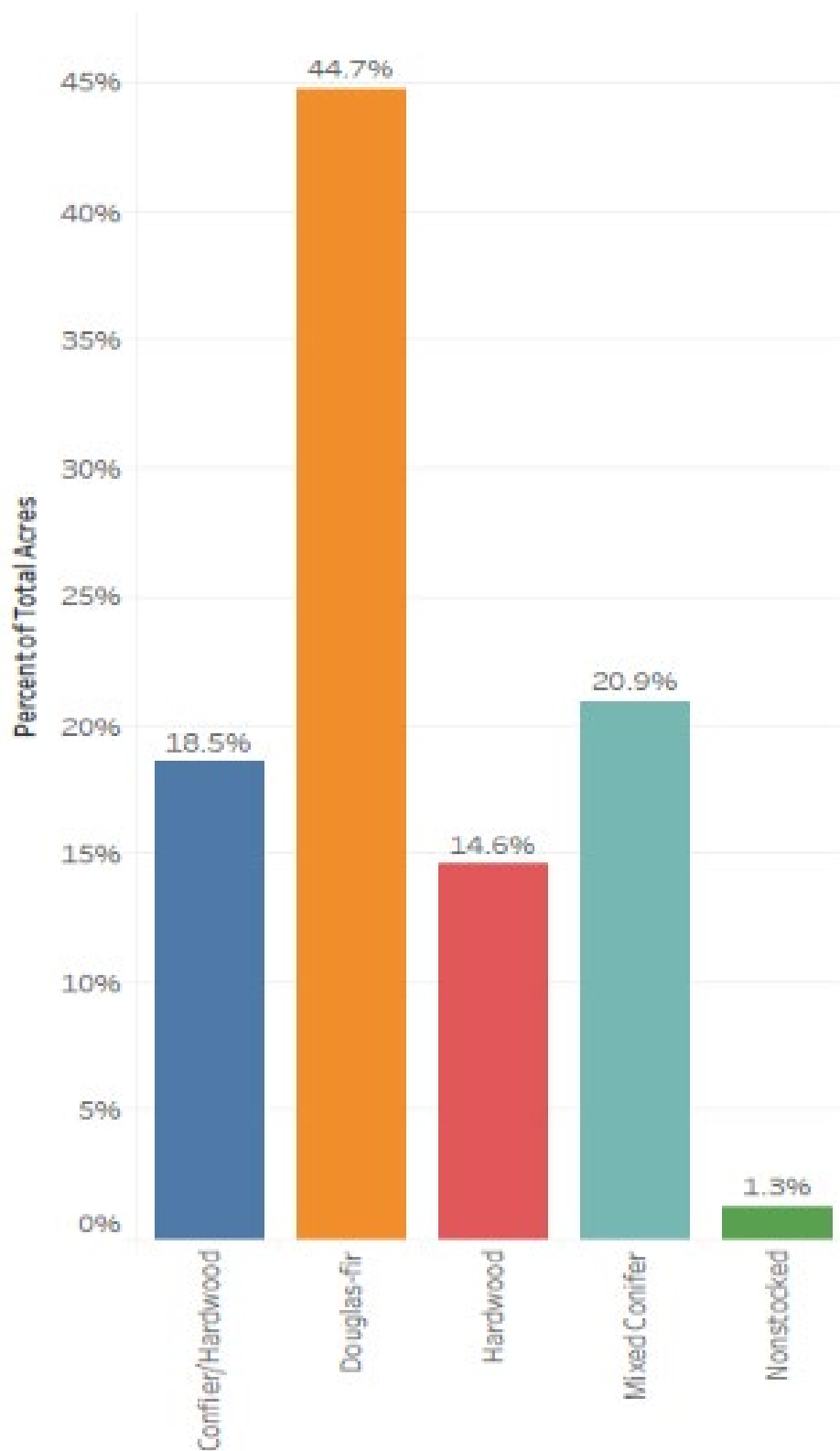
ODF = Oregon Department of Forestry; BLM = Bureau of Land Management

2.4.3.1 Coast Range Ecoregion

Forest Types, Age, and Structure on State Forest Lands

State forests in the Coast Range ecoregion⁴ are dominated by conifers, especially Douglas-fir, along with a variety of hardwoods (Figure 2-10). State forest stands are dominated by the 50- to 69-year-old trees (Figure 2-11). The forest structure is largely composed of mid-seral stands with understory characteristics, such as diverse shrub and herb layers. Tree canopies may range from a single-species, single-layered, main canopy with associated dominant, codominant, and suppressed trees, to multiple species canopies. However, significant layering of tree crowns has not yet developed. In these stands, the shrub and herb layers are likely to continue to diversify and maintain or improve their vigor. These stands offer good potential to develop into highly diversified vegetative communities. Depending on the intensity and timing of density-management activities, stands could continue in this condition, grow back into a closed single canopy state, or develop into late-seral complex stands. Approximately 70,000 acres under ODF management in this ecoregion are in stands aged 80 years and older. These stands have a range of structural complexity dependent on management history, disturbance, and local growing site conditions.

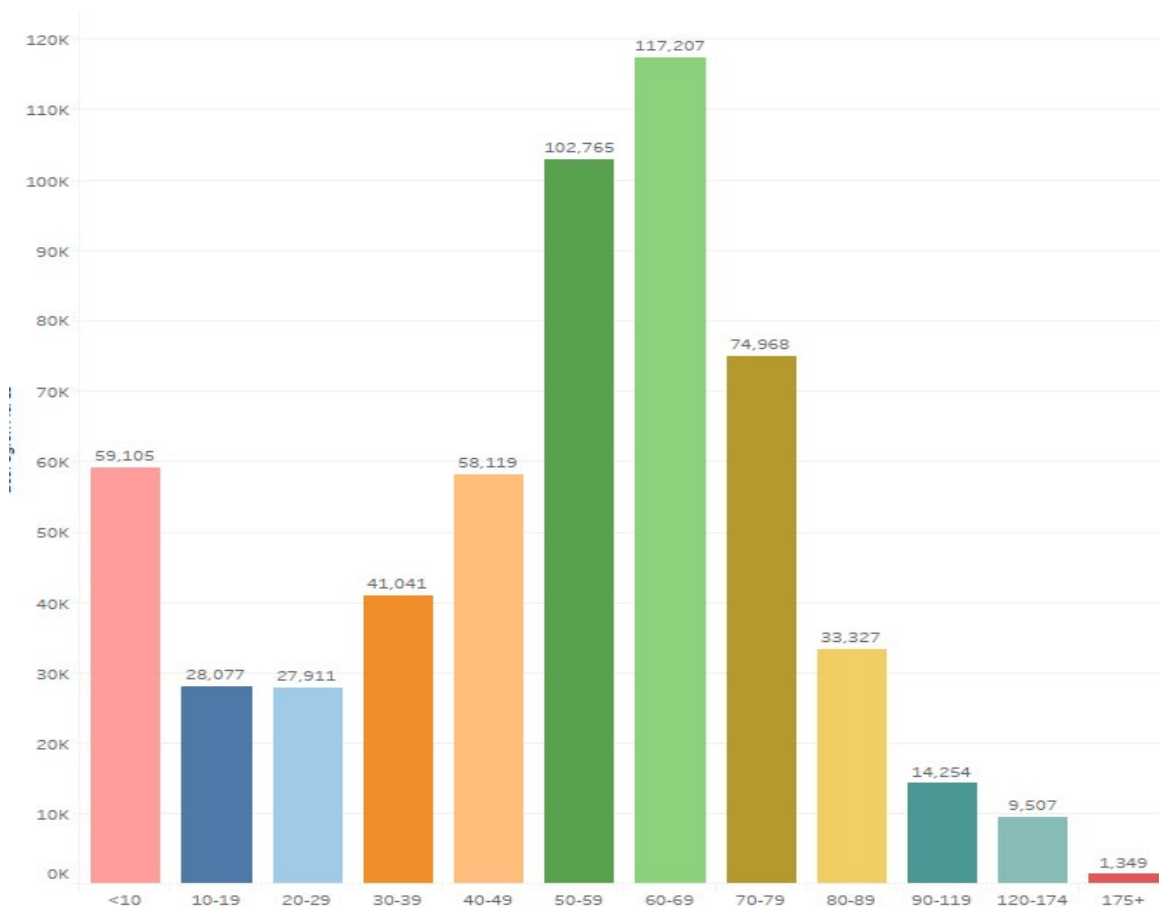
⁴ Forest age data are only available for BOFL and CSFL (i.e., the permit area). Data are not available for private or federal lands in the plan area.



Source: ODF file information.

Note: Percentages do not total 100% as non-forested vegetation types are not shown.

Figure 2-10. Forest Type in the Permit Area in the Coast Range Ecoregion



Source: ODF file information.

Figure 2-11. Acres of Forest by Age Class in the Permit Area in the Coast Range Ecoregion

Adjacent Ownership

There are approximately 1,539 miles of adjoining land ownership perimeter in the permit area of the Coast Range ecoregion. The primary adjoining landowner type is private (Table 2-7). A mapbook at the end of this chapter illustrates adjoining land ownership throughout the permit area (Figure 2-28a through Figure 2-28s).

Table 2-7. Adjacent Land Ownership of the Permit Area in the Coast Range Ecoregion

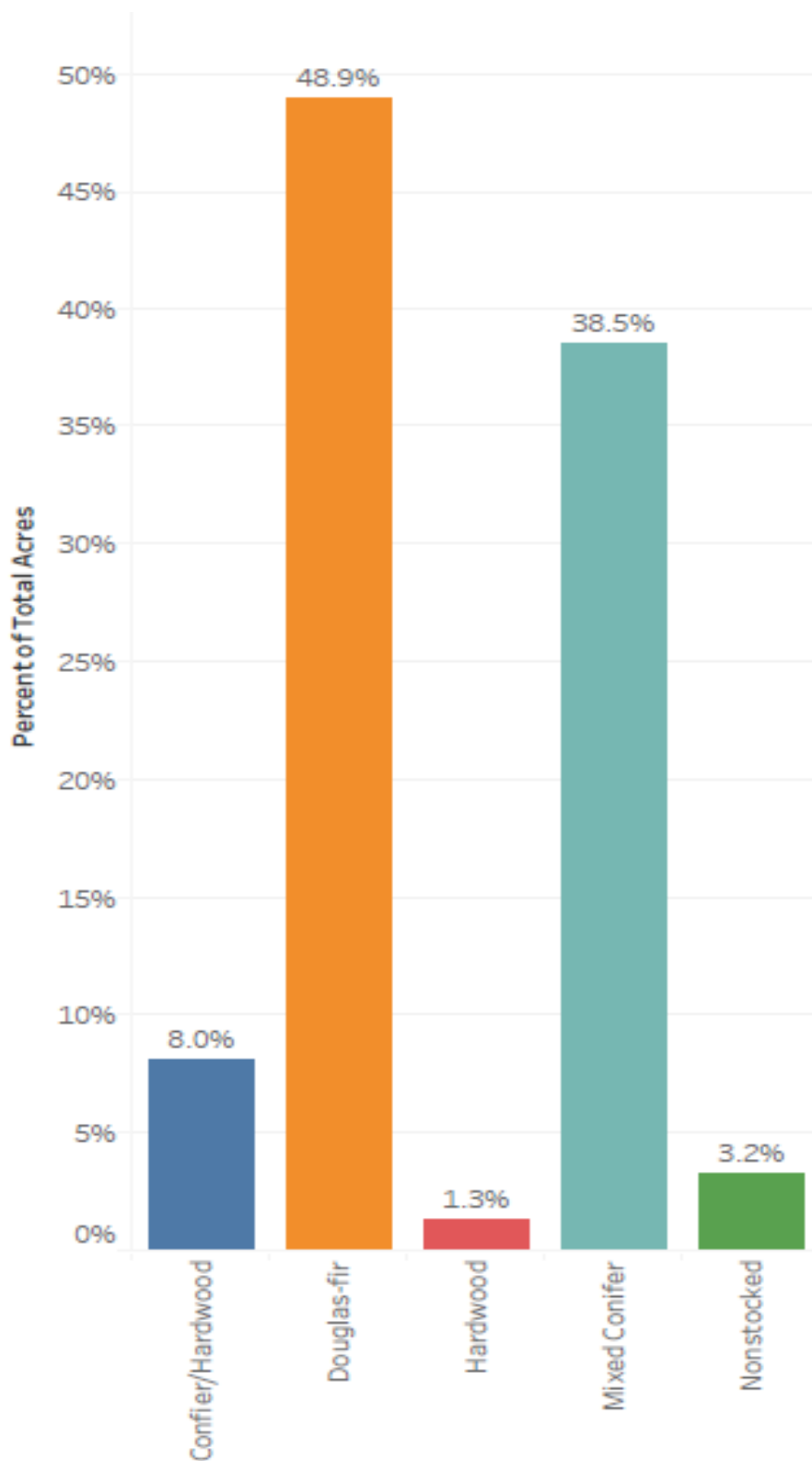
Adjacent Landowner	Miles	Proportion (%)
Private	848	55
Other state lands	429	28
Bureau of Land Management	213	14
U.S. Forest Service	46	3
Other federal agency	3	0
Total	1,539	100

2.4.3.2 West Cascades Ecoregion

Forest Type, Age, and Structure on State Forest Lands

State forests in the West Cascades ecoregion⁵ are almost entirely coniferous and dominated by Douglas-fir (Figure 2-12). Forest stands have a more even spread across age classes compared to the Coast Range ecoregion, with the highest proportion occurring in 60- to 89-year-old trees (Figure 2-13). Forest structure is composed of primarily mid-seral stands with a diverse herb or shrub layer and containing trees larger than sapling size. Tree canopies may range from a single-species, single-layered, main canopy with associated dominant, codominant, and suppressed trees, to multiple species canopies. However, significant layering of tree crowns has not yet developed. The shrub and herb layers are likely to continue to diversify and maintain or improve their vigor. These stands offer good potential for developing into highly diversified vegetative communities.

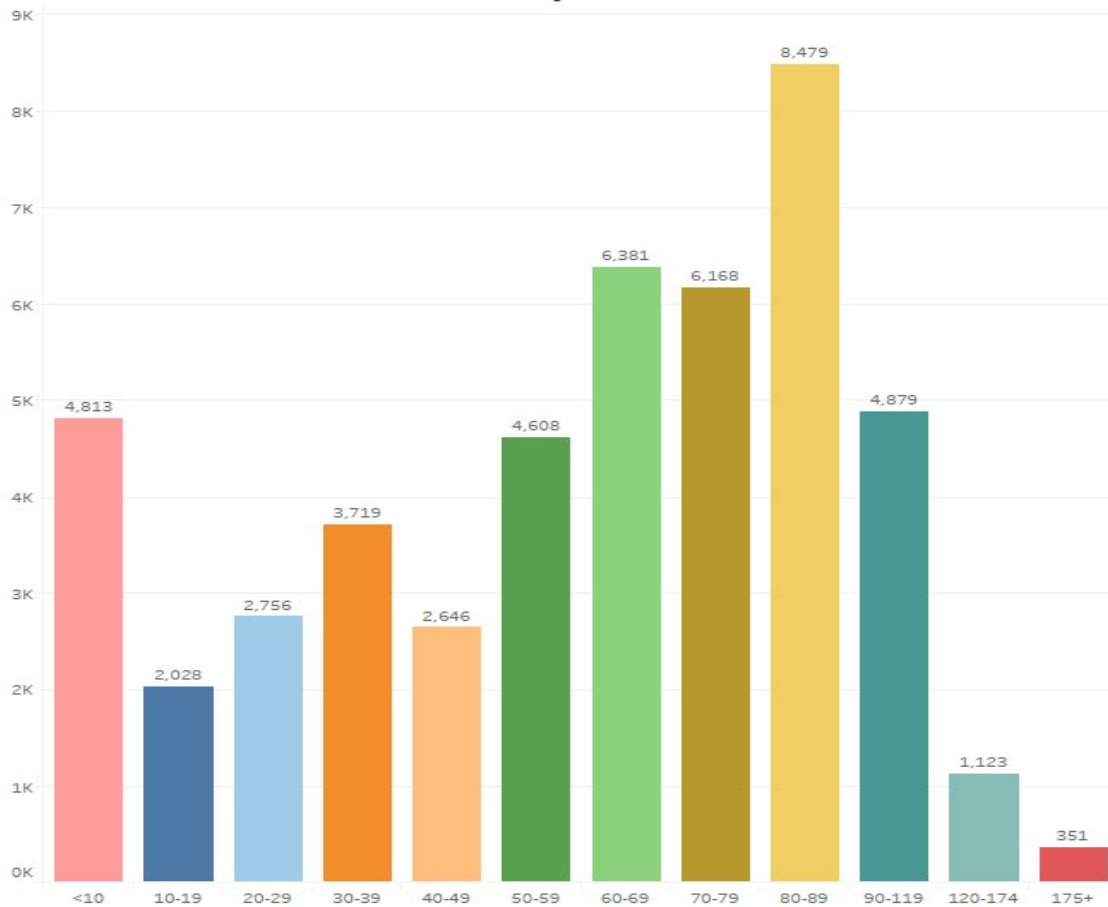
⁵ Forest age data are only available for Board of Forestry Lands and Common School Forest Lands (i.e., the permit area). Data are not available for private or federal land in the plan area.



Source: ODF file information.

Note: Percentages do not total 100% as non-forested vegetation types are not shown.

Figure 2-12. Forest Type in the Permit Area in the West Cascades Ecoregion



Source: ODF file information.

Figure 2-13. Acres of Forest by Age Class in the Permit Area in the West Cascades Ecoregion

Adjacent Ownership

There are approximately 251 miles of adjoining land ownership perimeter in the permit area of the West Cascades ecoregion. The primary adjoining landowner type is private (Table 2-8). A mapbook at the end of this chapter illustrates adjoining land ownership throughout the permit area (Figure 2-28a through Figure 2-28s).

Table 2-8. Adjacent Land Ownership of the Permit Area in the West Cascades Ecoregion

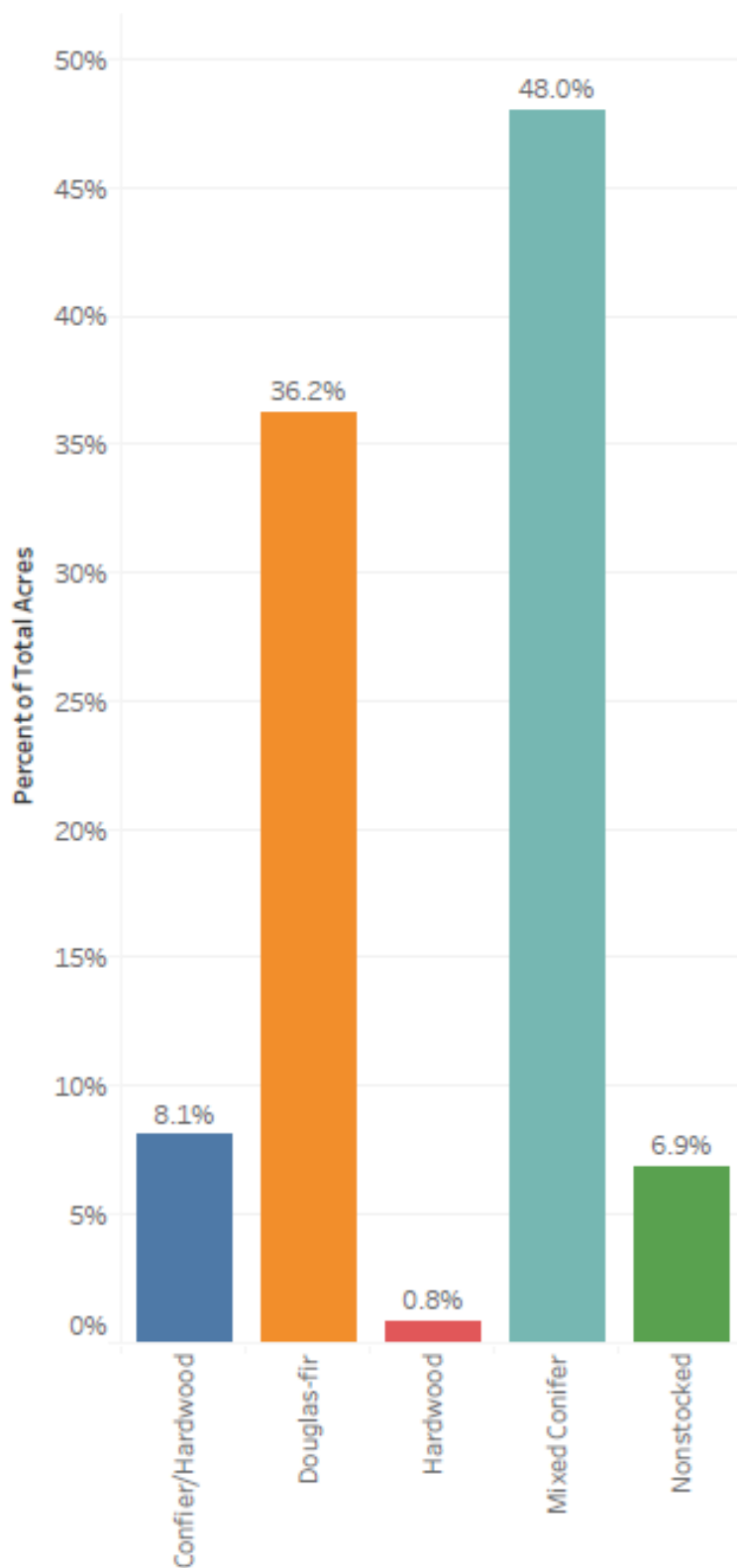
Adjacent Landowner	Perimeter Miles	Proportion (%)
Private	152	61
Bureau of Land Management	63	25
U.S. Forest Service	22	9
State lands	13	5
Other federal agency	1	0
Total	251	100%

2.4.3.3 Klamath Mountains Ecoregion

Forest Age and Structure on State Forest Lands

State forests in the Klamath Mountains ecoregion⁶ are dominated by mixed conifer and Douglas-fir (Figure 2-14). Forest stands generally range between 20- and 119-year-old trees (Figure 2-15). Forest structure is composed primarily of mid-seral stands of closed canopy stand types, with little or no understory development. While these closed canopy stands are the primary stand type on this part of the permit area, overall species diversity is high. Douglas-fir and madrone are usually the dominant tree species, but ponderosa pine, sugar pine, incense cedar, and grand fir are common conifer components. Common hardwood species include canyon live oak (*Quercus chrysolepis*), tanoak (*Notholithocarpus densiflorus*), and chinquapin (*Castanea pumila*) on xeric sites, and red alder, black cottonwood (*Populus trichocarpa*), Oregon ash (*Fraxinus latifolia*), and willow (*Salix*) in mesic areas. Soil types are diverse, including serpentine outcrops that support a distinctive array of trees and plants.

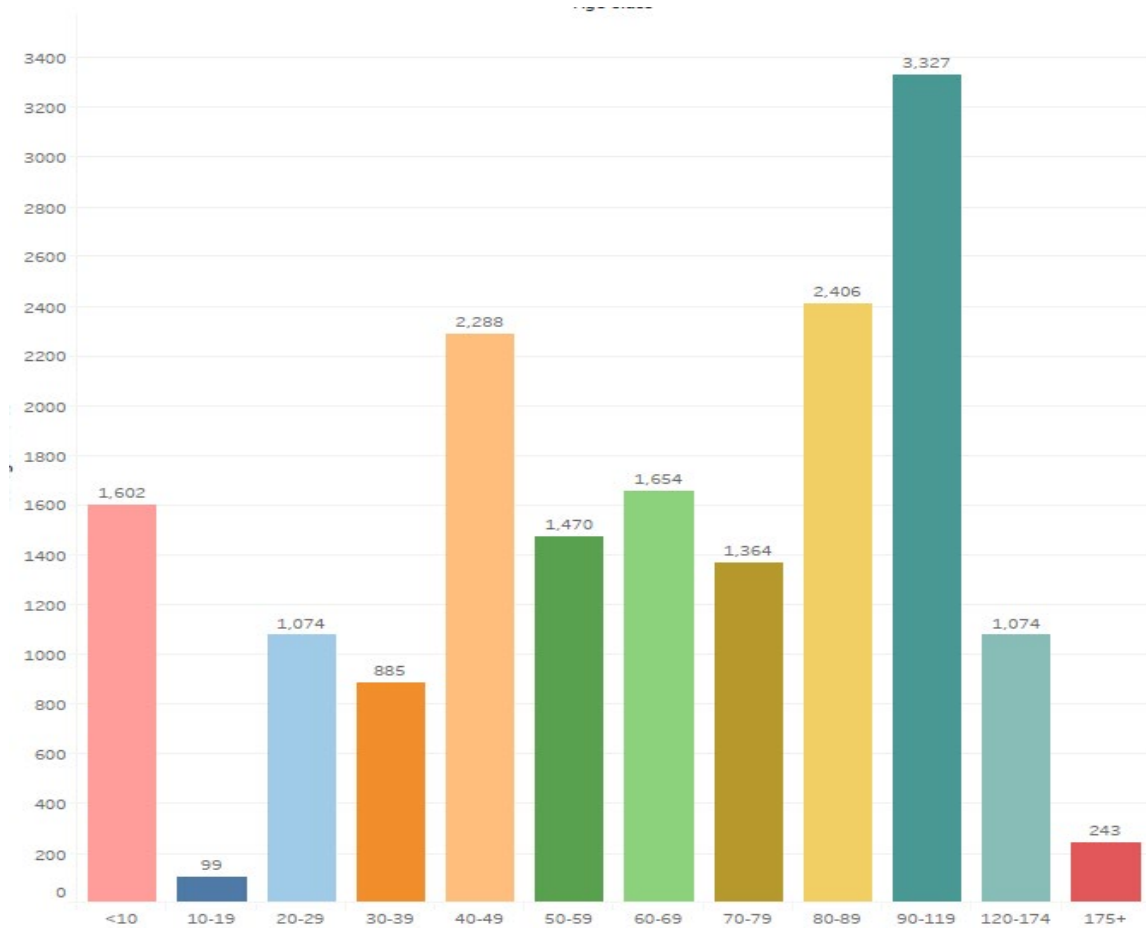
⁶ Forest age data are only available for BOFL and CSFL (i.e., the permit area). Data are not available for private or federal land in the plan area.



Source: ODF file information.

Note: Percentages do not total 100% as non-forested vegetation types are not shown.

Figure 2-14. Forest Type in the Permit Area in the Klamath Mountains Ecoregion



Source: ODF file information.

Figure 2-15. Acres of Forest by Age Class in the Permit Area in the Klamath Mountains Ecoregion

Adjacent Ownership

There are approximately 145 miles of adjoining land ownership perimeter in the permit area of the Klamath Mountains ecoregion. BLM is the primary adjoining landowner (Table 2-9). A mapbook at the end of this chapter illustrates adjoining land ownership throughout the permit area (Figure 2-28a through Figure 2-28s).

Table 2-9. Adjacent Land Ownership of the Permit Area in the Klamath Mountains Ecoregion

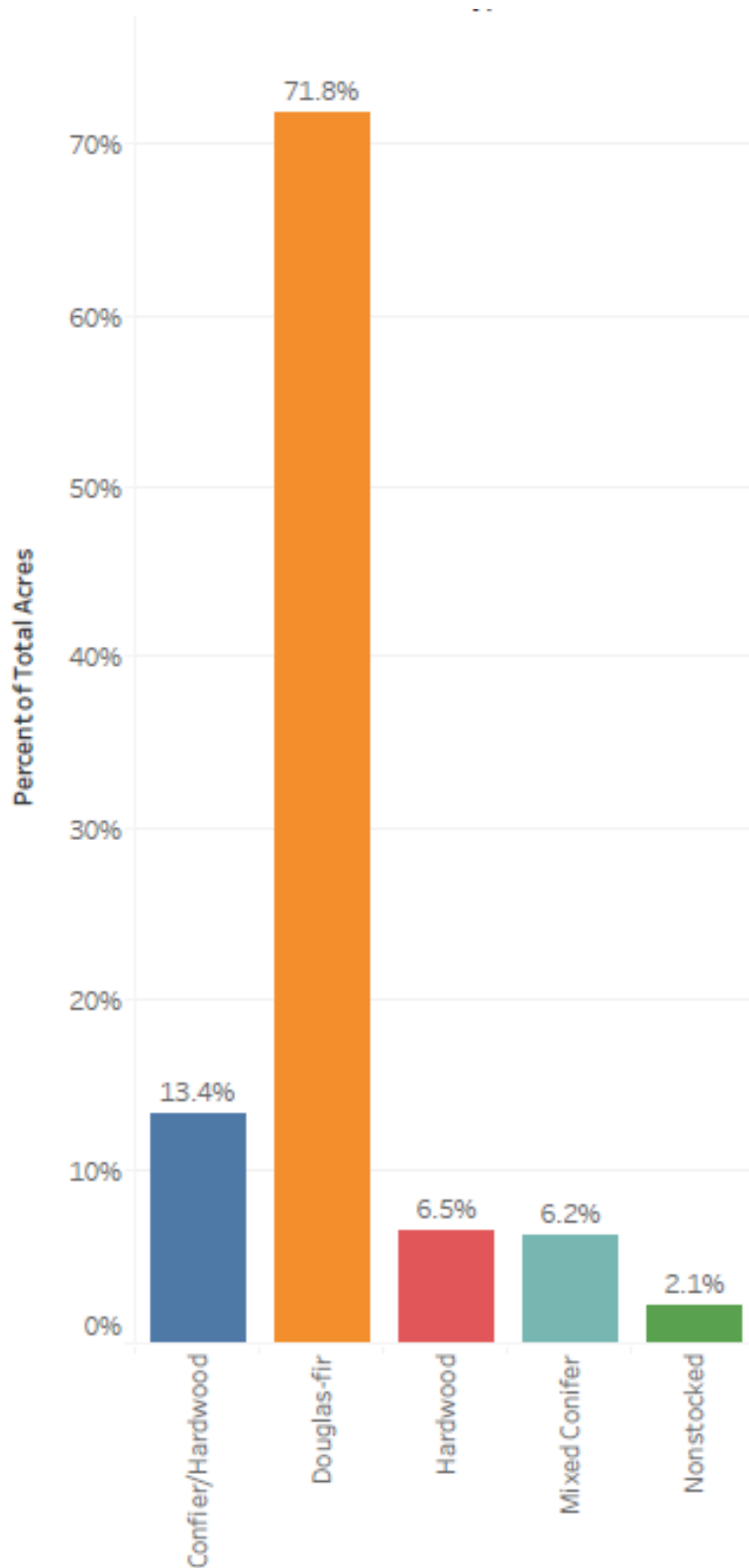
Adjacent Landowner	Miles	Proportion (%)
Bureau of Land Management	69	47
Private	47	32
U.S. Forest Service	26	18
Other state lands	3	2
Total	145	100%

2.4.3.4 Willamette Valley Ecoregion

Forest Type, Age, and Structure on State Forest Lands

State forests in the Willamette Valley ecoregion⁷ are dominated almost exclusively by Douglas-fir (Figure 2-16). Forest stands are dominated 60- to 69-year-old trees (35%) (Figure 2-17). Forest structure is composed of mid-seral stands with a diverse herb or shrub layer and trees larger than sapling size. Tree canopies may range from a single-species, single-layered, main canopy with associated dominant, codominant, and suppressed trees, to multiple species canopies. However, significant layering of tree crowns has not yet developed. The shrub and herb layers are likely to continue to diversify and maintain or improve their vigor. These stands offer good potential for developing into highly diversified vegetative communities.

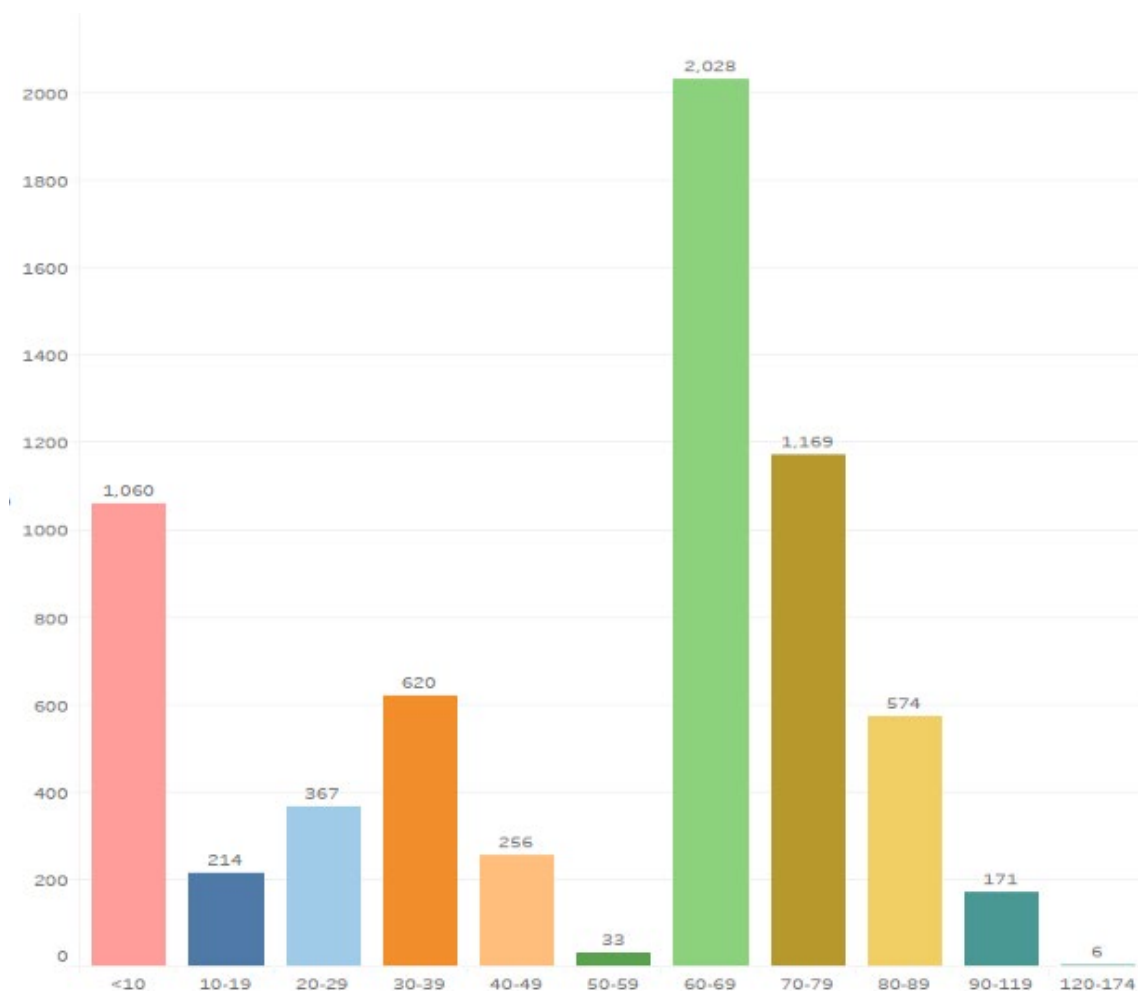
⁷ Forest age and structure data are only available for Board of Forestry Lands and Common School Forest Lands (i.e., the permit area). Data are not available for private or federal land in the plan area.



Source: ODF file information.

Note: Percentages do not total 100% as non-forested vegetations types are not shown.

Figure 2-16. Forest Type in the Permit Area in the Willamette Valley Ecoregion



Source: ODF file information.

Figure 2-17. Acres of Forest by Age Class in the Permit Area in the Willamette Valley Ecoregion

Adjacent Ownership

There are approximately 63 miles of adjoining land ownership perimeter in the permit area of the Willamette Valley ecoregion. The primary adjoining landowner type is private (Table 2-10). A mapbook at the end of this chapter illustrates adjoining land ownership throughout the permit area (Figure 2-28a through Figure 2-28s).

Table 2-10. Adjacent Land Ownership of the Permit Area in the Willamette Valley Ecoregion

Adjacent Landowner	Miles	Proportion of Ecoregion (%)
Private	40	64
Other state lands	17	27
Bureau of Land Management	5	8
Other federal agency	1	1
Total	63	100%

2.5 Covered Species

As described in Chapter 1, *Introduction*, ODF selected the covered species for the HCP based on review of all species of conservation concern known or suspected to occur in the plan area during the permit term. These species were then screened for coverage based on four selection criteria described in Chapter 1, Section 1.2.5.1, *Covered Species Selection Criteria*. A summary of that selection process is described in Appendix D, *Species Considered for Coverage*. Table 2-11 lists covered species and habitat associations.

Detailed species accounts of each of the 15 covered species, and two torrent salamanders, are provided in Appendix C, *Species Accounts*. These accounts summarize ecological information, distribution, status, threats, population trends, and conservation and management activities in the plan area. The accounts represent the best available scientific data for each species on which this HCP is based. The species accounts are not intended to summarize all biological information known about a species. Rather, each account summarizes scientific information that is relevant to the analysis in the HCP. The biological data in these accounts form the basis for the conservation strategy (Chapter 4) and effects analysis (Chapter 6).

Table 2-11. Covered Species and Habitat Associations

Covered Species	Habitat Associations ^a
Fish	
Oregon Coast coho (<i>Oncorhynchus kisutch</i>)	Clean and relatively stable gravel streambeds for spawning and egg incubation, complex channel features, cool stream temperatures during juvenile rearing, access to backwater and off-channel features for winter rearing, access for anadromous migration.
Oregon Coast Chinook (<i>O. tshawytscha</i>)	Clean and relatively stable gravel streambeds for spawning and egg incubation, complex channel features, cool stream temperatures during adult holding and juvenile rearing, access for anadromous migration.
Southern Oregon/Northern California Coastal Chinook (<i>O. tshawytscha</i>)	Clean and relatively stable gravel streambeds for spawning and egg incubation, complex channel features, cool stream temperatures during adult holding and juvenile rearing, access for anadromous migration.
Lower Columbia River coho (<i>O. kisutch</i>)	Clean and relatively stable gravel streambeds for spawning and egg incubation, complex channel features, cool stream temperatures during juvenile rearing, access to backwater and off-channel features for winter rearing, access for anadromous migration.
Upper Willamette River spring-run Chinook (<i>O. tshawytscha</i>)	Clean and relatively stable gravel streambeds for spawning and egg incubation, complex channel features, cool stream temperatures during adult holding and juvenile rearing, access for anadromous migration.
Upper Willamette River winter steelhead (<i>O. mykiss</i>)	Clean and relatively stable gravel streambeds for spawning, egg incubation, and juvenile overwinter, cool stream temperatures during rearing, access for anadromous migration.
Columbia River chum (<i>O. keta</i>)	Clean gravel streambeds in primary and side channels near tidewaters for spawning and egg incubation.
Southern Oregon/Northern California Coast coho (<i>O. kisutch</i>)	Clean gravel streambeds in primary and side channels near tidewaters for spawning and egg incubation. Juvenile overwinter,

Covered Species	Habitat Associations ^a
Lower Columbia River Chinook (<i>O. tshawytscha</i>)	cool stream temperatures during rearing, access for anadromous migration. Clean and relatively stable gravel streambeds for spawning and egg incubation, complex channel features, cool stream temperatures during juvenile rearing, access for anadromous migration.
Eulachon (<i>Thaleichthys pacificus</i>)	Spawn in lower reaches of coastal rivers and Columbia River tributaries. Streamflow and tides carry larva to ocean soon after emergence.
Birds	
Northern spotted owl (<i>Strix occidentalis</i>)	Late-seral forest or younger forest with residual late-seral components, including moderate to high canopy closure, multi-layered, multi-species canopy with large overstory trees, open space among lower branches to allow for flight, large standing and downed trees, and trees with deformities that create structural diversity.
Marbled murrelet (<i>Brachyramphus marmoratus</i>)	Much of their lives spent on the ocean, but nest in late-seral forests close to marine habitat (up to approximately 35 miles in Oregon) characterized by large trees, with large limbs for nesting platforms, multi-layered canopy, and moderate to high canopy closure. Can nest in younger forest with remnant large trees.
Amphibians	
Oregon slender salamander (<i>Batrachoseps wrighti</i>)	Late-seral forest and younger closed canopy forests where there are abundant mid- to advanced-decay Douglas-fir logs and bark debris mounds at base of snags. Talus and lava fields that retain moisture.
Columbia torrent salamander (<i>Rhyacotriton kezeri</i>) ^b	Cold mountain streams, seeps, and springs. Requires loose gravel stream beds with specific geologic characteristics (gradient). Adults can be found in headwater streams and adjacent areas with moist conditions.
Cascade torrent salamander (<i>R. cascadae</i>) ^b	Cold, fast-flowing, clear, permanent headwater streams, seeps and waterfall splash zones in forested areas. Gravel or small cobble substrate with continuous but shallow water flow for larvae and adults foraging and hiding. Continuous access to cold water. Requires moist adjacent forest and microhabitat features, such as basalt rock.
Mammals	
Coastal marten (<i>Martes caurina</i>)	Associated mostly with late-seral, structurally complex mixed conifer forest with multi-layer stands but found in other forests providing there is a high density of snags and logs for denning and foraging, and extensive, robust understory cover.
Red tree vole (North Oregon Coast population) (<i>Arborimus longicaudus</i>)	Late-seral, structurally complex conifer forest, prefers large stand sizes. Also found at lower densities in nearby, younger, closed canopy stands.

^a See species accounts in Appendix C, *Species Accounts*, for the literature sources of habitat associations.

^b Torrent salamanders are no longer included as covered species because they are not federally listed under the ESA and, as such, do not require incidental take authorization under this HCP. However, they remain addressed in the plan because the conservation measures are expected to benefit the species and its habitat, as described in the relevant sections.

2.5.1 Species Occurrence Data

Data on the occurrence of each species in the plan area and permit area are important inputs to the HCP. This HCP incorporates occurrence data through 2020, unless otherwise noted, as summarized in this section. This data cut-off date was established to provide a clear and fixed timeline for the development of the HCP. These data was used for the development of conservation actions (Chapter 4) and for the evaluation of adverse effects (Chapter 6). Survey data by species are also summarized in Table 2-12.

2.5.1.1 Fish Species

Fish occurrences are based on fish distribution data from the StreamNet cooperative information management and data dissemination project (<https://www.streamnet.org/>). This analysis includes all fish distributions for any subbasins (HUC-8) that are at least partially in the plan area. The analysis also considered available information from ODF regarding stream blockages and associated upstream intrinsic potential fish habitat.

Species occurrence by ecoregion is provided in Table 2-12. Maps showing occurrence data in the plan area can be found in each covered species' account (Appendix C, *Species Accounts*). Because surveys for species occurrence have not been completed across the entire plan area, some assumptions were made about where species might occur and the quality of habitat in those locations. To overcome those data limitations on species occurrence, the covered species' accounts include species distribution models to predict species occurrence across the entire plan area. These species distribution models are described in more detail in Section 2.5.2, *Species Habitat Distribution Estimates*.

Species presence is dynamic and always changing, and all potentially suitable habitat has not been recently surveyed for all species, so covered species' occurrences may have changed, and species may be present in habitat that has not yet been surveyed. To address this, this HCP also uses forest and habitat data and species-specific habitat models to estimate the extent of species distribution, and the locations of likely suitable habitat. Based on these surrogate data, the conservation strategy defines the types and magnitude of conservation actions needed to fully offset the impacts of take on the species and ensure their continued presence in the permit area.

Table 2-12. Covered Species' Occurrence by Ecoregion

Covered Species	Ecoregion ^a			
	Coast Range	West Cascades	Klamath Mountains	Willamette Valley
Fish				
Oregon Coast coho (<i>Oncorhynchus kisutch</i>)	✓	✓	✓	
Oregon Coast Chinook (<i>O. tshawytscha</i>)	✓	✓	✓	
Southern Oregon/Northern California Coastal Chinook (<i>O. tshawytscha</i>)	✓		✓	
Lower Columbia River coho (<i>O. kisutch</i>)	✓	✓		✓

Covered Species	Ecoregion ^a			
	Coast Range	West Cascades	Klamath Mountains	Willamette Valley
Upper Willamette River spring-run Chinook (<i>O. tshawytscha</i>)		✓		✓
Upper Willamette River winter steelhead (<i>O. mykiss</i>)		✓		✓
Columbia River chum (<i>O. keta</i>)	✓			
Southern Oregon/Northern California Coast coho (<i>O. kisutch</i>)	✓	✓	✓	
Lower Columbia River Chinook (<i>O. tshawytscha</i>)	✓	✓		✓
Eulachon (<i>Thaleichthys pacificus</i>)	✓			✓
Birds				
Northern spotted owl (<i>Strix occidentalis</i>)	✓	✓	✓	✓
Marbled murrelet (<i>Brachyramphus marmoratus</i>)	✓		✓	✓
Amphibians				
Oregon slender salamander (<i>Batrachoseps wrighti</i>)		✓		✓
Columbia torrent salamander (<i>Rhyacotriton kezeri</i>) ^b	✓			
Cascade torrent salamander (<i>R. cascadae</i>) ^b		✓		✓
Mammals				
Coastal marten (<i>Martes caurina</i>)	✓		✓	
Red tree vole (North Oregon Coast population) (<i>Arborimus longicaudus</i>)	✓			✓

^a See species accounts in Appendix C, *Species Accounts*, for the literature sources range.

^b Torrent salamanders are no longer included as covered species because they are not federally listed under the ESA and, as such, do not require incidental take authorization under this HCP. However, they remain addressed in the HCP because the conservation measures are expected to benefit the species and its habitat, as described in the relevant sections.

2.5.1.2 Oregon Slender Salamander

Survey History in the Permit Area

ODF has not conducted Oregon slender salamander surveys for project planning or monitoring purposes. From 2013 to 2019 and later between 2023 to 2024, Oregon State University led research in the geographic range of the Oregon slender salamander to evaluate species responses to natural and anthropogenic disturbances. Survey sites overlapped the permit area in the West Cascades, in

addition to adjacent private and public lands. This research documented known slender salamander observations using timed, intensive visual searches.

Species Occurrences in the Permit Area

Oregon slender salamander occurs in the West Cascades ecoregion of the plan area in Clackamas, Marion, and Linn Counties. Species occurrences have been documented across private and public lands in this ecoregion, including Santiam State Forest within the permit area (Figure 2-18). Data records for BLM and USFS lands were collected from 1980 to 2016, and represent sightings recorded during project area surveys or paired sites for research purposes. From 2013 to 2019, Garcia et al. (2020) conducted a 7-year Before-After Control-Impact cooperative study between Oregon State University, ODF, BLM, and private landowners. This study quantified Oregon slender salamander pre- and post-harvest occupancy and abundance in randomly selected harvest units in the West Cascades, including areas in the Santiam State Forest. All survey plots had positive detections for Oregon slender salamander over the course of this research effort, and there was no statistical evidence of harvest effects on the abundance of Oregon slender salamanders (Garcia et al. 2020). This work was extended to include a post-wildfire resurvey at the original study sites that overlapped the 2020 Beachie Creek Fire perimeter to compare pre and post-fire changes in salamander occupancy and abundance. The baseline species summary for Oregon slender salamander is found in Section 2.5.3.2, *Oregon Slender Salamander*.

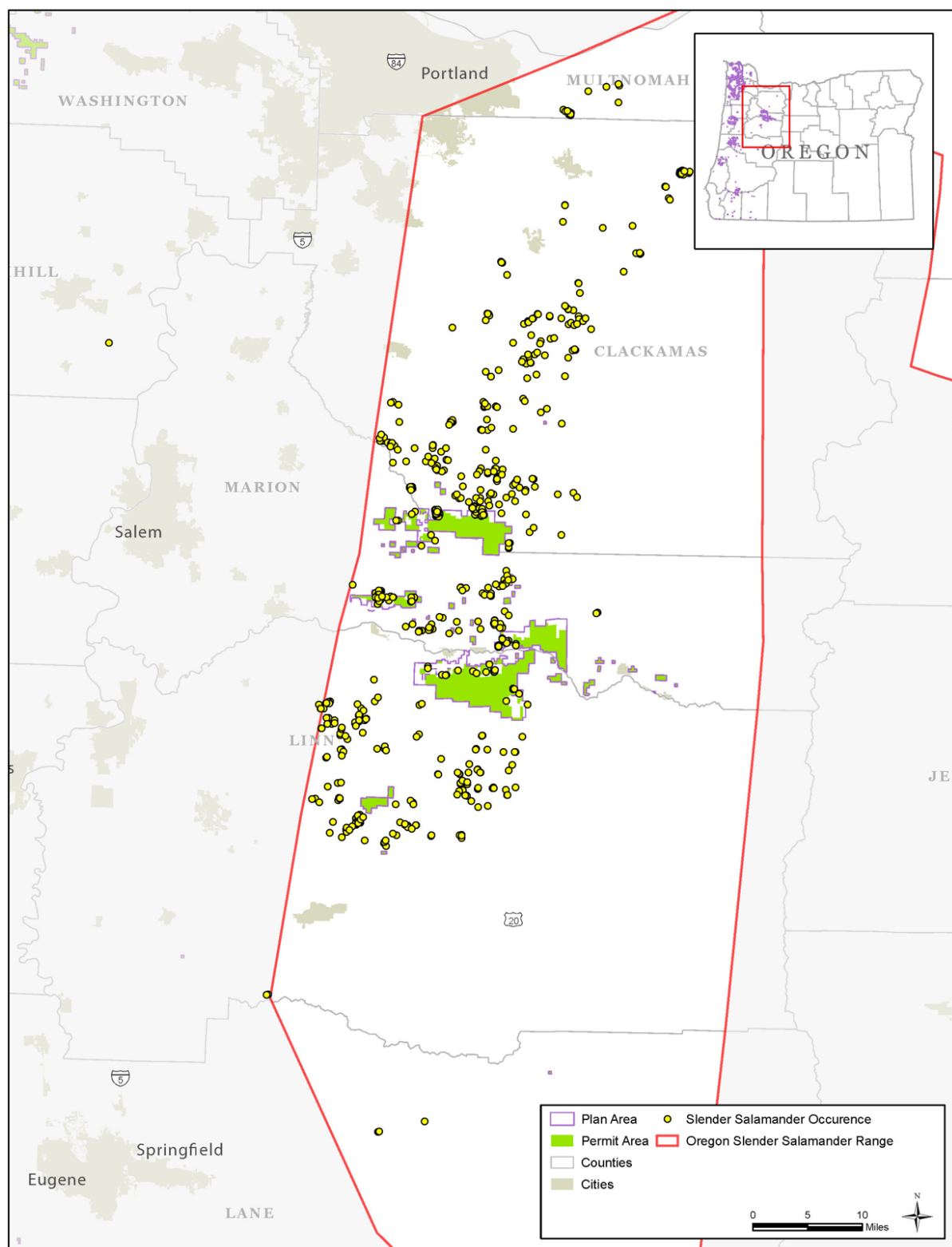


Figure 2-18. Range of Oregon Slender Salamander and Known Occurrences

2.5.1.3 Northern Spotted Owl

Survey History in the Permit Area

ODF has surveyed suitable habitat for northern spotted owls in state forests since 1992. Prior to 2016, the northern spotted owl survey program implemented operational surveys in response to planned forest-management activities throughout the permit area. After this time, ODF initiated a modified density survey approach (Forsman 1995) to provide increased flexibility for sale planning by dividing large tracts of ODF-managed lands into static survey units that are surveyed on an annual basis. Density surveys are conducted in the north and central Coast Range, and the West Cascades within the permit area. Operational surveys remain the primary northern spotted owl activity survey method for the smaller, more isolated ODF-managed lands distributed throughout the southern Coast Range and southwestern Oregon. These surveys are conducted in close collaboration with neighboring landowners and managers due to the high proportion of adjacent northern spotted owl sites.

More recently, ODF has increased the use of operational surveys to inform timber harvest planning in areas where density surveys are not warranted. Survey data result in the designation of activity centers, following the ODF Northern Spotted Owl Guidance document (Oregon Department of Forestry 2017a). Activity centers are based on the most biologically significant observation data collected during the nesting season (March through August) through implementation of the 2012 call-back survey protocol (U.S. Fish and Wildlife Service 2012c) and are centered on daytime locations of individuals or pairs and, optimally, the nest tree, if found (Sovern et al. 2019).

Species Occurrences in the Permit Area

Northern spotted owls occur in the plan area in the Coast Range ecoregion counties of Clatsop, Tillamook, Washington, Yamhill, Polk Lincoln, Benton, Lane, Douglas, Coos, Curry, Josephine, and Jackson and the Western Cascade ecoregion counties of Clackamas, Marion, and Linn.

Historically occupied areas include 60 northern spotted owl sites with activity centers in the permit area. These areas represent sites where spotted owl activity was documented within the past 30 years, but the status is currently unoccupied (i.e., inactive). Despite their inactive status, historically occupied areas where habitat remains were identified as a priority for conservation. There are 31 known active sites with activity centers centered in the permit area that include 20 sites occupied by pairs, 4 sites with pair status unknown, and 7 sites with resident single owls (Table 2-13). For this HCP, active activity centers are defined as those activity centers that have been confirmed at one point and have had less than 6 consecutive years of surveys with no observations. Activity centers that have not been surveyed consistently were assumed to have their same status as of their most recent survey history.

There are 142 northern spotted owl sites with activity centers outside of the permit area but within the provincial radius of permit area lands. Using the provincial radius, “owl circles” that overlap the permit area include 119 sites with confirmed pairs, 5 sites with unconfirmed pairs, and 18 sites with resident single owls. Because northern spotted owl numbers continue to decline throughout the species’ range, not all of these sites are believed to currently support owls. However, for this HCP, sites with confirmed pair status but no confirmed absence (i.e., 6 consecutive years with no observations) were assumed to be occupied to minimize the potential for take. The baseline species summary for northern spotted owl is found in Section 2.5.3.3, *Northern Spotted Owl*.

Table 2-13. Northern Spotted Owl Active Sites in the Permit Area, by ODF District

District	Location	Pair	Unconfirmed Pair	Resident Single	Total
Astoria	Permit area	2	--	--	2
	Adjacent	--	--	--	--
Coos ^a	Permit area	3	--	--	3
	Adjacent	24	--	3	27
Forest Grove	Permit area	2	--	--	2
	Adjacent	1	--	--	1
North Cascade	Permit area	3	2	--	5
	Adjacent	9	1	2	12
Southwest ^a	Permit area	3	--	2	5
	Adjacent	47	2	3	52
Tillamook	Permit area	3	2	3	8
	Adjacent	4	1	--	5
West Oregon	Permit area	2	--	2	4
	Adjacent	2	--	2	4
Western Lane	Permit area	2	--	--	2
	Adjacent	32	1	8	41
Total		139	9	25	173
Total Permit Area		20	4	7	31
Total Adjacent		119	5	18	142

^a Coos and Southwest references represent distinct administrative units in the Western Lane District that covers a large expanse of southern Oregon.

2.5.1.4 Marbled Murrelet

Survey History in the Permit Area

ODF has conducted over 32,000 individual surveys at more than 1,300 unique sites since 1992. This represents the largest survey effort for marbled murrelets by any land manager in Oregon, Washington, or California. Marbled murrelet nest sites are extremely difficult to locate, so this HCP uses “occupied behavior” observations made during protocol surveys (Evans Mack et al. 2003) as a surrogate for nest sites as the best available science (Oregon Department of Forestry 2019). Occupied habitat designations for known occupied sites since 2013 reflect guidance provided by Mack et al. (2003) along with consultation from USFWS, in some cases. Prior to 2013, occupied habitat designations did not incorporate the Mack et al. (2003) design guidance, but have been evaluated and updated over time when in the vicinity of a planned forest-management activity. A limited number of these unrevised occupied habitat designations still exist in the permit area and are included in the delineation of habitat conservation areas (Chapter 4, Section 4.6.7.1, *Objective 6.1: Conserve, Maintain, and Enhance Existing Marbled Murrelet Nesting Habitat*) and will be further incorporated based on occupied and highly suitable habitat (Chapter 4, Table 4-11).

Species Occurrences in the Permit Area

Known marbled murrelet nesting is concentrated in the northwest portion of the permit area (i.e., the Tillamook and Astoria Districts) and in the central Oregon Coast area (West Oregon District)

near the Elliott State Forest and Siuslaw National Forest (Figure 2-19 and Figure 2-20). The baseline species summary for marbled murrelet is found in Section 2.5.3.4, *Marbled Murrelet*.

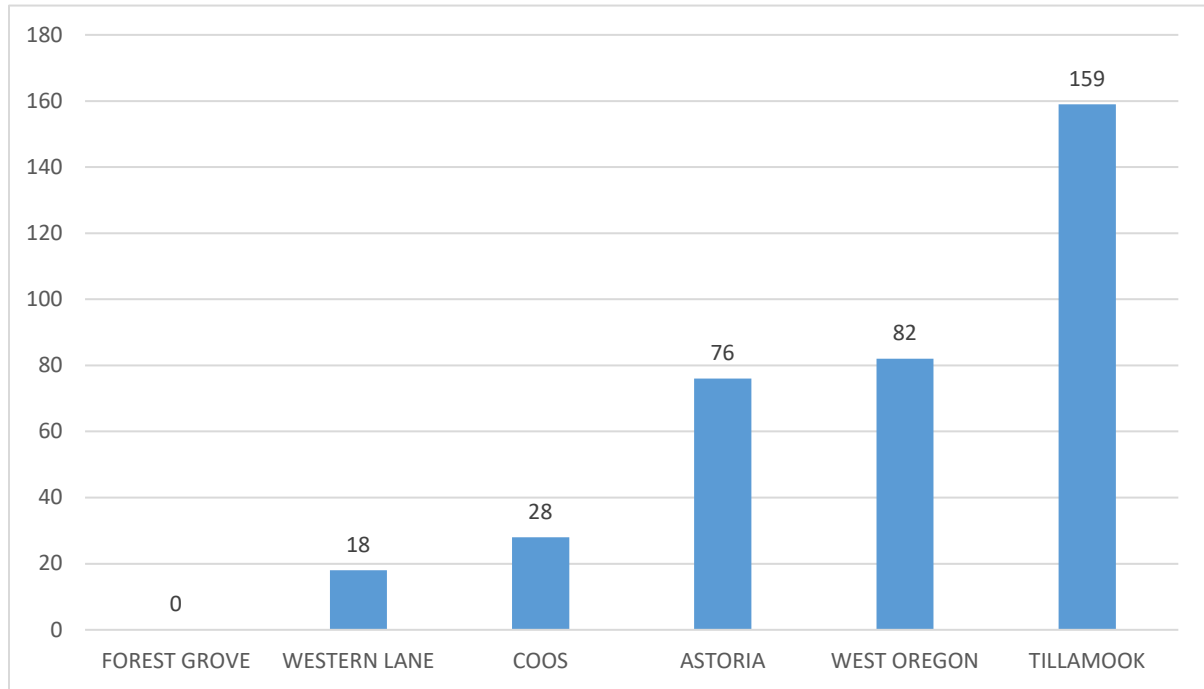


Figure 2-19. Number of Unique Areas with "Significant Observations" of Marbled Murrelets, by ODF District

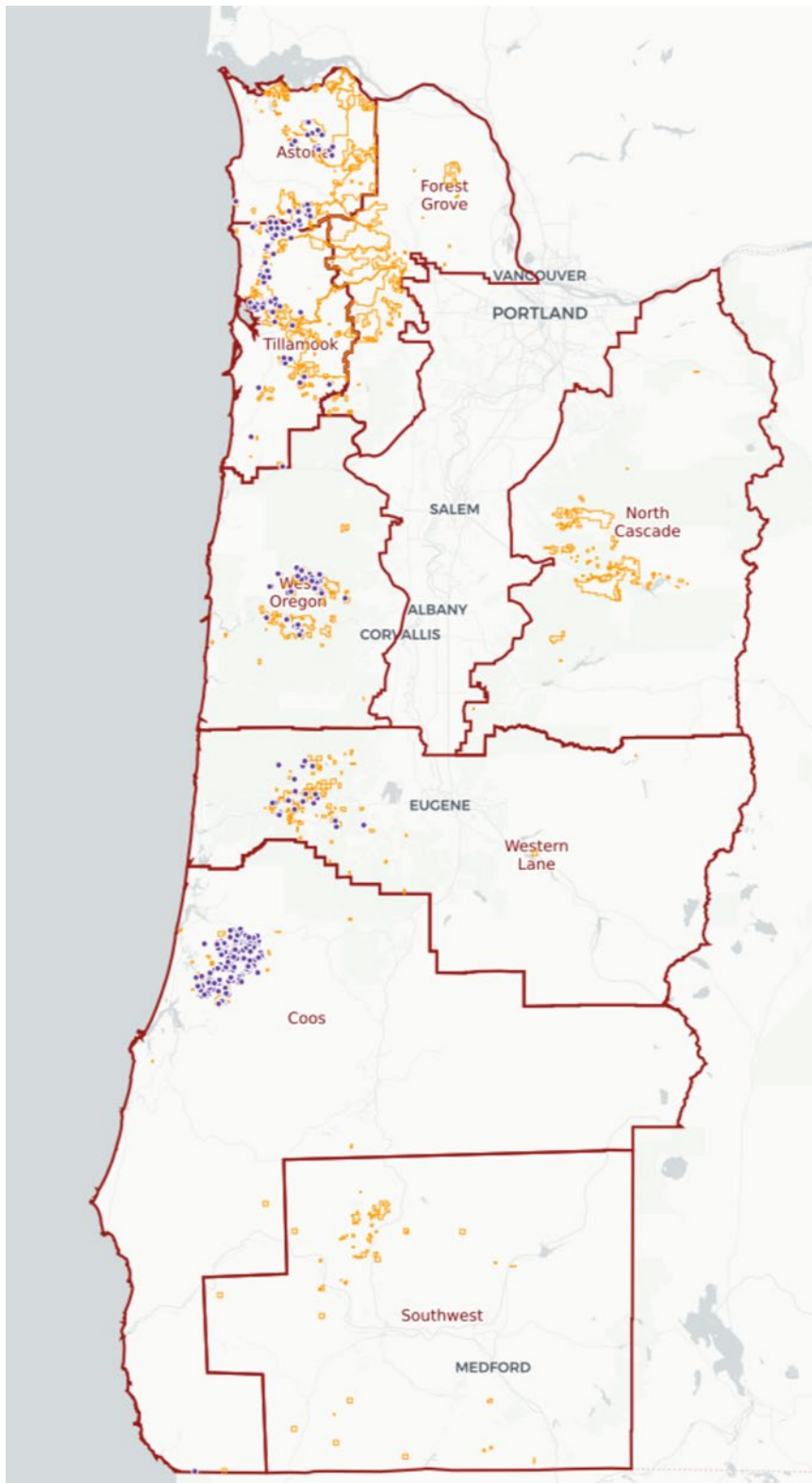


Figure 2-20. Location of Unique Areas with "Significant Observations" of Marbled Murrelets, by ODF District

2.5.1.5 Red Tree Vole

Survey History in the Permit Area

ODF has not conducted red tree vole surveys for project planning or monitoring purposes. Red tree vole occurrences described in the next section have been compiled from a combination of tree climbing and ground surveys conducted by USFS (Forsman et al. 2016) and Oregon State University (Price et al. 2015; Piasecki 2023).

Species Occurrences in the Permit Area

Within the DPS, the red tree vole is mostly restricted to isolated populations in old forest stands in the northern half of the DPS and larger blocks of federal land in the southern half of the DPS, with smaller numbers occurring in younger stands (Forsman et al. 2016; Price et al. 2015). The species is uncommon in the northern third of the DPS, including the Clatsop State Forest and most of the Tillamook State Forest (Figure 2-21). Price et al. (2015) surveyed 86 randomly selected plots in Tillamook and Clatsop State Forests from 2011 to 2013. Thirty-three red tree vole nests were found in four plots. Of these, 20 (61%) nests were found in stands 90 to 125 years old, and 13 (39%) were found in one plot in a 65-year-old stand (located approximately 150 meters from a 140-year-old stand). Of the 33 nests, 6 (18%) were occupied or likely occupied. The four occupied plots were on the western edge of the Tillamook State Forest in stands that did not burn during the 1933 to 1951 Tillamook Burn. Red tree voles also occur along the southern edge of the Tillamook State Forest in Tillamook and Yamhill Counties.

From 2019 to 2022, Oregon State University and the National Council for Air and Stream Improvement conducted a red tree vole study to assess occurrence across stand ages and distances from old forest on private industrial and public lands in the central Oregon Coast Range (Piasecki 2023). In the permit area, researchers located active red tree vole nests in 15 of 69 (22%) trees surveyed on the West Oregon District (Piasecki 2023). All identified nests were distributed across multiple stands that primarily ranged from 23 to 56 years in age, with 11 (16%) of nests documented in a 97-year-old stand. The baseline species summary for red tree vole is found in Section 2.5.3.5, *Red Tree Vole*.

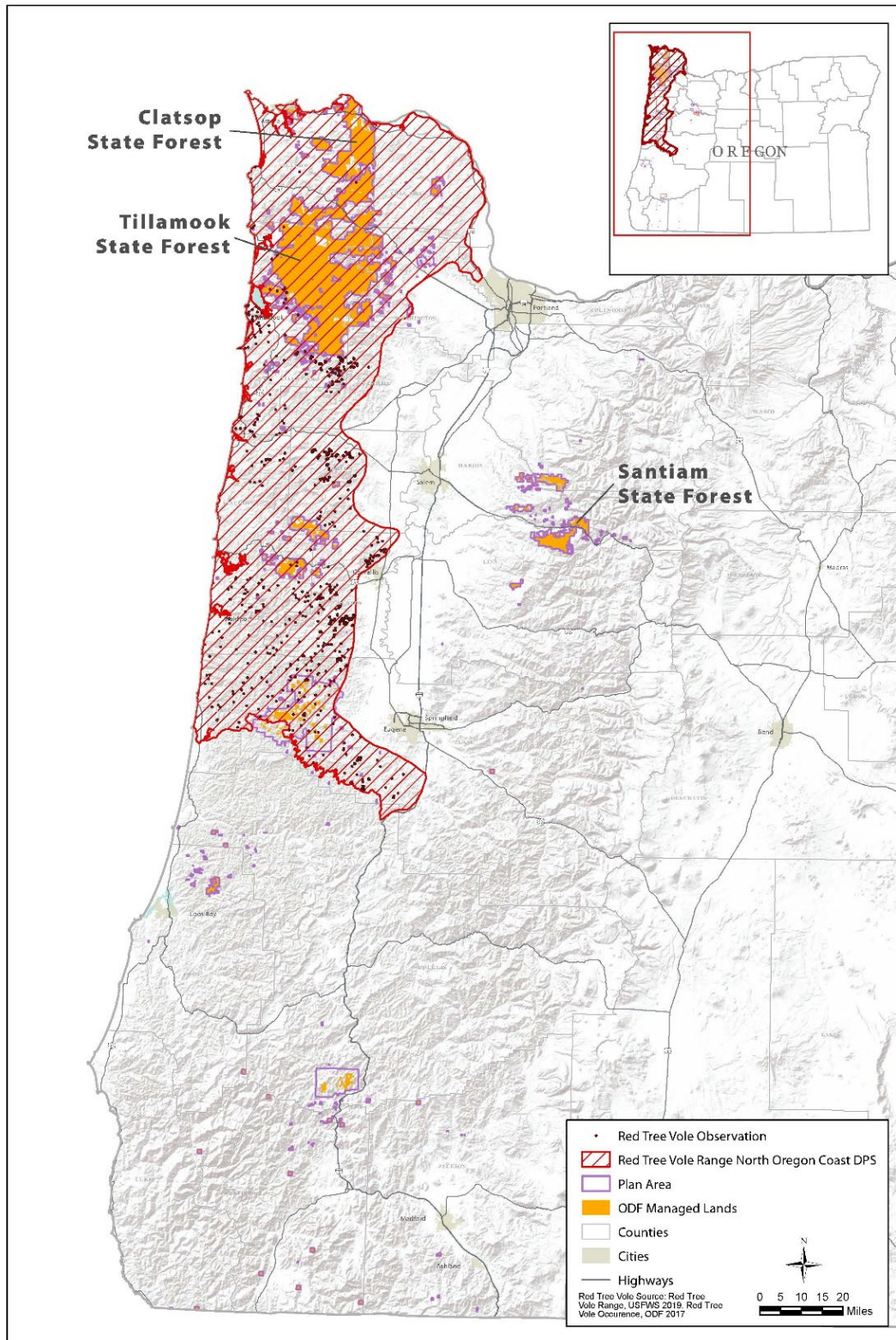


Figure 2-21. Range of Red Tree Vole (North Oregon Coast DPS) and Known Occurrences

2.5.1.6 Coastal Marten

Survey History in the Permit Area

In 2023, ODF conducted a limited number of trail camera surveys targeting mustelid species (coastal marten and Pacific fisher) near the Oregon coastline at two separate survey areas on ODF-managed lands via the Oregon State University 10(a)(1)(A) Recovery Permit # PER0046327.

Species Occurrences in the Permit Area

The coastal marten extant population areas depicted in Figure 2-22 are based on the USFWS Species Status Assessment (2026) and include species occurrences (up to 2023) inside and outside of the permit area. ODF detected this species on multiple trail cameras deployed at two survey sites within one survey area on ODF-managed lands south of Winchester Bay in the Central Coastal Oregon Extant Population Area (Douglas County). ODF trail cameras did not detect this species at the other survey area located in the permit area in the Upper West Fork Cow Creek Basin (Coos County; outside of the Southern Coastal Extant Population Area). Beyond surveys, a roadkill marten was located adjacent to ODF-managed lands near Highway 101 in 2015. The roadkill location is within 500 meters of the 2023 trail camera locations that detected marten presence. The baseline species summary for coastal marten is found in Section 2.5.3.6, *Coastal Marten*.

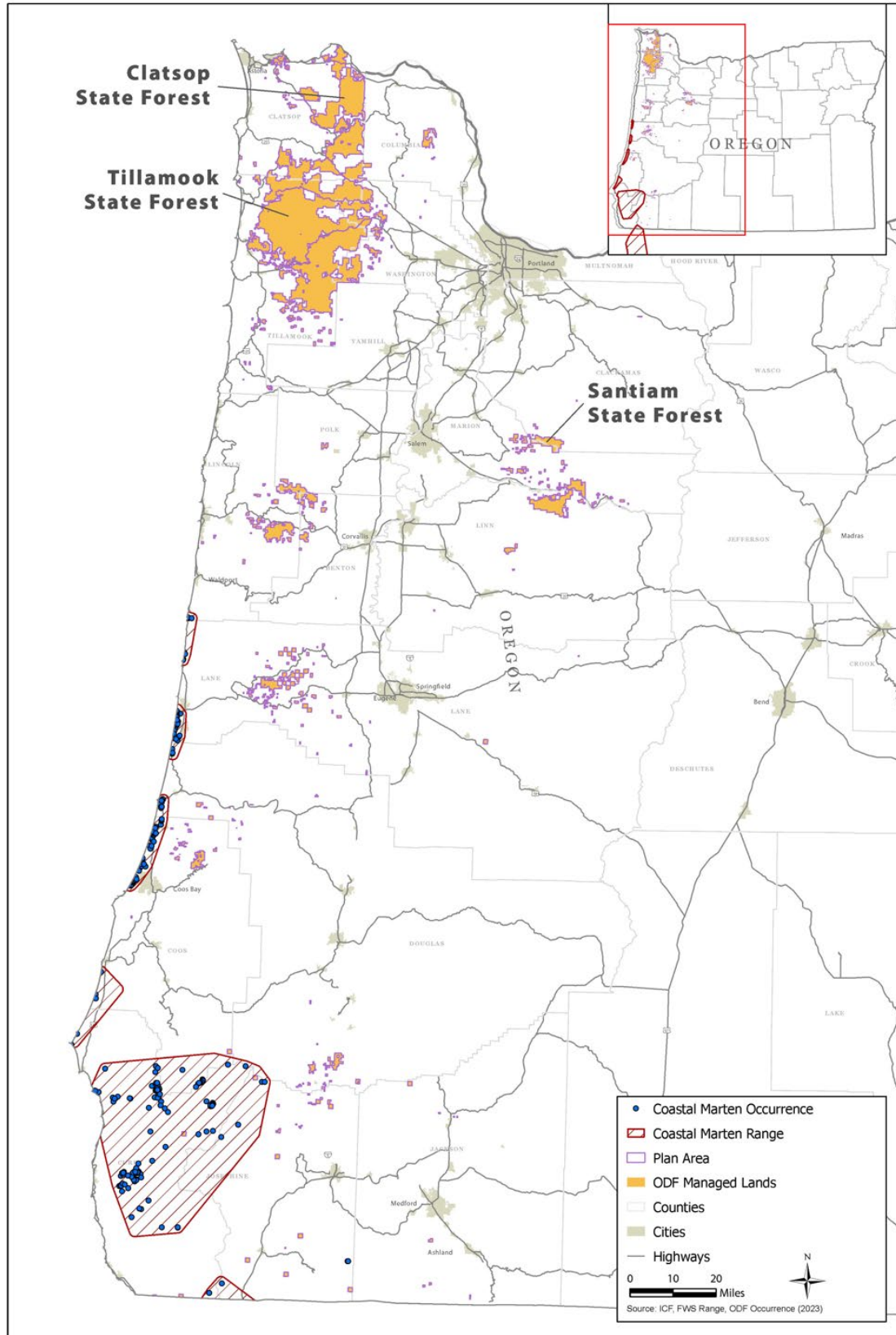


Figure 2-22. Range of Coastal Marten and Known Occurrences

2.5.2 Species Habitat Distribution Estimates

Because of the permit area's large size and the lack of consistent species surveys across this landscape, the HCP must also rely on predictions of species presence based on predictive models of habitat distribution and habitat suitability. Such models are commonly used in large-scale habitat conservation planning (ICF International 2012; ICF 2018). ODF has developed species accounts and habitat models for three of the species to be covered under the HCP: northern spotted owl, marbled murrelet, and red tree vole. For aquatic species, modeling was conducted to estimate the general benefit of conservation actions on the aquatic and riparian habitat, rather than for individual species. Discrete models were developed for four of the terrestrial species. Appendix C, *Species Accounts*, summarizes habitat model parameters developed for the species and the modeled habitat distribution in the permit area. The species accounts also document key information regarding each covered species, including taxonomy, distribution, habitat requirements, population status, and threats. Covered species' habitat distributions are generalized below but are described in greater detail in Chapter 6, *Analysis of Effects and Actions that May Result in Take*, within the various *Adverse Effects* sections.

2.5.2.1 Covered Fish Distribution

For the covered fish species, a NetMap watershed analysis was prepared by TerrainWorks (2020) for the permit area. This analysis includes any subbasin (HUC-8) that is at least partially in the permit area. NetMap provided a consistent synthetic stream layer that covers the permit area and allowed for the classification of stream reaches by vulnerability to increased stream temperatures and estimates of large wood recruitment.

2.5.2.2 Oregon Slender Salamander Distribution

Habitat Modeling Approach

A habitat model using the method described for northern spotted owl, marbled murrelet, and red tree vole was developed for Oregon slender salamander. However, due to limitations with how ODF's SLI data track downed woody debris, one of the primary indicators of Oregon slender salamander habitat, the model ultimately proved ineffective at differentiating between habitat types and quality. Oregon slender salamander are thought to be widespread and ubiquitous in the permit area. This HCP assumes that all of the permit area in and around the Santiam State Forest that is within the range of Oregon slender salamander could provide suitable habitat due to the distribution of detections documented on adjacent private and public lands.

Suitable Habitat

Characteristics

This HCP assumes all of the permit area in and around the Santiam State Forest that is within the range of Oregon slender salamander is suitable habitat. This species primarily occurs in old forests (generally older than 76 years) of Douglas-fir, bigleaf maple, western hemlock, and western redcedar (Blaustein et al. 1995; Bury and Corn 1988; Gilbert and Allwine 1991; Vesely et al. 1999; Center for Biological Diversity 2012; Garcia et al. 2020).

Oregon slender salamanders are associated with decayed large logs. In the western Cascades, Oregon slender salamander density is positively correlated with large-diameter (50- to 75-centimeter) logs and snags in forests with closed canopies, and negatively correlated with small-diameter (10- to 25-centimeter) logs and logs in intermediate levels of decay.

Vesely et al. (1999) found this species to be more abundant in old growth than second growth stands; they did not find Oregon slender salamander in clear-cuts, possibly due to canopy removal and low abundance of woody material. Canopy closure (median of 93% in old-growth stands and 92% in second growth stands) and west- and east-facing slopes were the best predictors of relative density of salamanders. Oregon slender salamanders may occur in younger stands, however, particularly if legacy downed wood has been retained (Clayton and Olson 2009; Garcia et al. 2020).

Amount and Distribution

An estimated 47,500 acres of existing suitable habitat (7% of permit area) occur on Santiam State Forest that overlaps the species' range.

2.5.2.3 Coastal Marten Distribution

Habitat Modeling Approach

A habitat model was not developed for coastal marten. A universally accepted description of habitat does not exist (U.S. Fish and Wildlife Service 2026), and not enough information is known about current coastal marten habitat relationships and distribution in the types of forests that occur in the permit area. Most information on coastal marten habitat relationships is from studies in the Central Coastal Oregon Dunes, Southern Coastal Oregon, and Northern Coastal California Extant Population Areas (U.S. Fish and Wildlife Service 2015). Multiple entities (e.g., USFWS, United States Department of Agriculture Forest Service Pacific Northwest Research Station and Pacific Southwest Research Station, the National Council for Air and Stream Improvement, Oregon State University, and California State Polytechnic University, Humboldt) have been working to refine and improve existing habitat models to better inform conservation planning (Moriarty et al. 2021; Gamblin et al. 2024). All of the areas for which models are available have habitat characteristics different enough from the forests in the permit area to make extrapolating habitat relationships from extant population areas to the permit area unreliable. This HCP assumes that all of the permit area from the northern boundary of Lane County south to the California border and west of Interstate 5 (I-5) could provide suitable habitat for coastal marten.

Suitable Habitat

Characteristics

Pacific and American martens have been shown to select habitat at four spatial scales (U.S. Fish and Wildlife Service 2018). USFWS characterizes habitat for coastal martens at these primary spatial scales, including microhabitat, stand, home range, and landscape scales. At the microhabitat scale, martens select habitat with suitable resting and denning structures. Structures used by coastal martens for resting include large-diameter trees with large horizontal limbs, cavities in snags, and downed hollow logs. At the stand scale, martens select forest stands that provide structural features adequate to support one or more life-history requirements, such as enough food, large logs to run along when foraging for prey, and cavities. At the home-range-scale, martens select enough habitat to meet their year-round life-history needs, such as home ranges with enough sources of seasonally

available food to ensure food is available year-round, den sites, and access to mates while not overlapping with same-sex individuals (Katnik et al. 1994; Powell 1994). Types of structures needed for resting, denning, and foraging can vary within season, so a diversity of resting structures in a home range is important.

Amount and Distribution

The defined coastal marten covered area overlaps the historic range of the species and includes the Central Coastal Oregon and Southern Coastal Oregon Extant Population Areas. All ODF-managed lands within the coastal marten covered area are considered suitable habitat, encompassing approximately 50,000 existing acres or 8% of the permit area (Appendix C, *Species Accounts*).

2.5.2.4 Northern Spotted Owl, Marbled Murrelet, and Red Tree Vole Habitat Distribution

Habitat Modeling Approach

Habitat distribution and suitability models were developed for northern spotted owl, marbled murrelet, and red tree vole to predict where they could occur based on habitat requirements known from field studies and as identified in published habitat suitability models. The models were used to assist in quantifying impacts of covered activities on covered species and to assist in developing the conservation strategy. Details of how the habitat distribution and suitability models (also called habitat models) were developed, including model parameters and data sources, are summarized and described in more detail in Appendix E, *Effects Analysis*.

The habitat models described in the species accounts were designed to estimate the extent and suitability of habitat in the permit area. The models use the best scientifically available information on the relationship between covered species' habitats and forest inventory metrics to assign a habitat suitability score to individual forest stands. These models are intended to be repeatable and scientifically defensible, while remaining as simple as possible, and relatable to ODF's forest inventory data.

SLI data on forest tree species composition and forest structure were used to characterize key habitat relationships for the terrestrial covered species. SLI data include attributes such as number of large trees per acre, density of trees, number of snags, and amount of downed wood, among other attributes, within a stand. The SLI data allow ODF to model covered species' habitat suitability using the same data that ODF uses to characterize its landscape for forest management and timber harvest. This approach will facilitate HCP implementation by integrating species habitat models with forest-management planning, growth and yield estimates, and forest activity models. The three species for which habitat is modeled are strongly associated with late-seral conifer forests. As such, the models include parameters that characterize attributes of late-seral forests, particularly those that provide key habitat features, such as large, old trees used by marbled murrelet for nest platforms.

Suitable Habitat

Northern Spotted Owl

Habitat characteristics associated with northern spotted owls are described in greater detail in Appendix E, *Effects Analysis*. In general, this species occupies late-seral forest but may also use

younger forests for foraging, movement, and dispersal (U.S. Fish and Wildlife Service 2012). Northern spotted owl habitat requirements are commonly ascribed to the specific essential behaviors of nesting, foraging and dispersal. Habitat estimates for each of these essential behaviors are provided below. Table 2-14 shows the estimated amount and distribution of northern spotted owl habitat in the permit area.

Table 2-14. Total Existing Northern Spotted Owl Habitat Estimates (acres) in the Permit Area

Habitat Type	Baseline Acres
Non-habitat ^a	186,524
Dispersal	232,766
Foraging	177,002
Nesting-roosting	42,378
Total	638,670

^a Non-habitat represents unsuitable habitat as defined in Appendix E, *Effects Analysis*.

Marbled Murrelet

Habitat characteristics associated with marbled murrelets are described in greater detail in Appendix E, *Effects Analysis*. Unlike other alcids, which nest in dense colonies on the ground, in burrows, on rocky cliffs, and on sea stacks at the marine-terrestrial interface, marbled murrelets nest in trees in dispersed locations up to 55 miles inland (Spies et al. 2018). Throughout the forested portion of the species' range, marbled murrelets typically nest in large conifers in late-successional forests (Spies et al. 2018). Table 2-15 shows the estimated amount and distribution of marbled murrelet habitat in the permit area.

Table 2-15. Total Existing Marbled Murrelet Habitat Estimates in the Permit Area

Habitat Suitability	Acres
Non-habitat	440,848
Suitable	130,658
Highly suitable	2,393
Total	573,899

Red Tree Vole

Habitat characteristics associated with red tree voles are described in greater detail in Appendix E, *Effects Analysis*. Red tree voles occur primarily in structurally complex late-seral conifer or mixed conifer-hardwood forests (Dunk and Hawley 2009; U.S. Fish and Wildlife Service 2011; Forsman et al. 2016; Rosenberg et al. 2016; Linnell et al. 2017; Johnston and Moskal 2017). Attributes of late-successional forest positively correlated with habitat suitability include large-diameter trees (Dunk and Hawley 2009; Rosenberg et al. 2016; Johnston and Moskal 2017); density of large conifers; percent of conifer cover; percent of food-source trees such as Douglas-fir, Sitka spruce, and western hemlock (Forsman et al. 2016); and extent of old forest cover (Linnell et al. 2017). Red tree voles have also been found in young forests (<80 years old) near complex late-seral conifer forests (Price et al. 2015; Linnell et al. 2017; Piasecki et al. 2026). The role of young forests in supporting viable red tree vole populations remains unclear; however, they may provide connectivity to older forests where more stable vole populations exist (Linnell et al. 2017; Piasecki et al. 2026). Nevertheless, red tree voles are sensitive to habitat fragmentation when stands are harvested or commercially

thinned (Martin and McComb 2002; Forsman et al. 2016; Linnell et al. 2017; Rosenberg 2019). Table 2-16 shows the estimated amount and distribution of red tree vole habitat in the permit area. Non-habitat includes habitats not defined as suitable or highly suitable in Appendix E or young forests defined in Table 2-16.

Table 2-16. Total Existing Red Tree Vole Habitat Estimates in the Permit Area

Habitat Suitability	Acres
Non-habitat	426,730
Young forests ^a	13,178
Suitable	107,248
Highly suitable	12,090
Total	559,246

^a Defined as stands between 20 to 39 years old that are within 1.4 kilometers of any stand greater than 80 years old and are 49 acres or larger in size (includes federal lands immediately adjacent to permit area boundaries).

2.5.3 Baseline Species Summary

The section provides baseline species summaries for each covered species in the permit area, integrating field data and habitat modeling to provide an overview of the status, distribution, and habitat associations of each covered species within the HCP permit area (Sections 2.5.1, *Species Occurrence Data*, and 2.5.2, *Species Habitat Distribution Estimates*, Appendix C, *Species Accounts*, and Appendix E, *Effects Analysis Approach*). These summaries identify the forest types, structures, and stream conditions most important for each species, while illustrating the connections between management history, disturbances, and habitat suitability. This context supports a robust evaluation of how proposed activities might affect each species and guides the development of effective conservation actions under the HCP.

2.5.3.1 Fish

Multiple salmonid evolutionary significant units (ESUs)/DPSs (Oregon Coast coho, Lower Columbia River coho, Upper Willamette River Chinook, Upper Willamette River steelhead, Columbia River chum, Southern Oregon/Northern California Coast coho, Lower Columbia River Chinook, Oregon Coast Chinook, Southern Oregon/Northern California Chinook) and eulachon are present in the permit area (Section 2.5.1.1, *Fish Species*, and Appendix C, *Species Accounts*). The plan area includes significant stream miles for Oregon Coast coho, for example, 480 miles in the North Coast stratum (Appendix C, Table C.1-1), Lower Columbia River coho (notably Big Creek and Youngs Bay populations), and Upper Willamette River Chinook and steelhead (primarily in the North Santiam River population). These species require clean, stable gravel streambeds for spawning, complex channel features, cool stream temperatures, and access for migration. Habitat degradation, water quality impairment (temperature, sediment, dissolved oxygen), and barriers to migration are key threats. The permit area's streams and riparian zones are critical for supporting spawning, rearing, and migration of the covered fish species (Appendix C).

2.5.3.2 Oregon Slender Salamander

Oregon slender salamanders occur in the West Cascades ecoregion, including Clackamas, Marion, and Linn Counties and the Santiam State Forest (Section 2.5.1.2, *Oregon Slender Salamander*, and Appendix C, Section C.13). The species is highly associated with older forests (>76 years) of Douglas-

fir, bigleaf maple, western hemlock, and western redcedar, and is strongly tied to the presence of large, decayed logs and closed canopy conditions. Recent studies in the Santiam State Forest and adjacent lands have documented occupancy in both old and younger stands, particularly where legacy downed wood is retained. The species is sedentary, with limited dispersal ability, and is sensitive to canopy removal, loss of downed woody debris, and soil disturbance. This HCP assumes that portions the permit area in and around the Santiam State Forest within the range of Oregon slender salamander could provide suitable habitat. This is because observations have been documented across private and public lands, including Santiam State Forest within the permit area (Section 2.5.1.2, *Oregon Slender Salamander*). Based on this assumption, and the associated modeling exercise, the permit area contains an estimated 47,500 acres of potentially suitable habitat (Section 2.5.2.2, *Oregon Slender Salamander Distribution*). This species is sensitive to habitat loss and fragmentation from timber harvest and fire.

2.5.3.3 Northern Spotted Owl

ODF has conducted northern spotted owl surveys across ODF-managed lands since 1992. Within this time frame, the survey program transitioned from exclusively implementing operational surveys, to annually covering large tracts of managed lands using a densified survey approach since 2016 (Forsman 1995). Operational surveys continue to be conducted as needed for smaller, more isolated ODF tracts in the southern Coast Range and southwestern Oregon. Northern spotted owls are present throughout the permit area, with 31 active sites with activity centers centered in the permit area: 20 territorial pairs, 4 pairs of unknown status, and 7 resident singles (Section 2.5.1.3, *Northern Spotted Owl*, and Appendix C, Section C.14). There are 142 northern spotted owl sites outside the permit area whose provincial radii overlap the permit area. This overlap includes 119 territorial pairs, 5 pairs of unknown status, and 18 resident singles (U.S. Fish and Wildlife Service 2012c). There are 60 historically occupied northern spotted owl sites with activity centers in the permit area where activity was documented within the past 30 years, but the status is currently unoccupied (i.e., inactive). For this HCP, active activity centers are defined as those activity centers that have been confirmed at one point and have had less than 6 consecutive years of surveys with no observations. Activity centers that have not been surveyed consistently were assumed to have their same status as of their most recent survey history. Based on the 30-year survey history, the species is most frequently found in the Coast Range and West Cascades ecoregion counties, including Clatsop, Tillamook, Washington, Yamhill, Polk, Lincoln, Benton, Lane, Douglas, Coos, Curry, Josephine, Jackson, Clackamas, Marion, and Linn (Section 2.5.1.3, *Northern Spotted Owl*, and Appendix C, Section C.14). Northern spotted owls require late-seral forests or younger forests with residual late-seral components, favoring stands with moderate to high canopy closure (60 to 80%), multi-layered canopies, large overstory trees, snags, and downed wood.

In the permit area, there is approximately 219,400 acres of nesting, roosting, and foraging habitat currently available for northern spotted owl. Of this total, 42,400 acres is nesting and roosting habitat, which is characterized by large-diameter trees (20 to 30 inches diameter at breast height or greater), high basal area, and structural diversity. There are 177,000 acres suitable for foraging (Section 2.5.2.4, *Northern Spotted Owl, Marbled Murrelet, and Red Tree Vole Habitat Distribution*). These habitats are mostly found in mid- to late-seral conifer forests, which are critical for supporting a variety of other species. The population is declining, with threats including habitat loss, fragmentation, and competition from barred owls. The permit area's forests provides important habitat connectivity and support for the species' persistence in Oregon (Appendix E, *Effects Analysis*).

2.5.3.4 Marbled Murrelet

Marbled murrelets are concentrated in the northwest portion of the permit area (Tillamook and Astoria Districts) and the central Oregon Coast (West Oregon District), with nesting behaviors observed primarily within 40 miles of the ocean (Section 2.5.1.4, *Marbled Murrelet*, and Appendix C, Section C.16). ODF has conducted over 32,000 individual surveys at more than 1,300 unique sites since 1992 (Section 2.5.1.4, *Marbled Murrelet*). This represents the largest survey effort for marbled murrelets by any land manager in Oregon, Washington, or California. Marbled murrelet nest sites are extremely difficult to locate; therefore, this HCP used observations of behaviors indicative of occupancy made during protocol surveys (Evans Mack et al. 2003) as a surrogate for nest sites (Oregon Department of Forestry 2019).

The species requires large conifers in late-seral forests for nesting, with platforms formed by large limbs or deformities, and prefers stands with moderate to high canopy closure and multi-layered canopies. In the permit area, 130,700 acres are classified as suitable habitat and 2,400 acres are classified as highly suitable, mostly in older forest stands (Section 2.5.2.4, *Northern Spotted Owl, Marbled Murrelet, and Red Tree Vole Habitat Distribution*). Murrelet populations in Oregon are considered stable, but habitat loss and fragmentation, especially on non-federal lands, remain significant threats. The permit area's older forests, particularly in the Coast Range, support the maintenance of nesting habitat and regional population stability.

2.5.3.5 Red Tree Vole

The red tree vole, North Oregon Coast DPS, is endemic to the lower elevation coniferous forests of the Oregon Coast Range, from the Columbia River south to the Siuslaw River. The species is uncommon in the northern third of the DPS, including most of the Clatsop and Tillamook State Forests (Section 2.5.1.5, *Red Tree Vole*, and Appendix C, Section C.17). Red tree voles are highly associated with late-seral, structurally complex conifer forests, especially those with large-diameter trees, high conifer cover, and abundant downed wood. They are sensitive to habitat fragmentation and have limited dispersal ability. Surveys from 2011 to 2013 found 33 nests in these forests, of which 61% of nests occurred in stands 90 to 125 years old, and 39% in one younger stand (65 years old) located 150 meters from a 140-year-old forest; only six nests were occupied or likely occupied. At the time of the survey, old forests (80 to 250 years old) were present in less than 4% of the study area (Price et al. 2015). Occupied sites were mostly on the western edge of the Tillamook State Forest in areas that escaped historic fires. Additional occurrences are documented along the southern edge of the Tillamook State Forest (Section 2.5.1.5, *Red Tree Vole*).

More recent surveys (2019 to 2022) in the West Oregon District found active nests in stands ranging from 23 to 56 years old, with some nests documented in a 97-year-old stand (Section 2.5.2.4, *Northern Spotted Owl, Marbled Murrelet, and Red Tree Vole Habitat Distribution*, and Appendix C, *Species Accounts*). This indicates that red tree voles occur in both older and some younger forest stands within the permit area, though populations remain sparse and patchy. The permit area's remaining older forests appear to support the species; however, much of the landscape is dominated by younger stands, limiting robust connectivity and persistence (Appendix E, *Effects Analysis*).

2.5.3.6 Coastal Marten

Coastal marten monitoring in the permit area is limited to two surveys conducted in 2023 that detected the species at multiple sites in one survey area located along the coastline in Douglas

County (Central Oregon Coastal Extant Population Area). These sightings were in proximity (<500 meters) to a marten roadkill documented along Highway 101 in 2015. Despite the paucity of marten detections, the permit area overlaps two of the four extant population areas (Central and Southern Coastal) that exist within their range (Section 2.5.1.6, *Coastal Marten*, and Appendix C, *Species Accounts*). The species' range in the permit area includes portions of Coos, Douglas, Lane, Josephine, Jackson, and Curry Counties, with critical habitat identified in northwestern Douglas, eastern Curry, and northern Josephine Counties (Section 2.5.1.6 and Appendix C). Coastal martens require structurally complex mixed conifer forests with large live trees, abundant snags and logs, and dense shrub cover. In the permit area, the abundance of large trees, snags, and logs is not uniformly distributed across the approximately 50,000 acres (8% of the permit area) of forested lands west of I-5 from Lane County south that is considered potential denning, foraging, and dispersal habitat (Section 2.5.2.3, *Coastal Marten Distribution*). Populations are extremely small and isolated, with fewer than 100 individuals in each extant population area. The primary threats are habitat loss and fragmentation from timber harvest, wildfire, and human-caused mortality (e.g., vehicle strikes, trapping). The permit area's forests support habitat connectivity and population recovery.

2.5.4 Recovery Plans for Covered Species

This section provides brief overviews of existing recovery plans relevant to the conservation of the covered species. These plans were used as guidance for the conservation strategy of this.

2.5.4.1 Recovery Plans for Salmon

Four separate recovery plans for the covered fish species identify key limiting factors (Table 2-17) (Oregon Department of Fish and Wildlife and National Oceanic Atmospheric Administration Fisheries 2011; National Oceanic Atmospheric Administration 2013, 2014a, 2016). These limiting factors are physical, biological, or chemical features that have the greatest impact on a population's ability to reach a desired status. These recovery plans identify recovery strategies and actions, many of which are applicable to conservation strategies and actions in this HCP. Conservation actions under this HCP will improve limiting factors in the permit area and have a long-term benefit for the covered fish species. Limiting factors, by species, are provided in Table 2-17. These factors were a key component in developing the conservation strategy of the HCP and will help guide implementation of the conservation actions to provide the greatest benefit for the covered salmonids.

Table 2-17. Key Limiting Factors for the Covered Salmon Species

Covered Fish Species	Recovery Plan	Limiting Factor					
		Reduced Amount and Complexity of Habitat	Peripheral and Transitional Habitats: Side Channels, Wetlands, and Floodplains	Impaired Riparian Function	Degraded Water Quality/Quantity	Blocked/Impaired Fish Passage	Adequate Regulatory Mechanisms to Protect Population
Oregon Coast coho	NOAA 2016	X	X	X	X	X	X
Oregon Coast Chinook	--		X	X	X		X
Southern Oregon/ Northern California Coastal Chinook	--	X	X	X	X	X	X
Lower Columbia River coho	NOAA 2013	X	X	X	X		X
Lower Columbia River Chinook	NOAA 2013		X	X	X		X
Columbia River chum	NOAA 2013			X	X		X
Upper Willamette River Chinook	ODFW and NOAA Fisheries 2011		X	X	X	X	X
Upper Willamette River winter steelhead	ODFW and NOAA Fisheries 2011	X	X	X	X	X	X
Southern Oregon/ Northern California Coast coho	NOAA 2014	X	X	X	X	X	X

NOAA = National Oceanic Atmospheric Administration; ODFW = Oregon Department of Fish and Wildlife

2.5.4.2 Eulachon Recovery Plan

The NOAA Eulachon Recovery Plan (National Oceanic Atmospheric Administration 2017) identifies a suite of interacting limiting factors affecting eulachon populations across their range. Climate change influences both marine and freshwater environments by altering ocean productivity, flow regimes, and thermal conditions, while dams, water diversions, and shoreline construction limits or restricts access to spawning and rearing habitats. Population viability is further affected by bycatch in commercial and recreational fisheries; direct harvest in tribal/First Nations; and increased predation, competition, disease, and non-indigenous species. Water quality degradation, dredging activities, and catastrophic events such as floods or spills can reduce survival at sensitive life stages, while changes in ocean conditions may exacerbate early marine mortality. In addition, limitations in scientific monitoring constrain the ability to detect population trends and evaluate recovery actions, collectively impeding effective conservation and management of this anadromous species. These factors were a key component in developing the conservation strategy of the HCP and will help guide implementation of the conservation actions to provide the greatest benefit for eulachon.

2.5.4.3 Recovery Plan for Northern Spotted Owl

The recovery plan for the northern spotted owl was first published in 2008 and revised in 2011 (U.S. Fish and Wildlife Service 2011). The current recovery plan identifies recovery units essential for the survival and recovery of spotted owls, with five recovery units in Oregon: Oregon Coast Range, Willamette Valley, Western Oregon Cascades, Eastern Oregon Cascades, and Oregon Klamath. The permit area includes lands in all of these recovery units except the Eastern Oregon Cascades.

The 2011 recovery plan relies heavily on recovery of spotted owls on federal lands but also identifies the need to retain a spotted owl distribution across the range where federal lands are lacking, and noted as an example northwestern Oregon, “potentially including parts of the Tillamook and Clatsop State Forests.” The recovery plan states that “managing to retain spotted owls at existing sites should be the most effective approach to conserving spotted owls” in these areas. The 2011 recovery plan defines 33 specific recovery actions. Of those, seven recovery actions are applicable to this HCP (Table 2-18).

Table 2-18. Recovery Actions Applicable to the HCP for Northern Spotted Owl

Recovery Action	Summary
Recovery Action 6	In most forests managed for spotted owl habitat, land managers should implement silvicultural techniques in plantations, overstocked stands, and modified younger stands to accelerate the development of structural complexity and biological diversity that will benefit spotted owl recovery.
Recovery Action 10	Conserve spotted owl sites and high-value spotted owl habitat to provide additional demographic support to the spotted owl population.
Recovery Action 14	Encourage applicants to develop Habitat Conservation Plans and Safe Harbor Agreements that are consistent with the recovery objectives.
Recovery Action 19	The Service will request the cooperation of Oregon Department of Forestry in a scientific evaluation of 1) the potential role of state and private lands in Oregon to contribute to spotted owl recovery; and 2) the effectiveness of current Oregon Forest Practices in conserving spotted owl habitat and meeting the recovery goals identified in this Revised Recovery Plan. Based on this scientific evaluation, the Services will work with the Oregon

Recovery Action	Summary
	Department of Forestry and other individual stakeholders to provide specific recommendations for how best to address spotted owl conservation needs on Oregon's non-federal lands.
Recovery Action 30	Manage to reduce the negative effects of barred owls on spotted owls so that Recovery Criterion 1 can be met.
Recovery Action 31	Develop mechanisms for landowners and land managers to support barred owl management using a collaborative process.
Recovery Action 32	Because spotted owl recovery requires well distributed, older, and more structurally complex multi-layered conifer forests on federal and non-federal lands across its range, land managers should work with the Services to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high-quality spotted owl habitat stands are characterized as having large-diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees.

Source: U.S. Fish and Wildlife Service 2011.

the Services = U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration

2.5.4.4 U.S. Fish and Wildlife Service Barred Owl Management

As described in the 2011 Northern Spotted Owl Recovery Plan, barred owls pose perhaps the most significant and immediate threat to spotted owl recovery (U.S. Fish and Wildlife Service 2011). Furthermore, regardless of the amount and type of spotted owl habitat available, competition with barred owl continues to stress northern spotted owl populations (Spies et al. 2018; Franklin et al. 2021). The USFWS recovery plan specified several substantive recovery actions to address this threat, including research on the competition between spotted and barred owls, experimental control of barred owls, and, if recommended by research, removal of barred owls using a combination of lethal and non-lethal methods.

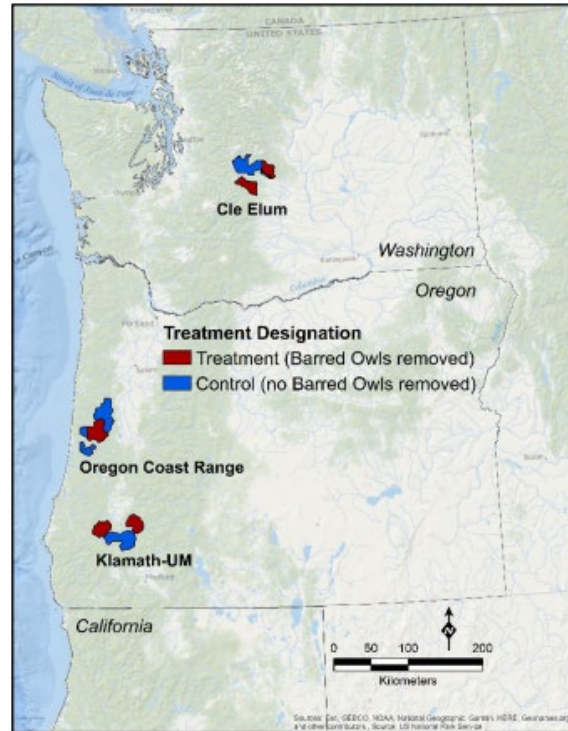
U.S. Fish and Wildlife Service Barred Owl Removal Experiment

In 2013, USFWS issued a Final Environmental Impact Statement and Record of Decision for the experimental removal of barred owls to benefit northern spotted owls (U.S. Fish and Wildlife Service 2013a, 2013b). Under the experimental removal plan, barred owl removals have occurred at one study area in Washington, two in Oregon, and one in California (Figure 2-23).

As of October 2019, 2,435 barred owls have been removed at the four study areas, with area-specific removals as follows (U.S. Fish and Wildlife Service 2020).

- Cle Elum, Washington: 472
- Oregon Coast Range: 1,018
- Klamath-Union/Myrtle Study Area, Oregon: 536
- Hoopa, California: 409

The experiment has found reduced and declining barred owl populations in the removal areas, while barred owls continue to increase in control areas where no removals have occurred. Across all study areas, USFWS believes that barred owl removal appears to have stabilized spotted owl populations, although total spotted owl numbers remain low (U.S. Fish and Wildlife Service 2020). An analyses of individual study areas conducted by Wiens et al. (2021) found that barred owl removal increased survival of individual spotted owls. In some cases, nonterritorial spotted owls were found to regain territories after the barred owl occupants had been removed. However, Wiens et al. (2021) cautioned that low reproductive rates continue to be a major barrier to northern spotted owl recovery, and in addition to increased survival of northern spotted owls, reproduction rates will also need to increase so that young, nonterritorial recruits are available to fill territory vacancies once barred owl occupants are removed.



Source: Wiens et al. 2019.

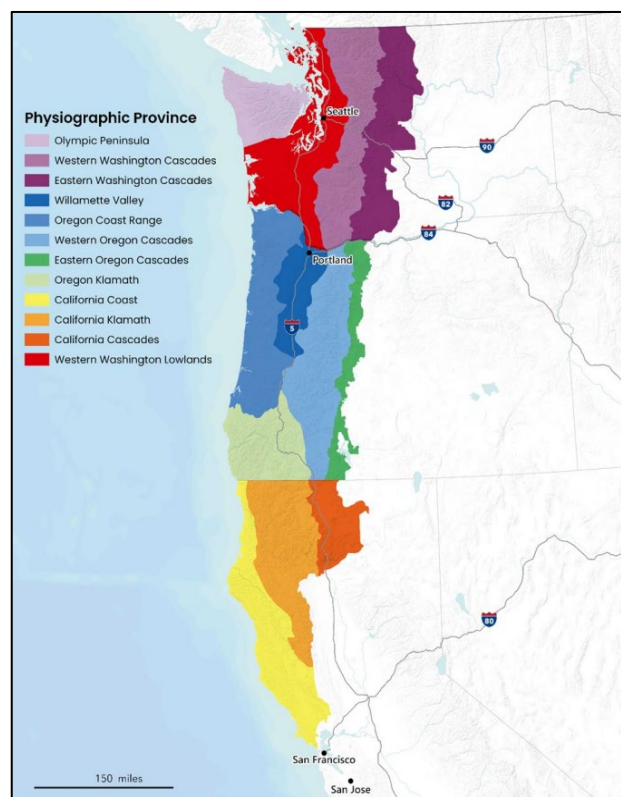
Figure 2-23. Barred Owl Study Areas in Washington and Oregon

U.S. Fish and Wildlife Service Barred Owl Management Strategy

In 2024, USFWS issued a Record of Decision and final Barred Owl Management Strategy (the Strategy), implementing a comprehensive management approach to address the threat to northern spotted owl survival and recovery from invasive barred owls (U.S. Fish and Wildlife Service 2024c). The Strategy is intended to be a voluntary tool in reducing the impact of the barred owl to northern spotted owl conservation, and its implementation requires a permit under the Migratory Bird Treaty Act.

The Strategy provides background about the barred owl and its impact on spotted owl populations and details the current conditions of the spotted owl from California to Washington. It outlines barred owl management priorities across the entire species range, as well as by physiographic province, including the Oregon Coast Range, Western Oregon Cascades, and Oregon Klamath provinces that overlap the permit area (Figure 2-24) (U.S. Fish and Wildlife Service 2024b).

Barred owl management is guided by three scaled approaches that vary for each province depending on northern spotted owl and barred owl activity, in addition to habitat condition. These scaled approaches include spotted owl site management, General Management Areas (GMA) with Focal Management Areas (FMA), and Special Designated Areas (SDA) (U.S. Fish and Wildlife Service 2024). GMAs are delineated within the physiographic province to maintain spotted owl populations and support the FMAs that act as subsets within a GMA and are intended to concentrate barred owl removals to maximize spotted owl benefit. SDAs represent zones where barred owl management may occur on willing lands within the focal and general area framework of a physiographic province. Spotted owl site management focuses on removing barred owls from occupied sites and the surrounding areas, and can be applied anywhere within the province regardless of a GMA location. This allows maintenance of the remaining spotted owls to act as source populations that may recruit young able to recolonize areas elsewhere where barred owl management occurs (U.S. Fish and Wildlife Service 2024).



Source: U.S. Fish and Wildlife Service 2024.

Figure 2-24. Physiographic Provinces in the Northern Spotted Owl Range

Safe Harbor Agreements for Barred Owl Removal Experiment

As part of the barred owl removal experiment described earlier in this section, USFWS has entered into Safe Harbor Agreements (SHAs) with four land management entities.

- ODF SHA for the northern spotted owl in the Oregon Coast Ranges Study Area of the Barred Owl Removal Experiment.
- Weyerhaeuser Company SHA for the northern spotted owl in the Oregon Coast Ranges Study Area of the Barred Owl Removal Experiment.
- Roseburg Resources Company SHA for northern spotted owls in Douglas County, Oregon.
- Roseburg Resources Company SHA for northern spotted owls in Union/Myrtle (Klamath) Study Area of the Barred Owl Removal Experiment.

An SHA is a voluntary agreement involving private or other non-federal property owners whose actions contribute to the recovery of species listed as threatened or endangered under the act. In exchange for actions that contribute to the recovery of listed species on non-federal lands, USFWS authorizes incidental take of covered species resulting from lawful activities, and will not require any additional or different management activities by the participants without their consent.

These SHAs provided assurances to permit holders that they would not be prohibited from harvesting areas that may be recolonized by spotted owls due to the USFWS experimental removal of barred owls. The enhancement of survival permit issued to ODF will be in effect through August 31, 2026, except for covered activities related to the harvest of timber sales in non-baseline sites and non-baseline areas outside of Thiessen polygons. Permit coverage for these locations will extend to August 31, 2029, for covered activities related to the harvest of timber sales that were auctioned and sold by ODF prior to August 31, 2026.

There are no other SHAs in Oregon for species covered under this HCP.

2.5.4.5 Recovery Plan for Marbled Murrelet

The recovery plan for marbled murrelet (U.S. Fish and Wildlife Service 1997) identifies six Marbled Murrelet Conservation Zones: Puget Sound (Zone 1), Western Washington Coast Range (Zone 2), Oregon Coast Range (Zone 3), Siskiyou Coast Range (Zone 4), Mendocino (Zone 5), and Santa Cruz Mountains (Zone 6) (U.S. Fish and Wildlife Service 2024c; Figure 2-25). Most of the permit area is in Zone 3, Oregon Coast Range. A portion of the permit area is in Zone 4, Siskiyou Coast Range.

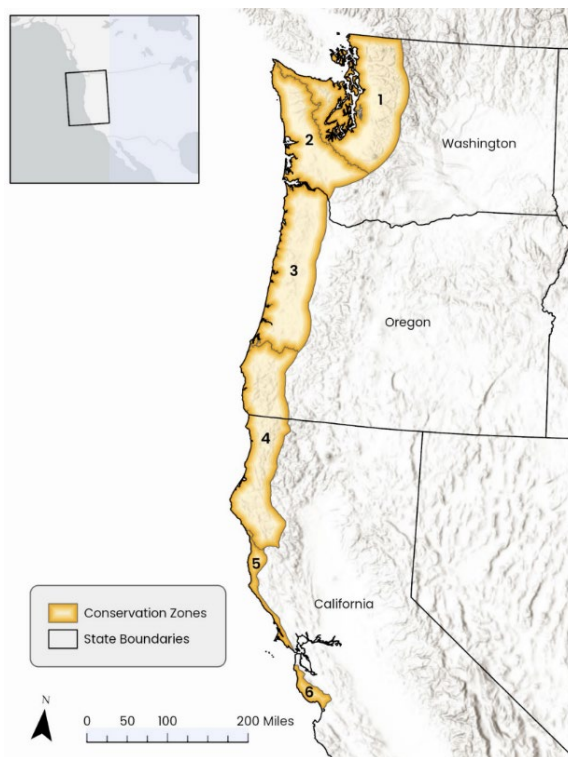
Zone 3, Oregon Coast Range, includes the majority of known marbled murrelet occupied sites in Oregon. The recovery plan includes the following description of recovery strategies for this zone.

Marbled murrelet occupied sites along the western portion of the Tillamook State Forest are especially important to maintaining well-distributed marbled murrelet populations. Efforts should focus on maintaining these occupied sites, minimizing the loss of unoccupied but suitable habitat, and decreasing the time for development of new habitat. Relatively few known occupied sites occur north of the Tillamook State Forest. Recovery efforts should be directed at restoring some of the north-south distribution of marbled murrelet populations and habitat in this zone. Maintenance of suitable and occupied marbled murrelet nesting habitat in the Elliott State Forest, Tillamook State Forest, Siuslaw National Forest, and BLM-administered forests is an essential component for the stabilization and recovery of the marbled murrelet.

The 1997 recovery plan also lists the following actions needed for the recovery of the species, which were used to help design the conservation strategy for this HCP.

- Establish Marbled Murrelet Conservation Zones and develop landscape-level management strategies for each zone.
- Identify and protect terrestrial and marine habitat areas in each Marbled Murrelet Conservation Zone.
- Monitor marbled murrelet populations and habitat and survey potential breeding habitat to identify potential nesting areas.
- Implement short-term actions to stabilize the marbled murrelet population.
- Implement long-term actions to stop population decline and increase marbled murrelet population growth.

Additionally, USFWS convened a Recovery Implementation Team where they identified northwest Oregon and the coastal area between Reedsport and the Siskiyou Province as potential gaps of terrestrial habitat lacking means for habitat restoration (U.S. Fish and Wildlife Service 2012). This HCP addresses this issue specifically in Chapter 4, Section 4.1.1, *Conservation Action 7: Manage Habitat Conservation Areas*.



Source: U.S. Fish and Wildlife Service 2024.

Figure 2-25. Marbled Murrelet Conservation Zones

2.6 Other Species of Conservation Concern that May Benefit from the HCP

Torrent salamanders are no longer included as covered species because they are not federally listed under the ESA and, as such, do not require incidental take authorization under this HCP. However, they remain addressed in the plan because the conservation measures are expected to benefit the species and its habitat.

2.6.1 Species Occurrence Data

2.6.1.1 Columbia Torrent Salamander

Survey History in the Permit Area

ODF has not conducted Columbia torrent salamander surveys for project planning or monitoring purposes. Columbia torrent salamander occurrences were derived from recently conducted research led by USGS and USFS. In 2019, these agencies assessed the distribution and occupancy of torrent salamanders across their range on public lands using visual and eDNA data collection methods (Thurman 2019). Randomly selected stream sites representative of model-predicted suitable habitat were distributed throughout the Clatsop and Tillamook State Forests.

Species Occurrences in the Permit Area

Columbia torrent salamander occurrences are based on surveys recently conducted by USGS and USFS within the species range on federal and state lands, including Tillamook and Clatsop State Forests (Thurman 2019). These surveys conducted in 2019 detected 184 Columbia torrent salamanders in 15 of 20 (75%) study sites distributed across multiple basins throughout the Tillamook and Clatsop State Forests (Figure 2-26). Additional occurrences have been recorded in Tillamook, Washington, and Yamhill Counties (Figure 2-26). The Columbia torrent range in Oregon totals 1,907,956 acres with 405,258 (21%) in the permit area. The baseline species summary for Columbia torrent salamanders is found in Section 2.6.3.1, *Torrent Salamanders*.

2.6.1.2 Cascade Torrent Salamander

Survey History in the Permit Area

ODF has not conducted Cascade torrent salamander surveys for project planning or monitoring purposes. Cascade torrent salamander occurrences were derived from recently conducted research led by USGS and USFS. In 2019, they assessed the distribution and occupancy of torrent salamanders across their range on public lands using visual and eDNA data collection methods (Thurman 2019). Randomly selected stream sites representative of model predicted suitable habitat were distributed throughout the North Cascades and included the Santiam State Forest.

Species Occurrences in the Permit Area

During amphibian surveys collected by in 2019, Cascade torrent salamanders were not detected at the single study site surveyed on Santiam State Forest. However, the frequency of occurrence of Cascade torrent salamanders was 33% for all study sites distributed across multiple basins on public lands throughout the North Cascades and adjacent to Santiam State Forest. Additional occurrences in the vicinity of the plan area have been recorded in Marion, Clackamas, and Lane Counties (Figure 2-27). Cascade torrent range totals 3,166,079 acres, with 46,750 acres (1.5%) of that being in the permit area. The baseline species summary for Cascade torrent salamanders is found in Section 2.6.3.1, *Torrent Salamanders*.

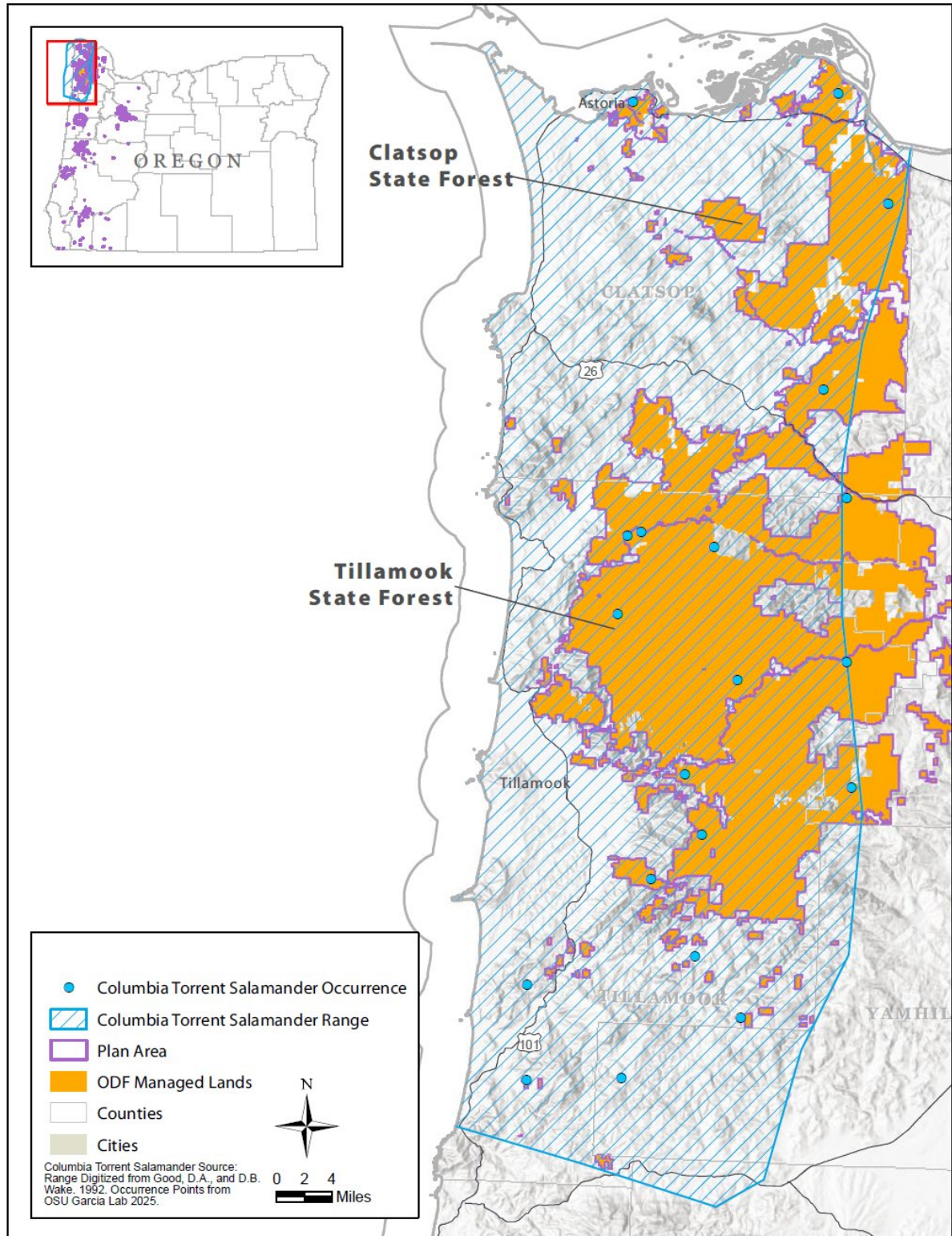


Figure 2-26. Range of Columbia Torrent Salamander and Known Occurrences

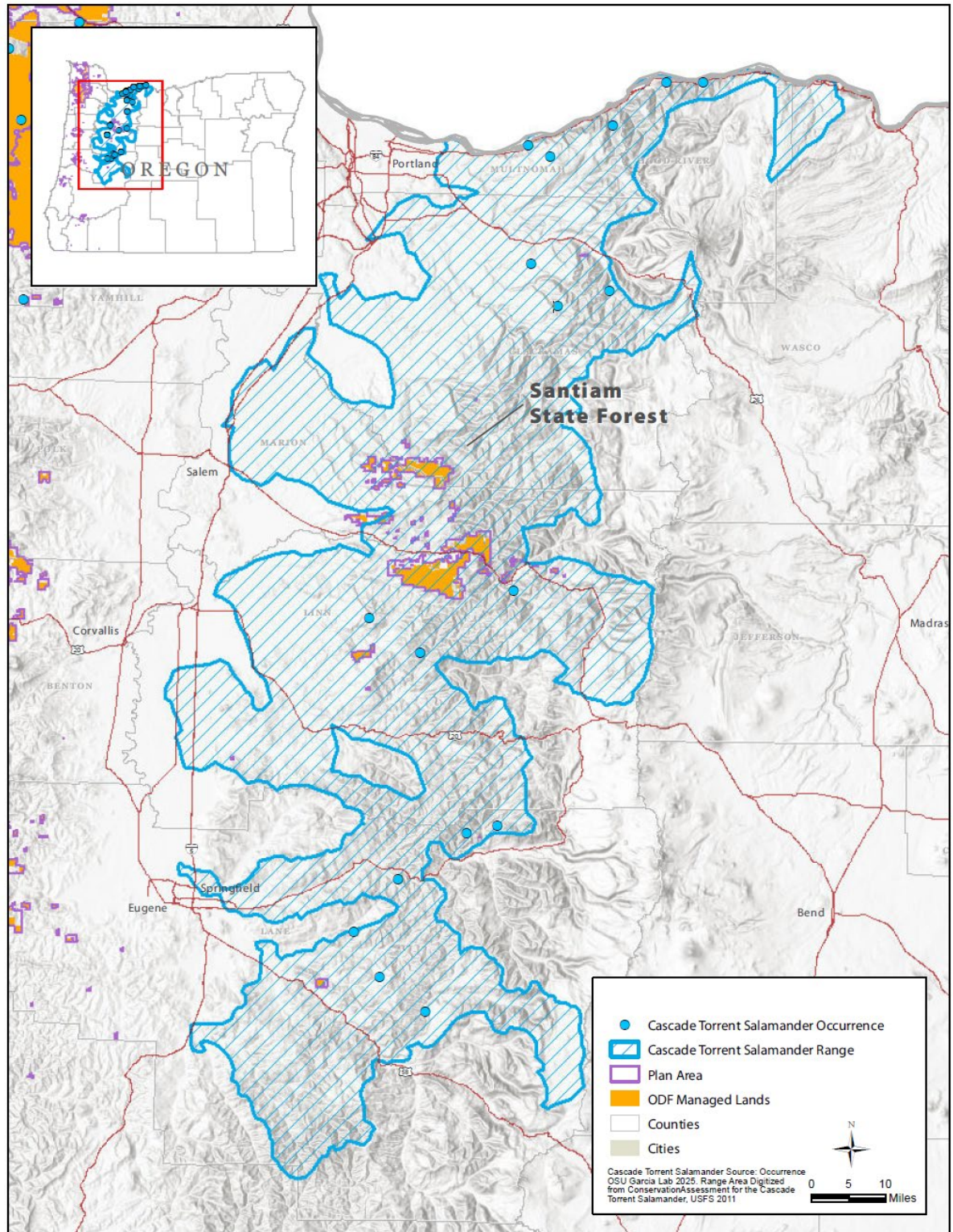


Figure 2-27. Range of Cascade Torrent Salamander and Known Occurrences

2.6.2 Species Habitat Distribution Estimates

2.6.2.1 Torrent Salamander Distribution

Habitat Modeling Approach

A discrete habitat model was not developed for torrent salamanders. Rather, all non-fish-bearing perennial and seasonal streams from the NetMap synthetic stream layer within the range of each torrent salamander species were assumed to be potentially suitable habitat. Both torrent salamanders are associated with high-gradient, perennial, cool or cold-water sources such as seeps, headwaters, and edges of larger streams within forests (Stebbins and Lowe 1951; Jones et al. 2005; Lannoo 2005; Thurman et al. 2025). Non-fish-bearing streams, where they are believed to persist, are located in the upper reaches of watersheds, approximating suitable headwater habitats (Thurman et al. 2025). Some adjacent upland habitat may be used for occasional dispersal events during wet, cool periods, but torrents rarely venture far from aquatic habitat (Howell and Maggiulli 2011).

Suitable Habitat

Characteristics

Stebbins and Lowe (1951) generalize the microhabitat conditions of torrent salamanders as “one of a cold, permanent stream with small water-washed or moss-covered rock, usually rock rubble, in and along running water, seeps and small, trickling tributary streams with rocks of small dimensions.” Torrent salamanders are primarily found in upper reaches of headwater basins in older, intact forest sites (Nussbaum and Tait 1977; Wilkins and Peterson 2000) that are water saturated (Sheridan and Olson 2003), and there is evidence that they prefer moderate tree density and closed canopy forest, especially Columbia torrent salamander (Thurman et al. 2025). However, Russell et al. (2004) found that at the landscape level, site occupancy and relative abundance of Columbia torrents was not related to age or composition of riparian vegetation per se, but rather more correlated with variation in physical features of the stream habitats at multiple spatial scales. Although the relative abundance of torrent salamanders in western Washington was negatively correlated to the proportion of dry channels, torrent salamanders were observed in short reaches of surface water within otherwise predominantly dry channels. In particular, those reaches with stream-associated seeps (Ojala-Barbour et al. 2024). Their habitat has been described as small cold (46° to 54°F [8° to 12°C] in summer) streams with water seeping through moss-covered gravel, splash zones of rocky, tumbling brooks in shady canyons, and the spray zones of waterfalls (Nussbaum et al. 1983).

Amount and Distribution

The permit area supports an estimated 4,674 miles of potential Columbia torrent salamander habitat and 519 miles of potential Cascade torrent salamander habitat (Table 2-19). These stream miles include large, medium, and small streams that are categorized as perennial or seasonal, non-fish-bearing streams. It is unclear how many miles of seasonal stream contain perennial ground water sources, such as seeps or springs, or wetted intermittent reaches. Generally speaking, and based on the biology of stream-breeding torrent salamanders, the highest densities of torrents are likely found in the smaller perennial streams (Stebbins and Lowe 1951; Nussbaum et al. 1983) identified in Table 2-19, in high-gradient seasonal streams near their perennial initiation points

(Sheridan and Olson 2003), or where wetted pools or seeps and springs are also located (Ojala-Barbour et al. 2023) along the 3,976 miles off potential Columbia torrent salamander habitat and 469 miles of potential Cascade torrent salamander habitat.

Table 2-19. Approximate Miles of Potentially Suitable Stream Habitat in the Range of Torrent Salamanders in the Permit Area

	NetMap Synthetic Stream Layer Class ^a			
Species	Large	Medium	Small	Total
Columbia torrent salamander				
Perennial stream	4	105	589	698
Seasonal stream	0	46	3,930	3,976
<i>Total</i>	4	151	4,519	4,674
Cascade torrent salamander				
Perennial stream	2	15	32	49
Seasonal stream	0	1	469	470
<i>Total</i>	2	16	500	519

^a Determined based on a combination of hydrologic and geomorphic attributes.

2.6.3 Baseline Species Summary

2.6.3.1 Torrent Salamanders

Columbia torrent salamanders are found in a limited portion of the permit area in the Coast Range ecoregion, particularly in multiple tributaries in the Clatsop and Tillamook State Forests based on limited surveys (Section 2.6.1.1, *Columbia Torrent Salamander*, and Appendix C, Section C.11). The species is associated with cold, fast-moving streams, seeps, and splash zones in older forests, but occupancy is more strongly correlated with abiotic features such as geology, elevation, and stream gradient than with forest age. Columbia torrent salamanders are highly sedentary, with limited dispersal, and are sensitive to increased water temperature, sedimentation, and stream channel disturbance. Timber harvest, road construction, and climate change are primary threats. The permit area supports an estimated 4,674 miles of potential stream-associated habitat (698 miles perennial, 3,976 miles seasonal), with the highest densities in small perennial streams in intact forest (Section 2.6.2.1, *Torrent Salamander Distribution*).

Cascade torrent salamanders are found in an even more limited portion of the permit area than Columbia torrent salamanders, including small portions of Marion, Clackamas, and Lane Counties in the West Cascade ecoregion (Section 2.6.1.2, *Cascade Torrent Salamander*, and Appendix C, Section C.12). There was a single survey site for Cascade torrent salamanders in the Santiam State Forest, which did not detect this species but found occupancy in adjacent basins. However, based on survey results from 2019, it can be inferred that Cascade torrent salamanders may be present in the permit area, although their occurrence has not been definitively confirmed (Section 2.6.1.2). The species is associated with high-gradient, cold, permanent headwater streams, seeps, and splash zones, and requires continuous access to cold, silt-free water and moist adjacent forests. Cascade torrent salamanders are highly sensitive to increased water temperature, sedimentation, and stream disturbance. Timber harvest, road construction, and climate change are primary threats. The permit area contains an estimated 519 miles of potential stream-associated habitat (49 miles perennial, 470

miles seasonal), with occupancy tied to small, cold streams in forested headwaters (Section 2.6.2.1, *Torrent Salamander Distribution*).

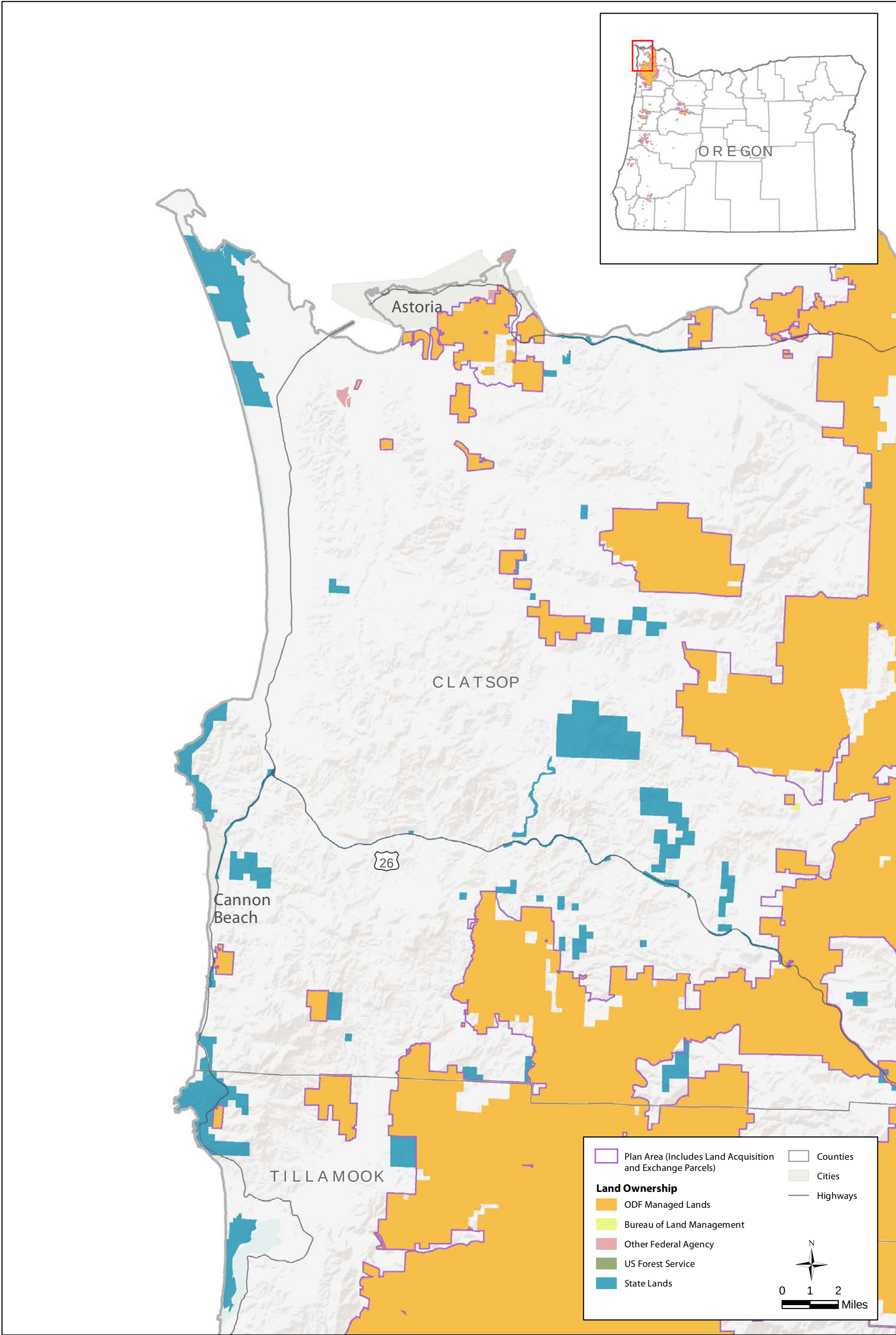


Figure 2-28a: Adjacent Land Ownership

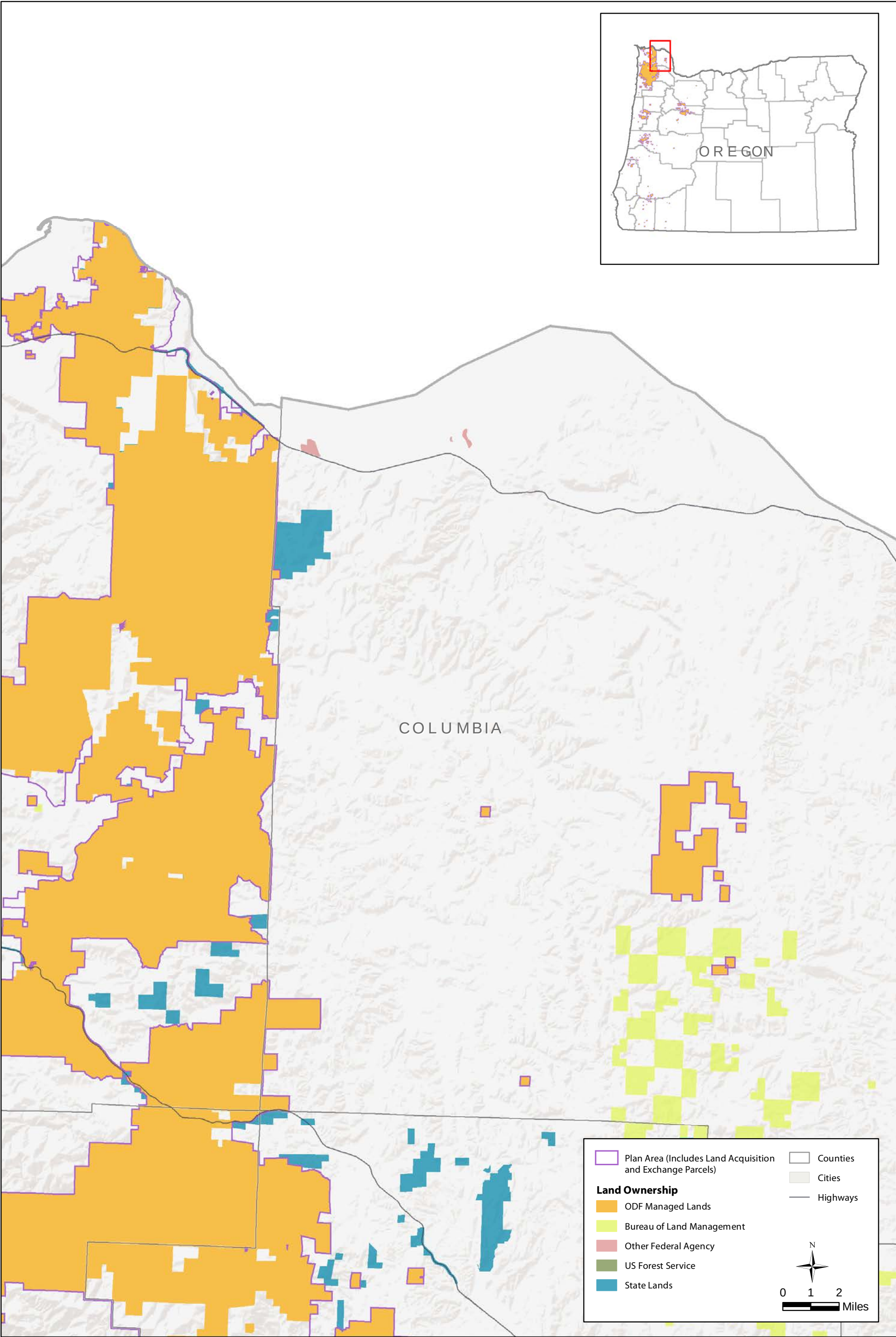


Figure 2-28b: Adjacent Land Ownership

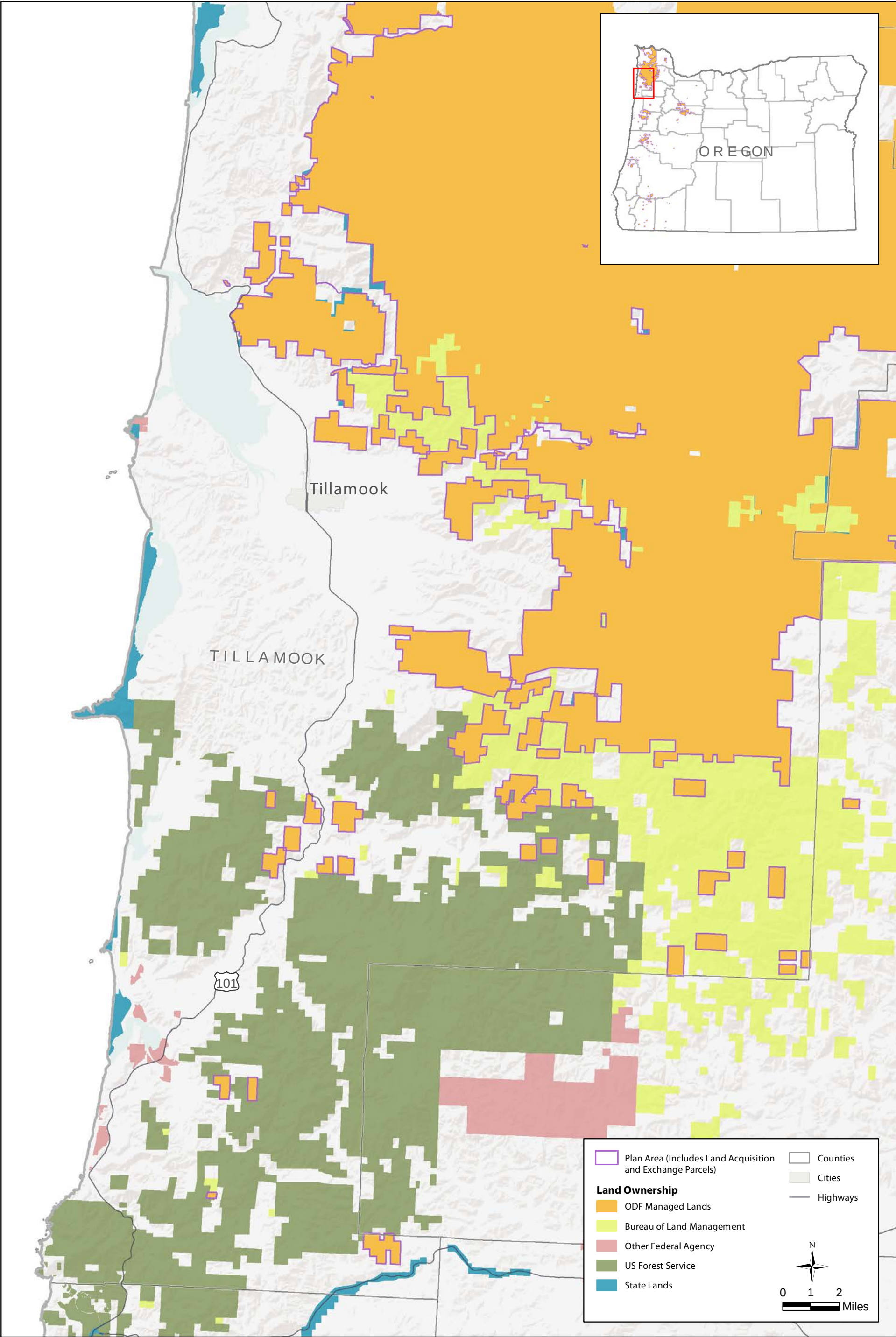


Figure 2-28c: Adjacent Land Ownership

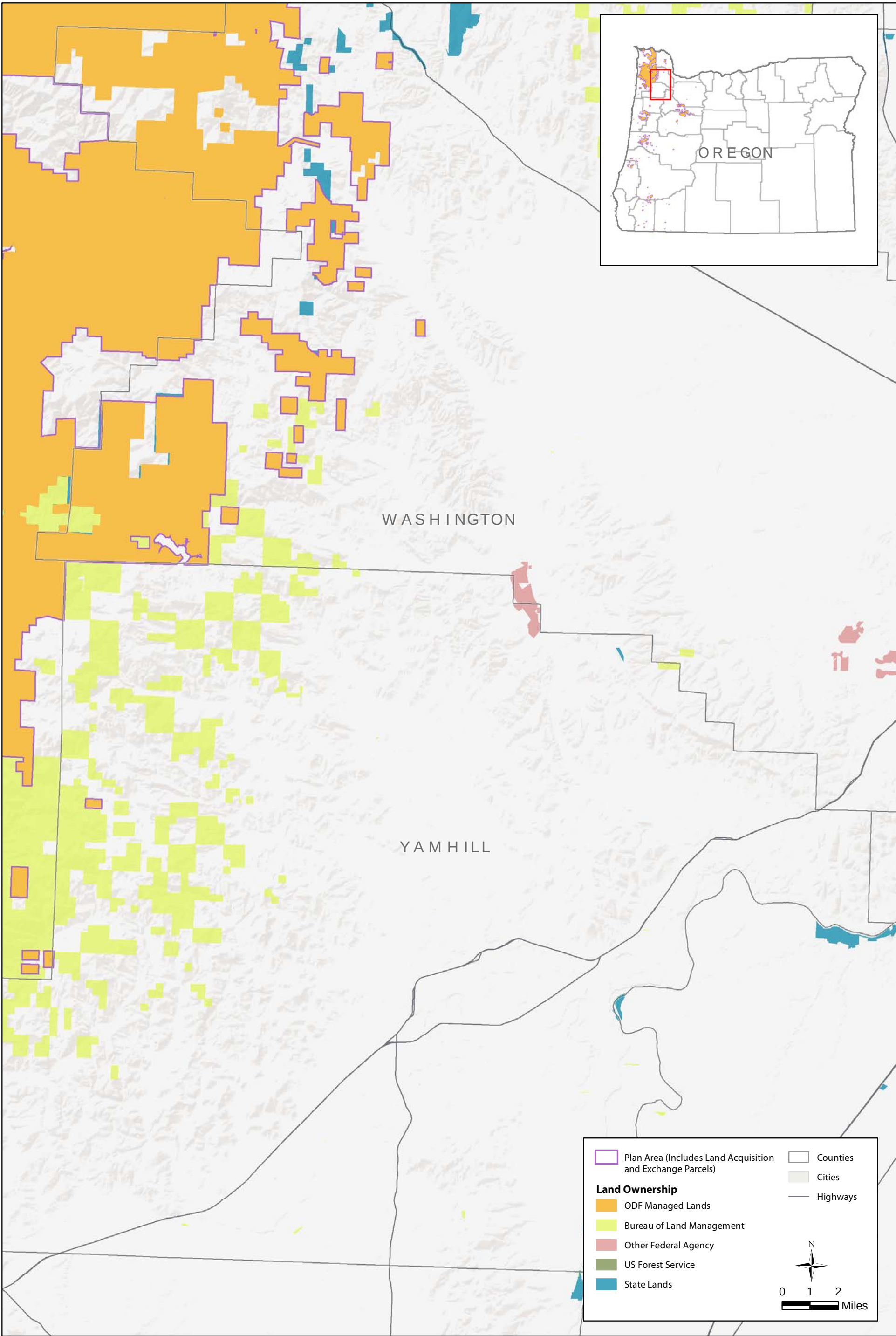


Figure 2-28d: Adjacent Land Ownership

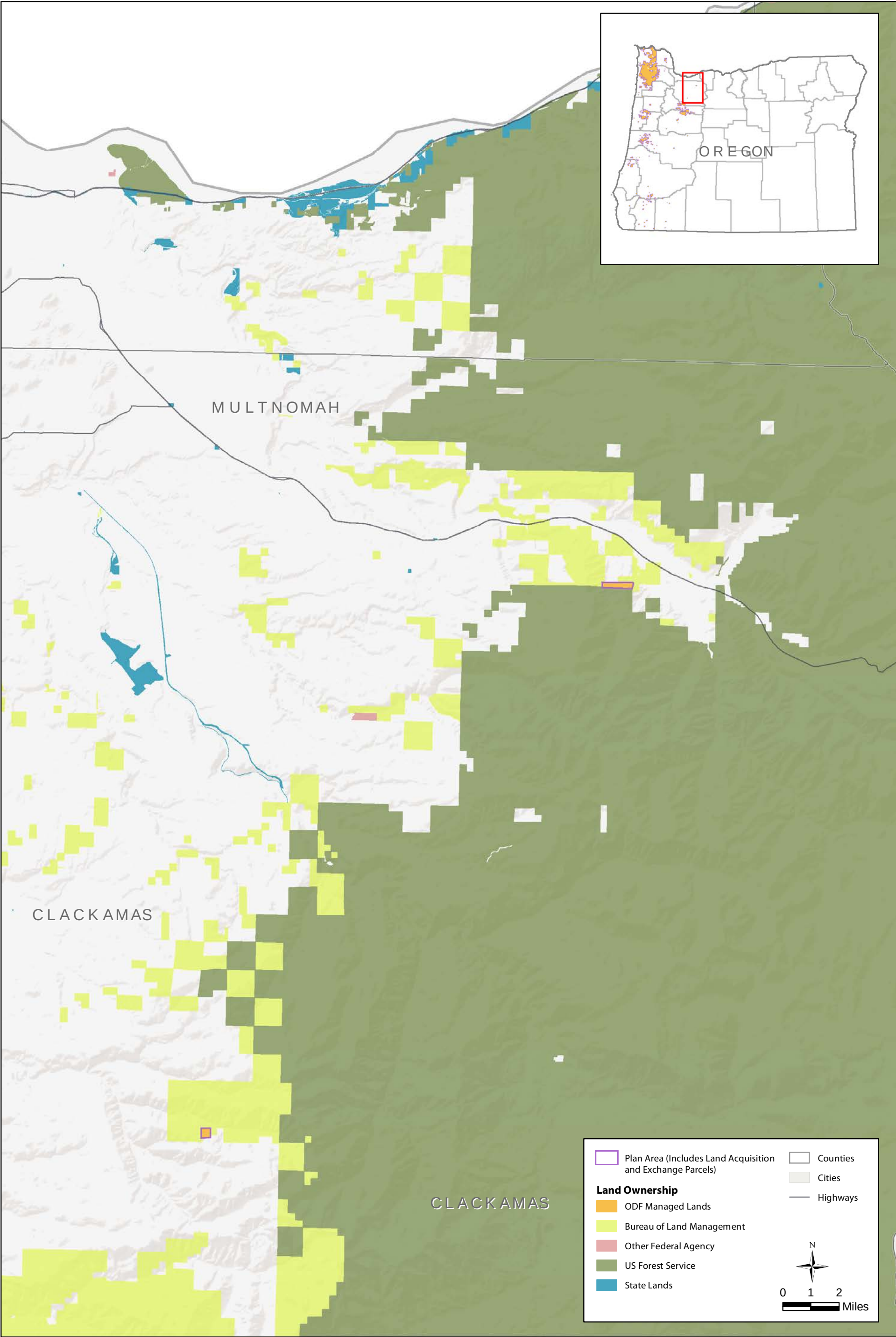


Figure 2-28e: Adjacent Land Ownership

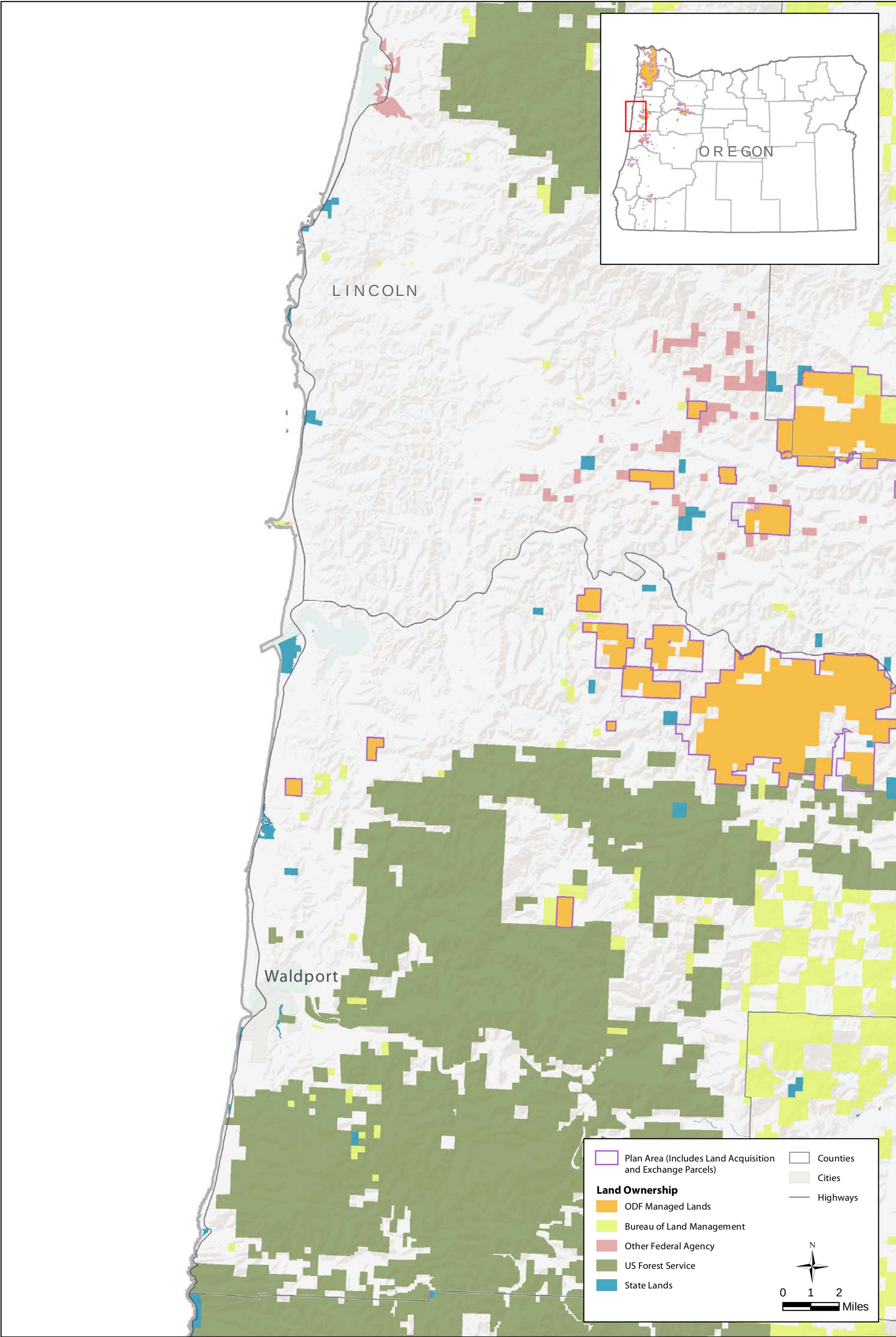


Figure 2-28f: Adjacent Land Ownership

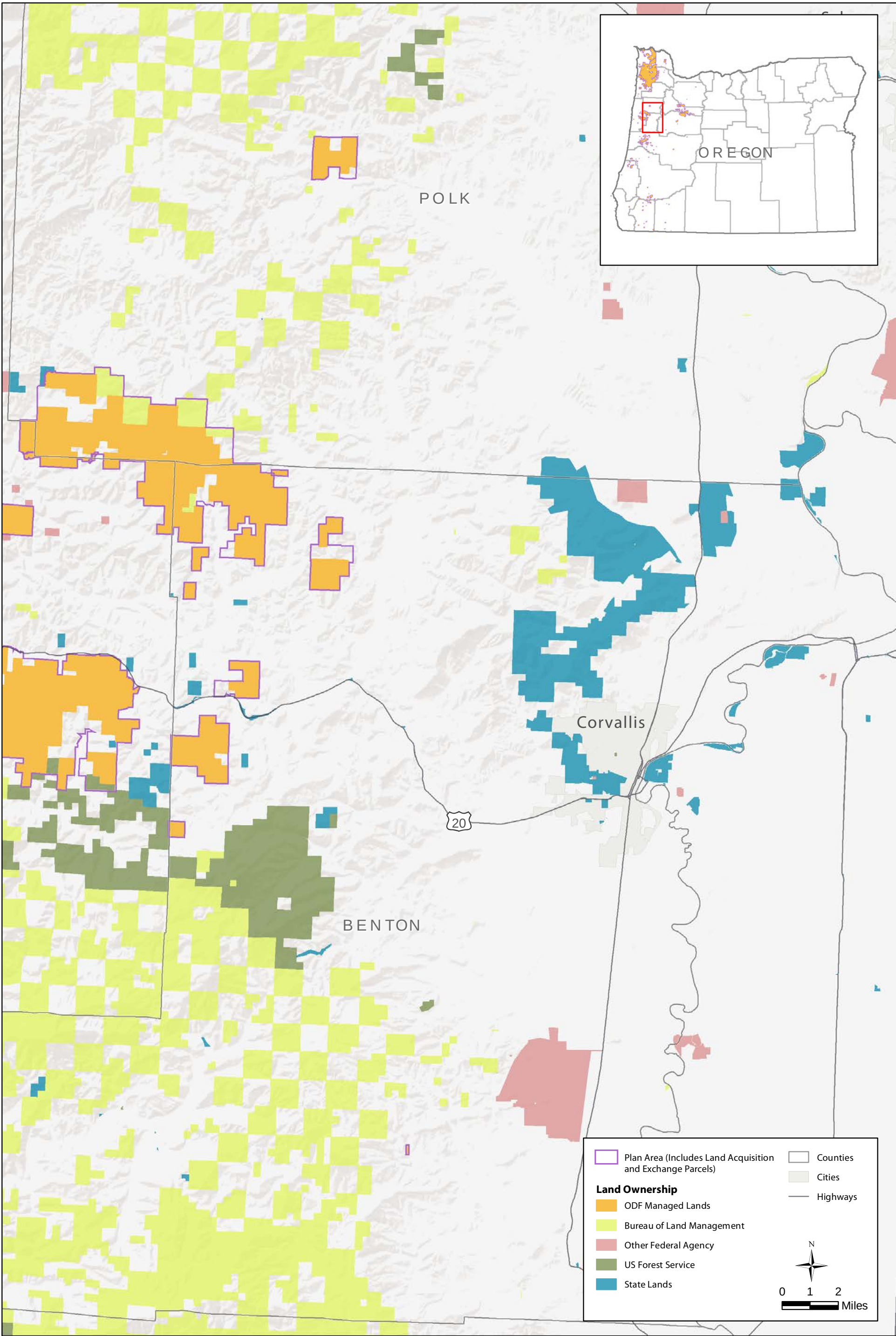


Figure 2-28g: Adjacent Land Ownership

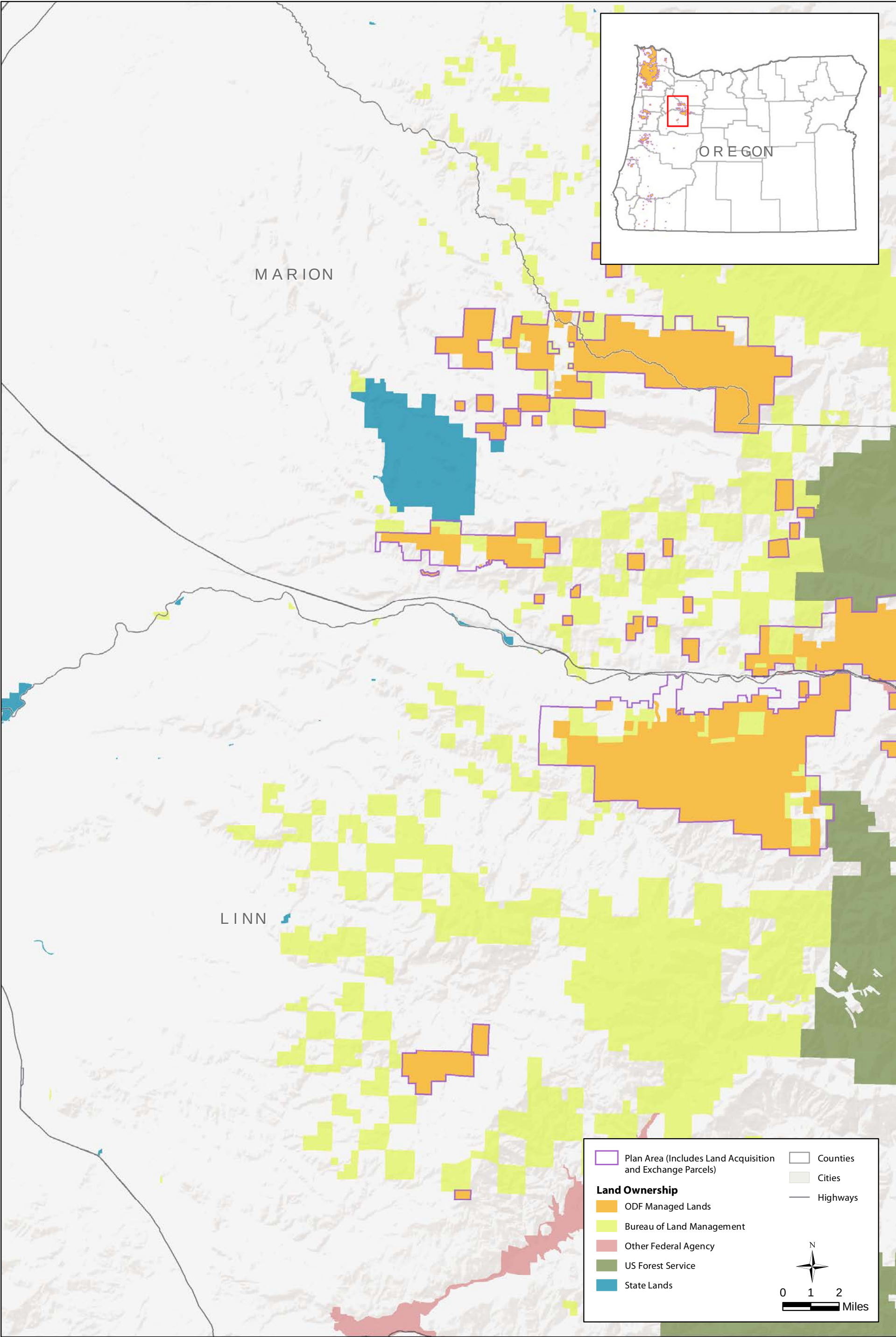


Figure 2-28h: Adjacent Land Ownership

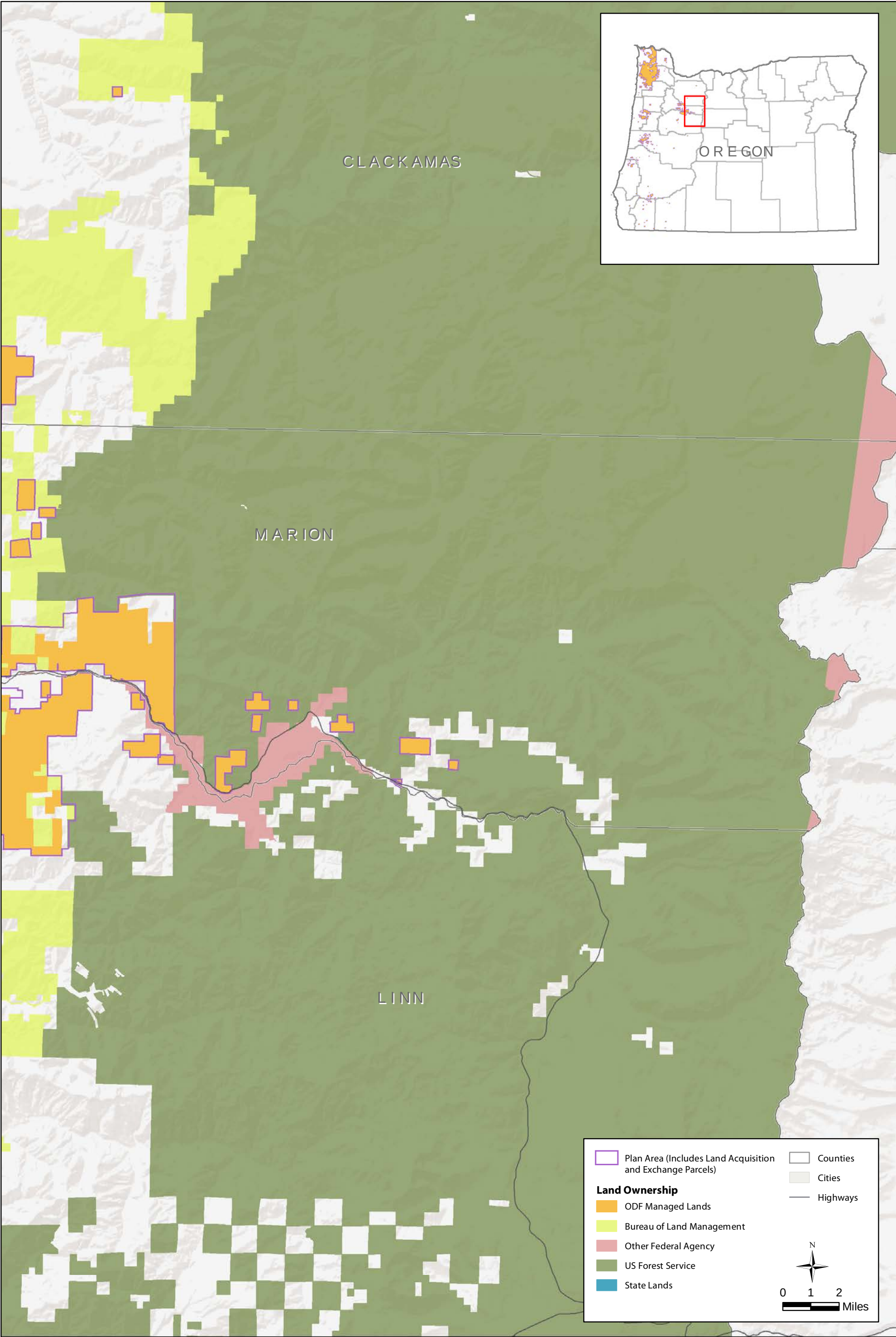


Figure 2-28i: Adjacent Land Ownership

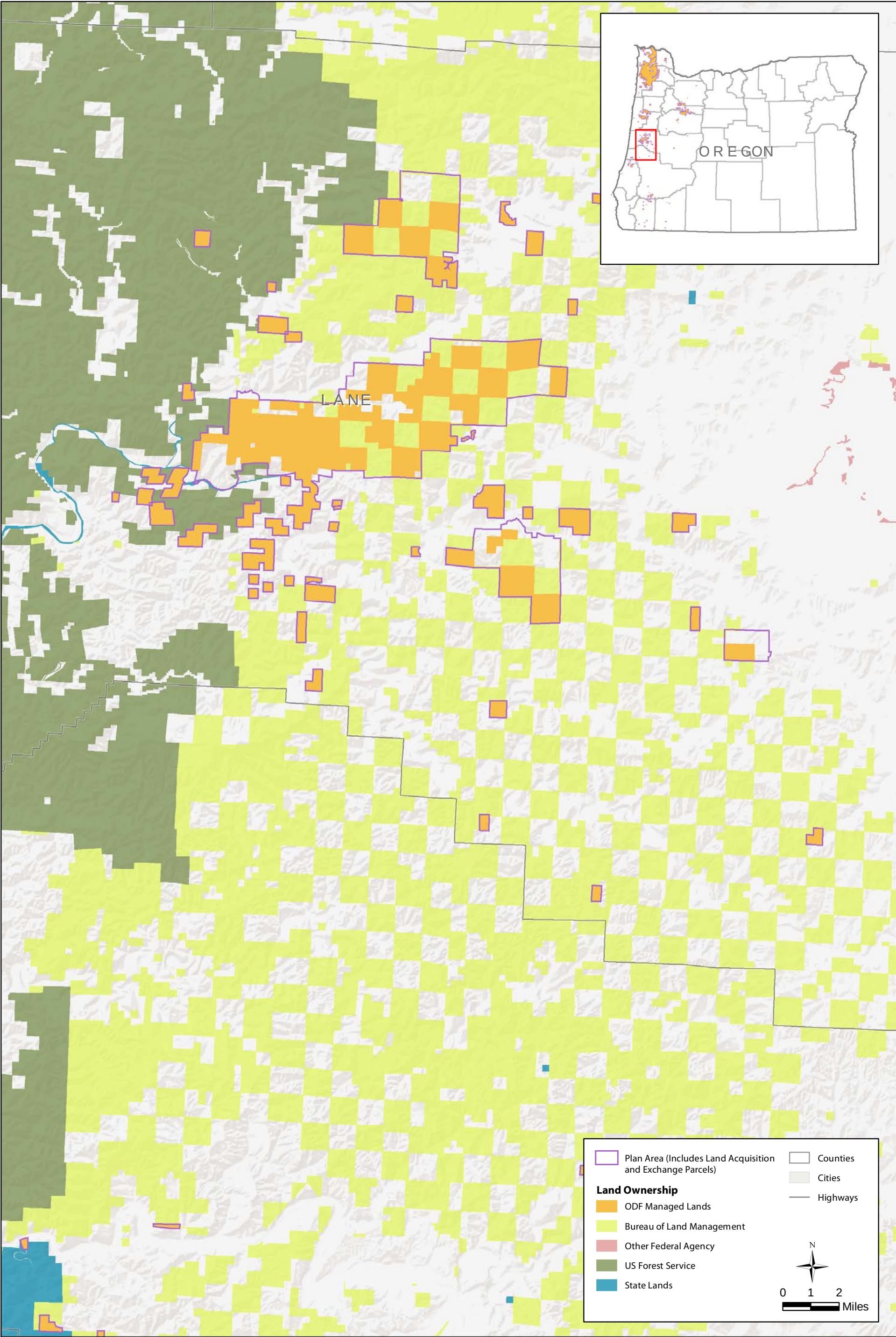


Figure 2-28j: Adjacent Land Ownership

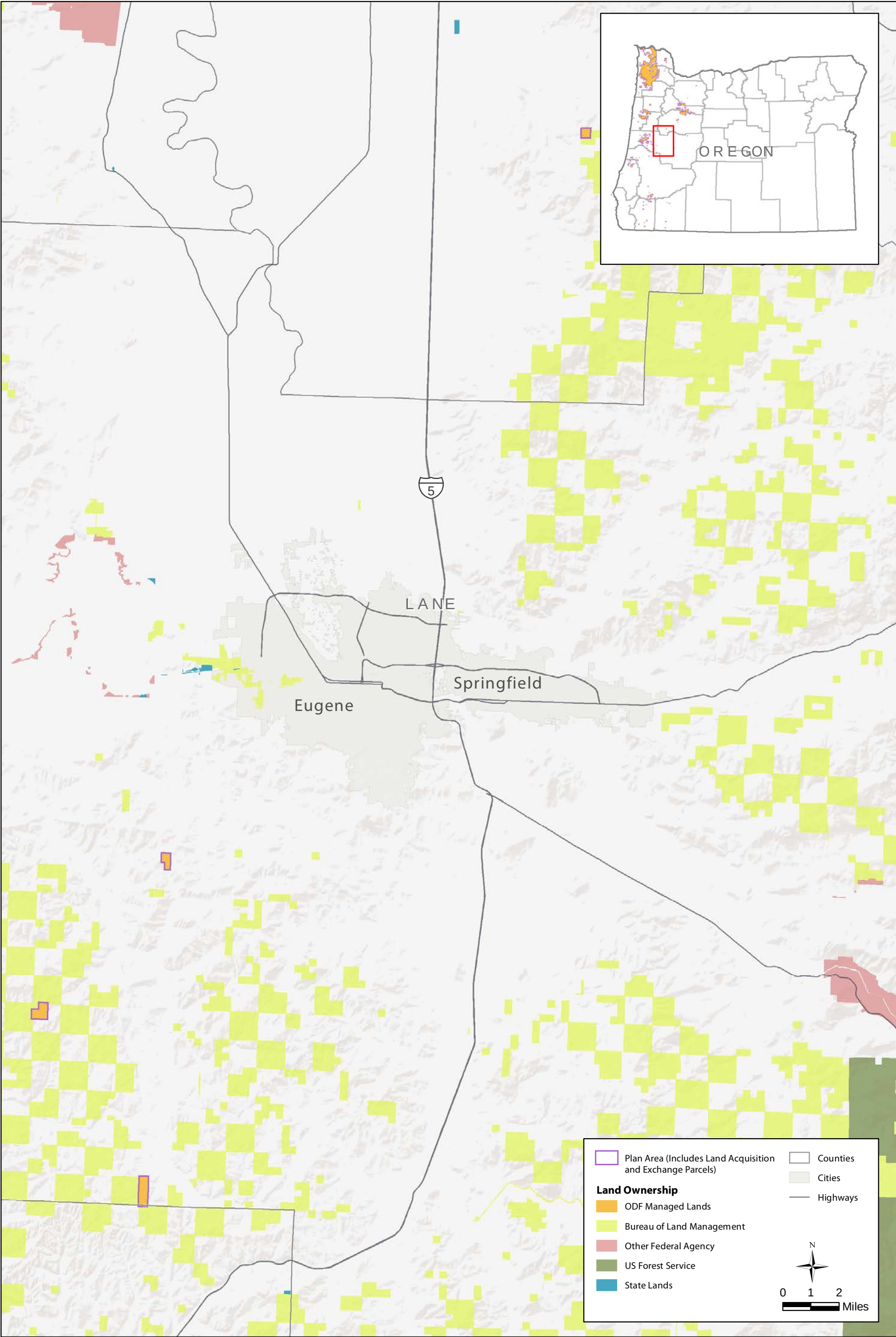


Figure 2-28k: Adjacent Land Ownership

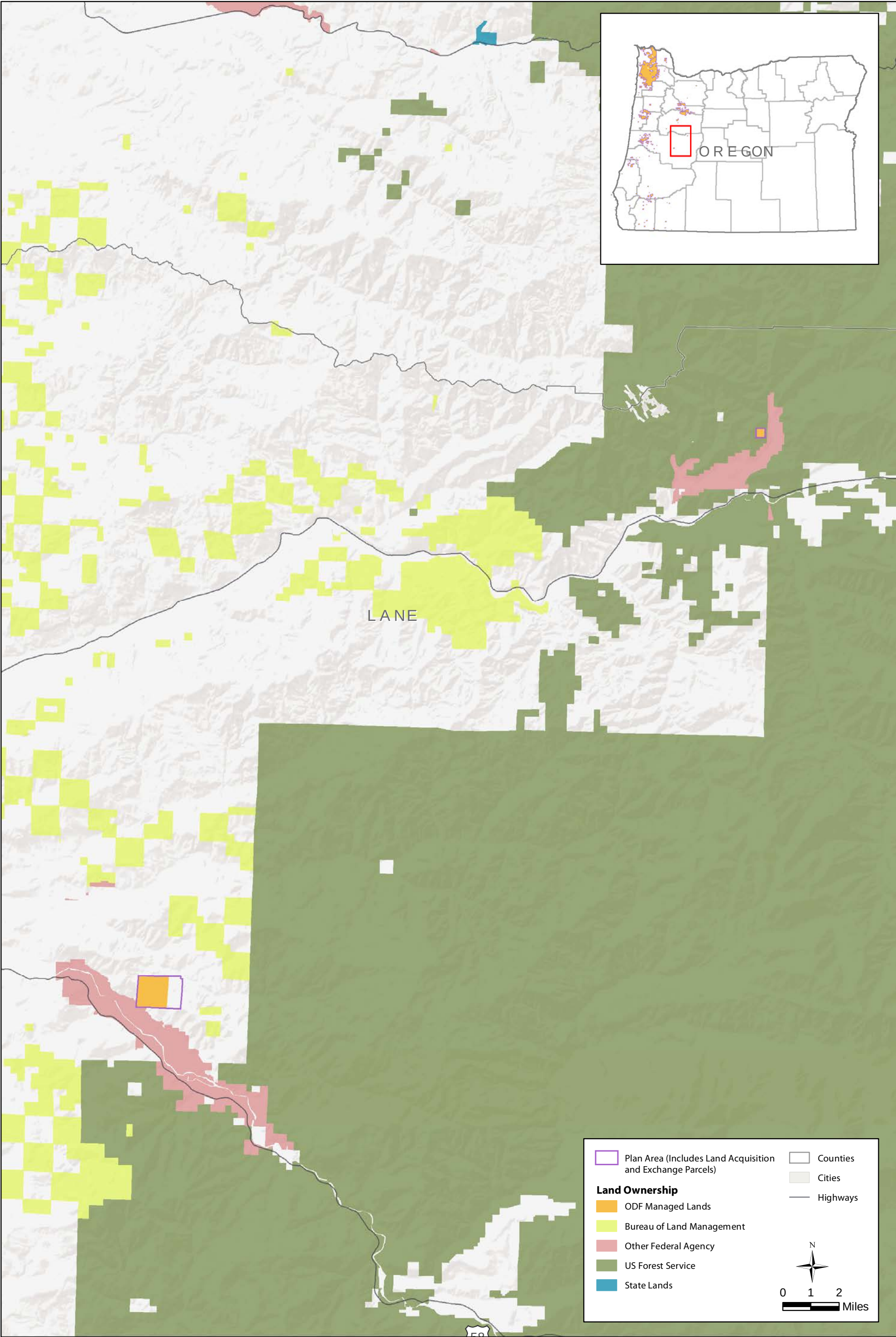


Figure 2-28l: Adjacent Land Ownership

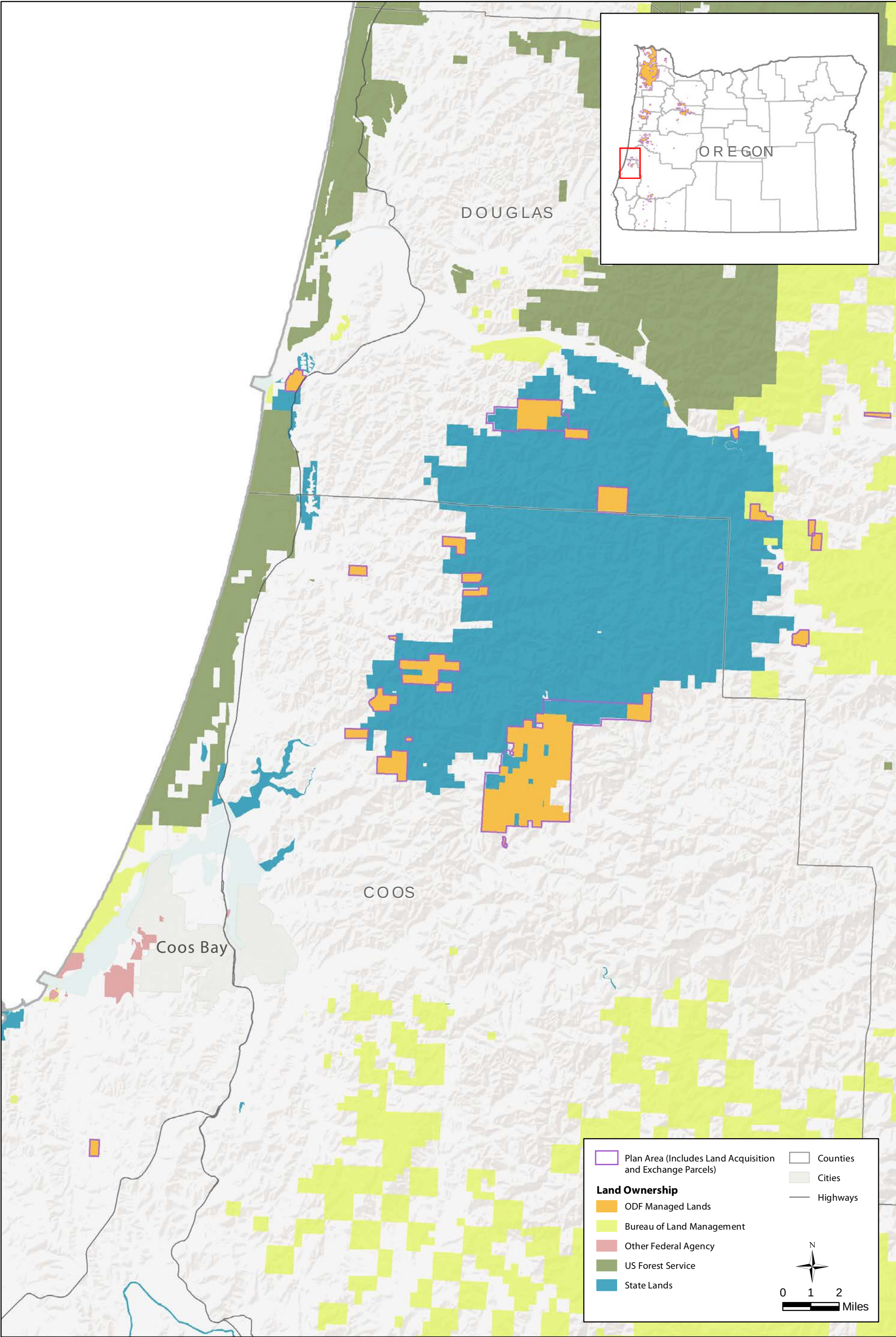


Figure 2-28m: Adjacent Land Ownership

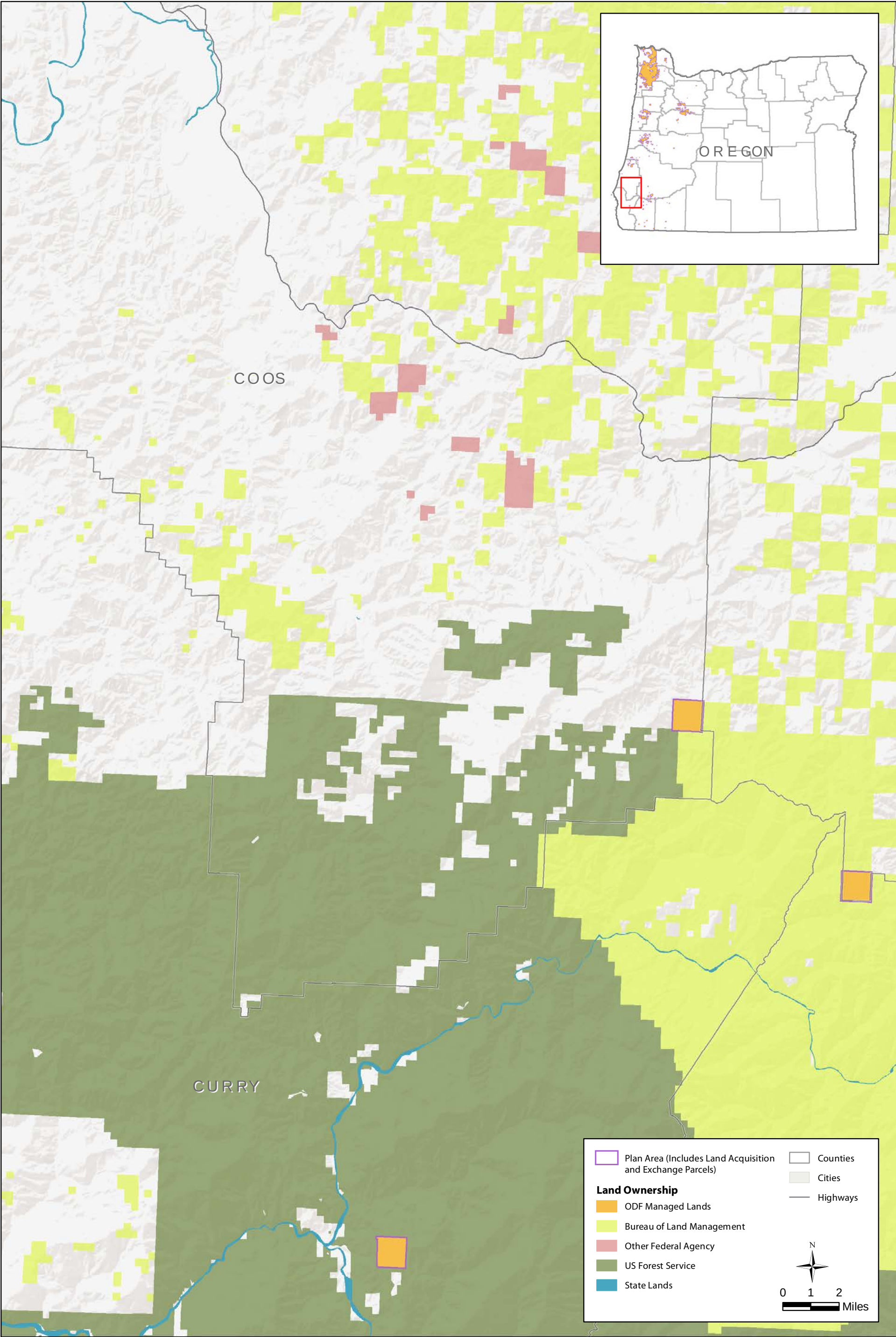


Figure 2-28n: Adjacent Land Ownership

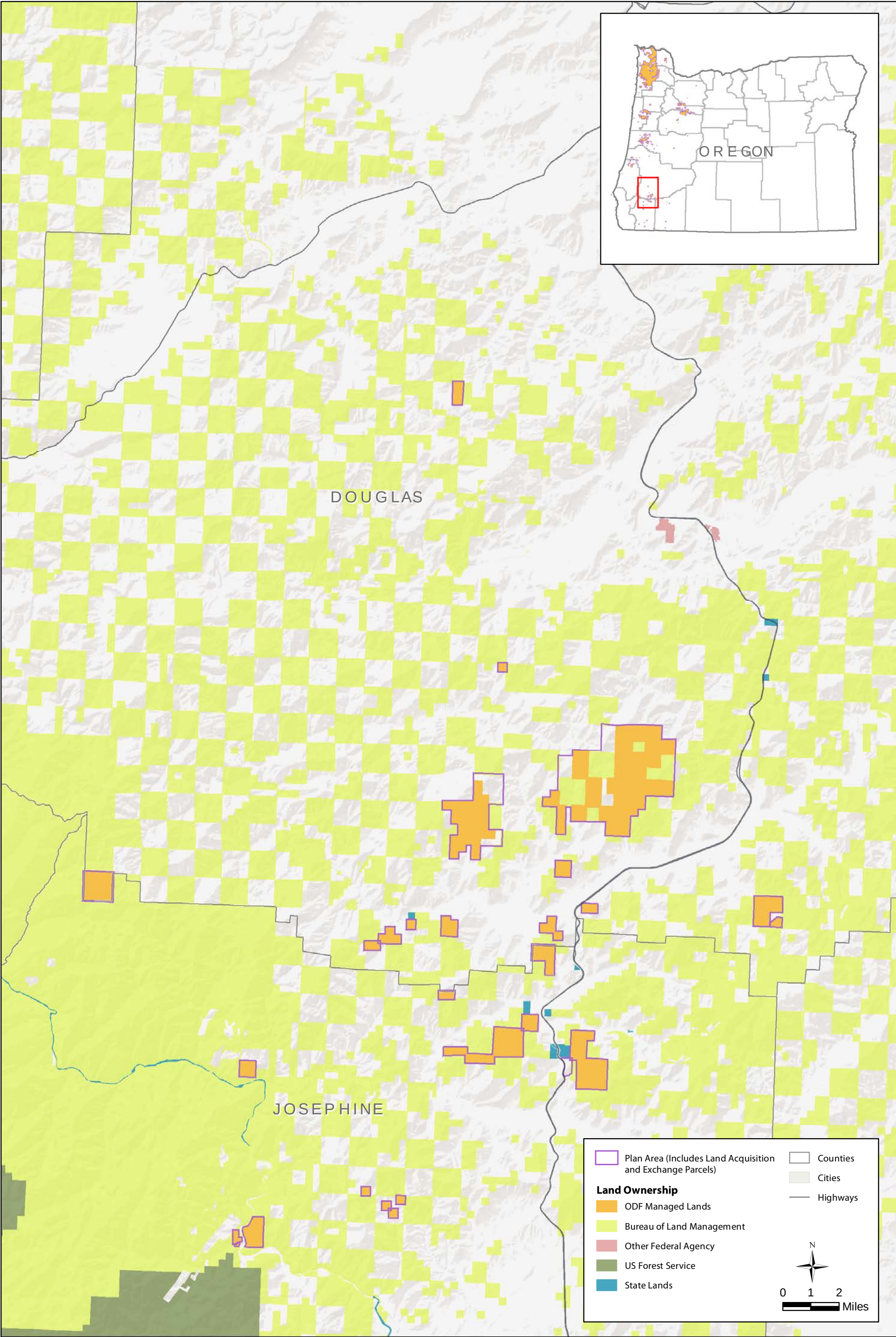


Figure 2-28o: Adjacent Land Ownership

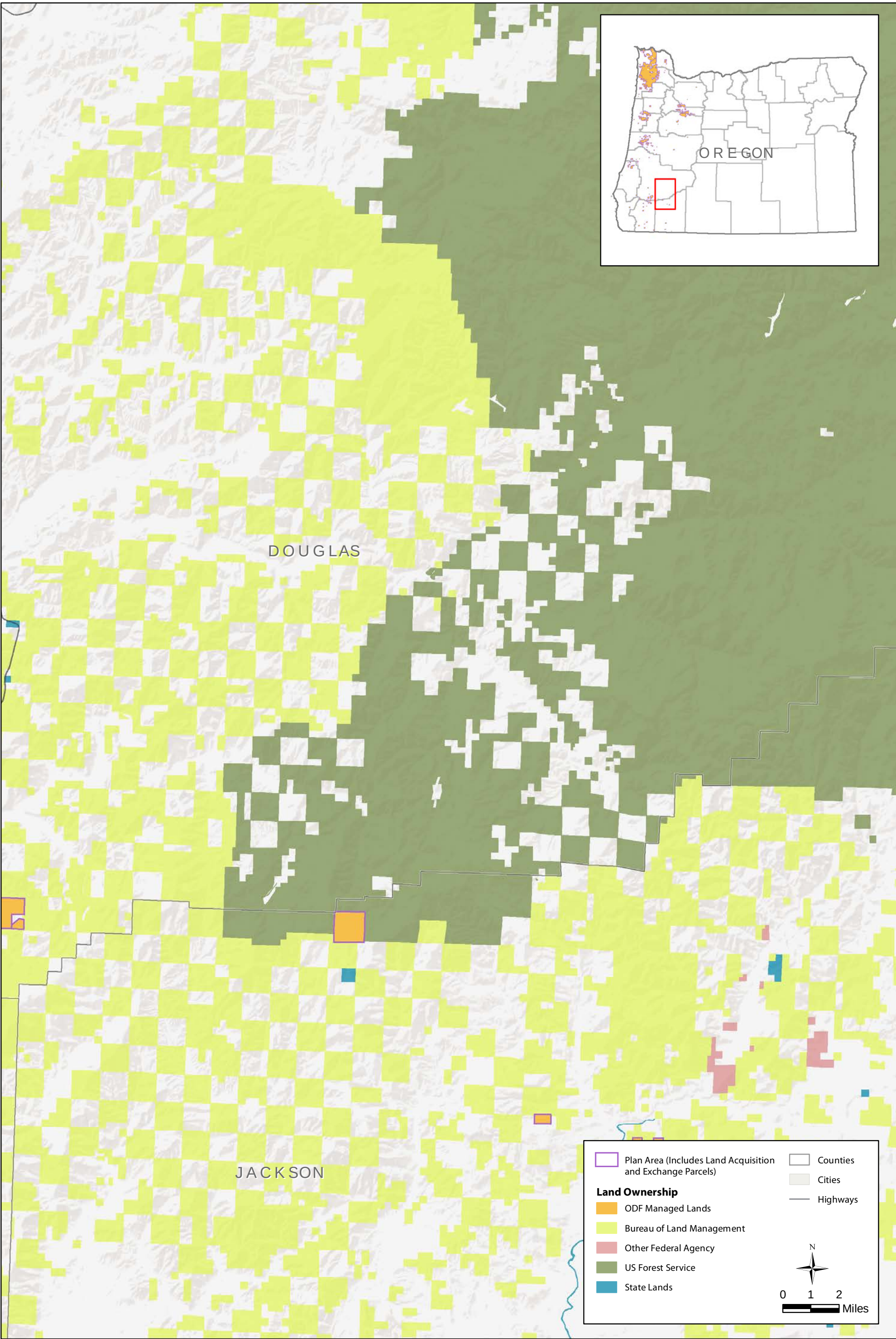


Figure 2-28p: Adjacent Land Ownership

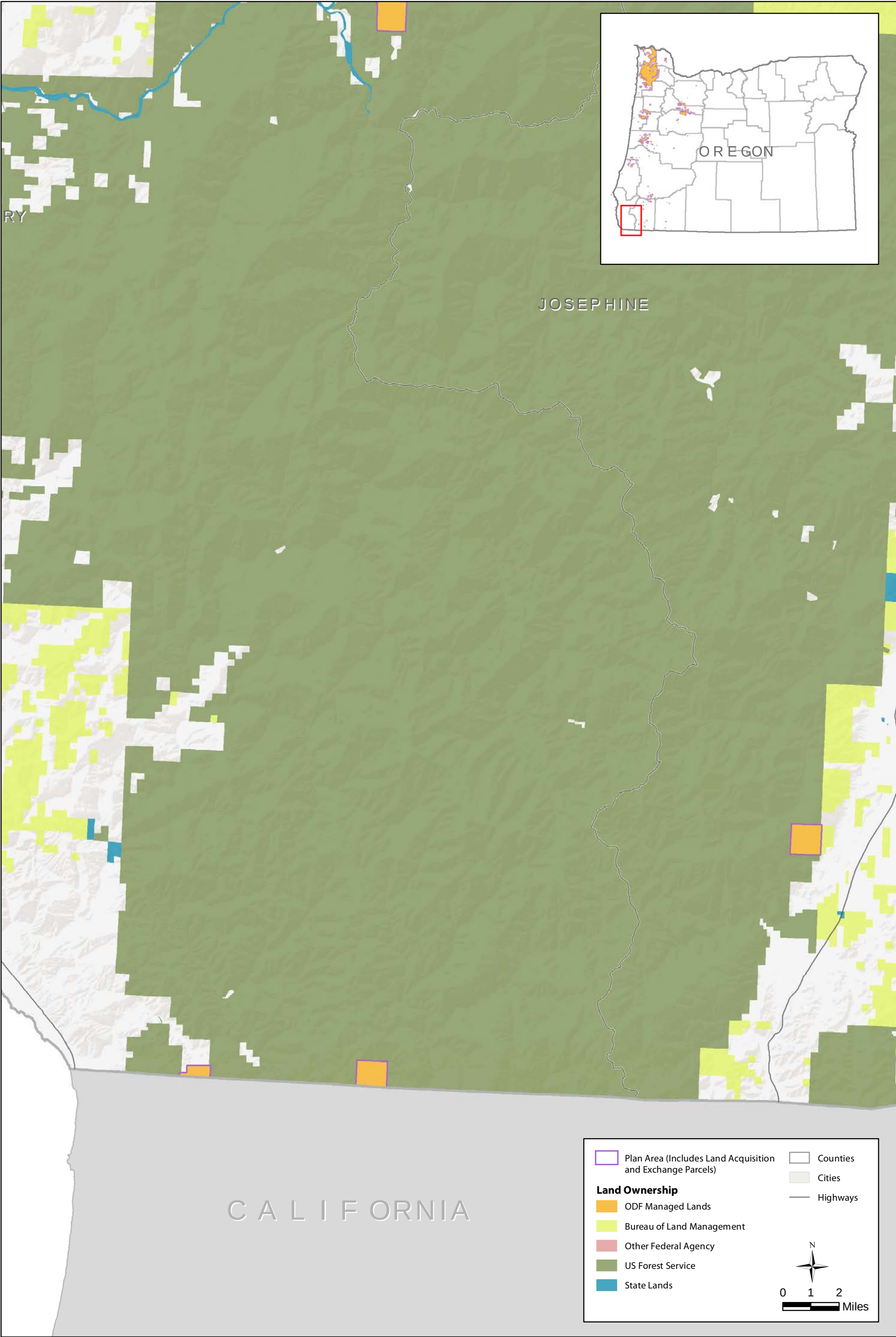


Figure 2-28q: Adjacent Land Ownership

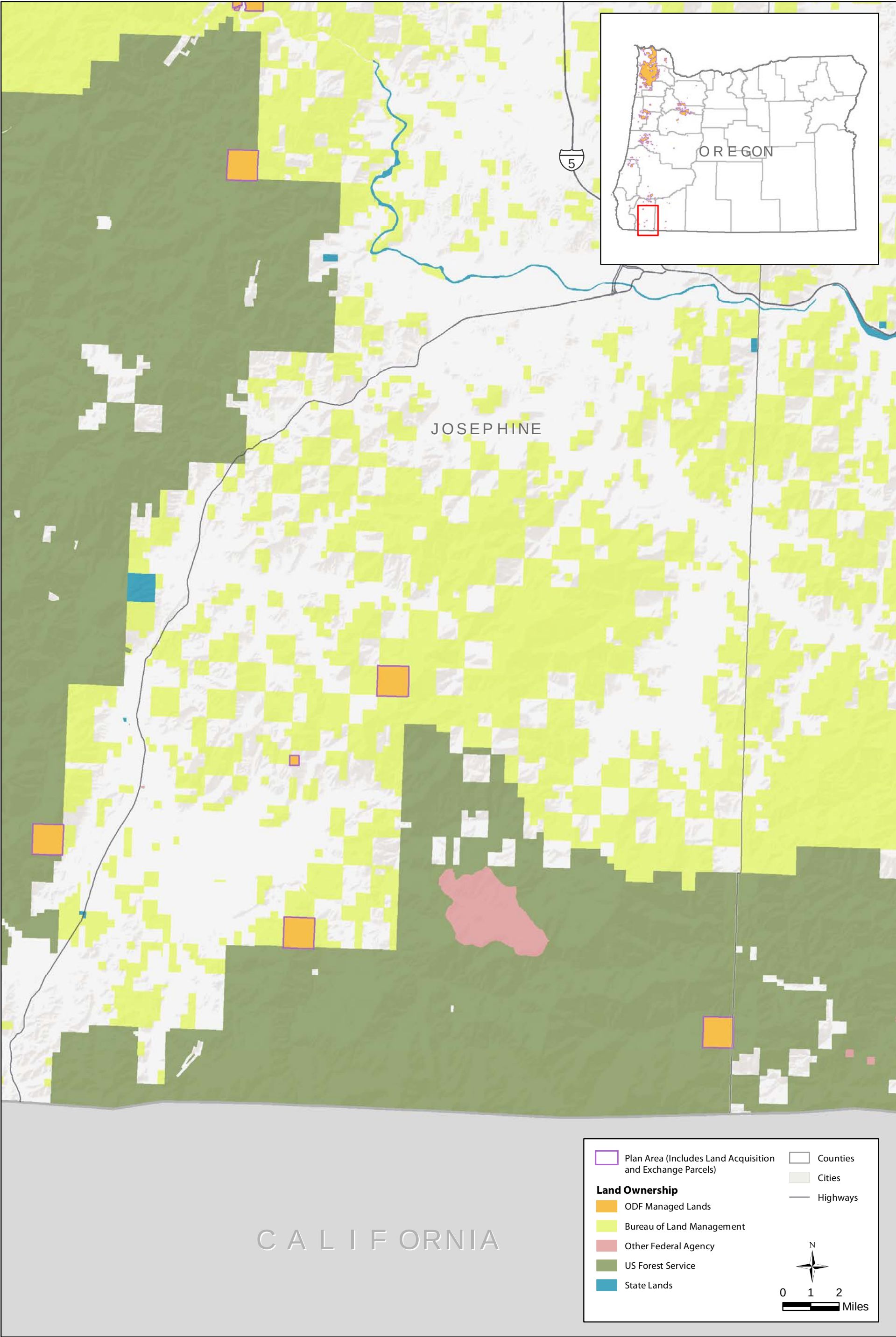


Figure 2-28r: Adjacent Land Ownership

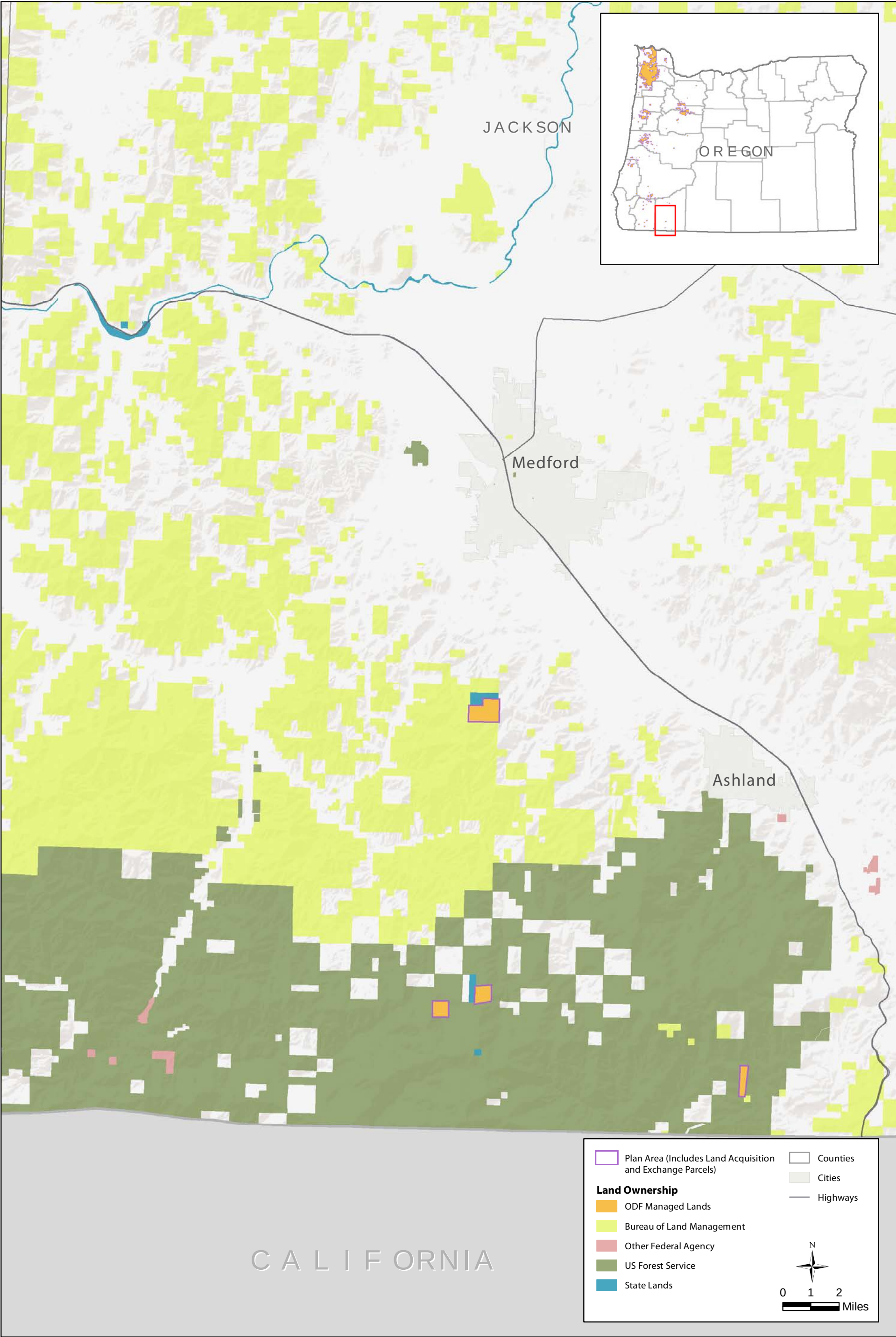


Figure 2-28s: Adjacent Land Ownership

3.1 Introduction

This chapter describes the projects and activities for which the Oregon Department of Forestry (ODF) proposes to receive incidental take authorization, collectively called *covered activities*. This chapter describes ODF's forest and recreation management activities in the permit area as well as the activities needed to carry out the conservation strategy, as described in Chapter 4, *Conservation Strategy*. In addition, Chapter 4 includes various operational and seasonal limitations on the covered activities, some of which are mentioned when describing covered activities. The descriptions in this chapter of the proposed covered activities, combined with the limitations on them, are of sufficient detail to support the conservation strategy and the analysis of the effects described in Chapter 6, *Analysis of Effects and Actions that May Result in Take*.

Covered activities were determined using a systematic screening process. ODF developed a list of screening criteria and then evaluated a draft list of potential covered activities against the criteria that follow to determine the need for coverage by the Western Oregon State Forests Habitat Conservation Plan (HCP).

Activities that met all of the following five criteria were identified as a covered activity in the HCP.

- **Control or authority.** The covered activity must be under the direct control of the permittee (ODF) as a project or activity it implements directly, implements through contracts or leases, or controls through regulation (e.g., a permit or other authorization).
- **Location.** The covered activity must occur in the permit area, as defined at the time the activity is executed.
- **Timing.** The covered activity must occur during the proposed permit term.
- **Impact.** The covered activity must have a reasonable likelihood of resulting in take of one or more covered species.
- **Project definition.** The location, footprint, frequency, and types of impacts resulting from the activity must be reasonably foreseeable and able to be evaluated in the HCP.

Broadly speaking, the covered activities described here correspond to activities regulated through the 1971 Oregon Forest Practices Act (FPA) (Oregon Revised Statutes [ORS] 527 and Oregon Administrative Rules [OAR] 629). The applicant's stewardship agreement with the ODF Forest Resources Division authorizes use of HCP methods and approaches instead of the OAR. Any action that is not otherwise described in this HCP would be implemented in accordance with the Oregon FPA. A permit amendment will be required if FPA standards change in a manner that exceeds analysis of take for the covered species.

The covered activities include HCP implementation actions that have the potential to cause incidental take, such as habitat restoration and some other conservation actions described in Chapter 4, *Conservation Strategy*. In addition, some types of covered species monitoring (e.g., fish

presence surveys) and some types of physical habitat monitoring could have the potential to cause incidental take.

The covered activities described in this chapter are intended to be as inclusive as possible of the activities currently occurring or expected to occur in the permit area and reasonably certain to result in take of the covered species. Activities not described in this chapter may become a covered activity under the HCP pursuant to the HCP modification process outlined in Chapter 8, Section 8.9, *Modifications to the Habitat Conservation Plan*.

ODF will notify and coordinate with the U.S. Fish and Wildlife Service (USFWS) and National Oceanic Atmospheric Administration (NOAA Fisheries) (collectively, the Services) regarding modifications to the HCP (Chapter 8, Section 8.9 *Modifications to the Habitat Conservation Plan*). The Services will make a determination about whether the proposed new activity can move forward under the terms and conditions of the existing permits. If the Services determine that it cannot, without violating the points above, ODF can seek an amendment, following the process described in Chapter 8, *Implementation*.

Covered activities are described in this chapter by type using eight broad categories: timber harvest activities; reforestation and young stand management; road system management; quarries, borrow sites, and stockpile sites; fire management; recreation infrastructure, maintenance, and operations; and conservation strategy implementation activities. The descriptions of covered activities are based on existing plans and reports by ODF.

Existing plans that were used to develop covered activities in the HCP include the following.

- *Northwest Oregon State Forests Management Plan, Revised Plan* (Oregon Department of Forestry 2010a).
- *Southwest Oregon State Forests Management Plan, Revised Plan* (Oregon Department of Forestry 2010b).

3.2 Timber Harvest Activities

Harvest activities are associated with the harvest of timber and other forest products. Harvest activities on state forest lands in western Oregon managed by ODF are carried out under a Forest Management Plan (FMP) developed by ODF and adopted by the Board of Forestry as administrative rules, as described in OAR 629-035-0030, and in accordance with the Oregon FPA and as modified by the HCP. An updated FMP is being prepared that will incorporate the conservation measures of the HCP as part of addressing required FMP resource goals pertaining to providing properly functioning aquatic and terrestrial habitat, both for covered species in the HCP and for a variety of other native wildlife species. The FMP will include the operational and seasonal constraints on harvest activities described in Chapter 4, Section 4.7.2, *Conservation Action 2: Riparian Equipment Restriction Zones*; Section 4.7.7, *Conservation Action 7: Manage Habitat Conservation Areas*; Section 4.7.8, *Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas*; Section 4.7.10, *Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species*, as well as additional guidance on the best management practices used by ODF.

Sustainable and predictable timber harvests, and their revenue, support jobs as well as county and local taxing districts; they also provide funds to support ODF operations, including implementation

of the HCP. Outside of proposed conservation areas, most stands will be managed for timber production, with a predicted focus on thinning and regeneration harvests to grow stands that generate a product mix of predominately large and medium sawtimber. Stands will be evaluated for precommercial thinning and considered for a commercial thinning entry prior to the regeneration harvest. Depending on individual site conditions and management objectives, a stand may receive multiple commercial thinning entries or none at all. This general management regime, in conjunction with the retention standards described below, will help ensure that areas outside of the conservation areas will provide conservation value for other native wildlife species that are not covered under this HCP. The habitats outside of the conservation areas as well as their location and longevity will reflect a dynamic landscape, based on ODF forest management planning. However, it is expected that these areas will contribute to habitat connectivity between conservation areas as well as support the potential presence of covered species throughout the permit term.

3.2.1 Harvest Methods

Harvest activities include felling, bucking, yarding, processing, loading, and hauling. *Felling* means cutting down trees. *Bucking* means cutting felled trees in the field into predetermined lengths, as specified by the timber purchaser, to maximize tree value. Trees may also be felled and yarded to be processed on a landing or road.

The following techniques are used to fell and buck trees.

- On steep terrain, contractors fell and sometimes buck trees with handheld chainsaws.
- Mechanical felling is done by a feller-buncher to fell trees when terrain is not steep. These machines are structurally similar to trackhoes. They use an articulated attachment to grab, fell, and bunch the trees with other trees or logs for subsequent skidding (transport) to the landing.
- A more complex machine, the cut-to-length, is used to grab, fell, de-limb, and buck trees into logs using processor heads. These machines can operate on moderate slopes. They have no blades or attachments for moving soil, which minimizes soil disturbance and compaction.
- All ground-based felling and skidding machines can be equipped with winches for use on steep slopes. Tethered-assist equipment and other advances in technology allow ground-based harvest on steeper terrain. Tethered-assist logging will be evaluated on a case-by-case basis and employed only where it does not increase sediment delivery to the aquatic system.

Yarding or skidding means moving logs from where they were felled to a landing using cable systems, ground-based equipment, or other means. *Landings* are cleared areas where logs are stored (yarded, swung, skidded, lowered, or forwarded) for subsequent loading onto trucks for transport.

The following techniques are used for yarding or skidding.

- Cable yarding employs wire ropes to move logs to a truck road or log landing; it is most often used to move logs uphill over steep terrain. Yarders use powered drums filled with rope or cable and a vertical tower or leaning boom to elevate the cables (“skylines”) as they leave the machine. The opposite end the wire rope is anchored to a tree, known as a *tail hold*. These locations are often across a canyon or on another hillside that provides the proper deflection and lift to make cable yarding possible. Wire-rope guy lines hold the tower in position while the machine is in operation.

- In steep terrain where one side of a canyon is not directly accessible, or ODF seeks to minimize road building, skylines are anchored high enough on the opposite slope so that logs can be fully suspended, thereby minimizing the width of corridors. Because of the geometry, the riparian forests along streams closest to the yarder require wider (20 to 35 feet wide) and generally more closely spaced corridors, which must be cut through them. Riparian forests that are farther from the yarder typically require fewer, smaller crossings cut through them (e.g., 100 to 150 feet apart and 12 to 15 feet wide).¹
- There are operational and seasonal constraints to the cable yarding described in Chapter 4, Section 4.7.2, *Conservation Action 2*, and Section 4.7.10, *Conservation Action 10*.
- A common technique employed is *ground-based yarding*, which involves the use of tracked or rubber-tired tractors (skidders) for skidding logs to the landing. Machines are able to grasp the logs using powered grapple attachments or wire-rope winch lines. Ground yarding generally works on gentle to moderate slopes, but some of the modern ground yarding equipment can work on slopes up to 60%.
- Ground-based yarding can also be done by loader logging. A trackhoe log loader physically picks up and swings the whole tree toward the landing. The tree may be picked up several times as the loader gets the trees to the landing for processing.
- Cut-to-length logs are skidded with a forwarder that is equipped with a grapple and bunks. This skidding system carries logs clear of the ground to the landing, thereby minimizing ground disturbance.

Processing includes limbing and bucking into logs. Some processing can occur on site where the tree is felled by chainsaw or cut-to-length, though most is done at the landing or road. Processing is mainly done by stroke de-limbers or dangle-head processors mounted on trackhoes.

Loading means loading logs from the landing area to a truck for transport. Logs are loaded onto trucks using equipment such as hydraulic trackhoe log loaders or heel-boom loaders, which may be used without leaving the road grade. Wheeled loaders have more limited mobility and functionality than tracked machines. Some log trucks are self-loading and equipped with a log loader on the truck to both load and transport logs.

Hauling means the transport of logs to mills by trucks. Road design and maintenance, including road surfacing, proper drainage, and overall stability, support the ability to haul during different weather conditions and control sediment delivery to the aquatic environment. Restrictions on hauling during wet weather (i.e., not allowing hauling activities during periods of wet weather) further prevent such sediment delivery.

3.2.2 Harvest Types

Silvicultural approaches described in this chapter are used when site-specific conditions warrant the need; they would be applied in future harvests under similar circumstances. For example,

¹ Yarding corridors radiate outward from the yarder much like spokes on a bicycle wheel, with the yarder acting as the hub. Corridor spacing varies, depending on the location along the spoke. Near the landing (the center), corridors are closer together; farther out, they are more widely spaced. Wider spacing near the landing helps prevent corridor overlap, especially when multiple corridors converge, ensuring efficient log movement and minimizing disturbance.

clearcutting² provides an efficient harvest and regeneration of forest stands; it also helps young trees reach a “free-to-grow” state that is not compromised by competition from a residual overstory of older trees or the possibility of damage from the repeated site disturbance that is implicit in the application of other silvicultural systems. When applied, clearcutting would follow the rules described under *Clearcut*, below.

3.2.2.1 Regeneration Harvest

The intent of a *regeneration harvest* is to develop a new stand. In general, residual trees left after a regeneration harvest are intended to remain on the site through the life of the new stand and subsequent stands. All types of regeneration harvests retain less than 80 square feet of basal area per acre (based on trees greater than 11 inches in diameter at breast height [DBH]). The harvest types are best defined using residual trees per acre or square feet of basal area per acre; in either case, only trees greater than 11 DBH are counted.

Clearcut

A *clearcut* removes all (or nearly all)³ trees in a stand; however, the Oregon FPA requires that at least a few live trees be retained in each unit, which will be met and exceeded, based on stand-level management standards described in Chapter 4, *Conservation Strategy* (Chapter 4, Table 4-10). Clearcuts will provide the best conditions for successful establishment of forest stands for future timber production. At higher retention densities, there can be nearly as much basal area as a heavy thinning.

At higher retention densities, regeneration is more difficult but still achievable, while complex stand structures are likely to develop more quickly than at lower densities.

The following requirements for the clearcut harvest types outside of designated habitat conservation areas (HCAs), are detailed further in Chapter 4, Section 4.7.8, *Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas*.

- Any Type 3 harvest would be subject to the Oregon FPA rules for Type 3 harvests (maximum size is 120 acres with green-up requirements).
- Retention of live green trees, snags, and downed wood in the upland harvest unit, as described in Chapter 4 (Chapter 4, Table 4-10).
- Retains up to 80 square feet of basal area per acre (on Site Class I, II, or III).

Clearcut harvest will also occur in HCAs to manage specific disease and forest composition issues during the first 30 years of the permit term. These harvests will adhere to additional requirements and follow the prescriptions detailed in Chapter 4, Section 4.7.7, *Conservation Action 7: Manage Habitat Conservation Areas*.

² Clearcutting removes most trees in a stand, with the exception of residual components of reserved trees, snags, and downed wood. Clearcutting is one of several types of regeneration harvests where a forest treatment is applied to a stand to improve its regeneration potential.

³ *Clearcut* refers to Type I, II, or III harvest types under the Oregon FPA. Most ODF clearcuts will be Type II or III.

3.2.2.2 Partial-Cut Harvest

The intent of a *partial-cut* harvest is to manage the growth and density of an existing stand. A prescription for a partial cut may be designed to increase the structural complexity of a stand, maximize volume growth, or capture tree mortality. A stand may be partially cut several times throughout its life. All partial-cut harvest types retain at least 80 square feet of basal area per acre for trees greater than 11 inches DBH. Improvements in markets for small wood and in the machinery used to harvest small stems may allow economic harvesting of younger stands, which would allow some stands to forego precommercial thinning and continue growing, with an early commercial thinning being employed instead.

There are several forms and intensities for partial cuts; however, the most common form is *thinning*. Thinning prescriptions are often designed using measures of Stand Density Index (SDI)⁴ or Relative Density to remove a portion of the trees from a stand in a generally uniform pattern. Sometimes thinning prescriptions are developed to increase the horizontal diversity within a stand; a diameter limit prescription often results in a stand with variable density.

The structure of a stand immediately after a partial cut (1 to 3 years) is dependent on both the harvest prescription and the structure of the stand prior to harvest. Generally, the stand structure will remain the same or become more complex, though a short-term reduction in canopy cover can reduce habitat suitability for some species (e.g., the covered ones).

Heavy Thinning

A *heavy thinning* approaches the harvest intensity of a regeneration harvest. The management focus will be on enhancing growth and the structural characteristics of retained trees, releasing an existing cohort of suppressed trees, or initiating a new cohort to speed up understory development, which leads to an increase in vertical canopy structure throughout the thinning area. A heavy thinning results in fast growth for individual trees but reduces the total volume growth of the stand.

Heavy thinning retains an SDI percentage of less than 25.

Moderate Thinning

A *moderate thinning* provides optimal stand growth and allows vigorous growth of individual trees. Where an established understory tree component exists, vertical canopy structure will continue to develop with a moderate thinning; depending on species composition and site index, a new cohort of trees may be initiated.

Moderate thinning retains an SDI percentage greater than or equal to 25 but less than 35.

Light Thinning

A *light thinning* focuses on maintaining stand growth and health. Yet, more complex stand structure may not be developed with a light thinning, and a new cohort of trees may not be initiated. To achieve these goals, a light thinning may occur more frequently than a heavy or moderate thinning in the same stand. Some examples of circumstances under which a light thinning might occur include:

⁴ Measure of the stocking of a stand of trees, based on the number of trees per unit area and DBH of a tree of average basal area.

- **Scenario 1.** Inside of HCAs, light thinning would occur in stands that buffer known occupied habitat or suitable habitat of unknown occupancy to improve buffer function and marbled murrelet habitat development while minimizing edge effects.
- **Scenario 2.** Light thinning may be implemented when the intent is to provide access to a nearby stand. For example, a yarder may need to cut a corridor through a small wedge of a different habitat type to access a larger block behind it. In such cases, the thinning at the top of the setting (near the yarder) may be lighter, aiming to minimize impact on the stand while still providing some treatment toward achieving a specified habitat type.
- **Scenario 3.** Multiple entries may be made in some locations with the intent of producing a specialty product, such as poles. For pole sales, an entry may be planned for the sale unit, targeting only a specific type of tree that meets a set requirement (e.g., tall, straight trees with no defect). A future entry may be made into the stand at a later date to either perform a regeneration harvest (if outside of HCAs) or thin the remaining stand further to meet a habitat target (inside of HCAs), if it is determined that this is still necessary beyond the initial light thinning.

In some cases, light thinning may also be used in one stand to provide access to a nearby stand where the treatment is targeting a specific habitat type. In these access situations, the light thinning would not be repeated in a stand used solely for access purposes. Light thinning retains an SDI percentage greater than or equal to 35.

Variable Density Thinning

Variable density thinning combines light, moderate, and heavy thinning within a stand at scales that mimic spatial heterogeneity in late-seral forests resulting from small-scale disturbances and unmanaged stand development. This type of harvest can be combined with patch cuts (e.g., in root-rot pockets) and underplanting to improve spatial and structural stand complexity.

A variable density thinning will retain at least 80 square feet of basal area. Potential patch cuts are applied at a 0.25- to 2.0-acre scale or less than 15% of the unit.

3.2.2.3 Salvage Harvest

Salvage harvest is the removal of timber in the aftermath of a natural disturbance event that affects forest health, such as insects, disease, wildfire, or severe weather such as wind or ice. Salvage activities would vary from selective harvest of individual trees to clearcut harvest, depending on the magnitude and severity of the disturbance event, pre- and post-disturbance stand conditions, and desired future conditions. Salvage efforts provide access, safety, and economic returns and have some control over reforestation/restoration pace and outcomes. Roadside salvage occurs at a specific distance from one or more roads rather than in a specific unit or area. Significant salvage acreages are grouped into harvest units that are treated similarly to other timber harvests.

Salvage harvest will not occur in riparian conservation areas (RCAs) or HCAs unless to specifically provide for the safety of the public; ODF employees; contractors, co-operators, and volunteers; or facilities and infrastructure, in which cases it is expected to be in the form of hazard tree removal (Section 3.2.2.4, *Hazard Tree Removal*) in a limited localized area that might infrequently include the harvest of a small cluster or patch of trees. If the salvage of hazard trees occurs in RCAs, felled trees will be left in the RCA and felled toward the aquatic zone so that they can eventually be recruited into the stream, thereby providing nutrients and sediment retention to benefit covered aquatic

species. In rare cases where retaining trees within RCAs would contribute to an ongoing hazard situation, tree removal may occur to address the hazard. This activity is expected to be infrequent and would be documented in the annual reporting process to provide transparency and assurance to the Services. Any salvage operations in HCAs not directly related to protecting public safety or facilities, or that affect more than a limited localized area, will be responded to pursuant to Chapter 7, Section 7.3.3.2, *Change in Species Habitat Quality from Fire, Storms, Invasive Species, or Disease*, under the *Response* subheading, unless the scale of the natural disturbance is so large that it would be deemed an unforeseen circumstance (Chapter 7, Section 7.3, *Changed and Unforeseen Circumstances*). If operations are below thresholds that trigger changed or unforeseen circumstances, they will be conducted pursuant to a technical assistance discussion with the Services (Chapter 8, Section 8.3, *Technical Assistance*) to determine if salvage might be necessary to support the biological goals and objectives of the HCP following a disturbance event.

3.2.2.4 Hazard Tree Removal⁵

Hazard tree removal is the removal of standing trees or snags that present a hazard to employees, the public, or infrastructure (public or private) due to conditions such as, but not limited to, deterioration or physical damage to the root system, trunk, stem, or limbs as well as the direction and lean of the tree (Occupational Safety and Health Administration 2025), as defined at <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.266>. Hazard tree removal uses the same equipment and methods as other types of harvest and is generally a selective removal of individual or small clumps of trees. During tree removal, the amount of compaction or erosion is generally limited due to the isolated nature of the tree removal. Multiple techniques are used to protect soils from compaction or ponding that causes excessive erosion. Common techniques include limiting ground equipment activity to gentle slopes and, if safely possible, time periods when soil moisture is low. Other techniques involve limiting the of area on which ground equipment may operate. Cable and ground equipment operations must minimize gouging and soil displacement.

3.3 Reforestation and Young Stand Management

Stand-management activities are those performed between the time when a stand has just been harvested and the time when the stand is ready for another harvest. This section describes these activities as well as certain other conservation actions, such as snag creation, that may be performed within a stand to enhance stand utility for covered species. These activities tend to be performed at certain times following stand removal, usually by clearcut harvest (Table 3-1). This section also addresses activities that will occur outside of HCAs. Reforestation and young stand management inside HCAs will be subject to additional standards described in Chapter 4, Section 4.7.7, *Conservation Action 7: Manage Habitat Conservation Areas*, and Section 4.7.10, *Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species*.

⁵ Not all hazard trees are removed or sold; it depends on circumstances. If the tree is sound enough, market conditions and feasibility may allow for sale. Otherwise, if not merchantable or removal is not feasible, logs are often left on-site, especially if they pose no further hazard.

Table 3-1. Typical Timing of Harvest and Stand Management Activities

Treatment	Timing of Treatment Typically Occurs
Site preparation	0–1 years post-harvest
Tree planting	0–2 years post-harvest
Release treatments	0–10 years post-harvest
Mountain beaver control	3–6 months prior to planting, 1–3 years post-planting ^a
Precommercial thinning and pruning	10–20 years post-planting

^a Refers only to mountain beaver control.

Stand management includes silvicultural practices designed to control the establishment, composition, growth, health, and quality of stands to achieve forest management objectives. Silvicultural practices include site preparation, tree planting, manual release, mountain beaver control, and precommercial thinning. Stand management activities are described in the order in which they are typically performed.

3.3.1 Site Preparation

The majority of harvest units subjected to clearcuts, regeneration harvest, retention, or patch cuts will receive site-preparation treatment. Site preparation is any planned measure to prepare a site for the favorable conditions for newly planted seedlings. Site preparation should not cause detrimental or excessive soil disturbance and should be carried out in a cost-effective manner. Through site preparation, factors that are limiting for seedling survival and growth may be overcome. Such factors may include limited soil moisture, low light levels, and compacted soil. Logging slash can have positive and negative benefits and should be evaluated on a site-by-site basis.

The three main site-preparation techniques are mechanical, chemical, and broadcast burning. Mechanical site preparation uses mechanized equipment (most commonly trackhoes or an excavator fitted with grapples) to rearrange or alter logging slash or disturb the forest surface layer and vegetation to create seedbeds or planting spots. Mechanical site preparation reduces competition of other vegetation with crop trees for light, water, and nutrients. It can alter wildlife habitat, both positively and negatively, and be a source of invasive species introductions; these should be taken into consideration before use at each site. It can also be used to treat the adverse effects of past activities, such as compaction.

Chemical site preparation is not a covered activity (Section 3.9, *Activities Not Covered*). Broadcast burning is a covered activity and described under Section 3.6, *Fire Management*.

3.3.2 Tree Planting

3.3.2.1 Initial Planting

Initial planting must occur within 2 years following a regeneration harvest. Planted seedlings will be well suited and adapted to the reforestation site; where appropriate, a mix of species will be planted to increase diversity across the permit area. ODF is required to meet certain stocking standards after harvest, as defined in the FPA (OAR 629-610-0000–629-610-0090). Planting density must be at least 200 trees per acre but is more likely to be 350 to 538 trees per acre. Seedlings will be well distributed, with greater than 80% of the harvest unit covered. Stock type will be site specific and

consider factors such as soil type, soil quality, and animal browse potential. Species selection will be on a site-by-site basis, with the goal of increasing diversity across the landscape to increase resiliency in the uncertainty of climate change. In areas of disease, such as Swiss needle cast or laminated root rot, planted species will be of tolerant stock or from a resistant species, with an emphasis on resistant species. Finally, seedlings will be free to grow (seedlings are able to out-compete surrounding vegetation) within 6 years after harvest activity. If desired conditions are not able to meet these standards, an alternative management plan (OAR-629-605-0173) will be submitted prior to harvest. Use of an alternative management plan is expected to occur inside HCAs and be subject to the additional standards described in Chapter 4, Section 4.7.7, *Conservation Action 7: Manage Habitat Conservation Areas*.

3.3.2.2 Interplanting

Interplanting generally occurs during the first or second year after initial planting when stocking levels fall below FPA minimums. In certain instances, interplanting will occur to increase stocking on high-quality sites to fully occupy the site. In other areas, lower stocking will be acceptable because it will provide more complex early seral stand conditions while still meeting FPA requirements. Interplanting of units can occur even if the unit meets the requirements of the FPA to ensure the site is fully captured. Density will be site dependent, but range from 200 to 400 trees per acre.

3.3.3 Manual Release Treatments

Manual release can include cutting down noxious weeds or hardwoods. Hardwood release is used when ingrowth of hardwoods, mainly red alder (*Alnus rubra*) in the Northwest, threaten to change the stand from conifer dominant to hardwood dominant. In this treatment, the majority of hardwood ingrowth is removed using chainsaws, leaving all of the conifer trees. This differs from precommercial thinning (Section 3.3.5, *Precommercial Thinning and Pruning*) in that conifer spacing and species are not manipulated.

3.3.4 Mountain Beaver Control

Animal damage on newly planted seedlings reduces the seedlings' overall size, health, and vigor. Extensive damage can lead to interplanting and extend the time to achieve free to grow, potentially violating the FPA. Animal damage occurs in many forms, but the most common is from mountain beaver.

Mountain beavers clip the seedling at its base, causing mortality. As the seedling ages, the diameter becomes too large; the animal climbs the stem and clips branches or girdles the tree roots. Mountain beaver browse will occur in most stands in the northern part of the permit area as well as some portions of the southern part.

Control measures are used when the negative impacts are expected to cross threshold limits. Common control methods include rigid seedling protector tubing and mountain beaver trapping. Mountain beaver control is implemented primarily in the Tillamook, Clatsop, and Santiam State Forests, following the management strategies identified by the Oregon State University Extension Service (Taylor et al. 2013). Traps are placed at active mountain beaver sites but may infrequently capture nontarget species such as skunks, rabbits, and long-tailed weasels.

3.3.5 Precommercial Thinning and Pruning

Precommercial thinning involves thinning dense, young forest trees by mechanical means, including felling individual trees or mechanically sawing or chipping rows or groups of trees. For stands between 10 and 20 years old, precommercial thinning may occur to remedy overstocked conditions in which trees exceed target densities. Thinning reduces tree density so that remaining trees achieve optimum diameter growth. Thinning can also be done to reduce insect and disease issues and increase overall forest health. Trees felled during a precommercial thin are typically left on the ground because they are too small to meet current merchantable standards. This operation is generally performed only once in the life of a stand and only in those stands with an excess number of trees per acre.

Pruning removes the lower limbs of desirable tree species to increase the eventual product value of the pruned trees. Pruning is a rarely used activity, optimally performed when the trees are small enough to minimize the size of knots on the tree and maximize the production of high-grade, knot-free wood at the time of anticipated harvest. Pruning can also be done for forest health. In western white pine stands, removing the lower limbs decreases the white pine blister rust pathogen. Pruned trees must maintain a minimum of 50% of their live crowns. To maintain the live crown and minimize the size of knots, pruning is typically done several times as the tree grows. Pruning is typically conducted by hand with hand tools or a chainsaw.

3.4 Road System Management

Road system management involves activities associated with the construction, use, and maintenance of forest roads and associated facilities—chiefly landings and drainage structures such as bridges and culverts. This category of covered activities also includes the vacating of such facilities.

ODF has inherited an extensive road network that was built in the 1940s, 1950s, and 1960s to access and service large-scale timber salvage operations in northwest Oregon, following four catastrophic wildfires between 1933 and 1951 (Chapter 2, *Environmental Setting*). Since that time, ODF has, when funding allows, vacated or improved roads that did not meet current environmental standards, particularly when these roads intersect new timber sales.⁶

ODF maintains approximately 4,151 miles of roads within the permit area (Table 3-2). Many of these roads were constructed according to the rules established under the Oregon FPA. The road system for the permit area is mostly in place, with most new road construction being short spurs for accessing individual harvest units or reroutes to better locations when roads have been vacated. The principal foreseeable changes to the system would consist of construction of short spur roads to access new timber harvest units. Spur roads may be closed once the unit has been replanted and the stand is free to grow. Where roads are fully vacated, they are rendered undrivable, cuts and fills are stabilized, and culverts are removed to provide natural drainage to minimize potential damage to resources, particularly waters of the state. Existing roads will be improved or constructed in accordance with Chapter 4, Section 4.7.5, *Conservation Action 5: Standards for Road Improvement and Vacating*; Section 4.7.10, *Conservation Action 10: Operational Restrictions to Minimize Effects on*

⁶ ODF funding from timber sales makes it economically feasible to improve roads that are directly related to the timber sale generating the revenue.

Covered Species; and Section 4.7.11, *Conservation Action 11: Road and Trail Construction and Management Measures*.

Table 3-2. Oregon Department of Forestry Road System Construction and Vacating in the Permit Area

Ecoregion	Total Road Miles (existing)	Average Yearly Road Construction Estimate (miles)	Average Yearly Road Vacating Estimate (miles)
Coast Range	3,845	23	5
West Cascades	306	2.5	1
Total ^a	4,151	25.5	6

^a Totals include natural surface roads and newly constructed temporary roads

ODF manages its road system consistent with the FMP to do the following (Oregon Department of Forestry 2010a).

- Keep as much forest land in a natural, productive condition as possible.
- Prevent water quality problems and associated impacts on aquatic resources.
- Minimize disruption of natural drainage patterns.
- Provide for adequate fish passage where roads cross fish-bearing streams.
- Minimize exacerbation of natural mass-wasting processes (e.g., landslides).

All road construction, use, maintenance, and vacating will be performed in accordance with Chapter 4, Section 4.7.10, *Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species*, and Section 4.7.11, *Conservation Action 11: Road and Trail Construction and Management Measures*, along with other applicable statutes. Additional implementation guidance for ODF management of roads (e.g., construction, use, maintenance, and vacating) in the permit area is provided in the *Forest Roads Manual* (Oregon Department of Forestry 2006) and *Anadromous Salmonid Passage Facility Design Manual* (National Oceanic Atmospheric Administration Fisheries 2023).

3.4.1 Road Use

The road system provides access for all management activities, fire suppression, and public use. Roads in the permit area are used primarily by utility vehicles accessing parts of the forest(s) and heavy equipment (e.g., log trucks and heavy equipment trailers hauled by similar tractors). All such road use by the permittee and contractors is a covered activity under this HCP. Such use is a year-round activity and unrestricted.

3.4.2 Road Construction

Roads in the permit area are most commonly constructed by felling and yarding timber along a predetermined road alignment. This activity is followed by excavating or filling hillslope areas using bulldozers or excavators. Road construction also commonly involves clearing and grubbing, establishing the road grade, shaping, compacting the road prism, constructing drainage ditches and ditchouts, installing ditch relief culverts, constructing stream crossings that use culverts and bridges, and disconnecting culverts. Clearing and grubbing is the removal of stumps and the duff

layer from a proposed road location. Establishment of a road grade involves filling in voids and removing humps from a proposed road location to establish a consistent surface that has an agreed-upon slope percentage that will allow for traffic. Shaping is the establishment of a crown or outslope to allow water to run off a proposed road surface. Compacting the road prism involves using a roller to compact a proposed road location and ensure both a solid subgrade and a solid road surface that will shed water properly. Constructing drainage ditches and ditchouts is completed once the subgrade has been established by digging out the ditches to allow water to shed from a crowned road to the ditchline and carry water to either a cross drain or ditchout where water dissipates. The intent is to have any potential sediment to enter these ditchouts and cross drains instead of a flowing water source. Constructing a stream crossing involves constructing an appropriate stream crossing, as identified in Chapter 4, Section 4.7.11, *Conservation Action 11: Road and Trail Construction and Management Measures*), where a road crosses a stream. Similar to the ditchouts, disconnect culverts are designed to allow ditch water to dissipate prior to entering a flowing stream to mitigate sediment delivery. At times, road construction requires blasting rock features or moving excess material to off-site waste areas to ensure slope stability, make the grade or width for water quality reasons, or place material in suitable locations. Road construction may also involve surfacing soil roads with rock, lignin, pavement, or other surface treatments. Roads also include vehicle turnouts, turnarounds, and timber harvest landings.

Landings are wide spots in the road used during harvest to yard felled logs and load them on trucks. Construction, maintenance, and the vacating of landings use the same techniques and are subject to the same regulatory constraints; these typically occur at the same time as road construction, maintenance, use, and abandonment. Landing construction will be performed in accordance with restrictions placed by the Oregon FPA—specifically, those identified in ORS 629-630-0200—but also include all other applicable rules. Landings will be constructed at the minimum size necessary for safe operation but may reach 0.75 acre in size. Landings are stable locations and will remain in places where roads are not removed. Spur roads and landings will remain cleared and operational as staging areas for reforestation and young stand management activities until newly planted stands reach a “free to grow” state, as defined by the Oregon FPA.

Typically, roads will be constructed with a subgrade width of approximately 16 feet and a 3-foot-wide ditch, for a total typical width of 19 feet. If the road is out-sloped, a minimum width of 14 feet will be needed. The total disturbance area of the road, including cut slopes, fill slopes, and clearing limits, will depend on the steepness of the terrain as well as the type of construction.

It is estimated that an average of 25.5 miles per year of road construction would occur during the permit term (based on ODF’s 2020 harvest model, discussed in Section 3.2.1, *Harvest Methods*, and Table 3-2). The majority of this construction will be spur roads, along with some collector roads. New road construction will be greater during the first 30 years of implementation and decrease over the remainder of the permit term. Natural-surface (i.e., not surfaced with rock) spur roads are typically closed after harvest and replanting activities are complete to prevent resource damage. It is estimated that, on average, 6 miles per year⁷ of roads will be closed or vacated during the permit term (Table 3-2).

⁷ This estimate includes natural-surface roads and newly constructed temporary roads.

3.4.3 Road Maintenance and Improvement

Road maintenance and improvement is the maintenance and repair of existing roads that are accessible to motorized use. Road maintenance and improvement typically include grading surfaces, clearing bank slumps, falling trees or snags that are safety hazards, repairing slumping or sliding fills, clearing ditches, repairing or replacing culverts and bridges, adding surface material, performing dust abatement, performing erosion control, and installing or replacing surface drainage structures.

Surface grading involves the grading and shaping of rocked or unsurfaced roads utilizing a grader that does not leave the existing road prism. Clearing bank slumps involves removing material (generally dirt or rock) that has slumped into ditchlines, thereby impeding their use. This is completed using an excavator or a grader, depending on the quantity of material. The material is removed and placed in a stable location that will not deliver sediment to a flowing stream. If no location is available, the material is end-hauled to a location that meets necessary criteria (as identified in Chapter 4, Section 4.7.12, *Conservation Action 12: Restrictions on Recreational Facilities*).

Falling trees or snags that are safety hazards, as identified in Section 3.2.2.4, *Hazard Tree Removal*, are removed as required by OR-OSHA. Repairing slumping or sliding fills involves varying methods, depending on the situation, but the intent is to shore up a fill that is in danger of failing to ensure that it does not. This is generally accomplished by using riprap rock or concrete blocks to establish a firm base for fill.

Clearing ditches involves removing material from ditchlines, generally using a grader or small backhoe to ensure the ditchline is functioning properly.

Culvert repair usually occurs when a culvert inlet or outlet has been smashed and needs to be re-opened. Culvert replacement is the removal of the old culvert and installation of a new.

Bridge replacement is the replacement of an existing bridge with a new one that meets the standards in Chapter 4, Section 4.7.11.1, *Road/Trail Design to Minimize Impacts on Covered Species*.

Adding surface material is the application of rock to meet the needs of hauling and allow seasonal use while not delivering sediment to streams. Performing dust abatement usually involves lignin application; however, a very short-term application can be water.

Performing erosion control generally involves the establishment of water bars. Installing/replacing drainage structures, which are generally ditch sumps or permanent rock filters installed in ditchlines, will mitigate any potential sediment delivery.

Road maintenance for fire prevention, public access, and timber management covered under the HCP includes mechanical control of roadside vegetation, such as grading, hand cutting, and using a road brusher, excavator, or other methods.

Because road conditions and maintenance needs are driven by highly variable environmental and operational factors, it is not possible to predict an exact amount of road maintenance or road improvement work that will occur over the permit term. Traffic levels, storm intensity and frequency, culvert performance, vegetation growth, and climate conditions all influence both the timing and the extent of required work. These factors fluctuate year to year and cannot be reliably forecast at a fixed quantity.

Routine road maintenance will occur regularly throughout the permit term to ensure that permanent roads remain open and function properly. This ongoing maintenance is essential for supporting Conservation Actions 4, 5, and 11 as well as maintaining access for monitoring commitments. Because these maintenance needs arise from normal road wear and environmental variability, they must remain flexible and responsive.

Road improvements, by contrast, will occur on an as-needed basis. These activities are triggered by site-specific conditions such as culvert failures, storm-related damage, aging infrastructure, or the need to relocate road segments away from sensitive areas. Improvement work is expected to be more frequent early in the permit as legacy issues are addressed and additional culverts are installed but will continue intermittently throughout the term.

Setting a fixed numerical limit on either maintenance or improvement activities would prevent timely responses to emergent conditions and undermine the effectiveness of the conservation actions themselves. To meet conservation objectives and maintain safe, functional access, both maintenance and improvement activities must remain adaptable to changing conditions over the life of the permit.

3.4.3.1 Beaver Management

ODF will encourage beaver damming activity in the permit area. However, beaver management will occur along sections of road in the permit area adversely affected by beaver activity. Beavers are attracted to constriction points in streams, which can be caused by culverts, and react by constructing dams. These dams plug the culvert system and, if not addressed, may result in significant road damage. In the permit area, beaver-damming activity is most likely in lower gradient streams with wide valley floors in the Coast Range. Outside the North Coast, these suitable conditions for beaver-dam establishment are less frequent in the permit area; on average, ODF addresses seven beaver-related road issues a year, with most of those occurring in Tillamook and Clatsop State Forests.

As part of regular maintenance, ODF will remove material deposited by beavers within or immediately upstream of culverts. In instances where there is persistent deposition of material from upstream, ODF will install a beaver co-existence device to respond to the conflict issue. In addition, ODF will evaluate consistent beaver occurrences and use the best alternative to reduce a conflict, which may include culvert replacement with a larger stream simulation culvert. ODF may remove beaver dams downstream of culverts where the beaver pond is backing up against road fill, in compliance with FPA rules that allow removal of any beaver dam that is within 25 feet of a culvert and where it is considered necessary for road maintenance. ODF staff members do not trap or remove beavers directly. In rare instances when trapping is required, ODF will contract with a wildlife control operator permitted through the Oregon Department of Fish and Wildlife (ODFW), who will be responsible for removing the individuals.

3.4.4 Road and Trail Vacating

Road and trail vacating refers to the process of making a road or trail impassable, including closing, stabilizing the road/trail bed surface, removing culverts and other drainage structures, and ensuring natural drainage. Roads or trails are vacated if deemed non-essential to near-term future management plans or where unrestricted access would cause resource damage. ODF determines which roads and trails to vacate during the implementation planning and annual operations

planning processes. Vacated roads and trails and reclaimed roads are left in a condition that is stable and provides for adequate drainage. Roads and trails will be vacated in locations where the hydrological benefit will be higher with the road or trail removed rather than left in place. In situations where vacating the road or trail would result in more hydrological damage than would be gained, the road or trail would be stabilized and left in place, where possible. Stabilization could take the form of providing natural drainage, creating water bars, or implementing storm-proofing that would leave roads in a condition that would be suitable for controlling erosion and maintaining water movement within natural drainages. Some situations will present themselves where no action is taken because the potential hydrological impact would be higher with stabilization compared with no action. Road vacating standards are described in Chapter 4, Section 4.7.5.2, *Road Vacating*.

3.4.5 Drainage Structure Construction, Maintenance, and Vacating

This activity includes the installation, maintenance, and removal of drainage structures on roads. Such structures are normally associated with roadways and include channel-spanning structures (culverts and bridges), roadside drainage ditches, and cross-slope drainage culverts. All such structures are installed and maintained in accordance with all applicable laws and regulations. Road drainage standards are described in Chapter 4, Section 4.7.5.1, *Road Drainage Repair Projects*.

3.4.6 Water Drafting and Storage

Water drafting occurs throughout ODF lands to provide a water source for road construction, improvement, and maintenance as well as for firefighting or filling water trucks that may be on standby during controlled burning. Water developments are located mainly at streams and rivers, with some at springs. Maintenance and construction of water developments, including brushing for access, maintaining the integrity of the basin, and removing debris or sediment, are covered activities.

3.5 Quarries, Borrow Sites, and Stockpile Sites

Quarries are generally multiple entry sites where specific rock products are developed, primarily for use as road surfacing material. Rock products may also be developed for other uses such as culvert bedding, armoring, ballast, and drainage. Quarry development may include the use of drills, explosives, bulldozers, rock crushers, loading equipment, and trucks. Quarries typically remain active for many years. The number and size of quarries will vary over time, with existing quarries expanding their footprint as additional rock is crushed and new quarries are discovered. Quarries are kept to the minimum size required. If and when rock quarries become no longer feasible to operate, they are reclaimed and returned to forest production to the extent practical. Quarry siting and operations are compliant with requirements detailed in Chapter 4, Section 4.7.10, *Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species*, and Section 4.7.11, *Conservation Action 11: Road and Trail Construction and Management Measures*.

ODF anticipates that the maximum quarry size would be approximately 10 acres and that at any given time there would be no more than 10 quarries in the permit area. When quarry operations are active, they are generally active 5 days a week for 8 to 12 hours a day. Operations are generally 10 to 20 days per entry. This range is due to the size of the proposed operation (how much rock is being

crushed) and the hours/days of the week that operators are active. Fewer hours in a day results in more days; less rock being crushed results in fewer days.

Blasting of rock, when necessary, varies among quarry site locations and the specific rock being shot. Charge size and intensity will change at any given site for each entry, based on the density of the rock and the quantities that are removed. Most sites do not require blasting and are able to be developed without it. Sites that do require blasting do not always require blasting for every entry.

Borrow sites are locations where native soil or rock is taken for use as fill material for road or landing construction. Borrow sites are typically discovered and accessed during road construction, resulting in a small expansion of the road prism. Borrow-site development may include the use of bulldozers, loading equipment, and trucks. Borrow sites are typically single-use sites or locations where very small quantities of material will be removed over a long period. All borrow sites will be hydrologically disconnected from aquatic resources and stabilized, in compliance with requirements detailed in Chapter 4, Section 4.7.11, *Conservation Action 11: Road and Trail Construction and Management Measures*.

Stockpile sites are locations where rock is stored for future use. They may also be used to stage equipment for other nearby projects. Stockpile sites are generally permanent parts of the transportation network and will be re-used over the course of the permit term. Stockpile sites will be sited outside of RCAs. New stockpile sites are reviewed by the geotechnical specialist for approval of siting and the amount of loading. All stockpile sites will be hydrologically disconnected from aquatic resources and stabilized, in compliance with requirements detailed in Chapter 4, Section 4.7.11, *Conservation Action 11: Road and Trail Construction and Management Measures*. Seasonal distance restrictions apply to blasting, rock processing, and heavy equipment use, as described in Chapter 4, Section 4.7.10, *Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species*.

Use of quarries, borrow sites, and stockpile sites will follow two general categories of seasonal restriction: (1) seasonal restrictions required under Conservation Action 10, and (2) seasonal restrictions based on the quality of the rock and the status of the quarry. For items listed under Category 2, the seasonal restriction will change, based on how “clean” the rock is. Quarries with more fine sediment have operating restrictions during winter months. This is a self-propagating rule because operating in the winter in these conditions clogs up screens and makes it very difficult for the operator to meet the crushing specifications called for in the contracts. Quarries that require this operating timeframe can vary because a “clean” quarry can have operations in a portion of the pit with more fine sediments and vice versa.

3.6 Fire Management

ODF and its state agency partners conduct controlled burns under specified conditions to accomplish stand management and other objectives. Burning is conducted under controlled conditions with little or minimal risk of catastrophic fire damage. As such, burning is considered fire hazard abatement because it greatly diminishes the available concentration of fuel sources. Fire season restrictions placed each year by ODF prohibit burning from approximately May/June until the beginning of the rainy season in approximately November. Controlled burning is performed in upland forests, outside of RCAs. Types of controlled burns conducted in the permit area include broadcast burning, pile burning, and underburning.

- **Broadcast burning.** By definition, broadcast burning is pre-planned and performed under strict environmental and personnel safety conditions that are meant to keep the fire confined to a predetermined area under specific conditions. A broadcast burn improves seedling survival and growth while emulating natural processes. It is also intended to remove slash (fine woody debris) after harvest operations and other wildland fuels to reduce the risk of catastrophic wildfire.
- **Pile burning.** Following harvest operations, slash is machine piled along roads and around landings. Some piles may be scattered throughout harvest unit. Piles are generally covered with plastic to keep the core of the pile dry, then burned when weather conditions permit. Pile burning will not occur within an RCA.
- **Underburning.** A controlled fire under a timber or brush overstory that serves as a method for removing wildland fine fuels and improving overall forest health. ODF traditionally employs manual fuels management techniques where smaller ladder fuels are piled and burned. As a result, underburning has not traditionally been employed within the permit area. Changing conditions due to drought and climate change may necessitate increased use of this tool in the future (Chapter 7, Section 7.3.3.2, *Change in Species Habitat Quality from Fire, Storms, Invasive Species, or Disease*, under the *Response* subheading).

The average number and size of these types of burns are summarized in Table 3-3. It is estimated that the level and type of controlled burning will be consistent through the permit term at the levels shown in Table 3-4.

Table 3-3. Yearly Average (2008 to 2018) Controlled Burn Acres, by Type, in the Permit Area

Controlled Burn Type	Times Conducted per Year	Average Size (acres)
Broadcast burning	0–1	80
Pile burning	70	20

3.7 Recreation Infrastructure, Maintenance, and Operations

There are diverse recreation activities in the permit area, with dispersed use throughout the forest. Activities include camping, picnicking, fishing, hunting, target shooting, driving on forest roads, hiking, off-highway vehicle (OHV) use on trails, horseback riding, mountain biking, swimming, paddling, rock climbing, nature study, and sightseeing. Public use rules for state lands (Recreational Use of State Forest Land, Chapter 629, Division 25) establish standards for recreational use. The rules regulate OHV use, camping, firearm use, disposal of garbage and human waste, and other activities associated with recreational activity. Public use at ODF-managed existing and future facilities will abide by legal rules and regulations.

The HCP covers ODF's siting, construction, maintenance, operation, and legal and intended public use of recreational infrastructure, including maintenance, trash management, and improvement of existing facilities, and standards and guidelines for new developments.

Infrastructure includes, but is not limited to, the following examples that may occur within the same spatial footprint.

- Campgrounds
- Day use (e.g., picnicking)
- Designated dispersed camping sites
- Trailhead facilities
- Motorized and nonmotorized trails (OHV, single-track, equestrian, mountain bike, foot, etc.)
- Boat launches
- Target-shooting lanes
- Education and interpretation facilities
- Administrative buildings

ODF staff members maintain this infrastructure and patrol the recreation trail networks, striving to protect trail investments, provide for safety (including the felling of hazard trees),⁸ address trail issues,⁹ and protect water quality. This is typically done on foot, bike, light trucks, or OHVs using established roads and trails in state forests. Heavy equipment is also used to complete maintenance, predominantly on motorized trails and in recreational facilities.

Most recreation trails and facilities in the permit area occur in the Coast Range ecoregion.

ODF expects to increase the number of facilities and related infrastructure over the permit term.

Table 3-4. Recreational Infrastructure in the Permit Area

Existing Miles of ODF-Designated Recreation Trails ^a	Estimated Increase in Trail Miles during Permit Term	Existing Number of Other Recreation Facilities (2019) ^b	Estimate Increase in Number of Facilities during Permit Term
638	600	94	47

^a Includes hiking, biking, OHV, and horse trails.

^b Includes campgrounds, trailheads, day-use areas, designated dispersed sites, boat ramps, staging areas, and target-shooting lanes. If one facility is nested inside of an existing footprint for another facility, it is not double counted.

3.8 Conservation Strategy Implementation Activities

Conservation strategy implementation activities are those activities that are required as part of the HCP's conservation strategy (including the monitoring and adaptive management program) and have potential to result in take of one or more of the covered species. Some activities associated with the conservation strategy, such as stand management to accelerate development of late successional

⁸ A standing tree that presents a hazard to employees due to conditions such as, but not limited to, deterioration or Physical damage to the root system, trunk, stem or limbs or the direction and lean of the tree, as defined at <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.266>.

⁹ For example, safety concerns, trail maintenance concerns (this could include everything from debris across the trail to rutting), inappropriate use (if motorized traffic is occurring on a non-motorized trail, additional signage or barriers may need to be installed), and required signage (this may be maintenance or replacement of existing signs or the need for additional signage).

features (Section 3.2.1, *Harvest Methods*) and vacating of roads and associated facilities (Section 3.4.4, *Road and Trail Vacating*), have been described in the preceding sections. This section summarizes other plan implementation activities associated with the conservation strategy. For a complete description of these actions, see Chapter 4, *Conservation Strategy*.

3.8.1 Aquatic Habitat Restoration

Riparian areas are the transitional land between the aquatic ecosystem and the adjacent terrestrial ecosystem that directly affect or are affected by the aquatic environment. These areas include streams, rivers, and lakes and their adjacent side channels, floodplains, and wetlands as well as portions of uplands that serve as streamside habitats for wildlife.

Projects in the plan area that will benefit the aquatic ecosystem may include, but are not limited to, the placement of logs or whole trees in streams to create pools and retain spawning gravels, replacement or removal of stream crossing structures (i.e., culverts) that block fish passage, relocation or redesign of existing roads or trails, stabilization of sediment sources (i.e., cutbank improvement of road drainage systems), process-based restoration,¹⁰ road and/or trail closure, and/or road and trail vacating. Larger-scale restoration projects could include widening or deepening channels, side channel reconfiguration, and floodplain reconnection.

Accessing the aquatic zone to place large wood into streams typically requires several approaches: (1) logger(s) may walk into the site and fell trees directly into the aquatic zone, (2) an operator may walk an excavator down through the RCA to the aquatic zone, and (3) at times, it may be necessary to daylight a small portion of the RCA to allow for the cable placement and delivery of large wood. In addition, implementation of aquatic restoration activities often involves spending significant time walking within the aquatic zone to facilitate these efforts.

3.8.2 Upland Restoration Activities

Upland restoration activities will be completed using the silvicultural techniques described in Section 3.2, *Timber Harvest Activities*, and Section 3.3, *Reforestation and Young Stand Management*, but will be subject to the conditions described in Chapter 4, Section 4.7.7, *Conservation Action 7: Manage Habitat Conservation Areas*. These management activities are intended primarily to benefit terrestrial covered species but may also provide benefits to some of the aquatic covered species.

3.8.3 Barred Owl Management

ODF plans to use a portion of the conservation fund to establish and implement a regional barred owl management program (Chapter 4, Section 4.7.9.1, *Barred Owl Management*). The program will focus on barred owl management in the permit area but be coordinated with USFWS and other regional partners that might conduct barred owl management programs of their own across private, state, and federal lands. Barred owl management entails primarily removal of barred owls from habitat otherwise suitable for spotted owls. ODF's barred owl management program will be conducted to support the USFWS Barred Owl Management Strategy (U.S. Fish and Wildlife Service 2024b) and evolve over time as more information is collected on the efficacy of various techniques.

¹⁰ Process-based restoration involves riparian thinning to advance development of late-seral forests (Chapter 4, Section 4.7.3.2, *Process-Based Restoration*).

3.8.4 Fish Salvage

ODF will conduct fish salvage efforts to support road system management within the permit area during the permit term. ODF expects up to 33 projects will require fish salvage operations due to instream work and channel dewatering over the permit term. Fish passage projects are expected to be the most common project types requiring fish salvage efforts. Prior to salvaging fish, a site-specific fish salvage plan will be created. Although salvage activities will vary, depending on site conditions, generally, the aquatic work area will be isolated at the upstream and downstream ends to prevent fish from entering the construction area. Once the work area has been isolated, the ODF staff aquatic biologist will lead capture and relocation of all aquatic species encountered using various techniques, including, but not limited to, seine netting, dip netting, and electrofishing. The ODF staff aquatic biologist or qualified project partners will oversee salvage operations to ensure fish are handled safely and stress, injury, and mortality are minimized. Electrofishing will be used as necessary when less invasive techniques are not suitable or effective and follow best practices described by the NOAA Fisheries (2000).

NOAA Fisheries prohibits the use of electrofishing when water temperatures reach or are expected to exceed 18°C and when spawning fish or redds are present. ODF will not conduct fish salvage work when water temperatures are greater than NOAA Fisheries standards or if salmonid spawning activity is occurring. Conductivity and dissolved oxygen are also important water quality parameters that can influence electrofishing effectiveness and the risk of injury or death. Water quality conditions will be assessed prior to conducting salvage operations, activities will not occur during periods of high turbidity, and salvage operations will be monitored periodically during salvage efforts to ensure maintenance of adequate water quality conditions. Following capture, fish will be transferred to oxygen-controlled containers and held before release back into the stream. Release locations will be located downstream from the construction site but as close to the capture location as possible to minimize handling time. Prior to release, fish will be enumerated by species, life stage, and capture methods. The total number of injuries and mortalities, as well as water quality parameters, will also be recorded.

Salvage will occur during ODFW approved in-water work windows established in the *Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife* (Oregon Department of Fish and Wildlife 2024 or most recent); if work cannot be conducted during these periods, appropriate approvals will be coordinated through ODFW prior to salvaging fish.

3.9 Activities Not Covered

The list of activities not covered under the HCP is not intended to be exhaustive; instead, it highlights those activities that are anticipated to occur most frequently within the permit area. Other activities not listed here may also be excluded from coverage under the HCP. Fire suppression is not a covered activity because of the difficulty in defining the extent, location, and intensity of fire and the overall rarity of fire in the predominantly moist conditions of the permit area. As such, it is not possible to state the frequency or magnitude of fire suppression activities.

ODF may use herbicides in the permit area for purposes of reforestation site preparation or release treatments. In addition, ODF will implement take avoidance in compliance with the Endangered Species Act. Herbicide application, regardless of the aerial application method (i.e., fixed-wing

airplane, helicopter, unmanned aerial system) or ground application method, is, therefore, not proposed for incidental take authorization under this HCP.

Certain parties have easements or special-use permits, providing access to and use of lands in the plan area. Use of lands in the permit area by easement holders or other parties who are not ODF representatives, contractors, or other government or state agencies conducting research or survey activities supporting HCP monitoring is not a covered activity.

Any handling of covered species, apart from fish salvage operations described under Section 3.8.4, that may have the potential to incur take is not a covered activity in this HCP. These activities will require separate USFWS recovery permits (ePermit ID: 3-200-59: Scientific Purposes, Enhancement of Propagation, or Survival Permits) issued to allow take as part of activities intended to foster the recovery of listed species.

Chapter 4

Conservation Strategy

This chapter describes the conservation strategy the Oregon Department of Forestry (ODF) will use to avoid, minimize, and mitigate impacts of *take*¹ on listed species as required under Section 10(a)(2)(A) of the federal Endangered Species Act (ESA) and its implementing regulations. Chapter 6, *Analysis of Effects and Actions that May Result in Take*, specifies the take that is predicted to occur by carrying out the proposed covered activities (Chapter 3, *Covered Activities*), the impacts of such taking, and the net effects following consideration of the proposed conservation actions described in this chapter. Chapter 5, *Monitoring and Adaptive Management*, specifies the monitoring and adaptive management program that will be implemented to help ensure the intended benefits of the conservation strategy are realized.

4.1 Conservation Approach and Methods

The conservation approach was developed in the context of a forested landscape that has been modified from historical conditions across the permit area. When the state acquired these lands, the majority of them had a history of early twentieth-century railroad logging, splash dam logging, and repeated large-scale wildfires, coupled with extensive salvage logging (Magby et al. 2018). This is particularly notable in the northwest portion of the permit area (i.e., the Clatsop and Tillamook State Forests). This land use and disturbance history dramatically altered forest development and associated forest structure, composition, and distribution. On the Tillamook State Forest, for example, most older forest stands were lost in the repeated fires and extensive salvage operations. As a result, many forest stands are now dominated by densely spaced, young conifer and mixed deciduous forests (for a detailed description of current conditions and their history, see Chapter 2, *Environmental Setting*).

Over the last few decades, ODF has worked to shift forest trajectories (primarily by thinning, regeneration cuts, and planting) to develop state forests into a landscape that contains a more natural forest structure, composition, and distribution and is resilient to disturbance such as fire, insects, disease, and drought (Oregon Department of Forestry 2010a, 2010b). The conservation approach of the Western Oregon State Forests Habitat Conservation Plan (HCP) builds upon ODF's commitment to restore healthy, resilient, and sustainable forest ecosystems across western Oregon's state forest lands.

Responding to past disturbance, the conservation approach of this HCP prioritizes conserving remnant habitat occupied by the covered species, maintaining high-quality unoccupied habitat or habitat of unknown status (as needed to augment occupied habitat), ensuring habitat connectivity across the landscape, and enhancing habitat where habitat quality can be improved effectively through forest management activities. The conservation approach is balanced with other management activities across the permit area to help ensure social, economic, and environmental benefits provided by ODF lands in the permit area.

¹ *Take* is defined by the Endangered Species Act (ESA) as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any threatened or endangered species.

4.2 Data Sources

As presented in Chapter 2, *Environmental Setting*, covered species occurrence and habitat data used for this HCP are based on the following.

- Survey occurrence data for covered species, as collected by ODF and others, including Oregon Department of Fish and Wildlife (ODFW), U.S. Fish and Wildlife Service (USFWS), U.S. Bureau of Land Management (BLM), U.S. Forest Service (USFS), and private landowners.
- Published distribution data, such as presented for covered fish species through the StreamNet cooperative (<https://www.streamnet.org/>).
- ODF forest inventory data that document the age class distribution and provide insight into the range of habitat types available in state forests.
- Species-specific habitat models for terrestrial species used to estimate the extent of species distribution and the locations of likely suitable habitat in locations where survey data are limited or missing.

See Chapter 2, Section 2.5, *Covered Species*, for details on these data sources.

As presented in Chapter 1, *Introduction*, the following other sources were used to inform the conservation strategy.

- Recovery plans, species status assessments, and related documents and plans (Chapter 1, Section 1.4.4, *Document Organization*).
- Other conservation plans in Oregon (Chapter 1, Section 1.4, *Overview of Planning Process*).
- Critical habitat designations.

4.3 Developing Avoidance and Minimization Measures

Avoidance and minimization measures are central to the conservation strategy to reduce effects on habitat occupied by the covered species, maintain suitable unoccupied or unsurveyed habitat, and minimize incidental disturbance of or harm to covered species. Avoidance and minimization measures were developed and refined based on input from USFWS and the National Oceanic and Atmospheric Administration (NOAA) Fisheries (collectively, the Services) and ODFW; the consulting team; and ODF foresters and biologists with institutional knowledge of ODF forest lands and ODF forest management practices. In addition, avoidance and minimization measures have been informed by other similar HCPs, including the Washington State Department of Natural Resources *HCP for State Trust Lands* (Washington State Department of Natural Resources 1997), Montana Department of Natural Resources and Conservation *Forested State Trust Lands HCP* (Montana Department of Natural Resources and Conservation 2010), the *Green Diamond Resource Company Forest HCP* (Green Diamond 2018), and the *Port Blakely Habitat Conservation Plan for the John Franklin Eddy Forestlands* (Port Blakely 2023).

The avoidance and minimization measures outlined in the conservation actions of this HCP also build on existing practices by ODF. As stated previously, ODF has made a long-term commitment to restoring forest habitats and associated ecosystem/watershed functions across ODF lands in western Oregon (Magby et al. 2018). Oregon Administrative Rule (OAR) 629-035 (Management of

State Forest Lands) provides direction that allows ODF to develop policies and other measures that serve to avoid and minimize effects on terrestrial, aquatic, and riparian habitat important to ESA-listed and other sensitive species.

4.4 Determining Mitigation Needs and Strategies

Although the conservation strategy is largely designed to avoid or minimize incidental take of most known covered species sites, mitigation strategies will be used to offset the impacts of the taking of covered species that cannot be avoided. For example, over the life of the HCP, habitat for the covered species may be lost through timber harvest or other covered activities. However, habitat lost to covered activities will be offset by implementing conservation actions throughout the permit area that will increase habitat quality and, in some cases, quantity. For the terrestrial covered species, this will occur primarily in habitat conservation areas (HCAs), as described in Conservation Action 6: Establish Habitat Conservation Areas, and Conservation Action 7: Manage Habitat Conservation Areas. For aquatic covered species, this will be achieved primarily through stream restoration and enhancement activities, as described in Conservation Actions 3: Stream Complexity, 4: Remove or Modify Artificial Fish-Passage Barriers, and 5: Standards for Road Improvement and Vacating.

The conservation strategy is intended to be considered in totality when assessing how conservation benefits will offset effects on covered species. In other words, the conservation program as whole, comprising avoidance, minimization, and mitigation actions, is designed to achieve the biological objectives for each covered species. These biological goals and objectives are described in Section 4.6, *Biological Goals and Objectives*.

4.5 Considering Changes Due to Climate Change

Increases in atmospheric concentrations of greenhouse gases have unequivocally increased global temperatures and contributed to increased variability in precipitation and disturbance regimes (e.g., fire, insects, pathogens, and windstorms) (Intergovernmental Panel on Climate Change 2013; 2023) that have already begun to adversely affect the health of western Oregon forests and their associated ecosystems (Dalton et al. 2017). These changes may have profound effects on covered species in the permit area over the next century (Reilly et al. 2018). Although modeled increased temperatures may actually increase growth of Douglas-fir (*Pseudotsuga menziesii*) where soil moisture remains adequate (Albright and Peterson 2013), Reilly et al. (2018) reported mostly adverse climate change effects modeled throughout the Pacific Northwest, including the following.

- Reduced tree growth and increased tree mortality due to drought.
- An increase in nonnative invasive species.
- Increased potential for wildfire.
- Potential loss of some native species.
- Potential loss of native habitat.
- Increased competition between nonnative and native species.

The HCP's conservation strategy considers the potential effects of climate change on state forest lands through management strategies at stand and landscape scales in order to reduce the vulnerability of state forest lands to the effects of climate change. The HCP is intended to build on the resilience strategies typical of ODF's forest management plans, which are designed to actively promote a diverse and healthy forest ecosystem that is resilient to biotic and abiotic factors. The HCP conservation strategy is designed to increase resistance to and resilience from disturbances caused by drought, pest infestations, fire, or their interactions, which are expected to be more frequent and severe in the future (Spies et al. 2018).

The designation and active management of HCAs provide adaptation opportunities for covered species with respect to the expected effects of climate change. Silvicultural treatments reduce risks of habitat loss to drought, fire, wind, insects, or disease. The HCAs emphasize the establishment and accelerated development of large blocks of late-seral forest habitat across a diversity of environmental gradients that will, over time, reduce habitat fragmentation, improve landscape connectivity, and improve carbon sequestration. Increasing the amount of late-seral forests and enhancing species corridors across the permit area will provide stand and landscape diversity and facilitate movement of covered species to future habitat, providing resilience to potential habitat shifts in response to climate change.

Concentrating HCAs in fewer locations would have a higher risk of losing most of the inherent conservation benefit to the covered species. This is because a single large fire could eradicate concentrated HCAs. To avoid this, the conservation strategy deliberately sought a broader distribution of HCAs to distribute risk and provide both redundancy and resiliency for covered species' habitat by ensuring representation across latitudinal and elevational gradients. Ensuring connectivity of habitat across between HCAs will enhance the ability of the covered species to respond to habitat shifts in response to the effects of climate change.

Enhancing adaptive capacity is essential to mitigate the increasing threat of environmental variability (Siegel and Crozier 2019). Bottom et al. (2009) suggest that strengthening resilience for salmon populations to express their maximum life-history variations will require expanding habitat opportunities. Changes in climate alter aquatic conditions across all life stages; however, the effects are not equally distributed. Changes have spatial and temporal variation, depending on how the climatic regimen interacts with local conditions (Bottom et al. 2009). The HCP includes conservation actions that support long-term, natural stream processes to provide for salmon habitat, with special attention to large wood recruitment, minimization of sediment delivery, and temperature protection. This is accomplished primarily through the designation of riparian conservation areas (RCAs). Approximately 47% of RCAs are within HCAs for terrestrial species, allowing upland conservation actions to complement the overall hydrologic regime across the permit area by helping to moderate overall stream flow regimes, especially summer low flows. In addition, the HCP includes conservation actions that result in the enhancement of salmon habitat for all life-history stages through stream and riparian habitat enhancement.

4.6 Biological Goals and Objectives

This section describes the biological goals and objectives that guide the HCP's conservation strategies for covered species. Biological goals and objectives for covered species are required to be included in HCPs by the *Habitat Conservation Planning Handbook* (U.S. Fish and Wildlife Services and

National Oceanic Atmospheric Administration Fisheries 2016).² *Biological goals* are broad guiding principles, based on the conservation needs of the resources. *Biological objectives* are expressed as conservation targets or desired conditions. Objectives are measurable and quantitative when possible; they clearly state a desired result that, collectively, will achieve the biological goals and that can be monitored over the permit term. In this HCP, biological objectives are provided as a commitment to the number of acres and, where predictive habitat models are available, habitat quality for terrestrial species and for improvements to habitat quality for aquatic species. The success of the HCP will be measured against whether these objectives are met by the end of the permit term. Where appropriate, interim targets are provided in order for ODF and the Services to ensure that the HCP is on track for meeting the objectives as stated and, if not, that corrective measures can be taken by ODF during implementation.

The biological goals and objectives were developed collaboratively with the scoping team in a series of workshops. These goals and objectives were refined over time with stakeholder and public input and as the conservation actions supporting each objective were developed. Biological goals and objectives are provided in Table 4-1, followed by sections for each species or species group that provides the rationale for each biological objective. The biological goals and objectives are given unique numeric codes to enable easier tracking during implementation. For all of the covered fish, four biological objectives are grouped under a single goal because of the similarity in the fish species' habitat needs. Some of these habitat needs also extend to the two stream-associated torrent salamander species. Subsequent tables detail specific population objectives where appropriate. The remaining covered wildlife species each have distinct biological goals and objectives.

Conservation actions designed to meet all biological objectives are found in Section 4.7, *Conservation Actions for Covered Species*. The contributions toward meeting the biological objectives will come primarily from areas defined as RCAs and HCAs (Appendix F, *Habitat Conservation Area Maps*), although lesser contributions will also come from the areas outside of RCAs and HCAs, primarily from additional operationally limited areas and legacy component retention such as green trees, snags, and downed wood. Detailed linkages between the biological goals and objectives for each covered species, covered activities, and conservation actions are provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

4.6.1 Terms Used in Biological Goals and Objectives

The following terms are used in the biological goals and objectives.

- **Persist.** To continue in existence.
- **Conserve.** To protect from harm and destruction.
- **Maintain.** Management, both active and passive, that enables favorable habitat conditions to continue at the current level of functionality.
- **Enhance.** Describes actions, both active and passive, that are implemented or facilitated in suitable habitat for a covered species that improve quality of certain habitat features.

² The requirement for biological goals and objectives in HCPs was first published by USFWS and NOAA Fisheries in 2001 in what was then called the "5-Point Policy" (65 FR 35242).

Table 4-1. Biological Goals and Objectives for the Western Oregon State Forests Habitat Conservation Plan

Fish
Oregon Coast coho, Oregon Coast Chinook,³ Lower Columbia River coho, Lower Columbia Chinook, Columbia River chum, Upper Willamette River steelhead, Upper Willamette River Chinook, Southern Oregon/Northern California Coast coho, Southern Oregon/Northern California Coast Chinook, and eulachon
<i>Goal 1: Support the persistence and sustainability of Oregon Coast coho, Oregon Coast Chinook, Lower Columbia River coho, Lower Columbia Chinook, Columbia River chum, Upper Willamette River steelhead, Upper Willamette River Chinook, Southern Oregon/Northern California Coast coho, Southern Oregon/Northern California Chinook, and eulachon in the permit area.</i> Objective 1.1: Conserve, maintain, and enhance riparian conditions that promote long-term large wood recruitment in streams through establishment of RCAs as measured by three sets of metrics: a) riparian forest structure, b) wood volume on potentially unstable slopes that have potential to deliver to fish-bearing streams, and c) long-term trends of instream large wood (key pieces, size, frequency adequate to support the covered species). See Appendix E, <i>Effects Analysis</i>, for specifics for each ESU. Objective 1.2: Conserve, maintain, and enhance overall stream channel complexity through targeted stream enhancement projects to address limiting factors for covered fish species. See Appendix E, <i>Effects Analysis</i>, for specifics of each ESU. Objective 1.3: Maintain and enhance water quality and quantity conditions most important to covered fish species as determined by current conditions and long-term trends in temperature, fine sediments, pool temperature and depth, and summer low-flow on ODF-managed lands. See Appendix E for specifics for each ESU. Objective 1.4: Maintain or enhance fish passage to suitable spawning and rearing habitat by removing or modifying artificial barriers during the course of construction, routine maintenance, and emergency road repair.
Amphibians
Columbia torrent salamander ^a
<i>Goal 2: Support the persistence of Columbia torrent salamanders in the Clatsop and Tillamook State Forests.</i> Objective 2.1: Conserve and maintain riparian habitat along all 4,675 stream miles where Columbia torrent salamanders have high potential to occur (headwater perennial non-fish streams and perennially wet stream-associated seeps or springs in the range of the species) primarily through implementation of RCAs and ERZs.
Cascade torrent salamander ^a
<i>Goal 3: Support the persistence of Cascade torrent salamanders in the Santiam State Forest.</i> Objective 3.1: Conserve and maintain riparian habitat along all 519 stream miles where Cascade torrent salamanders have high potential to occur (headwater and perennial non-fish streams and perennially wet stream-associated seeps or springs in the range of the species) primarily through implementation of RCAs and ERZs.

³ Includes both spring and fall runs.

Oregon slender salamander

Goal 4: Support the persistence of Oregon slender salamander and increase the quantity of high-quality habitat in the Santiam State Forest over time.

Objective 4.1: Conserve, maintain, and enhance all occupied habitat and suitable habitat within HCAs (approximately 19,200 acres) and RCAs within them (approximately 2,150 acres). Of the total habitat in HCAs, enhancement actions will target 3,600 acres of low-quality younger habitat with limited downed wood to increase the quality of suitable habitat over the permit term. Maintain an additional 2,050 acres (4% of the range in permit area) of currently suitable habitat in RCAs outside of HCAs for a total of 23,400 acres (49% of the permit area) of conserved habitat where habitat conditions will improve over time.

Objective 4.2: Retain and recruit large decayed downed wood throughout the permit area by establishing HCAs and RCAs. Establish retention requirements for downed wood and leave trees outside of HCAs and RCAs to support the maintenance and/or development of Oregon slender salamander habitat.

Birds

Northern spotted owl

Goal 5: Support the persistence of northern spotted owl in the permit area and increase the quantity of high-quality habitat^b over time.

Objective 5.1: Within HCAs, conserve, maintain, and enhance all existing nesting and roosting habitat (approximately 30,633 acres) and conserve, maintain, and enhance all existing foraging habitat (approximately 92,112 acres, as of 2023). This total 122,775 acres within HCAs represents 72% of the nesting/roosting habitat and 52% of the foraging habitat in the permit area. Collectively, HCAs represents 56% of the total nesting/roosting and foraging habitat in the permit area (219,351 acres). Another approximately 1,500 acres of nesting/roosting and 9,800 acres of foraging habitat will be conserved in RCAs outside of HCAs. This combined total of 134,075 acres within HCAs and RCAs represents approximately 76% of the total nesting/roosting and 58% of foraging habitat in the permit area.

Objective 5.2: Maintain at least 40% of the approximately 364,500 acres of permit area outside of HCAs as habitat that facilitates effective dispersal and foraging of northern spotted owls, as defined and quantified in Conservation Action 8, with one half of that target (20%) in the form of 60-year-old stands and/or stands representing foraging habitat or better (e.g., nesting and roosting habitat) where RCAs less than 120 feet in width and not part of a stand that meets these standards will not be counted toward this. In addition to northern spotted owl habitat in HCAs, another approximately 41,000 acres of RCAs outside HCAs will also grow and develop more mature forest conditions in well-distributed but linear patterns across the landscape that will facilitate foraging and dispersal.

Objective 5.3: Within HCAs, use active and passive management to increase the quantity of nesting and roosting habitat by between 110,000 and 138,000 acres, for a potential total of 169,000 acres in HCAs by the end of the permit term. Some foraging-only habitat (upward of 30,000 acres) in HCAs will mature into higher-quality nesting and roosting habitat. As a result, model projections suggest total nesting, roosting, and foraging habitat at the end of the permit term could reach 230,000 acres within HCAs. Habitat quality will also be improved through barred owl removal efforts detailed in Conservation Action 9.

Marbled murrelet

Goal 6: Support the persistence of marbled murrelet in the permit area and increase the quantity of high-quality habitat^b over time.

Objective 6.1: Within HCAs, conserve, maintain, and enhance all existing suitable habitat (approximately 78,585 acres) and all existing highly suitable habitat (approximately 2,320 acres). This total of 80,905 acres within HCAs represents 60% of the suitable habitat in the permit area and 98% of the highly suitable habitat in the permit area. Collectively, HCAs represent 61% of all suitable and highly suitable habitat in the permit area (133,011

acres). Approximately 39% of existing habitat (52,100 acres) is located outside of HCAs and will be subject to harvest. However, some habitat values (e.g., legacy features) will be retained through implementation of Conservation Action 8.

Objective 6.2: Within HCAs, use active and passive management to increase the amount of highly suitable habitat by between 54,000 and 68,000 acres, for a potential total of 70,000 acres of highly suitable habitat in HCAs by the end of the permit term. Similarly, increase the amount of suitable habitat by between 44,000 and 55,000 acres, for a potential total of 134,000 acres of suitable habitat in HCAs by the end of the permit term. This, combined with passive management, leads to model projections that suggest total suitable and highly suitable habitat at the end of the permit term could reach 204,000 acres.

Mammals

Red tree vole (North Oregon Coast Distinct Population Segment)

Goal 7: Support the persistence of red tree vole (North Oregon Coast Distinct Population Segment) in the permit area and increase the quantity of high-quality habitat^b over time.

Objective 7.1: Within HCAs, conserve, maintain, and enhance all existing suitable habitat (approximately 61,191 acres) and all existing highly suitable habitat (approximately 10,664 acres, as of 2023), for a total of 71,800 acres of red tree vole habitat in HCAs (as of 2023). This total of 71,855 acres within HCAs represents 60% of the total suitable and highly suitable habitat in the permit area (119,339 acres). Although approximately 40% of existing habitat (suitable and highly suitable) located outside of HCAs will be subject to harvest, model projections indicate that additional habitat may develop outside HCAs under the proposed management strategies, which could provide benefits to red tree voles.

Objective 7.2: Within HCAs, use active and passive management to increase the amount of highly suitable habitat by between 54,000 and 67,000 acres, for a potential total of 78,000 acres of highly suitable habitat in HCAs by the end of the permit term. Similarly, increase the amount of suitable habitat by between 30,000 and 37,000 acres, for a total of 98,000 acres of suitable habitat in HCAs by the end of the permit term. As a result, model projections suggest total habitat at the end of the permit term could reach 176,000 acres.

Coastal marten

Goal 8: Support the persistence of coastal marten in the permit area and increase the quantity of high-quality habitat over time.

Objective 8.1: Conserve, maintain, and enhance all existing denning, resting, foraging, and dispersal habitat (approximately 27,000 acres) in HCAs in the range of the species.^b

Objective 8.2: Within HCAs, use active and passive management to increase the quality of denning, resting, foraging, and dispersal habitat within the 27,000 acres over the permit term (Appendix C, *Species Accounts*).

ERZs = equipment restriction zones; ESU = evolutionary significant unit; HCAs = habitat conservation areas; ODF = Oregon Department of Forestry; RCAs = riparian conservation areas

^a Torrent salamanders are no longer included as covered species because they are not federally listed under the ESA and, as such, do not require incidental take authorization under this HCP. However, they remain addressed in the plan because the conservation measures are expected to benefit the species and its habitat.

^b See Appendix C, *Species Accounts*, and Chapter 2, Section 2.5.2.4, *Northern Spotted Owl, Marbled Murrelet, and Red Tree Vole Habitat Distribution*, for suitable and highly suitable habitat definitions.

4.6.2 Goal 1: Support the Persistence of Covered Fish

The objectives below will support the persistence and sustainability of Oregon Coast coho, Oregon Coast Chinook, Lower Columbia River coho, Lower Columbia Chinook, Columbia River chum, Upper Willamette River steelhead, Upper Willamette River Chinook, Southern Oregon/Northern California Coast coho, Southern Oregon/Northern California Chinook, and eulachon in the permit area.

4.6.2.1 Objective 1.1: Riparian Wood Recruitment

Objective

- Conserve, maintain, and enhance native riparian conditions that promote long-term large wood recruitment in streams through establishment of riparian conservation areas (RCAs),⁴ as measured by three sets of metrics.
 - Riparian structure.
 - Wood volume on potentially unstable slopes that have potential to deliver to fish-bearing streams.
 - Long-term trends of instream large wood (key pieces, size, frequency adequate to support the covered species).
- Specific measures will include establishing riparian setbacks around streams and rivers, maintaining tree buffers along potentially unstable slopes, and providing deliberate large wood inputs through targeted stream enhancement projects (Appendix N, *Biological Goals and Objectives Crosswalk*, and Sections 4.7.1, *Conservation Action 1: Establish Riparian Conservation Areas*, and 4.7.2, *Conservation Action 2: Riparian Equipment Restriction Zones*).

Rationale

Healthy riparian forests provide important stream functions such as large wood recruitment, shading, nutrient and energy inputs and moderation, bed and bank stability, and sediment filtration. Recruitment of large wood has multiple ecosystem benefits for fish and other aquatic species. Its presence in stream systems forms pools for juvenile rearing, and it can create or enhance thermal and flow refugia for salmon to use as migratory or holding habitat. It promotes the habitat complexity required by juvenile and adult salmon for successful rearing and spawning. In addition, large wood increases ecosystem diversity across trophic levels, enhancing foraging opportunities for fish of all life stages (Thompson et al. 2018). Increased large wood in permit area streams will benefit covered fish species as well as other covered aquatic vertebrates.

A common issue in fish-bearing streams in western Oregon is a lack of large wood in streams. Reduced large wood in streams is the result of historical and widespread logging practices in the riparian zone around streams and rivers as well as the long-standing practice of clearing large wood and logjams from river channels (Bryant 1983). The resulting lack of instream wood is a limiting factor for covered species in many locations in the permit area (Appendix E, *Effects Analysis*). To

⁴ Riparian conservation areas are defined and described in Conservation Action 1: Establish Riparian Conservation Areas.

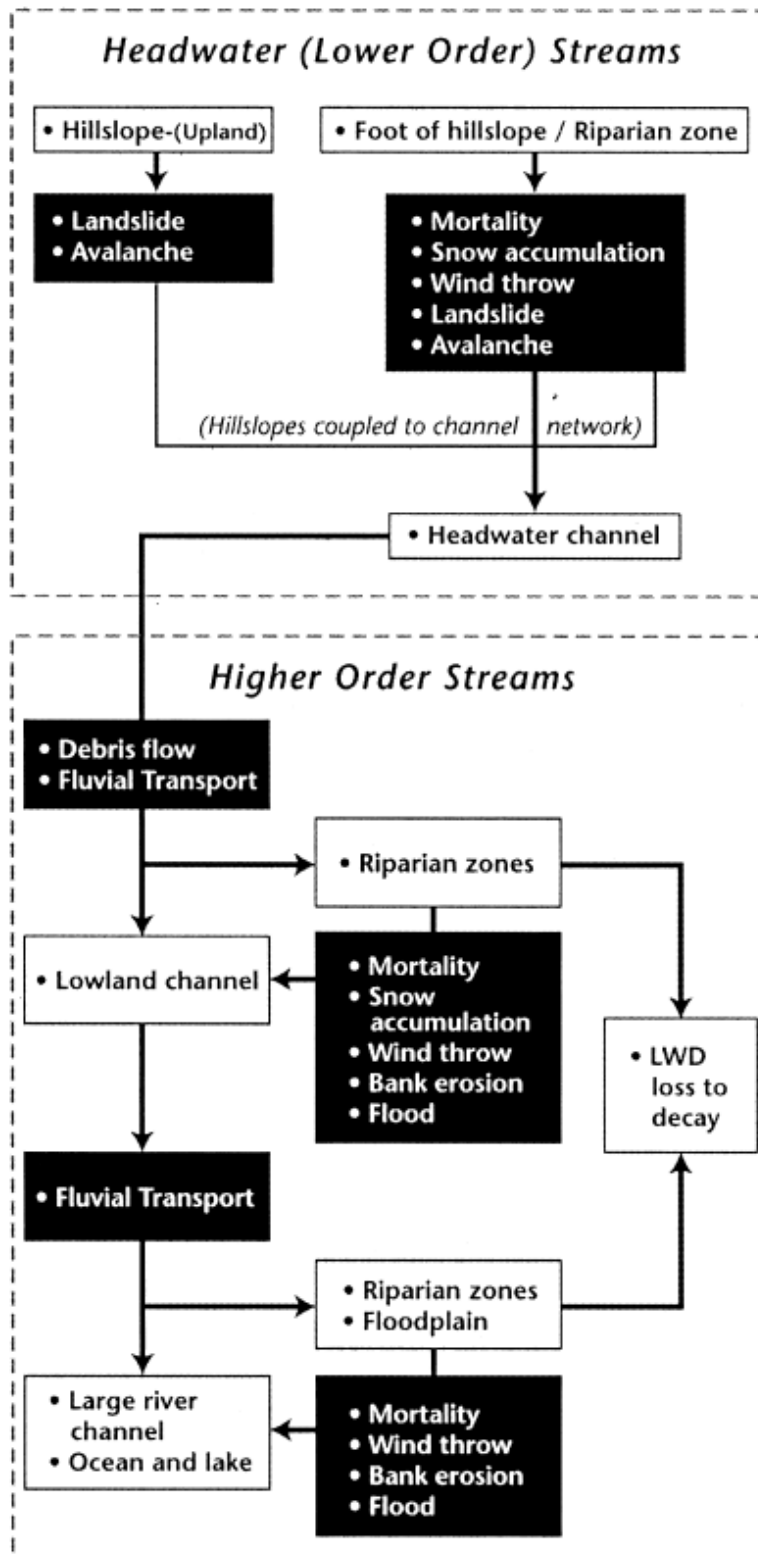
remedy the scarcity of large wood in streams, riparian areas around streams will be managed to favor large wood recruitment over time (Wooster and Hilton 2004).

The mix of land ownership, land cover, and management regimes that overlap the covered fish species distribution means that there is a dynamic mosaic of habitat conditions that continue to change over time and that the permit area represents a small portion of the overall distribution of covered species (Appendix E, *Effects Analysis*). Within the permit area, the conservation, maintenance, and enhancement of RCAs along fish- and non-fish-bearing streams during timber harvest will promote the development of larger coniferous trees. Large trees recruited from RCAs provide the most stable and key functional pieces of wood to streams (Montgomery et al. 1996; Wing and Skaugset 2002) and, when they retain their root and branch structure, are more stable and persistent in stream environments where they contribute to the maintenance of important pool habitats (Rosenfeld and Huato 2003). All wood recruited from RCAs plays a role in creation and maintenance of high-quality, complex rearing habitats.

Landscape characteristics, such as riparian forest conditions, affect large wood recruitment and alter the habitat conditions of covered fish species (Beechie et al. 2000; Steele et al. 2003 as cited by Burnett et al. 2007). Per Spies et al. (2013), 95% of near-stream large wood inputs come from the area between the streambank and 82 to 148 feet (horizontal distance) of the edge of the stream, with shorter input distances occurring in younger stands and longer distances in older, taller stands.

Headwater streams may comprise up to 80% of the overall length of a stream network and are important for collection and transport of material into higher-order downstream habitats that support the covered fish species (Bryant et al. 2007). Maintaining riparian forests on headwater streams allows channels to accumulate and store sediment and large wood for future delivery to lower-gradient reaches of the river. In addition, actions performed in lower-order streams will also benefit the covered amphibian species that use perennially wet habitats in and around these water bodies.

Figure 4-1 provides an overview of sources of a large wood budget in a watershed. The open squares represent geomorphic areas related to the location for the sources and storages of large wood, and filled squares represent the processes that affect large wood transport. Landslides and avalanches are a key component of large wood delivery in large portions of the permit area; however, avalanche activity is considered quite rare in the permit area.



Source: Hassan et al. 2005.

Figure 4-1. Flow Diagram for Wood Budget in a Watershed

4.6.2.2 Objective 1.2: Stream Complexity

Objective

- Conserve, maintain, and enhance overall stream channel complexity through targeted stream enhancement projects to address limiting factors for covered fish species.
- Conduct stream enhancement projects, as described in Conservation Action 3: Stream Complexity.

Rationale

Stream complexity (e.g., presence of large wood, pools, sinuosity, floodplain connection), which contributes to slow-moving water and sheltered conditions for juvenile rearing and overwinter habitat, is a limiting factor⁵ for many of the covered fish species (National Oceanic Atmospheric Administration Fisheries 2013, 2014b; Oregon Department of Fish and Wildlife and National Oceanic Atmospheric Administration Fisheries 2022). Stream enhancement projects, such as large wood and boulder placement, can provide rapid improvements to physical habitat and fish production before conservation efforts detailed in Objective 1.1 enhance the underlying processes that deliver large wood to streams in the permit area (Beechie et al. 2012).

The use of targeted stream enhancement projects that add large wood to streams and rivers will provide structured channel morphology⁶ and influence the formation of pools, sort sediments, and provide food and cover for covered aquatic species in much the same way that natural large wood inputs do (Jones et al. 2014). The purposeful introduction of in-stream large wood will help with pool development and sediment retention, provide cover and spawning habitat, potentially increase floodplain connection, and promote nutrient cycling. These stream enhancement projects will immediately improve local habitat conditions in the permit area, benefiting the covered fish species. However, in isolation such actions are unlikely to increase life-history diversity or resilience of salmon populations (Beechie et al. 2012). Stream enhancement projects will be strategically located to efficiently provide the most comprehensive benefits to the covered fish species, such as in areas where fish species' intrinsic potential⁷ is high or in proximity to previous projects. Riparian management actions, as described in Objective 1.1, will allow forests to become a long-term source of large wood for the aquatic systems within and downstream of the permit area.

4.6.2.3 Objective 1.3: Water Quality and Quantity

Objective

- Maintain and enhance water quality and quantity conditions most important to covered fish species, as determined by current conditions and long-term trends in temperature, fine sediments, pool temperature and depth, and summer low flows on ODF-managed lands.
- Identify roads that are hydrologically connected to streams and prioritize them for improvement or vacating to reduce the potential for chronic sedimentation that could affect the covered fish species.

⁵ Limiting factors constrain a population size and slow or stop population growth.

⁶ Channel morphology influences river shape and directions.

⁷ Intrinsic potential is the measure of a stream's capacity to provide high-quality habitat.

- Construct new roads using best management measures, including requiring hydrologic disconnection and/or mitigation for roads that cannot be sited outside of RCAs.
- Water quality and quantity will be protected through the designation and management of RCAs, as described in Conservation Action 1: Establish Riparian Conservation Areas, Conservation Action 2: Riparian Equipment Restriction Zones, and Conservation Action 3: Stream Complexity.

Rationale

Stream ecosystems are dynamic and typically experience large fluctuations in water quality due to changing flow regimes (Armstrong and Schindler 2013). Protection of existing functional riparian systems and restoration of degraded systems can address water quality issues. Riparian areas maintain ecological processes, such as regulating stream temperature and streamflow, cycling nutrients, providing organic matter, filtering chemicals and other pollutants, trapping and redistributing sediments, stabilizing stream channels and banks, absorbing and detaining floodwaters, maintaining fish habitats, and supporting the food web for a variety of biota (Buffler 2005).

Degraded water quality, especially elevated stream temperature (National Oceanic Atmospheric Administration Fisheries 2013, 2014; Oregon Department of Fish and Wildlife and National Oceanic Atmospheric Administration Fisheries 2022), is one of the primary threats to many of the covered fish species. Many of the covered fish species require cold water to maximize growth and survival of their younger stream-dependent life stages. The restoration of riparian function, through the establishment of RCAs in the permit area, will help reduce stream temperature increases by maintaining and increasing shading (Beechie et al. 2012) and, subsequently, reducing thermal loading to streams in the permit area. This will benefit the covered species by increasing instream habitat complexity, channel stability, and channel form and function.

In forested environments, sediment delivery is often increased through surface erosion on unpaved roads and disturbed riparian areas or landslides from roads or clearcuts (Beechie et al. 2012). A review of landslides in the permit area associated with the 1996 storm indicates the majority of landslides were not associated with roads; rather, they occurred in recent clearcuts (0 to 10 years after harvest) with steep slopes (more than 70%). However, where road-associated landslides did occur, they were about four times larger in volume than non-road-associated slides (Oregon Department of Forestry 2017b). The implementation of stand and road management conservation actions will reduce the risk of landslides and the associated effects of sedimentation in the permit area and benefit the covered fish species.

Forest roads, if not sited properly, can result in chronic inputs of sediment from all parts of the road prism that degrade water quality and affect the covered salmon and steelhead. Juvenile coho have been documented to avoid waters once turbidity reaches a level of 70 nephelometric turbidity units (NTU) (Boston 2016). The amount of sediment generated depends on the condition of the road, aggregate quality, maintenance practices, amount of exposed surfaces on the cut and fill slopes, soil texture, and climate as it influences type and intensity of precipitation events (Boston 2016).

Beechie et al. (2012) estimate that reduction in summer low flows due to climatic events will be greatest west of the Cascade Mountains, with monthly flow decreasing by 10 to 70% over the course of the twenty-first century.

Forests have an effect on water yield through the interception of precipitation and transpiration by trees; in some forests, fog capture can be significant. Increased coarse sediment following logging can increase the effect of low flows by shallowing and widening stream channels (Hicks et al. 1991). Summer low flows can negatively affect the covered salmon species by reducing the availability of rearing habitat in the permit area and increasing sensitivity to temperature changes. The implementation of conservation actions will limit sedimentation, benefiting the covered species by increasing habitat availability in the permit area.

4.6.2.4 Objective 1.4: Fish Passage

Objective

- Maintain or enhance fish passage to suitable spawning and rearing habitat by removing or modifying artificial barriers during the course of routine construction, emergency road repair, or maintenance work.

Rationale

The removal or modification of artificial barriers in the permit area will increase fish passage to upstream areas that could be used by salmonids for spawning and rearing and release gravels that have accumulated behind barriers to downstream locations. The access to additional, previously inaccessible habitat will increase the carrying capacity of the system, potentially increasing populations of covered fish. Barrier removal that increases longitudinal connectivity⁸ and provides the covered species access to varied physical and thermal conditions can increase habitat diversity and allow expression of alternative life-history strategies (Beechie et al. 2012). Increased fish passage will benefit the covered species as water warms during climate change by expanding available habitat, potentially increasing population resilience of the covered species (Beechie et al. 2012).

4.6.3 Goal 2: Support the Persistence of Columbia Torrent Salamander

Columbia torrent salamanders are no longer included as covered species because they are not federally listed under the ESA and do not require incidental take authorization under this HCP. The objective below remains in the plan because the conservation measures are expected to benefit the species and its habitat in the Clatsop and Tillamook State Forests.

4.6.3.1 Objective 2.1: Conserve and Maintain Riparian Habitat within Torrent Salamander Ranges

Objective

- Conserve and maintain riparian habitat along all 4,674 stream miles where Columbia torrent salamanders have high potential to occur (headwater perennial non-fish streams and perennially wet stream-associated seeps or springs in the range of the species) primarily

⁸ Increase migratory pathways and restore natural streamflow, sediment, and organic matter transport (Beechie et al. 2012).

through implementation of RCAs and equipment restriction zones (ERZs), as shown in Table 4-2 and Table 4-3.

- Implement the standards for road improvement and vacating, road and trail construction and management measures, and the establishment of HCAs that will protect dispersing salamanders and maintain favorable stream microclimates (e.g., cooler temperatures and perennially high humidity levels).
- Limit stream crossings on roads and trails to limit risk of direct impacts.

Rationale

A total of 2,149 miles (46%) of potential Columbia torrent stream habitat is inside of RCAs within HCAs and will be subject to less harvest over time and, therefore, fewer new roads. Outside of HCAs, an additional 2,525 miles (54%) of potential Columbia torrent stream habitat is buffered by RCAs (1,504 miles, 32%) that will mature with time. That leaves a potential of 1,021 miles (22%) of small seasonal streams outside of RCAs and HCAs. However, streams outside of HCAs will not exist in isolation from forest connectivity. They will exist in a landscape of variably aged stands, including young regenerating stands and stands within a large range of older age classes that will allow for dispersal among stream systems.

The Columbia torrent salamander is an aquatic, stream-adapted salamander that occurs in seeps, springs, small high-gradient streams with perennially wet areas, and the margins of perennial streams with cold water (Hammerson 2004; Russell et al. 2004). Protecting such potential habitat that occurs in the permit area within the range of Columbia torrent salamander will support population persistence and redundancy as well as provide habitat for population expansion. In the permit area, lands in and around the Clatsop and Tillamook State Forests support populations of Columbia torrent salamander. Implementing RCAs and HCAs, as shown in Table 4-2 and Table 4-3, will maintain stream environments where torrent salamanders are most likely to occur, ensuring that they persist on the landscape, even following implementation of covered activities.

Columbia torrent salamanders are sensitive to forest practices in riparian areas that can degrade microhabitats through sediment deposition and elevated stream temperatures due to reduced stream shading (Vesely and McComb 2002; Russell et al. 2004). Due to the species' sedentary nature (Nussbaum and Tait 1977; Welsh and Lind 1996; Nijhius and Kaplan 1998) and limited dispersal capabilities, torrent salamanders exhibit limited movement and have small home ranges (Nussbaum et al. 1983). Retaining RCAs on perennial streams and seasonal streams immediately upstream from perennial streams allows for seasonal movements of salamanders within the riparian corridor. Maintaining HCAs provides protection of small seasonal streams adjacent to perennial waters, and maintaining ERZs on the landscape minimizes direct impacts from covered activities within small seasonal headwater streams.

A study comparing salamander density in riparian buffers on either side of streams within unlogged forests and recently logged forests (clear cut within 5 years) found the width of the riparian buffer explained 40% of the variance in total torrent salamander abundance (Vesely and McComb 2002). The density of torrent salamanders was highest (approximately 70%) within 0 to 10 meters (0 to 33 feet) of streams and that 80% of torrent salamanders were within 20 meters (65.6 feet). The remaining 20% of detectable torrent salamanders were 40 meters (131 feet) from streams in unlogged control forests (Vesely and McComb 2002). Research findings from this study and others suggests maintaining riparian forests across an array of physical conditions in high-gradient

streams close to the initiation of perennality will help minimize the impacts of timber harvest on torrent salamanders (Steele et al. 2003; Russell et al. 2005; Howell and Maggiulli 2011).

4.6.4 Goal 3: Support the Persistence of Cascade Torrent Salamander

Cascade torrent salamanders are no longer included as covered species because they are not federally listed under the ESA and do not require incidental take authorization under this HCP. The objective below remains in the plan because the conservation measures are expected to benefit the species and its habitat in the Santiam State Forest.

4.6.4.1 Objective 3.1: Conserve and Maintain Riparian Habitat within Torrent Salamander Ranges

Objective

- Conserve and maintain riparian habitat along all 519 stream miles where Cascade torrent salamanders have high potential to occur (headwater seasonal and perennial non-fish streams and perennially wet stream-associated seeps or springs in the range of the species) primarily through implementation of RCAs and ERZs, as shown in Table 4-2 and Table 4-3.
- Additional secondary actions that will also contribute to meeting this objective include implementing the standards for road improvement and vacating, road and trail construction and management measures, and the establishment of HCAs that will protect dispersing salamanders and maintain favorable stream microclimates (e.g., cooler temperatures and perennially high humidity levels). ODF's limitation on stream crossings on roads and trails will limit the risk of direct impacts. Establishing large HCAs provides connected dispersal habitat for Cascade torrent salamander.

Rationale

A total of 251 miles (48%) of Cascade torrent salamander habitat is inside of RCAs within HCAs and will be subject to limited harvest in the first 30 years of the permit term and, therefore, fewer new roads. Outside of HCAs, an additional 87 miles (17%) of Cascade torrent salamander habitat is in RCAs outside of HCAs, which will mature with time. That leaves a potential of 180 miles (35%) of small seasonal streams outside of RCAs and HCAs. However, streams outside of HCAs will not exist in isolation of forest connectivity. They will exist in a landscape of variably aged stands, including young regenerating stands and stands within a large range of older age classes that will allow for dispersal among stream systems.

As with the Columbia torrent salamander, the Cascade torrent salamander is a stream-dwelling amphibian that can be found along the edges of high-gradient, cold, rocky reaches and near seeps. Adults may also be found along streambanks; during wet periods, they may venture into upland areas (Howell and Maggiulli 2011). Protecting such habitat that occurs in the permit area within the range of Cascade torrent salamander will support population persistence and provide room for population expansion. In the permit area, lands in and around the Santiam State Forest are known to support populations of Cascade torrent salamander.

As described under Objective 2.1, Cascade torrent salamanders are sensitive to forest practices in riparian areas. Retaining RCAs on perennial streams and seasonal streams immediately upstream from perennial streams allows for seasonal movements of salamanders within the riparian corridor. Maintaining HCAs provides protection of small seasonal streams uphill from perennial waters and maintaining ERZs on the landscape minimizes direct impacts from covered activities within small seasonal headwater streams. The maintenance of riparian forests in perennial, high-gradient streams close to the stream origin in the permit area will help minimize the impacts of timber harvest on torrent salamanders (Steele et al. 2003; Russell et al. 2005; Howell and Maggiulli 2011).

4.6.5 Goal 4: Support the Persistence of Oregon Slender Salamander

The objectives below will support the persistence of Oregon slender salamander and increase the quantity of high-quality habitat in the Santiam State Forest over time.

4.6.5.1 Objective 4.1: Conserve, Maintain, and Enhance Existing Oregon Slender Salamander Habitat

Objective

- Conserve, maintain, and enhance all occupied and suitable habitat within HCAs (approximately 19,200 acres) and RCAs within them (approximately 2,150 acres), for a total of 21,350 acres. Of the total habitat in HCAs, enhancement actions will target 3,600 acres of low-quality younger habitat with limited downed wood to increase the quality of suitable habitat over the permit term.
- Maintain an additional 2,050 acres (4% of the range in permit area) of currently suitable habitat in RCAs outside of HCAs, for a total of 23,400 acres (49% of the permit area) of conserved habitat where habitat conditions will improve over time (described in Chapter 6, Section 6.6.8, *Net Effects*).
- Green tree, downed wood, and snag retention management strategies in areas outside of HCAs and RCAs will contribute to habitat for the species in another 24,100 acres (51%) of the permit area within the range of Oregon slender salamander (47,500 acres).
- ODF will conduct baseline monitoring for Oregon slender salamander in a subset of stands over the first 10 years of the permit term, including pre- and post-harvest surveys to document species response to harvest activities (Chapter 5, Section 5.3.3.2, *Terrestrial Habitat Monitoring by Species Objectives*).

Rationale

Due to the restricted distribution and limited dispersal capabilities of Oregon slender salamander (Clayton and Olson 2009; Garcia et al. 2020), it is important to conserve occupied habitat, or habitat that is likely to be occupied, to provide for population persistence. Contiguous suitable habitat will promote dispersal and reduce genetic isolation in a fragmented landscape. Although larger HCAs will provide significant blocks of habitat, smaller HCAs distributed across the permit area can serve as redundant sources of refugia in more intensively managed landscapes.

4.6.5.2 Objective 4.2: Retain and Recruit Downed Wood to Support Oregon Slender Salamander

Objective

- Retain and recruit large decayed downed wood throughout the permit area by establishing HCAs and RCAs.
- Establish retention requirements for downed wood and leave trees outside of HCAs and RCAs to support the maintenance and/or development of Oregon slender salamander habitat.
 - Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas, describes downed wood retention standards in the permit area.
 - In addition, ODF will retain other nonmerchantable coarse woody material on-site; minimize the use of broadcast or pile burning to that needed to meet site productivity, reforestation, and fuel reduction goals; and retain wood piles for habitat values.
- Surveys to determine whether Oregon slender salamander persists in stands that are managed will be conducted in a subset of harvested stands outside HCAs and managed stands inside HCAs to determine whether downed-wood retention standards are adequately supporting the species.

Rationale

Retaining and creating downed wood of appropriate size and decay classes is necessary to ensure appropriate microhabitat conditions are present for Oregon slender salamander (Clayton and Olson 2009; Garcia et al. 2020). Leaving this decayed wood post-harvest will allow the Oregon slender salamander to persist following harvest by reducing the negative impacts of tree removal on the species, thereby supporting the continued occurrence and abundance of the species. Management within HCAs will provide the greatest opportunity for the development of large downed wood within older stands. ODF will also implement silvicultural actions outside of HCAs, such as green tree and snag retention, to enhance the growth of trees and ensure a supply of future large woody material. During regeneration harvest, existing downed wood of decay class 3 and 4 (Maser et al. 1979) and snags of decay stages 3 and 5 (Cline et al. 1980) that are not a safety hazard will be retained. In addition, where available, 600 cubic feet of hard conifer logs (decay class 1 and 2), on average, per acre in each harvest unit outside RCAs will be retained, including at least an average of two logs per acre greater than 20 inches in diameter (at the largest end). Sales that are unable to meet the requirements for cubic feet or diameter due to the composition of stand species, small-diameter residual logs, or any other reason will be reported as part of the annual report along with an explanation of the rationale and any efforts that were taken to mitigate. Within the range of Oregon slender salamander habitat, ODF will ensure that downed wood left in harvest units has a trunk that is in contact with the ground to promote decay and provide Oregon slender salamander habitat.

4.6.6 Goal 5: Support the Persistence of Northern Spotted Owl

The objectives below will support the persistence of northern spotted owl in the permit area and increase the quantity of high-quality habitat over time.

4.6.6.1 Objective 5.1: Conserve, Maintain, and Enhance Existing Northern Spotted Owl Habitat

Objective

- Within HCAs, conserve, maintain, and enhance all existing nesting and roosting habitat (approximately 30,633 acres) and all existing foraging habitat (approximately 92,112 acres, as of 2023). This total 122,775 acres within HCAs represents 72% of the nesting/roosting habitat and 52% of the foraging habitat in the permit area. Collectively, HCAs represent 56% of the total nesting/roosting and foraging habitat in the permit area (219,351 acres) (Chapter 6, Table 6-23).
- Another approximately 1,500 acres of nesting/roosting and 9,800 acres of foraging habitat will be conserved in RCAs outside of HCAs. This combined total of 134,075 acres within HCAs and RCAs represents approximately 76% of the total nesting/roosting and 58% of foraging habitat in the permit area.
- Enhancing existing habitat, in part through barred owl removal projects and application of seasonal restrictions for covered activities, in HCAs across the landscape will help offset habitat degradation and threats from loss or alteration of habitat from stand-replacing fire, loss of genetic diversity, competition, and environmental variability.
- Active sites where covered activities are planned will be monitored each nesting season to inform the application of operational restrictions, in addition to monitoring a subset of active sites in the permit area to ascertain how northern spotted owls are responding to management in HCAs as well as other management actions, such as barred owl management (Chapter 5, Section 5.3.3.2, *Terrestrial Habitat Monitoring by Species Objectives*).

Rationale

Conserving existing pair and resident sites and associated nesting and roosting habitat is the most effective method to avoid further declines in northern spotted owl populations because spotted owls on established territories are likely to be more successful if they remain in those locations (U.S. Fish and Wildlife Service 2011). Northern spotted owl was listed under the ESA in 1990 (U.S. Fish and Wildlife Service 1990) because of widespread habitat loss across the range of the species. Past habitat and current habitat loss and increasing barred owl populations continue to threaten the spotted owl, and populations of spotted owl have continued to decline (Davis et al. 2016; Lesmeister et al. 2018). Competition with barred owls for the best habitat and food continues to stress northern spotted owl populations (Spies et al. 2018; Franklin et al. 2021).

Within the permit area, late-seral habitat used by spotted owls for nesting is limited in many areas due to past natural and anthropogenic disturbances (Chapter 2, *Environmental Setting*) and because of increases in barred owl populations. Because of this, retaining and enhancing existing nesting and roosting habitat is essential to supporting the persistence of northern spotted owls. Moving north from the southern end of the Tillamook State Forest there is less federal land to provide habitat for demographic or dispersal support for northern spotted owls, making the conservation, maintenance, and enhancement of spotted owl habitat in the Clatsop and Tillamook State Forests particularly important (U.S. Fish and Wildlife Service 2011).

Protecting northern spotted owl habitat in the permit area will help sustain survival and reproduction of northern spotted owls in currently occupied habitat, support and potentially

improve persistent low densities in the northern Coast Ranges and retain sufficient unoccupied habitat to accommodate potential future recolonization. In addition, conserving, maintaining, and enhancing existing habitat, in part through barred owl removal projects and application of seasonal restrictions for covered activities, in HCAs across the landscape will help offset habitat degradation and threats from loss or alteration of habitat from stand-replacing fire, loss of genetic diversity, competition, and environmental variability (U.S. Fish and Wildlife Service 2011; Forsman et al. 2011; Halofsky et al. 2024; Hobart et al. 2025).

4.6.6.2 Objective 5.2: Facilitate Northern Spotted Owl Landscape Connectivity

Objective

- Maintain at least 40% of the approximately 364,500 acres of permit area outside of HCAs as habitat that facilitates effective dispersal and foraging of northern spotted owls, as defined and quantified in Conservation Action 8, with one half of that target (20%) in the form of 60-year-old stands and/or stands representing foraging habitat or better (e.g., nesting and roosting habitat) where RCAs less than 120 feet in width and not part of a stand that meets these standards will not be counted toward this.
- In addition to northern spotted owl habitat in HCAs, another approximately 41,000 acres of RCAs outside HCAs will also grow and develop more mature forest conditions in well-distributed but linear patterns across the landscape that will facilitate foraging and dispersal. Combined, RCAs and operationally limited stands where harvest is currently infeasible provide approximately 63,000 acres that are northern spotted owl dispersal, foraging, or nesting and roosting habitat.
- Additional stands will be grown forward prior to harvest and provide dispersal and foraging habitat in the landscape. In addition, leave-tree strategies will provide potential nesting, roosting, and denning opportunities for covered species outside of HCAs and ensure that habitat features important to northern spotted owl prey and general landscape connectivity are present in areas managed primarily for timber production.

Rationale

Maintaining sufficient dispersal habitat at the landscape level is vital to sustaining populations of northern spotted owl by allowing juveniles to disperse to temporary or permanent territories (Davis et al. 2016). Juvenile spotted owls disperse within their first year of leaving the nest. Although northern spotted owls can disperse through highly fragmented forest landscapes, highly fragmented forest can reduce survival if dispersing birds are exposed to higher risk of predation (Forsman et al. 2002). The quality and distribution of dispersal habitat within a forested area can help reduce predation risk. The conservation strategy will reduce those risks by providing “dispersal-capable” lands across the permit area, many of which can also provide foraging opportunities.

Dispersal habitat may also support movement of adult owls between more suitable habitats and facilitate inter-territory movement by adult spotted owls in response to the colonization of barred owls (Dugger et al. 2011; Olson et al. 2004). For example, the percentage of monitored owls dispersing each year increased from approximately 7% early in the study to approximately 25% over 28 years; this pattern coincided with a rapid increase in numbers of invasive and competitively dominant barred owls (Jenkins et al. 2021). Historically, Jenkins et al. (2021) believe the primary

reason spotted owls dispersed was to improve fitness (i.e., find new high-quality breeding habitat), but now, northern spotted owls appear likely to also disperse to avoid competition with barred owls.

HCAAs are expected to develop significant amounts of nesting, roosting, and foraging habitat over the permit term. Areas within HCAAs that do not have all the components of nesting, roosting, and foraging habitat are still expected to develop into stands that will support landscape connectivity. Outside of HCAAs, dispersal-capable landscapes that support northern spotted owl movement will be maintained for at least 40% of the area outside of HCAAs in stands having at least 11 inches average diameter at breast height (DBH) and 40% canopy cover; however, many stands will easily exceed this. This includes areas of older trees in RCAs outside of HCAAs, stands that are maturing before harvest later in the permit term, stands that cannot currently be harvested for operational reasons, and retention standards outlined in Conservation Action 8 that emphasize leaving the oldest or largest legacy components during harvest (i.e., green trees, snags, and downed wood), thereby enhancing the general functionality of the landscape that facilitates effective dispersal and foraging habitat that maintains landscape connectivity.

4.6.6.3 Objective 5.3: Increase the Amount of High-Quality Habitat for Northern Spotted Owl

Objective

- Within HCAAs, use active and passive management to increase the quantity of nesting and roosting habitat by between 110,000 and 138,000 acres, for a potential total of 169,000 acres in HCAAs by the end of the permit term. Some foraging-only habitat (upward of 30,000 acres) in HCAAs will mature into higher-quality nesting and roosting habitat. As a result, model projections suggest total nesting, roosting, and foraging habitat at the end of the permit term could reach 230,000 acres within HCAAs.
- Habitat quality will also be improved through barred owl removal efforts detailed in Conservation Action 9.

Rationale

The *Revised Recovery Plan for Northern Spotted Owl* (U.S. Fish and Wildlife Service 2011) encourages active management actions that restore, enhance, and promote development of high-value habitat, which, for this HCP, includes nesting, roosting, and foraging habitat. Habitat for late-seral species—including northern spotted owls—can be increased through both passive management (i.e., allowing the stand to develop over time naturally) or through active management, including “ecological forestry,” which involves primarily partial cutting prescriptions that encourage the growth of larger trees while maintaining key habitat components to reduce short-term negative impacts (Kuehne et al. 2015). Specific standards for silvicultural activities to enhance northern spotted owl habitat are described under Conservation Action 6: Establish Habitat Conservation Areas. Therefore, in addition to conserving known nesting, roosting, and foraging habitat, as described in Objective 5.1, ODF will use both active and passive management to increase the amount of nesting, roosting, and foraging habitat in HCAAs that is available over the permit term. When using active management, ODF will generally target low-quality habitat acreage within HCAAs for enhancement and development of suitable habitat (additional detail is provided in Conservation Action 7). Habitat quality will also be improved through barred owl removal efforts detailed in Conservation Action 9. Targeted lands will

be primarily adjacent to existing suitable northern spotted owl habitat or in locations where northern spotted owls once persisted but have not been detected recently. This expansion of available habitat will be necessary to achieve Goal 5.

The growth of large trees and the development of snags, multilayered canopies, and other key elements of forest structure takes decades, particularly in stands that have little residual legacy structure and that lack large trees (Lindenmayer and Franklin 2002; Dodson et al. 2012), which is the case over much of the permit area. In addition, some stands may require multiple treatments over time. Therefore, this objective is intended to provide benefits during the middle to later periods of the permit term.

Improving the quality of existing northern spotted owl habitat will expand the availability of suitable habitat for the species and provide support for reducing key threats faced by northern spotted owls. This net increase in owl habitat is intended to result in a potentially wider and less-fragmented distribution of the species' habitat across the permit area and foster productivity on the North Coast.

Figure 4-2 shows the total acres of northern spotted owl nesting, roosting, and foraging habitat modeled to occur in HCAs over the permit term, by decade, as a result of both passive and active management under the HCP. Contingencies that may occur over time, including fire and wind disturbance or altered growth regimes due to drought, might preclude or delay realizing some of this modeled habitat development. Given the uncertainty, ODF has a high level of confidence that at least 80% (110,000 acres) of the nesting and roosting habitat modeled to grow in HCAs over the 70-year permit term can be achieved, given potential changes in disturbance and growth regimes. ODF will be in compliance with the HCP (in terms of this objective) as long as the conditions that limit habitat attainment to these levels are reasonably beyond ODF's control and the HCAs are managed with the intent of achieving their full modeled habitat potential.

As described under Conservation Action 7: Manage Habitat Conservation Areas, HCA standards will direct land-management activities in HCAs to improve long-term habitat values for covered species in HCAs while minimizing impacts in the short term. These limitations on management actions in habitat, and other operational restrictions detailed in Conservation Action 10, ensure that, as much as possible, all of the habitat modeled to occur in HCAs will be attained and protected.

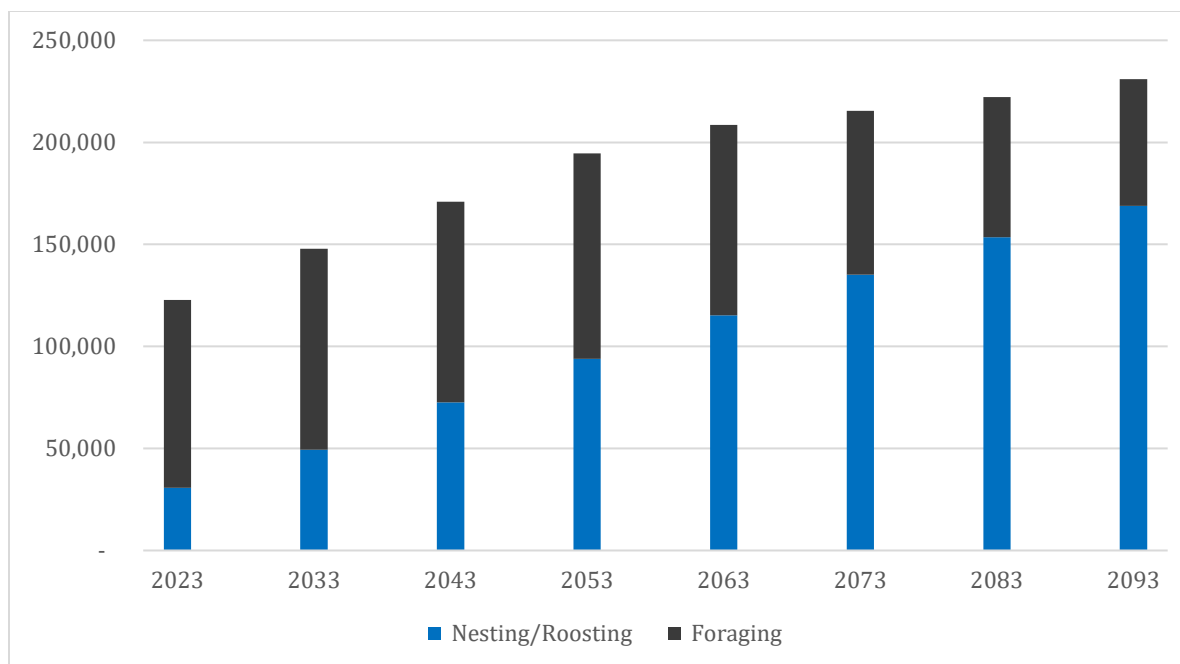


Figure 4-2. Acres of Northern Spotted Owl Habitat Modeled in HCAs, by Decade

4.6.7 Goal 6: Support the Persistence of Marbled Murrelet

The following objectives will support the persistence of marbled murrelet in the permit area and increase the quantity of high-quality habitat over time.

4.6.7.1 Objective 6.1: Conserve, Maintain, and Enhance Existing Marbled Murrelet Nesting Habitat

Objective

- Within HCAs, conserve, maintain, and enhance all existing suitable habitat (approximately 78,585 acres) and all existing highly suitable habitat (approximately 2,320 acres). This total of 80,905 acres within HCAs represents 60% of the suitable habitat in the permit area and 98% of the highly suitable habitat in the permit area. Collectively, HCAs represent 61% of the total suitable and highly suitable habitat in the permit area (133,011 acres) (Chapter 6, Table 6-23). The habitat within HCAs includes locations where occupancy has been previously documented (as of 2020).
- Approximately 39% of existing habitat (52,100 acres) is located outside of HCAs and will be subject to harvest. However, some habitat values (e.g., known nest trees, legacy features, platform bearing trees) will be retained through implementation of Conservation Action 8.
- ODF will monitor a subset of suitable and highly suitable habitat distributed across the permit area during the first 20 years of implementation, with results informing application of operational restrictions for covered activities (see Section 5.3.3.2, *Terrestrial Habitat Monitoring by Species Objectives*).

Rationale

Conserving existing occupied habitat is the most effective method to avoid further declines in marbled murrelet populations because murrelets can use multiple nest trees within and among years and co-occur with other murrelets (U.S. Fish and Wildlife Service 1997). As with the northern spotted owl, the marbled murrelet was listed as threatened due to widespread habitat loss (Betts et al. 2020). Past disturbance in the permit area has limited marbled murrelet nesting habitat and distribution. Conserving, maintaining, and enhancing existing marbled murrelet nesting habitat in the permit area may help support or increase populations. Forest stands where 99% of visual observations and 84% of auditory observations of murrelets (as of 2020) suggest potential nesting (i.e., occupied stands) are protected by design in HCAs, and it is believed that these encompass some actual nest locations and patches of likely nesting habitat.

Conservation of existing nesting habitat will provide particular conservation benefits in the Clatsop and Tillamook State Forests, which support small clusters of marbled murrelet nesting sites believed to be important to maintaining marbled murrelets in the northwest Oregon Coast (U.S. Fish and Wildlife Service 1997). In other parts of the permit area, focusing conservation efforts on existing nesting habitat and on state forest lands that are adjacent to protected federal nesting habitat will support recovery efforts under the *Northwest Forest Plan* (U.S. Department of Agriculture and U.S. Department of the Interior 1994) and the U.S. Bureau of Land Management's *Western Oregon Resource Management Plans* (U.S. Bureau of Land Management 2016a, 2016b).

When HCAs were created, they were designed to include existing buffers around designated occupied habitat or lower-quality habitat areas adjacent to designated occupied habitat to provide some buffer against forest edge. Buffers reduce/minimize edge effects (i.e., windthrow, reduced development of epiphytes, and forest conditions that attract predators). They also increase interior habitat area, which can reduce predation risk. Thus, buffers maintain or enhance habitat quality and may improve nest success over time. Furthermore, seasonal restrictions will be used to minimize noise, line-of-sight, and smoke impacts from disruptive activities that could influence nesting success during sensitive nesting and chick rearing stages.

4.6.7.2 Objective 6.2: Increase the Amount of High-Quality Habitat for Marbled Murrelet

Objective

- Within HCAs, use active and passive management to increase the amount of highly suitable habitat by between 54,000 and 68,000 acres, for a potential total of 70,000 acres of highly suitable habitat in HCAs by the end of the permit term.
- Similarly, increase the amount of suitable habitat by between 44,000 and 55,000 acres, for a potential total of 134,000 acres of suitable habitat in HCAs by the end of the permit term.
- Active management will include light to moderate thinning in buffers adjacent to designated occupied, and highly suitable habitat that will create temporary edge habitats until stands can mature and transition into higher-quality habitat over time. This, combined with passive management, leads to model projections that suggest total suitable and highly suitable habitat at the end of the permit term could reach 204,000 acres.

Rationale

Marbled murrelets nesting near “hard edges” created by clearcuts or heavy thinning are vulnerable to increased risk of windthrow, potential degradation of microclimate, and nest predation by corvids and other edge-associated predators (Raphael et al. 2018; Malt and Lank 2007, 2009). In addition, edges can create microclimates that limit development of the moss on branches used by nesting murrelets (Van Rooyen et al. 2011). However, at small scales, thinning and manipulation of individual trees or cluster of trees can accelerate the formation of large nest branches and lead to late successional tree structure (Carey et al. 2003, Franklin et al. 2007, and Sillett et al. 2018 as cited therein).

Under this objective, conservation actions will maintain and enhance quality and quantity of habitat adjacent to designated occupied nesting habitat within HCAs. This will increase the distance between nest sites and hard edges, which is expected to reduce predation risk and encourage the development of moss and associated nesting platforms. HCAs that support marbled murrelets were designed to support sufficient interior habitat area to reduce predation risks associated with fragmentation and hard edges and increase nest site productivity over time.

The intention of this objective is to expand marbled murrelet habitat over time through management actions that accelerate development of late-seral forest characteristics and, in particular, nest platforms and associated cover (Nelson and Wilson 2002). Management will be strategically focused in areas where the habitat suitability model predicts that habitat is likely to develop in the future, and actions will be aimed at developing that habitat faster. Designated occupied habitat or habitat that is current modeled as highly suitable will not be managed (Conservation Action 7: Manage Habitat Conservation Areas). Light to moderate thinning will occur in buffers adjacent to designated occupied and highly suitable habitat that will create temporary edge habitats until stands can mature and transition into higher-quality habitat over time. Although stand-level responses to silvicultural treatments have not been measured long enough to make definitive conclusions in murrelet habitat management, the evidence at smaller scales suggests manipulation of small clusters of trees can be used to accelerate the formation of large nest branches (Franklin et al. 2007; Sillett et al. 2018; Case et al. 2023). Management in these areas will focus on enhancing buffer function around designated occupied habitat or otherwise highly suitable habitat to increase habitat quantity and enhance the functionality of existing habitat, thereby reducing edge effects through the creation of larger blocks of suitable nesting habitat.

Figure 4-3 shows the total acres of marbled murrelet suitable and highly suitable habitat modeled to occur in the HCAs over the permit term, by decade, as a result of both passive and active management under the HCP. As described under Goal 6, ODF commits to managing HCAs to attain as much of this habitat as possible. Contingencies that may occur over time, including fire and wind disturbance or altered growth regimes due to drought, might preclude or delay realizing some of this modeled habitat development. Given the uncertainty, ODF has a high level of confidence that at least 80% (54,000 acres) of the highly suitable habitat modeled to grow in the HCAs over the 70-year permit term can be achieved, given potential changes in disturbance and growth regimes. ODF will be in compliance with the HCP (in terms of this objective) as long as the conditions that limit habitat attainment of these levels are reasonably beyond ODF's control and the HCAs are managed with the intent of achieving their full modeled habitat potential. As described under Conservation Action 7: Manage Habitat Conservation Areas, HCA standards will direct land-management activities in HCAs to improve long-term habitat values for covered species in HCAs while minimizing impacts in the short term. These limitations on management actions in habitat, and other operational

restrictions detailed in Conservation Action 10, will help ensure that, as much as possible, all of the habitat modeled to occur in HCAs will be attained and protected.

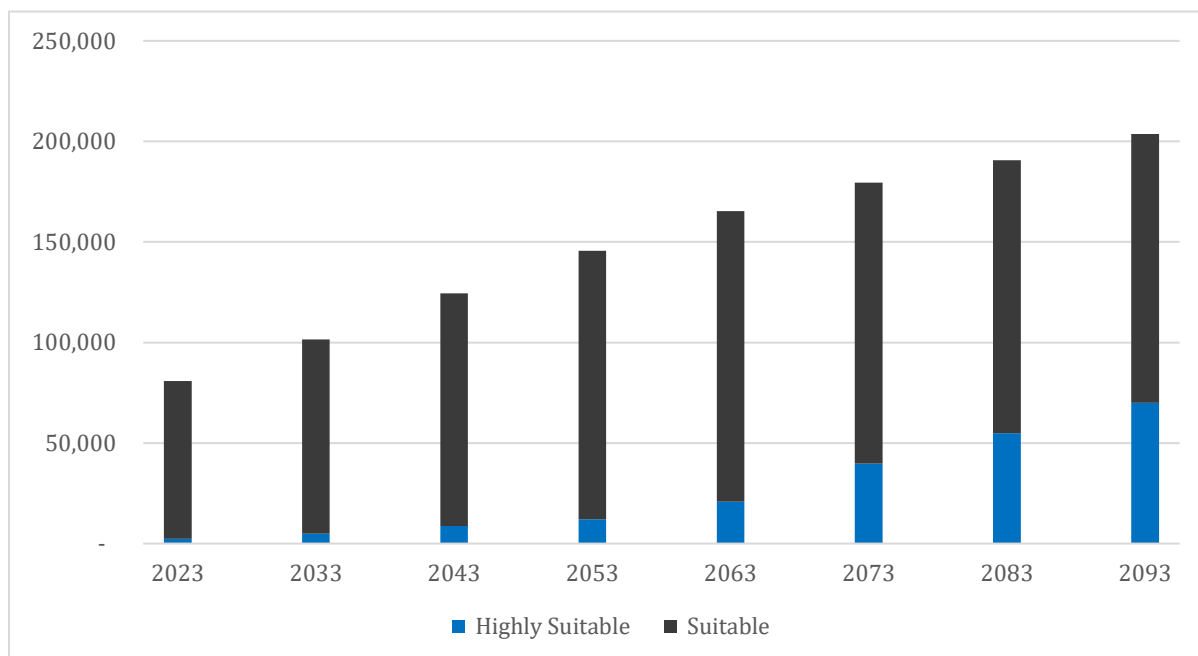


Figure 4-3. Acres of Marbled Murrelet Habitat Projections in HCAs, by Decade

4.6.8 Goal 7: Support the Persistence of Red Tree Vole

The objectives below will support the persistence of red tree vole (North Oregon Coast Distinct Population Segment) in the permit area and increase the quantity of high-quality habitat over time.

4.6.8.1 Objective 7.1: Conserve, Maintain, and Enhance Occupied Red Tree Vole Habitat

Objective

- Within HCAs, conserve, maintain, and enhance all existing suitable habitat (approximately 61,191 acres) and all existing highly suitable habitat (approximately 10,664 acres, as of 2023). This total of 71,855 acres within HCAs represents 60% of the total suitable and highly suitable habitat in the permit area (119,339 acres). The habitat within HCAs include locations where occupancy has been previously documented (as of 2023).
- Although approximately 40% of existing habitat (suitable and highly suitable) located outside of HCAs will be subject to harvest, model projections indicate that additional habitat may develop outside HCAs under the proposed management strategies, which could provide benefits to red tree voles. Some habitat values (e.g., known nest trees, legacy features, large diameter trees, trees with key features, Sitka spruce in northwestern portion of distinct population segment) will be retained through implementation of Conservation Action 8.
- To establish baseline conditions, ODF will conduct and complete surveys of a subset of suitable and highly suitable habitat in HCAs within 20 years of permit issuance. Surveys will start within

suitable and highly suitable habitats in proximity to known subpopulations and occupied stands and expand into adjacent habitat of lower quality to gain a better understanding of habitat use (see Section 5.3.3.2, *Terrestrial Habitat Monitoring by Species Objectives*).

Rationale

Conserving stands where red tree voles have been documented is a key first step in supporting the persistence of red tree voles in the permit area. Red tree voles occur at low densities and are distributed irregularly across landscapes of suitable habitat (Rosenberg et al. 2016). Although population size estimates are not available to estimate trends, data and anecdotal information strongly suggest that current North Oregon Coast Red Tree Vole Distinct Population Segment is considerably smaller than historical numbers (U.S. Fish and Wildlife Service 2023b). Therefore, conserving the few occupied sites confirmed to occur in the permit area is a priority for implementation in the HCP.

Most ODF lands in the range of the North Oregon Coast Red Tree Vole Distinct Population Segment have not been surveyed. In addition, determining red tree vole occupancy of a given forest is challenging due to notable differences in detection rates, depending on the survey method (e.g., ground or canopy), and stand age, with time-consuming canopy-based surveys having higher detection rates in older stands (Rosenberg et al. 2016; Marks-Fife 2016; Piasecki 2023). If conservation is limited to occupied habitat identified by species presence at a given point of time, suitable habitat of unknown occupancy may be removed or modified, further contributing to population declines or inhibiting future recovery (Camaclang et al. 2015). Therefore, conservation of unsurveyed or unoccupied suitable habitat is important for supporting the persistence of red tree voles in the permit area.

4.6.8.2 Objective 7.2: Increase the Amount of High-Quality Habitat for Red Tree Vole

- Within HCAs, use active and passive management to increase the amount of highly suitable habitat by between 54,000 and 67,000 acres, for a potential total of 78,000 acres of highly suitable habitat in HCAs by the end of the permit term.
- Similarly, increase the amount of suitable habitat by between 30,000 and 37,000 acres, for a total of 98,000 acres of suitable habitat in HCAs by the end of the permit term.
- As described under Conservation Action 7, enhancement of red tree vole habitat within HCAs will be limited to using silvicultural actions to develop larger trees with more habitat structure over time, including an overall increase in canopy connectivity within the range of the species. Many of these benefits will be realized from the silvicultural prescriptions implemented for northern spotted owls and marbled murrelets. As a result, model projections suggest total habitat within HCAs at the end of the permit term could reach 176,000 acres. Additional habitat suitable for red tree vole is anticipated to grow outside of HCAs through implementation of Conservation Action 8.

Rationale

Red tree voles are associated with large blocks of late-seral conifer forests (Martin and McComb 2002; USFWS 2023b). They have very poor dispersal capabilities and are sensitive to habitat fragmentation. The probability of red tree vole occurrence in a given forest patch decreases with

distance to suitable habitat (Rosenberg et al. 2016; Linnell et al. 2017). Increasing the number and size of patches of late-seral interior forest habitat between and adjacent to occupied habitat will reduce dispersal distances between late-seral forest patches, facilitate dispersal, and encourage colonization of unoccupied suitable habitat (Linnell et al. 2017). Enhancement of red tree vole habitat would be limited to using silvicultural actions to develop larger trees with more habitat structure over time, including an overall increase in canopy connectivity within the range of the species. Many of these benefits will be realized from the silvicultural prescriptions implemented for northern spotted owls and marbled murrelets.

As described later under Conservation Action 7, enhancement of red tree vole habitat will be limited to using silvicultural actions to develop larger trees with more habitat structure over time, including an overall increase in canopy connectivity within the range of the species. Habitat enhancement activities in HCAs where the permit area is adjacent to mature habitat on federal lands will provide additional habitat in areas where red tree voles are known or likely to exist, expanding local populations and associated resilience and long-term persistence of the species.

Figure 4-4 shows the total acres of red tree vole suitable and highly suitable habitat modeled to occur in the HCAs over the permit term, by decade, as a result of both passive and active management under the HCP. As described under Goal 7, ODF commits to managing the HCAs to attain as much of this habitat as possible. Contingencies that may occur over time, including fire and wind disturbance or altered growth regimes due to drought, might preclude or delay realizing some of this modeled habitat development. Given the uncertainty, ODF has a high level of confidence that at least 80% (54,000 acres) of highly suitable habitat modeled to grow in the HCAs over the 70-year permit term can be achieved, given potential changes in disturbance and growth regimes. ODF will be in compliance with the HCP (in terms of this objective) as long as the conditions that limit habitat attainment to these levels are reasonably beyond ODF's control and the HCAs are managed with the intent of achieving their full modeled habitat potential. Within HCAs, modeled habitat acres beyond the committed acres are not considered excess acres that could be subject to more flexible, intensive, or revenue-driven management. ODF's intent is to attain as much habitat as possible in HCAs, and management activities will be planned accordingly. As described under Conservation Action 7: Manage Habitat Conservation Areas, HCA standards will direct land-management activities in HCAs to improve long-term habitat values for covered species in HCAs while minimizing impacts in the short term. These limitations on management actions in habitat, and other operational restrictions detailed in Conservation Action 10, will help ensure additional habitat that develops in HCAs beyond commitments remains similarly protected.

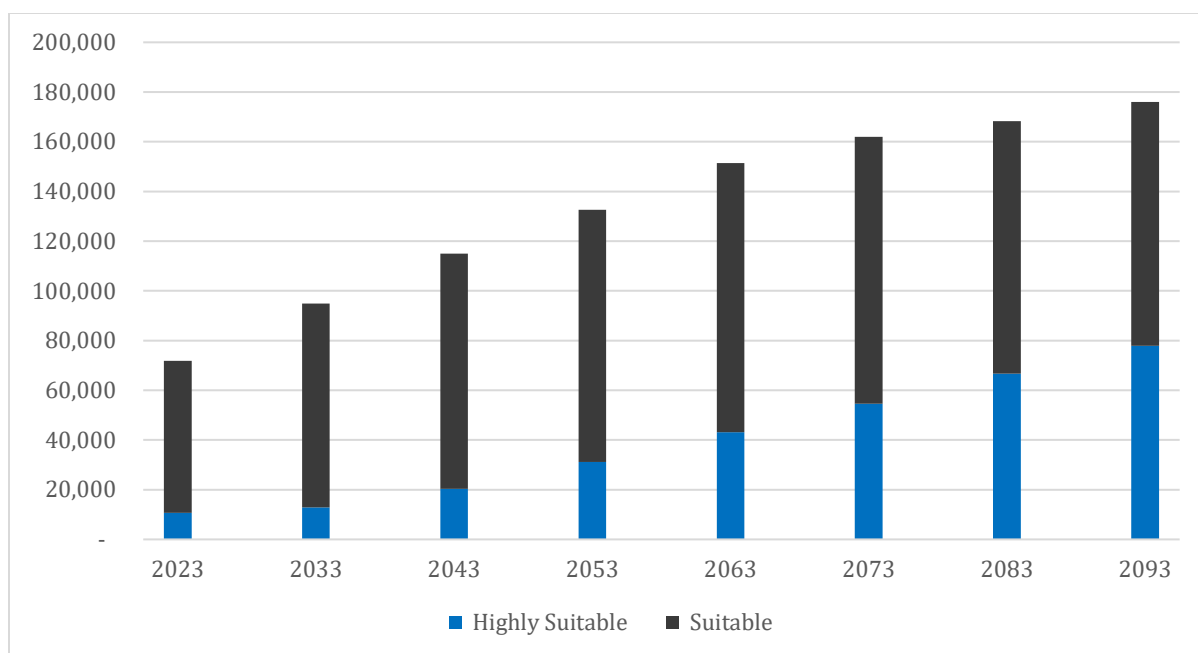


Figure 4-4. Acres of Red Tree Vole Habitat Commitments and Modeled Habitat in HCAs, by Decade

4.6.9 Goal 8: Support the Persistence of Coastal Marten

The objectives below will support the persistence of coastal marten in the permit area and increase the quantity of high-quality habitat over time.

4.6.9.1 Objective 8.1: Conserve, Maintain, and Enhance Existing Coastal Marten Habitat

Objective

- Within HCAs, conserve, maintain, and enhance all existing potential denning, foraging, and dispersal habitat (approximately 27,000 acres) in the range of the species.
- Outside HCAs, habitat values (e.g., legacy features, large-diameter trees, trees with key features, hardwoods) will be retained through implementation of Conservation Action 8. Initially the monitoring goal for coastal marten is to gain a better understanding of species distribution and habitat use patterns in the permit area. Once a better understanding of species distribution and habitat use in the permit area is established, monitoring will focus on evaluating changes in habitat quality for coastal marten following management activities and eventually species response to changes in habitat quality (see Section 5.3.3.2, *Terrestrial Habitat Monitoring by Species Objectives*).

Rationale

Coastal marten exist in three isolated populations: northern coastal California, southern coastal Oregon, and central coastal Oregon (Linnell et al. 2018; Moriarty et al. 2019). The Southern Coastal Oregon Extant Population Area delineated by Slauson et al. (2019) overlaps with ODF lands in Curry and Josephine Counties and contains the majority of the permit area acres in the range of coastal

martin (87%). Vegetation in this area is composed of a mixed conifer forest, which is dominated by Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), and Douglas-fir, interspersed with unique plant communities adapted to serpentine soils, including forests of widely spaced pines (*Pinus* spp.) with an understory of grasses and more mesic areas with dense and diverse shrub layer, including tan oak (*Notholithocarpus densiflorus*) and huckleberries (*Vaccinium* spp.) (Moriarty et al. 2019). The Central Coastal Oregon Extant Population Area is near the permit area in Coos and Douglas Counties (U.S. Fish and Wildlife Service 2018). Coastal martens in the central coastal Oregon population occupy shore pine (*Pinus contorta* ssp. *contorta*) and transitional shore pine/Douglas-fir-hemlock forests dominated by young stands of shore pine and young Sitka spruce. The understory is dominated by willow (*Salix* spp.) and ericaceous shrubs such as evergreen huckleberry (*V. ovatum*) and salal (*Gaultheria shallon*) (Moriarty et al. 2016; USFWS 2018).

Moriarty et al. (2019) found martens using young forests with interconnected, dense patches of shrubs. Based on this finding, it is assumed that timber harvest practices that do not dramatically alter the dominant overstory cover (combination of both overstory and understory cover of at least 65%) while encouraging dense shrub growth, particularly salal and evergreen huckleberry, and retain or increase large woody material will benefit coastal marten populations. Moriarty et al. (2019) also found both spotted owls and martens in areas with many large and tall trees and suggest that retention and recruitment of large structures will benefit both species. Conservation of coastal marten habitat on ODF lands will, therefore, focus on identifying stands that currently provide, or could be enhanced to provide, these conditions.

4.6.9.2 Objective 8.2: Increase the Amount of High-Quality Habitat for Coastal Marten

Objective

- Within HCAs, use active and passive management to increase the quality of denning, foraging, and dispersal habitat within 27,000 acres over the permit term.
- Additional habitat in RCAs will also grow and develop more mature forest conditions in well-distributed patterns across the landscape that will facilitate foraging and dispersal. As described under Conservation Action 7, active management inside HCAs will enhance stand conditions actively by encouraging dense growth of fruit-bearing shrub cover (healthy conifer thinning) and passively through the retention and recruitment of hardwoods and structural features that provide suitable resting and denning structures. Outside of HCAs, the upland leave retention strategy will contribute to sources of large trees, snags, and logs through implementation of Conservation Action 8.

Rationale

The viability of coastal marten depends on maintaining the three existing isolated populations and potentially establishing new populations to restore connectivity between populations (Slauson et al. 2019a). Current and modeled future resiliency of the Southern Coastal Oregon Extant Population Area that overlaps the permit area is considered low because of small population size (less than 100 individuals), limited connectivity to the California–Oregon border population, and limited habitat for predatory avoidance (U.S. Fish and Wildlife Service 2018). The Central Coastal Oregon Extant Population Area has limited overlap with the permit area. This population consists of a limited

number of adults (71 individuals across two subpopulations) that are at an extinction risk in the next 30 years (Linnell et al. 2018).

In all cases, enhancement of habitat within the range of the species will provide higher-quality habitat, with the intent being to stabilize existing populations and improve population trends. Silvicultural prescriptions will be used that promote the development of robust, diverse shrub-dominated understories that provide extensive, tall, dense cover (particularly where ericaceous shrubs are present). Increased stratification of canopy layering and midstory development will also be favored. Management activities in HCAs that occur in the range of coastal marten will be a combination of thinning and regeneration harvest that will open up areas to promote shrub growth both inside and outside HCAs. In areas where regeneration harvests are used inside HCAs, they will be reforested using methods that support maintenance of a low shrub layer and retain and promote marten denning structures.

4.7 Conservation Actions for Covered Species

This section describes the conservation actions that ODF will implement to achieve the biological goals and objectives described in Section 4.6, *Biological Goals and Objectives*, and minimize and mitigate the impacts of covered activities on the covered species (Chapter 6, *Analysis of Effects and Actions that May Result in Take*). Most conservation actions are intended to benefit multiple species, including aquatic and terrestrial species.

The conservation actions to be implemented under the HCP fall into three general groups.

- Conservation Actions 1 through 5 and 12 target measures that ODF will implement to protect and enhance aquatic and riparian habitats to benefit primarily covered fish and aquatic amphibians.
- Conservation Actions 6 through 9 and 13 are focused on the preservation and enhancement of the terrestrial environment to benefit primarily covered birds, terrestrial amphibians, and mammals.
- Conservation Actions 10 and 11 address the minimization measures that ODF will implement throughout the permit area to minimize effects from timber harvest and road construction and maintenance on covered species.

Each conservation action will help to achieve more than one biological objective. Detailed linkages between the biological goals and objectives for each covered species, covered activities, and conservation actions are provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

4.7.1 Conservation Action 1: Establish Riparian Conservation Areas

Conservation Action 1 is intended to support primarily⁹ the biological objectives below. A complete list of all the covered activities and linkages is provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

- 1.1: Riparian Wood Recruitment
- 1.2: Stream Complexity
- 1.3: Water Quality and Quantity
- 2.1 and 3.1: Conserve and Maintain Riparian Habitat within Torrent Salamander Ranges
- 4.1: Conserve, Maintain, and Enhance Existing Oregon Slender Salamander Habitat
- 4.2: Retain and Recruit Downed Wood to Support Oregon Slender Salamander

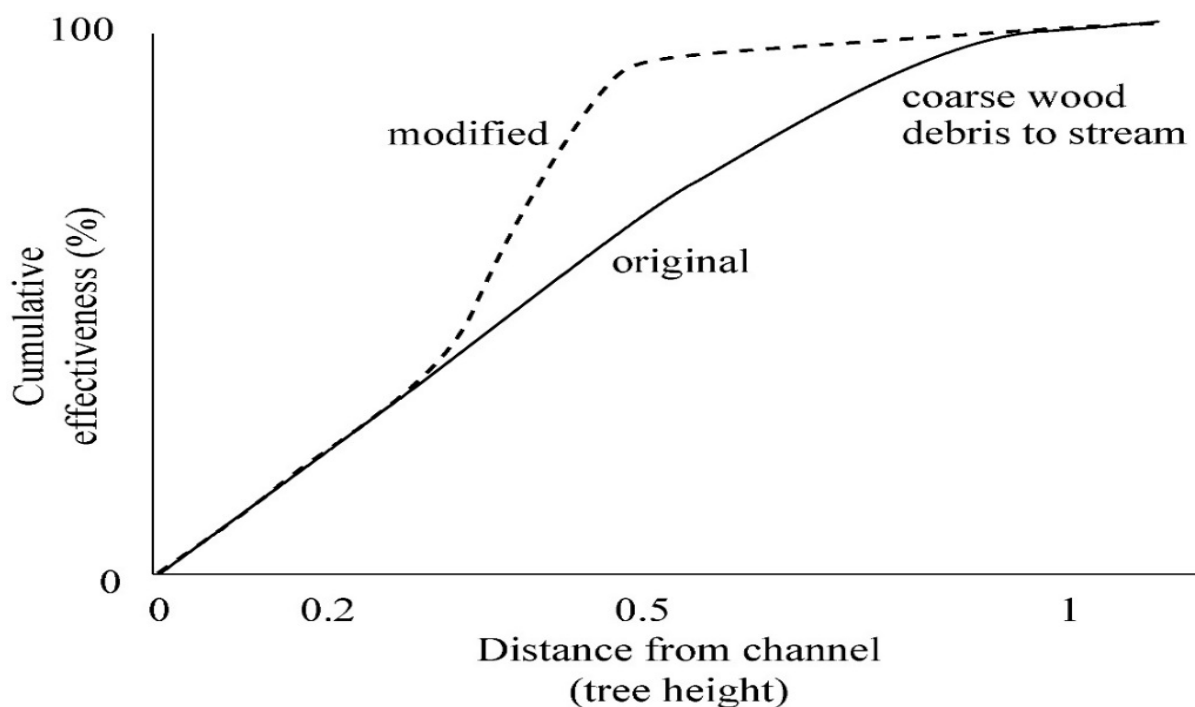
This conservation action describes how ODF will implement a riparian management strategy to ensure important riparian functions are maintained in the permit area and provide suitable habitat for the fish species covered under this HCP and other aquatic species (e.g., torrent salamanders). Riparian functions addressed in this action are large wood and gravel recruitment, stream shading, nutrient input, and streambank integrity, many of which are limiting factors identified for the covered aquatic species. Maintaining intact RCAs in the permit area will increase ecosystem resilience by buffering ecological function against changes in streamflow (Beechie et al. 2012). Harvest, as defined in Chapter 3, Section 3.2.2, *Harvest Types*, will not occur in the RCAs. Felling of hazard live or dead trees may occur in RCAs where such trees threaten public safety or infrastructure (e.g., roads, trails, campgrounds). When this occurs, the trees will be felled toward the stream and remain within the RCA if a stable location is available; otherwise, they will be left as downed wood outside of the RCA. Some stand-management activities such as road and trail construction or maintenance (as defined in Chapter 3, Section 3.4, *Road and System Maintenance*), stream enhancement projects (e.g., process based restoration [PBR]), and interplanting within RCAs to enhance riparian areas may occur as part of the covered activities.

Large wood contributes to natural processes and promotes instream channel complexity by adding structure to streams that influence channel form and function. Large wood placed in streams facilitates the creation and maintenance of hydrologic features, such as pools, gravel bars, and backwater areas, all of which provide essential habitat features for various life-history stages of the covered aquatic species. Large wood changes sediment routing through the aquatic system, slowing the movement of bedload sediments and causing an increase in storage of sands and gravels. Field research and modeling demonstrate that approximately 95% of the total instream wood inputs from adjacent riparian areas to fish-bearing streams come from distances of 82 to 148 feet (slope distance) from the edge of the stream channel. This distance represents 0.5 to 0.8 of site-potential tree height¹⁰ (Reeves et al. 2016) (Figure 4-5), based on the modified effectiveness curve that has

⁹ RCAs may secondarily support other covered species by aiding landscape connectivity for northern spotted owl outside of HCAs and providing occasional nest platforms and large woody material that may aid other terrestrial covered species.

¹⁰ *Site-potential tree height* refers to the average maximum height of the tallest dominant trees (200 years or older) for a given site class.

been developed since the original 1993 Forest Ecosystem Management Assessment Team curve. The effectiveness curve shows the percent of instream wood delivery that would be expected, based on the distance the riparian area extends from the stream channel.



Source: Reeves et al. 2016.

Figure 4-5. Modified Effectiveness Curve for Wood Delivery to Streams as a Function of Distance from Stream Channel

Streamside riparian harvest reduces the number of trees available for large wood recruitment because those trees are removed from the riparian zone. The establishment of RCAs in fish- and non-fish-bearing streams and limiting harvest activities in RCAs will increase large wood inputs and benefit the covered species by increasing instream habitat complexity, channel stability, and channel form and function. This increase in large wood input and instream habitat complexity will occur because, as they mature, the riparian stands will produce larger-diameter trees and a greater diversity of tree sizes and shapes. Large wood also provides nutrients to streams and collects gravels and cobbles for aquatic invertebrate production (e.g., food for covered fish and torrent salamanders).

Removing trees in the riparian forest adjacent to streams can reduce canopy cover, which affects stream shading. Solar radiation is the main source of heat for small mountain streams. The implementation of RCAs will maintain and increase streamside canopy cover and shading to prevent increases in stream water temperatures for the coldwater aquatic species (covered fish and torrent salamanders). The riparian conservation actions described here will be complemented by management direction within designated HCAs (Conservation Action 6: Establish Habitat Conservation Areas), where appropriate, to provide additional benefits to covered species in the permit area. This will include larger areas of passive management adjacent to many RCAs as well as additional legacy retention for silvicultural prescriptions within HCAs, such as additional clustering of green trees at the junction of seasonal and perennial streams.

4.7.1.1 Delineation of Riparian Conservation Areas

ODF will establish RCAs adjacent to the aquatic zone, which includes the stream channel(s) and associated aquatic habitat features (beaver ponds, stream-associated wetlands, side channels, and the channel migration zone) (Figure 4-6). The RCAs will benefit the covered fish species and aquatic amphibians by conserving, maintaining, and enhancing riparian processes that create aquatic habitat. The functions of these streams will be maintained by retaining vegetation in riparian areas during adjacent harvest activities. No harvest, as defined in Chapter 3, Section 3.2.2, *Harvest Types*, will occur in the RCAs, including harvesting of standing or downed trees for salvage after disturbance events. Felling of hazard live or dead trees may occur in RCAs where such trees threaten public safety or infrastructure (e.g., roads, trails, campgrounds). RCA management direction and best management practices (BMPs) will apply to all RCAs, whether they are located within or outside of HCAs.

RCA buffer widths will be applied to stream reaches, dependent on the presence of fish, stream size (determined by average annual flow), flow duration (perennial versus seasonal), and the potential for landslides (potential debris flow tracts) or fluvial transport during high-energy seasonal flow events. RCA buffer widths are reported in horizontal distances unless otherwise noted. Once the initial management area is determined, delineation and posting of RCAs will occur in and adjacent to the area. Prior to this delineation, the field staff will conduct stream surveys to determine fish presence, stream size, and flow duration (i.e., perennial versus seasonal) where unclassified and identify any sensitive areas such as seeps, springs, perennial reaches, and potentially unstable slopes that may require further refinement, additional buffering, or consultation. An ODF staff aquatic biologist or geomorphologist will review these areas and conduct site visits, as necessary, to provide technical assistance in delineating RCAs and sensitive areas and applying RCA strategies. Assessment and delineation of these features may begin 1 to 3 years before a forest management activity will be implemented and continues up through the preparation of the area for operations (e.g., boundary posting for a timber sale).

The RCA width is measured and applied in the field horizontally, regardless of slope. It is measured from the aquatic zone of the water body, or the edge of the stream-associated wetland, side channel, or channel migration zone,¹¹ whichever is farthest from the waterway, to the uplands. As slope increases, the width of the conservation area in the field (slope distance), therefore, also increases. For example, a 120-foot management area has an actual effective width, as measured on the ground (i.e., along the slope), of 120 feet at 0% slope and 170 feet at 100% slope (Figure 4-9). Similarly, a 35-foot management area has an actual effective width of 35 feet at 0% slope and 49 feet at 100% slope (Figure 4-9). The width of these areas will be expanded to up to 170 feet in width to encompass sensitive sites (e.g., inner gorges) that occur (Figure 4-9).

¹¹ The area where the active channel of a stream or river is prone to move; the movement results in a potential near-term loss of riparian function and associated habitat adjacent to the stream.

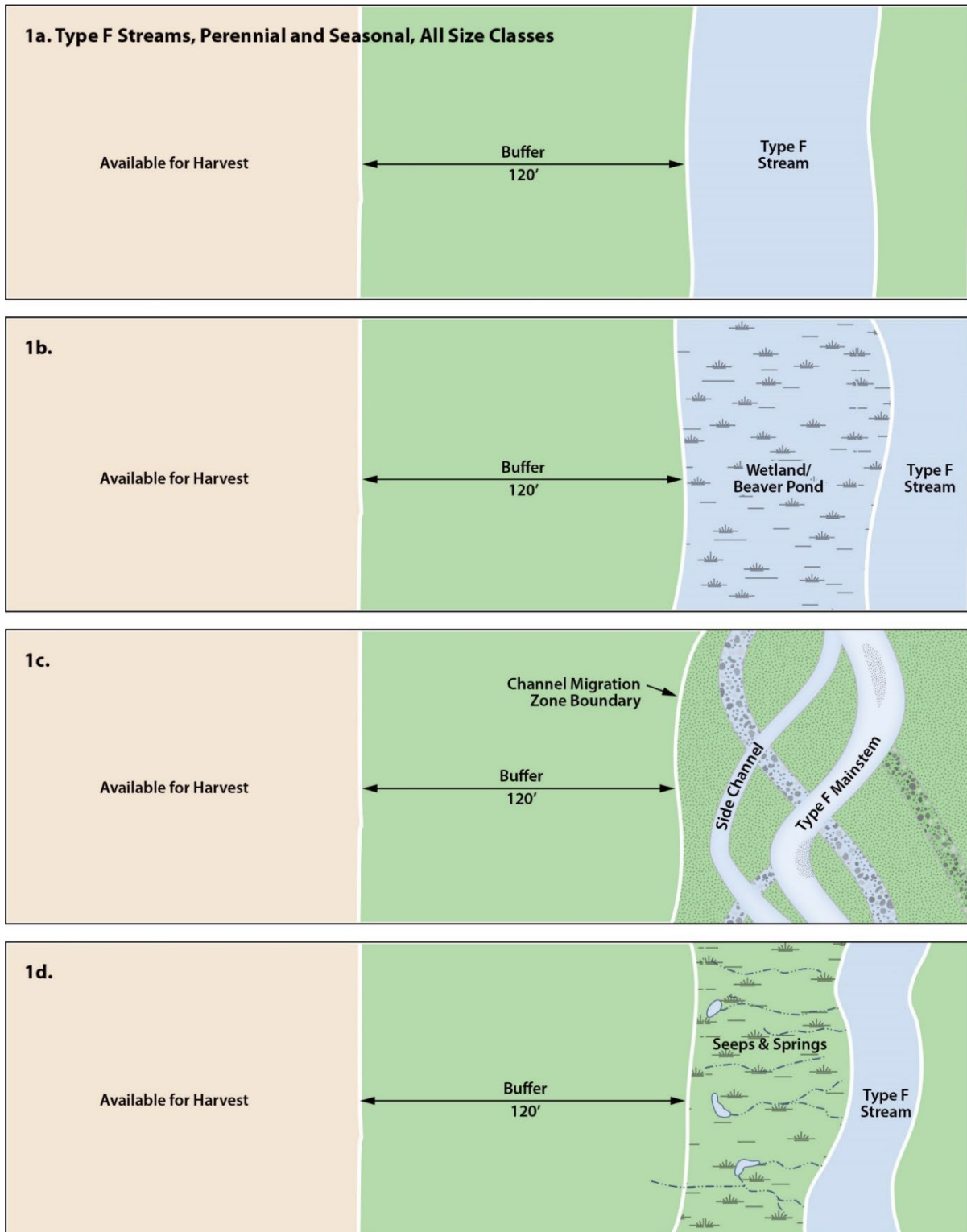


Figure 4-6. Effects of Aquatic Zone Designations on Riparian Conservation Areas

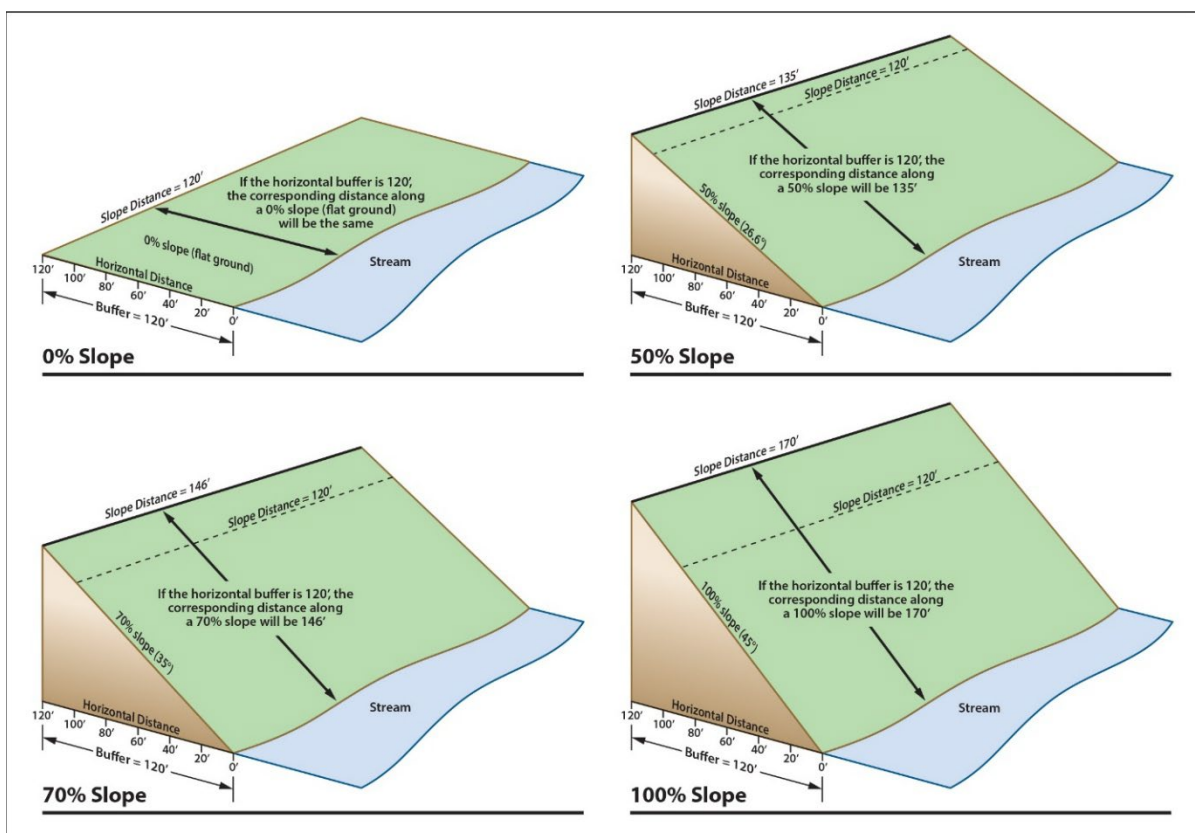


Figure 4-7. Examples of the Horizontal Distance Measurement of a 120-foot Riparian Conservation Area

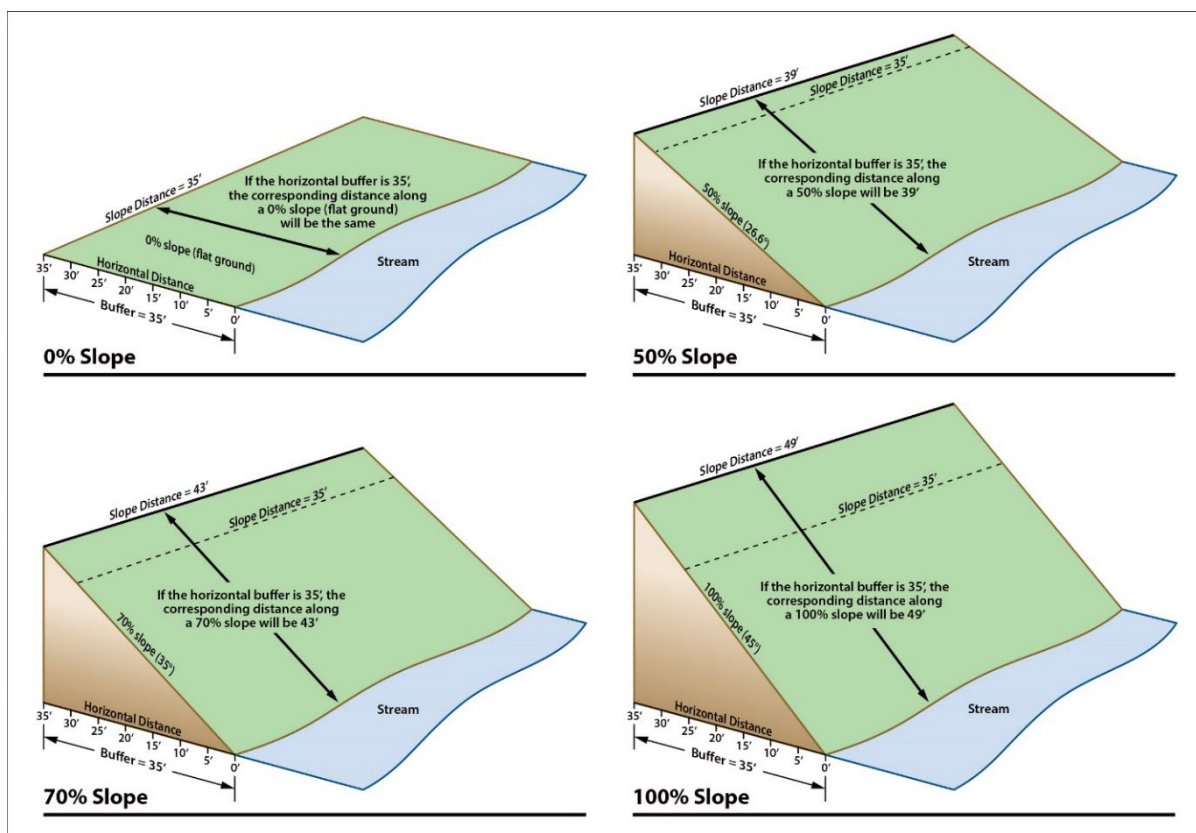


Figure 4-8. Examples of the Horizontal Distance Measurement of a 35-foot Riparian Conservation Area

4.7.1.2 Structure of Riparian Conservation Areas

The width of RCAs will vary, based on stream size, stream type, localized flow features, fish presence (fish versus non-fish), and horizontal distances (Table 4-3 and Table 4-6; Figure 4-9). The structure of the RCAs is as follows.

- Large and medium non-fish-bearing streams will be treated the same as fish-bearing streams; all will have a 120-foot (horizontal distance) RCA that extends from the aquatic zone.
- Seasonal fish-bearing streams will have a 120-foot (horizontal distance) RCA that extends from the aquatic zone for the entire stream segment (Table 4-2).
- Small, perennial non-fish-bearing streams will retain a 120-foot RCA (horizontal distance) from the aquatic zone for the first 500 feet upstream from the end of fish use on perennial fish-bearing streams to create a process protection zone (PPZ). ODF expects the PPZ to reduce the rise of stream temperature to less than 0.3 degree Celsius (°C) above baseline prior to mixing with fish-bearing streams (Appendix E, *Effects Analysis*, Temperature Protection Memorandum section). Upstream of the 500-foot PPZ, the buffer will be 35 feet (horizontal distance) from the aquatic zone.
- Seasonal non-fish-bearing streams that are a potential debris flow track or high-energy reaches that have the potential to deliver large wood to fish-bearing streams will have RCAs that extend 50 feet (horizontal distance) from the aquatic zone for the first 500 feet upstream of the end of

fish use to recruit large wood into streams from standing trees. Upstream of the 500-foot PPZ, the buffer will be 35 feet (horizontal distance) from the aquatic zone to the stream initiation point in a potential debris flow track or high-energy reaches (Table 4-3; Figure 4-10). The length and width are sufficient to contain 98% and 93% of all debris flow impact widths, respectively, based on unpublished debris flow track data collected from two 1996 storms (Robison et al. 1999). As a result, existing standing trees and downed wood within reaches identified as likely debris flow tracks will be available as large wood inputs to the aquatic system, mimicking the natural mass wasting regime.

- Seasonal non-fish reaches that are not potential debris flow tracks or high-energy reaches, as described above, will not have an RCA, but they will have a 35-foot ERZ from the aquatic zone. Ground-based operations will be limited to only conservation actions, those actions required for the felling and harvest of trees, along with road and trail building and maintenance. Disconnected sections of seasonal streams (e.g., no stream channel or evidence of surface flow) will not have RCAs, except ground-based equipment restrictions. The ERZ is further described in Conservation Action 2: Riparian Equipment Restriction Zones. The differing buffer strategies for the three seasonal stream types is depicted in Figure 4-11. A 35-foot-wide transition zone will be maintained 100 feet upstream from the perenniality initiation point, as depicted in Figure 4-12. This transition zone is intended to address uncertainty around accurate identification of the end of perenniality.

4.7.1.3 Landscape Distribution

RCAs will exist in a dynamic mosaic of habitat conditions that continue to evolve through time. RCAs within HCAs will have relatively contiguous connections with upland forests; however, RCAs outside of HCAs will not exist in isolation of forest connectivity. They will exist in a landscape of variably aged stands, including young regenerating stands (see Appendix G for decadal stand age estimates). Approximately 77,900 acres are proposed to be designated as RCAs across the permit area. Approximately 36,700 acres of RCAs overlap with HCAs, leaving approximately 41,200 acres of RCAs outside of HCAs (approximately 6.4% of the permit area). The approximate number of miles of streams in the permit area, described above by buffer type, is shown in Table 4-4.

Table 4-2. Buffer Widths (Horizontal Distance) for All Type F and Large and Medium Type N

Stream Type	Management Area Width (feet) ^a	
	Type F	Type N
Large	120	120
Medium	120	120
Small	120	See Table 4-3
Seasonal ^b	120	See Table 4-3

^a Distance will be measured horizontally, which results in the implementation of larger buffers in steeper terrain (Figure 4-8).

^b Seasonal: A stream that does not have surface flow after July 15.

Table 4-3. Riparian Conservation Area Widths (Horizontal Distance) for Small Perennial and Seasonal Type N Streams

Stream Type	Management Area Width (feet) ^a	
	Within 500-foot Process Zone	Upstream of 500-foot Process Zone
Perennial small Type N	120	35
Potential debris flow track (Seasonal Type N) ^b	50	35
High energy (Seasonal Type N) ^c	50	35
Seasonal other (Type N) ^d	0 ^e	0 ^e

^a Distance will be measured horizontally, which results in the implementation of larger buffers in steeper terrain (Figure 4-8).

^b Potential Debris Flow Tracks: Reaches on seasonal Type N streams with potential to deliver wood to a Type F stream.

^c High Energy: Reaches on seasonal Type N streams with potential to deliver wood and sediment to a Type F stream during a high-flow event.

^d Seasonal: A stream that does not have surface flow after July 15.

^e A 35-foot equipment restriction zone will apply to these streams.

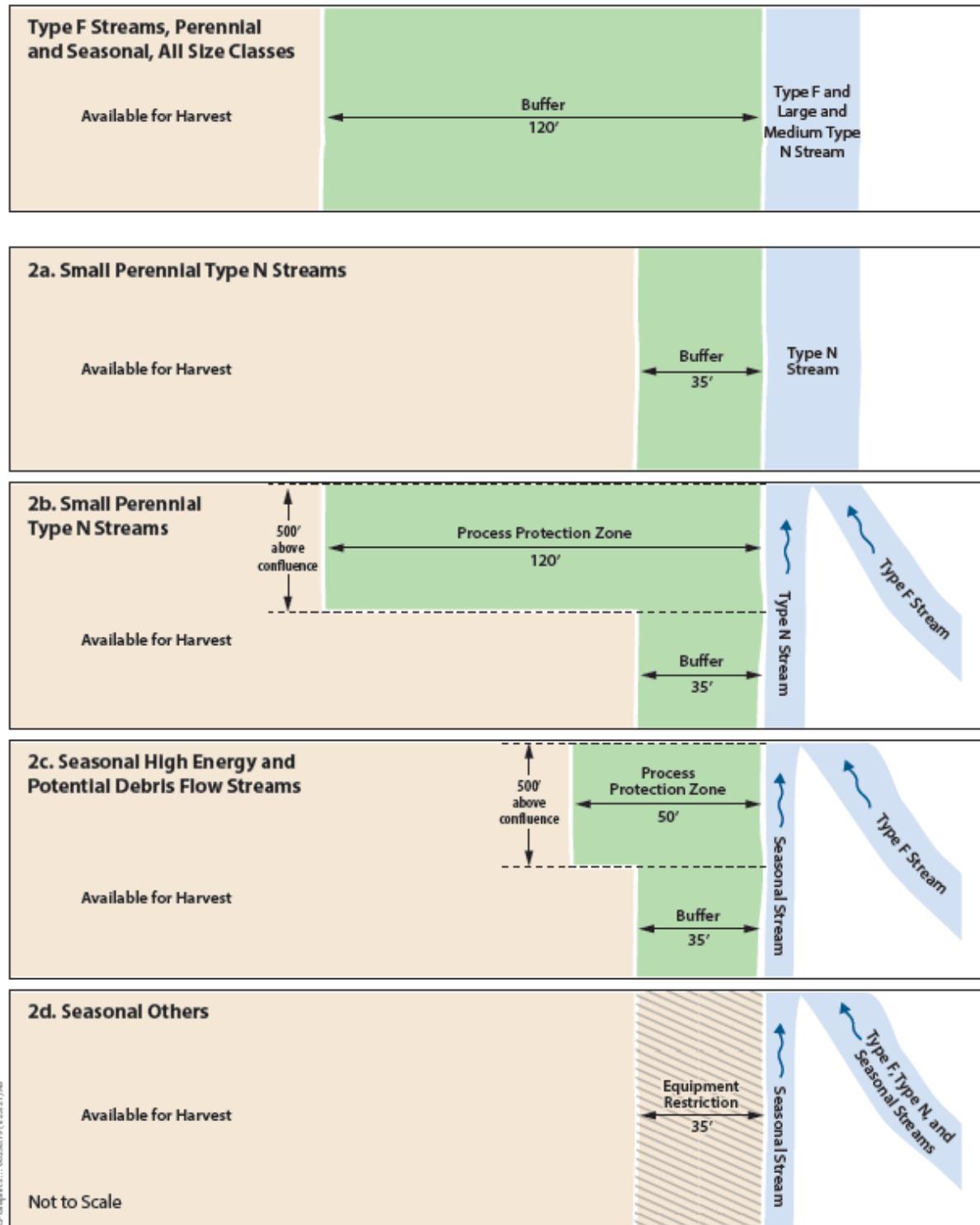


Figure 4-9. Riparian Conservation Areas on Type F and N Streams, Perennial and Seasonal, All Size Classes

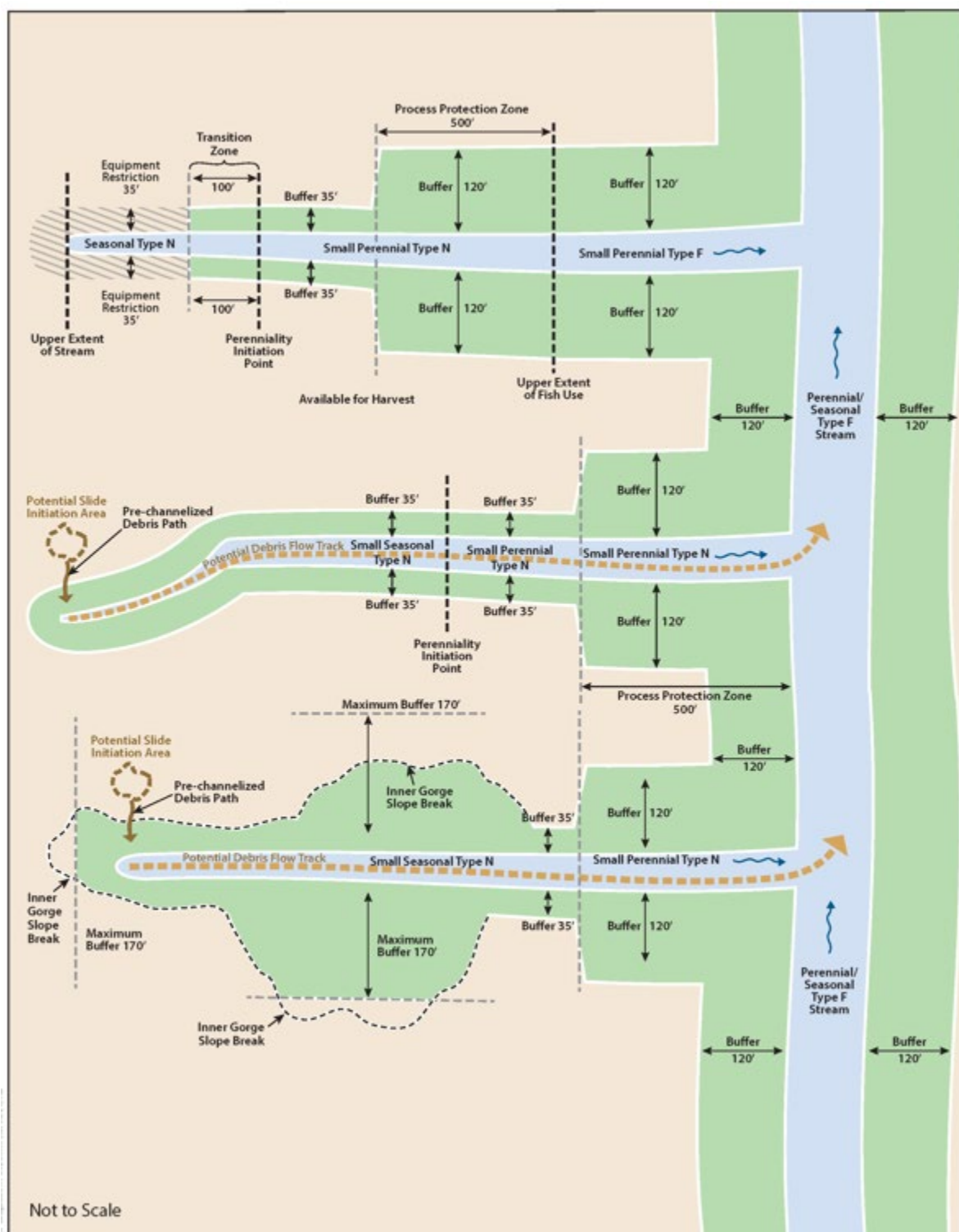


Figure 4-10. Riparian Conservation Areas in Process Protection Zones

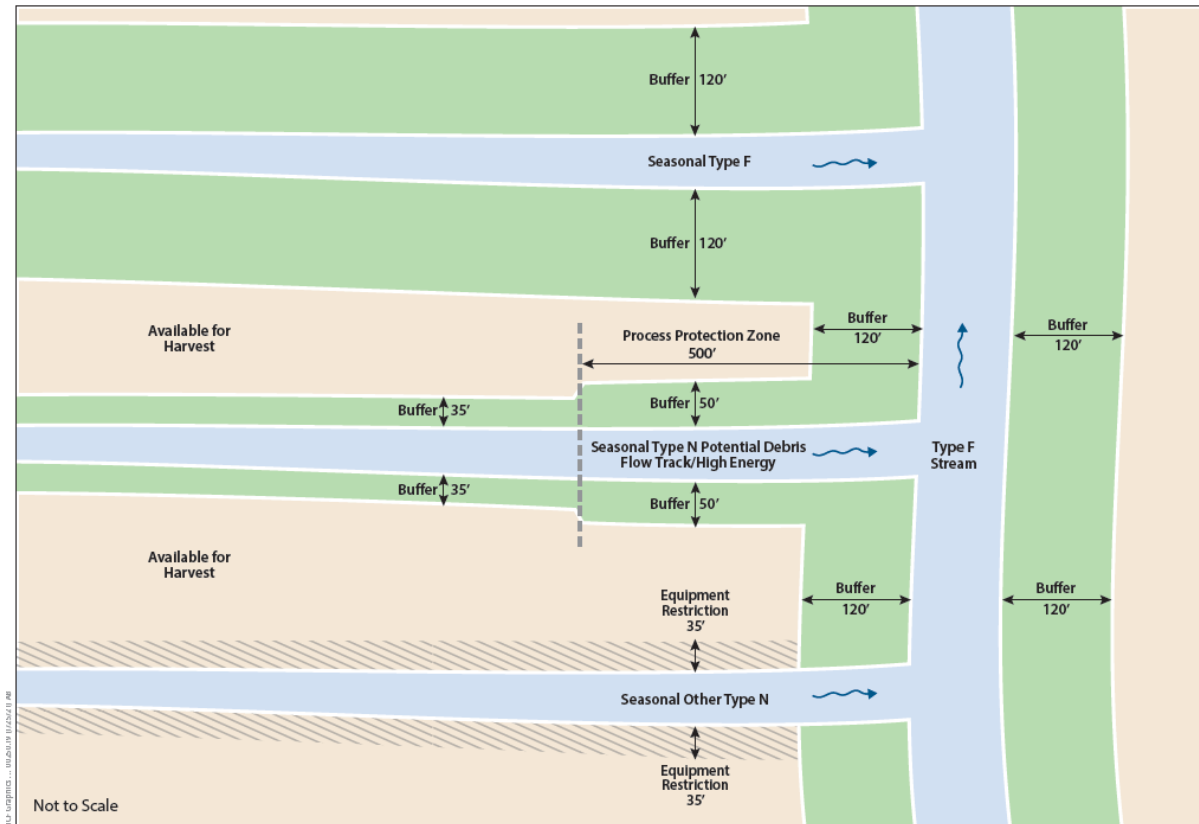


Figure 4-11. Riparian Conservation Areas along Seasonal Streams

Table 4-4. Estimated Miles of Stream by Buffer Type in the Permit Area

Stream Type	Stream Type	Buffer Width (feet) Measured in Horizontal Distance	Estimated Stream Miles in Permit Area	Estimated Stream Miles inside HCAs	Estimated Stream Miles outside HCAs
Type F	Type F Perennial – Large, Medium, Small	120	1,190	580.6	609.4
	Type F Seasonal	120	30	19.7	10.3
	Type N Perennial – Large and Medium	120	110	50.0	60.0
Type N	Perennial Small Type N – in PPZ	120	105	45.5	59.5
	Type N Perennial Small – above PPZ	35	865	324.1	540.9
	PDFT (Seasonal Type N) – in PPZ	50	700	350.8	349.2
	PDFT (Seasonal Type N) – above PPZ	35	1,955	961.5	993.5
	HE (Seasonal Type N) – in PPZ	50	10	6.0	4.0
	HE (Seasonal Type N) – above PPZ	35	20	7.1	12.9
	Transition Zone between Perennial Type N and Seasonal	35	70	25.1	44.9
Seasonal	Seasonal Other (Type N)	— ^a	2,960	1,223.9	1,736.1

^a A 35-foot ground-based equipment restriction.

HE = high energy; PDFT = potential debris flow track; PPZ = process protection zone

If stream-associated seeps and springs occur in a harvest unit, their extent will be evaluated when determining the RCA. Where a seep or spring is connected to a perennial stream, as determined by either surface flow or the presence of wetland plants or hydric soils, it will be included in the RCA buffer for that stream. Where the seep or spring is not fully encompassed by the RCA for the associated stream, the RCA will be extended to encompass it with a 35-foot buffer (Figure 4-12). In instances where stream-associated seeps and springs are documented in unbuffered Type N seasonal streams, creating an isolated perennial stream segment, a 35-foot RCA will be incorporated to protect and maintain that feature.¹² In addition, all splash zones in perennial stream segments, an important habitat component supporting torrent salamanders, will be protected by RCA buffers. Some splash zones that may occur along seasonal Type N streams will be partially protected by ERZs.

The width of the RCA will be expanded to a maximum of 170 feet to more fully encompass nearby inner gorges and aquatic adjacent unstable areas, as described in Section 4.7.1.5, *Special*

¹² The ODF staff may not encounter 100% of all perennial stream reaches along seasonal Type N streams where topographical obstructions prevent inspection of the entire stream reach above perennial initiation points or where seeps and springs are not obviously associated with the riparian area evaluated during the timber unit's preharvest inspections and stand marking.

Considerations for Potentially Unstable Slopes. Where either of these slope features is identified, the RCA will be extended. The expansion of the RCA will go to the inner gorge slope break or the top of the adjacent unstable slope, up to a maximum of 170 feet (horizontal distance) from the edge of the aquatic zone, whichever occurs first (Figure 4-12). The additional RCA width in these areas will ensure that potentially negative impacts from landslides and other soil movement (i.e., sloughing) will be minimized and the RCAs will function to the benefit of the aquatic system through large wood delivery and nutrient cycling and provide additional shade to streams where slope aspect is favorable.

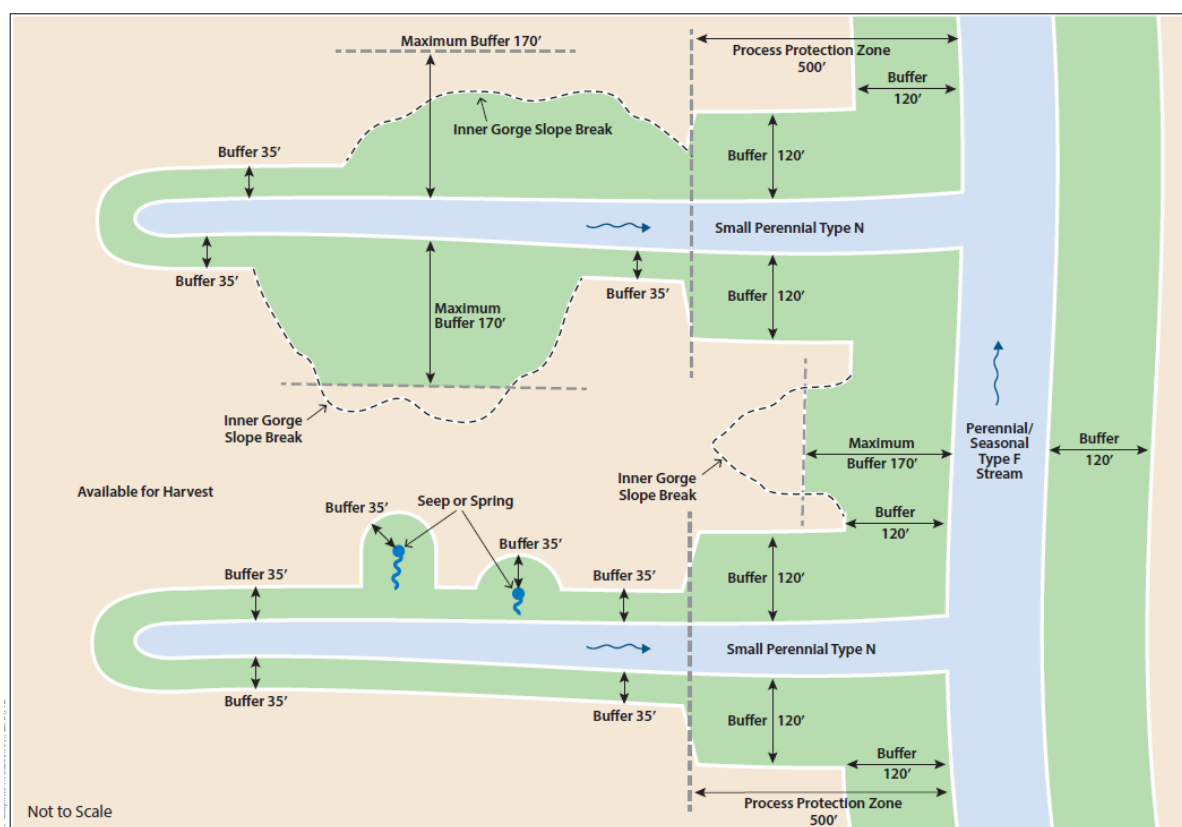


Figure 4-12. Effects of Seeps, Springs, and Inner Gorges on Riparian Conservation Areas

RCAs are intended to provide the ecological functions and processes required to create and maintain habitat for the covered fish species in the permit area (Reeves et al. 2016). The prescribed buffers in large and medium fish and non-fish streams, as well as small fish streams, are sufficient to capture the large wood modeled to be available over the permit term and provide shading to maintain cold stream temperatures (TerrainWorks 2020). The amount of shade provided by streamside vegetation is perhaps the most important variable affecting stream temperatures in a forested environment (Groom et al. 2011).

Headwaters that do not support fish typically drain at least 60 to 70% of a catchment area, constitute up to 90% of the stream network's length, and provide a prey base, source of downed wood, and sediment input for downstream fish reaches (Olsen et al. 2007; Reeves et al. 2003). Along small non-fish-bearing perennial streams and non-fish-bearing seasonal streams associated with potential debris flow tracks (PDFTs) and high-energy (HE) reaches, the overall goal of RCAs is to retain and grow the vegetation sufficient to support important functions and processes and

contribute to achieving properly functioning conditions in downstream fish-bearing waters as well as benefit the Cascade and Columbia torrent salamander. The functions of these streams will be maintained by retaining vegetation in riparian areas during harvest activities. This HCP recognizes that a variety of small non-fish-bearing streams exists across the forest landscape and that these streams may differ in their physical characteristics, dominant functional processes, and contribution to watershed-level processes.

As stated previously, headwaters, which include seasonal streams, provide numerous ecological services. Furthermore, some covered fish species use the upper portion of coastal stream networks, including seasonal streams, for spawning and high-flow refuge. Wigington et al. (2006) found that the overwinter smolt survival rate for juvenile coho is higher in seasonal streams than mainstems and equivalent to survival in perennial streams. The function of these fish-bearing seasonal streams will be maintained by retaining vegetation, minimizing soil disturbance, and protecting channel morphology in riparian areas during harvest activities.

4.7.1.4 Special Considerations for Instream Temperature Protection

Harvest activities adjacent to fish-bearing streams can increase summer stream temperatures through a reduction in shade, allowing increased solar radiation to reach the water's surface. This can also occur on small, non-fish-bearing streams that flow into fish-bearing streams, particularly in stream reaches immediately above fish-bearing streams. Temperature increases, if not managed, can extend downstream into fish-bearing waters and affect the covered fish species.

RCAs adjacent to small non-fish-bearing perennial and seasonal streams will be narrower than RCAs adjacent to fish-bearing and medium and large non-fish-bearing streams. A PPZ will be maintained for the first 500 feet of the stream upstream of the end of fish use. The PPZ will provide additional shading to promote the cooling of water prior to it entering a perennial fish stream. Upstream of the 500-foot PPZ, the buffer will be 35 feet (horizontal distance) from the aquatic zone (Table 4-3 and Figure 4-8). The 120-foot RCA (horizontal distance) within the 500-foot PPZ at the intersection of fish and small perennial non-fish-bearing streams will help improve any potential stream temperature increases from upstream and prevent any further addition of heat to the stream.

4.7.1.5 Special Considerations for Potentially Unstable Slopes

Landslides are the dominant erosional process in the mountainous terrain of the northwest Oregon forests, with shallow, rapidly moving landslides being a common feature. These landslides have a depth comparable to the rooting depth of vegetation in steep terrain, which is usually constrained by a relatively hard, impermeable bedrock surface. Shallow slides usually involve only the upper weathered bedrock and overlying soil, are almost always less than 5 feet deep, and have been found to average only 2.5 feet deep at the initiation site (Robison et al. 1999). Because of these characteristics, they can be affected by timber harvest, road construction, and related ground-disturbing activities.

Debris flows can initiate in headwalls or elsewhere on mountain slopes. Steep and convergent terrain is more likely to be an initiation site for these landslides. Debris flows are triggered by the saturation of soil, causing slope failures. Some slides occur in the absence of forest management activities, while some may be related to past logging practices or current forest management activities. Generally, vegetation removal and ground disturbance increase the likelihood of slope failure during triggering weather events. As landslides are initiated, debris moves downslope. In

cases where the slide reaches a confined stream channel, it may continue, incorporating water and becoming a more fluid mass known as a channelized debris flow. Channelized debris flows can gather volume by adding soil, stream sediments, and woody material as they traverse the stream network to lower topographic positions. These flows are events that can shape stream habitats; however, not all debris flows reach the stream network, and not all channelized debris flows travel into fish-bearing streams. When a channelized debris flow enters a fish-bearing stream, increased sedimentation can deteriorate instream habitat and water quality (Ubechu and Okeke 2017). Although channelized debris flows can travel to fish-bearing streams and scour or bury habitat (Thompson and Edwards 2008), they can also deliver large wood along with coarse and fine sediments to streams. These organic and inorganic materials are requirements for long-term aquatic health, affecting processes such as food sources, nutrient cycling, sediment routing, channel morphology, and refugia (Bilby and Bisson 2001). ODF uses geotechnical expertise in planning and carrying out management activities to minimize the increased risk of slope movements that can result from forest management operations.

The stream network in the permit area will be evaluated on a harvest-unit basis to determine which hill slopes and headwater streams are potential sources of debris flows that would deliver large wood to fish-bearing streams. Other features, such as inner gorges and aquatic-adjacent unstable slopes, are also identified during harvest planning and the field assessment. Aquatic resources are protected by standard stream buffers that relate the width of the adjacent buffer to stream size, flow duration (perennial versus seasonal), and fish presence. In the case of identified slope instability features, these will often add additional buffer width and buffer length or establish harvest modifications upland not directly adjacent to an RCA. There are three types of these additional protections for aquatic resources that are slope-stability related: aquatic adjacent unstable slopes, inner gorges, and upland, potentially unstable slopes and their associated debris flow tracks (Table 4-5); these features are described in detail in Appendix I, *Unstable Slopes Riparian Strategy*.

A three-part hazard-based approach (Appendix I) will be taken to determine the applicability of buffers for potentially unstable upland slopes: 1) the potentially unstable landform present, 2) what is the potential for debris flow initiation (irrespective of forest management), and 3) if the site fails and a debris flow results, will it deliver large wood to a fish-bearing stream (typically via channelized debris flow).

When evaluating this feature, the geotechnical specialist determines the potential for slide initiation as high, medium, or low. A *high* hazard site is a location that has characteristics indicating a relatively high probability of failing. A *medium* hazard site may have a relatively high probability of failing, but there is uncertainty. Characteristics of *low* hazard sites indicate a lack of potential slope instability. Relative hazard can be determined by various indicators (Appendix I [Slopes Table 1]). However, a smaller set of features that are themselves the net result of multiple factors, namely slope steepness, topographic and timber indications of instability, and slope shape, are more commonly used to indicate risk. ODF will use the best available scientific information for this assessment, including various data sources, models, and other analytic products (e.g., the modeled stream network developed for this HCP [TerrainWorks 2020]). However, the final determination of hazard level is based on professional experience and field observation.

The determination to retain trees on potential initiation sites or apply 35-foot RCA buffers is based on the likelihood of failure and likelihood of delivering large wood to a fish-bearing stream. If a potential initiation site is deemed “high hazard” and there is any likelihood of delivery to a fish-bearing stream, then harvest modifications are required. These modifications will include retaining

trees within one canopy width above the high-hazard-potential initiation site, the portion of the debris flow track occupying any non-stream-feature swale above surface water flow, and establishing a 35-foot RCA buffer along both sides of the potential channelized debris flow track where there are indications of surface water flow where an RCA is not already designated.

In the case of medium hazard initiation sites, harvest modification is required that establishes a 35-foot RCA buffer along both sides of the potential channelized debris flow track that traverses any indications of surface water flow. Retaining trees on the potential initiation site or below the initiation site and above the upper extent of surface water flow are not required. In the case of a low hazard initiation site, no harvest modification or establishment of an RCA buffer is required below the potential slide initiation site. However, the low-hazard stream buffers will retain an ERZ (Figure 4-13).

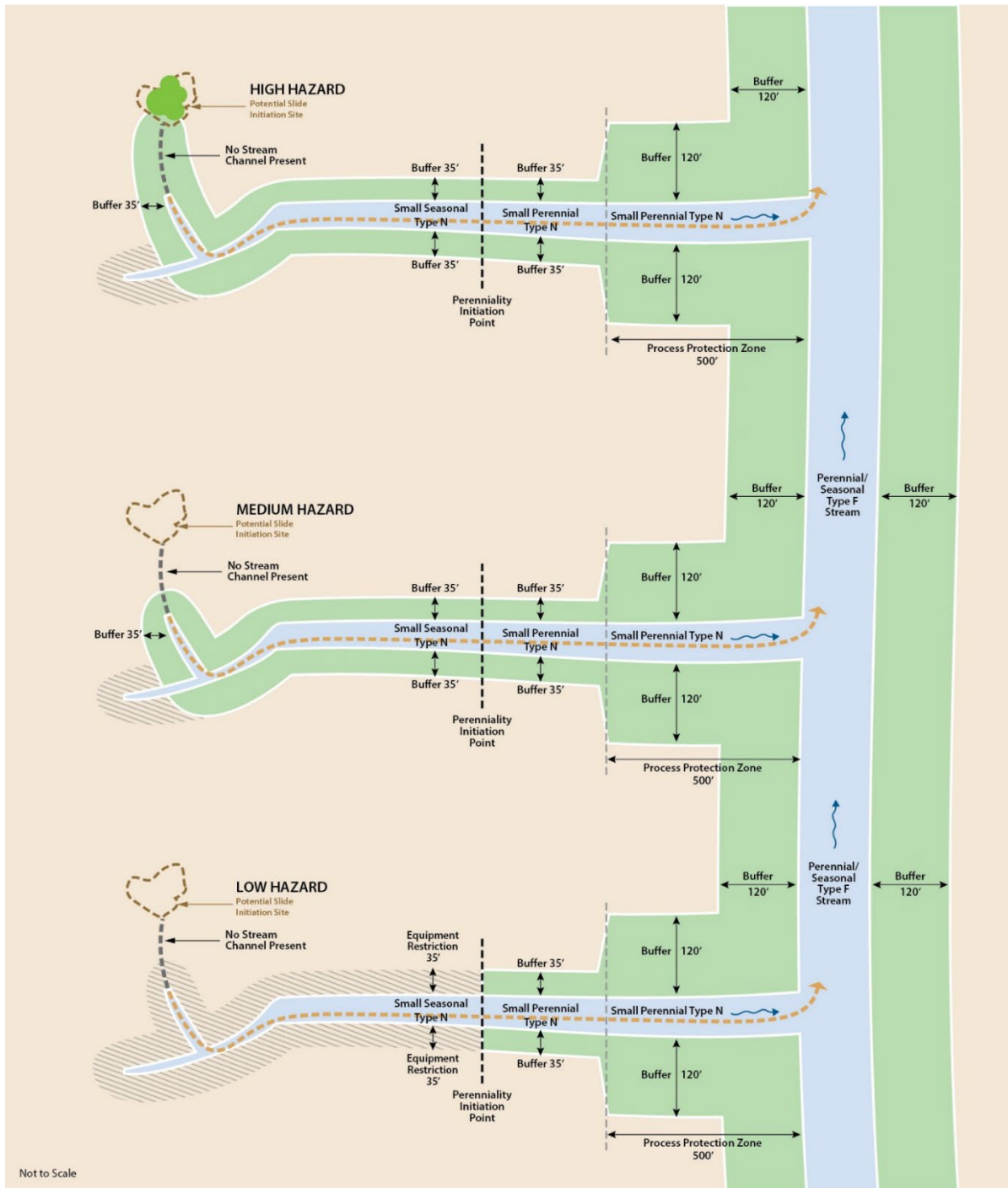


Figure 4-13. Effects of Slide Initiation Hazard-Level Ratings on Riparian Conservation Areas along Seasonal Streams

Table 4-5. Slope Buffers for Protection of Wood Delivery to Fish-Bearing Streams

Slope Classification	Characteristics	Management Practices	Buffer above Fish Bearing When:
Inner gorge	Obvious slope breaks of >20% from moderate to steeper slopes of $\geq 70\%$ and ≥ 15 feet in height. Not to exceed widths of 170 feet from the edge of the aquatic zone.	No harvest. Leave trees within one canopy width ^a above the slope break, unless at least one conifer of the dominate cohort ^b already occupies the inner gorge, in which case leave trees only within the gorge.	Adjacent to: Type F; Perennial Type N; Seasonal High Energy; ^c Potential Debris Flow Track. ^d
Aquatic-adjacent unstable slope	Unstable slope immediately adjacent to a channel where the toe of the unstable slope interacts directly with erosive forces of a stream. Not to exceed widths of 170 feet from the edge of the aquatic zone.	No harvest. Retain trees within one canopy width above the unstable slope, unless at least one conifer of the dominate cohort already occupies the unstable slope, in which case leave trees only on the unstable portion of the slope.	Adjacent to: Type F; Perennial Type N; Seasonal High Energy; Potential Debris Flow Track.
Upland potentially unstable slopes and debris flow tracks ^e	High-hazard upland slopes: Do have relatively high likelihood of slide initiation.	Retain trees within one canopy width above potential slide initiation sites, unless at least one conifer of the dominant cohort already occupies the site, in which case retain trees only on the unstable portion of the slope. Apply 35-foot RCA buffer protections to entire debris flow track, including underlying seasonal streams.	Deliverable to Type F stream. Debris flow track may traverse other high-energy seasonal and perennial Type N segments between the potential unstable upland site and Type F stream. Applies when large wood could become trapped within downstream segments for a time before remobilizing to potentially deliver to fish.
	Medium-hazard upland slopes: May have relatively high likelihood of slide initiation.	Apply 35-foot RCA buffer protections to underlying debris flow track.	
	Low-hazard upland slopes: Do not have a relatively high likelihood of slide initiation.	No harvest modifications required on potential initiation site, debris flow track, or underlying seasonal stream. Apply ERZs on seasonal non-fish stream reaches.	N/A

^a Canopy width is the width of the canopy of an average dominant tree within a stand.

^b Dominant cohort is a surrogate. It does not imply that only one conifer of this size is needed to be delivered in case of slope failure; rather, if a conifer of this size is present, it is highly likely that there will be plenty of other species and conifers on the site to provide adequate large wood to the aquatic system.

^c High-energy reach is a stream segment on a seasonal non-fish stream with any likelihood of large wood and gravel delivery to fish-bearing during a large flow event. These are independent of potential up-channel initiation sites.

^d Debris flow track is a reach on a seasonal non-fish stream with any likelihood of large wood delivery via channelized debris flow to a fish-bearing stream. Remobilization by subsequent debris flow and deposition is also considered delivery. Deposition, which remains in a non-fish stream, is not considered.

^e See *Slope Hazard and Delivery Assessment Process* section below and Appendix I, *Unstable Slopes Riparian Strategy*.

ERZ = equipment restriction zone; N/A = not applicable; RCA = riparian conservation area

Slope Hazard and Delivery Assessment Process

The assessment of slope hazard and potential delivery involve both a geographic information system (GIS) analysis and field visits, which help in understanding the various factors that could be present at a particular site that contribute to slope stability hazard.

All planned clearcut harvest units will undergo a GIS screening during the development of operations plans, which may take place 1 to 3 years in advance of harvest activities occurring. Across much of the permit area, there is a low chance of encountering potential sites that require further analysis; however, some areas of generally steeper terrain will require additional analysis and fieldwork to accurately assess specific sites and designate protections. In addition to areas found during screening, the field staff may become aware of additional potential slope issues during harvest unit preparation activities such as road design, stream classification and designation, boundary posting, and timber cruising. Any potential slope issues discovered at any point during the planning process or preparation of the harvest unit for auction will be brought to the geotechnical specialist for further review.

A GIS review is conducted on all proposed clearcut harvests and new road alignments using the ODF GIS system. Data reviewed include proposed harvest and buffer locations provided from harvest planners, orthophotographs, stream data (location, size, seasonality, fish presence), underlying geology, and digital elevation models (and associated products) derived from light detection and ranging (LiDAR). Paramount in the GIS review is the use of LiDAR topographic data, which exist for all lands west of the Cascades. Various renderings of the data are used to evaluate the steepness, shape, and texture of the ground surface, including analysis of fine-scaled contours;¹³ multi-directional hillshade models; slope steepness categories (as percent slope); ODF's High Landslide Hazard Location (HLHL) model;¹⁴ and slopeshade (a continuous representation of slope steepness, as percent slope). The modeled stream network, developed for this HCP, or best available science, showing landslide initiation and delivery risk GIS products, may also be used during this review (TerrainWorks 2020). The desktop review often identifies locations of the four landforms described above and associated slope buffers. For upland potentially unstable slope features, delivery to fish-bearing streams can sometimes be determined during this stage of review as well. This review often identifies former landslides and areas of higher hazard that could be affected by harvest activities or that may fail in the future.

The GIS review may necessitate a field review to ground-truth a given site. Various indicators of slope hazard are not fully discernable by the desktop review and can be more fully understood in the field.

¹³ Fine-scaled contours are either 5- or 10-foot contours.

¹⁴ The HLHL GIS model was created from LiDAR DEM. Slopes longer than 30 feet and ≥ 80 or $\geq 70\%$ for convergent topography. In forests underlain by the Tyee Formation slope, thresholds are 5% less. Thresholds determined from recommendations from ODF's 1996 storm report and issue paper.

After determinations are made from either the GIS review and/or field visit, the landform is identified, and the appropriate vegetative buffer is applied to the harvest area. In the case of road alignments, recommendations often involve special BMPs or complete avoidance of an identified location. The retention of all trees on potentially unstable slopes with a high risk of failure and any potential to be delivered to fish-bearing streams will be mapped and posted, along with additional buffering for downstream debris flow tracks. Additional standing trees may be left adjacent to potentially unstable slopes due to operational considerations. This tree retention can help reduce the near-term likelihood of landslides due to harvest and associated activities and support the delivery of large wood to the aquatic environment if they do occur. In addition, trees will be retained within one canopy width above the identified feature, unless at least one conifer of the dominate cohort already occupies the unstable slope, in which case trees need to be left only on the unstable portion on the slope. The dominant cohort is being used as a surrogate. It does not imply that only one conifer of this size will be delivered in case of slope failure; rather, if a conifer of this size is present, it is highly likely there will also be other species and conifers on the site to provide adequate large wood to the aquatic system.

Although there is no retention requirement for a site with a medium risk of failure that has any potential to deliver large wood to fish-bearing streams, the downstream debris flow track will be mapped and posted, and the site itself will be considered for upland green tree retention. As part of the monitoring plan, a subset of medium- and high-risk sites will be identified for monitoring at 1-, 5- and 10-year intervals after harvest.

4.7.2 Conservation Action 2: Riparian Equipment Restriction Zones

Conservation Action 2 is intended to support primarily the biological objectives below. A complete list of all the covered activities and linkages is provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

- 1.1: Riparian Wood Recruitment
- 1.2: Stream Complexity
- 1.3: Water Quality and Quantity
- 2.1 and 3.1: Conserve and Maintain Riparian Habitat within Torrent Salamander Ranges
- 4.1: Conserve, Maintain, and Enhance Existing Oregon Slender Salamander Habitat
- 4.2: Retain and Recruit Downed Wood to Support Oregon Slender Salamander

RCAs (Conservation Action 1: Establish Riparian Conservation Areas) will be applied to conserve and maintain the riparian process, as described in the biological goals and objectives. However, in some cases, covered activities will need to occur inside of RCAs. Activities that could occur inside of RCAs include establishing yarding corridors, constructing or maintaining roads (including temporary roads and stream crossings), constructing and maintaining recreational trails, vacating or decommissioning roads, and conducting stream enhancement activities (including PBR and tipping/falling trees into the stream). If heavy equipment is used for stream enhancement, cable logging or cable yarding is preferred for large wood installation. Heavy equipment access is permitted for placement of logs, boulders, spawning gravels, or other restoration work. Activities that require in-stream work will follow the established Oregon Guidelines for Timing of In-Water

Work to Protect Fish and Wildlife (Oregon Department of Fish and Wildlife 2024, or most recent). Where these activities take place within an RCA, a 35-foot ERZ will be maintained where vegetative ground disturbance and tree-canopy removal will be minimized and the BMPs implemented, as described later in this subsection. The ERZ will occur on both sides of the stream. This ERZ represents the land closest to the stream, including streambanks. Most riparian functions are supported to some extent by vegetation in this zone, including providing aquatic shade, delivering downed wood and organic inputs (leaves and tree litter) to the stream and riparian area, stabilizing the streambank, contributing to floodplain functions, and influencing sediment-routing processes. To protect these processes within an RCA, ODF will minimize stream entry with machinery and choose locations to minimize the loss of riparian trees or erosion to the banks. Machinery access is permitted for stream enhancement and restoration work, as noted for the RCA generally (Conservation Action 3: Stream Complexity).

Limited machinery access is permitted in seasonal other (Type N) streams because no RCA buffers are proposed on them. Seasonal other (Type N) streams are not fish bearing and do not have surface water flow after July 15 during typical water years. ODF intends to harvest the merchantable timber within the 35-foot ERZ on seasonal other Type N streams while reducing direct impacts on the aquatic covered species. ODF will work with operators to maintain the integrity of the seasonal other Type N stream channels during the harvest operation. Soil disturbance will be limited to 10% of the ERZ within the harvest unit. Ground-based operations and one-end suspension cable operations will occur when there is no flowing or ponded water in the seasonal stream. Further, ODF will limit skid trails and stream crossings, siting them at locations where the least damage is expected to occur; retain existing stumps and downed wood; and limit damage to vegetation. This may offer short-term amphibian microclimate habitat, limit soil erosion and impacts on water quality and streamflows, and may accelerate habitat recovery post-harvest.

The need for cable-yarding corridors will vary, based on the location of the landing, relative to the RCA. Type F streams and large and medium Type N streams are most often located at the bottom of the slope that defines the boundary of a harvest unit. Where harvest units occur on both sides of streams in this location, they will normally be harvested from their respective sides, eliminating the need for yarding corridors. In steep terrain where one side is not directly accessible, or ODF seeks to minimize road building, skylines are anchored high enough on the opposite slope so that logs can be fully suspended, thereby minimizing the width of corridors. RCAs that are higher upslope in the harvest unit where they are closer to the yarder will require wider (20 to 35 feet wide) or more closely spaced corridors versus RCAs lower in the unit far away from the yarder, which can require fewer, smaller crossing widths (100 to 150 feet apart and 12 to 15 feet wide) (see Chapter 3, Section 3.2.1, *Harvest Methods*, for the rationale). Actual yarding corridor width will be determined by the distance between felled trees within the stream buffer zone. Corridor widths will exceed the distances listed below only when other alternatives are not operationally feasible or a higher impact on the riparian buffers would occur.

Management directions for how to operate inside of ERZs (0 to 35 feet) are listed below for each stream type.

4.7.2.1 All Type F Streams, All Sizes (Large, Medium, and Small), and Large and Medium Type N Streams

- Road, trail, temporary stream crossing, culvert, and restoration activities:
 - Limit work to only those actions needed for construction/removal of stream crossings, general road/trail maintenance or vacating, culvert installation/replacement, equipment access, and instream restoration projects.
 - Minimize construction and project footprint, and limit tree and vegetation removal to not extend beyond what is necessary to accomplish the activity.
 - Follow BMPs identified in Conservation Action 11: Road and Trail Construction and Management Measures.
- Yarding activities:
 - No tree felling beyond what is necessary for safe operational accommodation of the activity.
 - Full suspension required during cable yarding.
 - No ground-based equipment operation.
 - Leave any trees damaged or felled in RCAs from yarding activities, unless designated for in-water placement in other areas.
 - Where possible, fall trees toward the stream.
 - Average yarding corridors to be 15 to 20 feet wide, with a maximum of 35 feet (up to 10% of corridors on a given reach within a harvest unit), and spaced no closer than 100 to 150 feet apart.

4.7.2.2 Small Perennial Type N, Small Seasonal Type N: High-Energy and Potential Debris Flow Track Streams

- Road, trail, temporary stream crossing, culvert, and restoration activities.
- In addition to those listed for all Type F Streams and Large and Medium Type N Streams:
 - Equipment access is allowed to facilitate operations where the impact on the stream, stream buffer, or ERZ would be decreased by allowing for temporary stream crossings.
- Yarding activities:
- In addition to those listed for all Type F Streams and Large and Medium Type N Streams:
 - Full suspension required during cable yarding when water is flowing or ponding water is present.

4.7.2.3 Other Seasonal Type N Streams

- Road, trail, temporary stream crossing, culvert, and restoration activities:
 - Limit work to only those actions required for construction/removal of stream crossings, general road/trail maintenance, culvert installation/replacement, instream restoration projects, and timber harvest.
 - Minimize construction and project footprint, and limit tree and vegetation removal to not extend beyond what is necessary to accomplish the activity.
 - Follow BMPs identified in Conservation Action 11: Road and Trail Construction and Management Measures.
- Yarding activities:
 - Maintain integrity of stream channel and limit skid trail and stream crossing damage.
 - Limit soil disturbance to 10% of ERZ in harvest unit.
 - Conduct ground-based operations and one-end suspension cable operations only when there is no flowing or ponded water in the seasonal stream.
 - Retain existing downed wood and stumps.
 - Avoid slash accumulation in stream channels and ERZ.

4.7.3 Conservation Action 3: Stream Complexity

Conservation Action 3 is intended to support primarily the biological objectives below. A complete list of all the covered activities and linkages is provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

- 1.1: Riparian Wood Recruitment
- 1.2: Stream Complexity

Stream enhancement projects will focus on restoring natural processes to create habitats that improve overall conditions for the covered fish species and other aquatic organisms in the permit area, allowing for immediate improvements to instream complexity while the adjacent riparian forests are maturing to provide long-term benefits. Appendix E provides an overview of fish populations in the permit area that could benefit from stream enhancement projects.

4.7.3.1 Commitment to Stream Enhancement Projects during the Permit Term

ODF will support aquatic restoration projects through the development of a conservation fund dedicated to the support and implementation of stream enhancement projects. For aquatic species, the fund will focus on improvements that address the limiting factors of the aquatic species covered by the HCP. Aquatic restoration projects can range from the installation of large wood to complex floodplain reconnections, migration barrier removal, or channel restoration and revegetation.

Project planning and design will consider the basin, watershed, species action plans and assessments, local knowledge and expertise of current habitat conditions, intrinsic potential, stream

processes, and the disturbance regime at the watershed and basin scale to identify areas best suited for stream enhancement projects (Appendix E, *Effects Analysis*). Projects will be designed and implemented consistent with the natural dynamics and geomorphology of the site and with the recognition that introduction of large wood will cause changes to the stream channel. Projects will be selected that contribute to the timely improvement of desired aquatic physical habitat conditions for the covered species in the permit area, as described in the biological objectives. Depending on available resources, projects will be designed to create conditions and introduce sufficient and appropriately sized materials to enhance or reestablish natural physical and biological processes.

Over the course of the permit term, ODF will complete 440 instream improvement projects,¹⁵ with an average of 60 projects being constructed per decade. Projects are expected to be located in areas where covered activities are occurring, with most work being focused in the northwest portion of the permit area (i.e., Clatsop and Tillamook State Forests). Ten-year restoration targets will be identified as part of the Aquatic Inventory Program process, using the identification of high intrinsic potential¹⁶ stream reaches in the permit area so restoration projects target key areas that will produce the most beneficial response for the covered aquatic species (Burnett et al. 2007). Stream enhancement targets will be tied to and commensurate with the level of harvest expected in any one evolutionary significant unit (ESU) during that 10-year implementation planning cycle. Chapter 5, *Monitoring and Adaptive Management*, describes how aquatic enhancement activities will be tracked during the permit term, including how conservation fund monies are expended on stream enhancement projects. Targeting specific limiting factors such as large wood and overwinter habitat will achieve immediate benefits to the covered fish species. Long-term benefits will be achieved through a focus on restoring habitat-forming processes, riparian vegetation, and connectivity in line with the reach's natural potential.

Aquatic conservation actions are focused on protecting and improving important watershed processes and functions for the covered salmon, steelhead, and aquatic salamanders (in non-fish streams) in the permit area. Benefits to aquatic species of cultural importance (i.e., pacific lamprey) may also occur as part of the aquatic conservation actions. The conservation fund is described in Chapter 9, *Costs and Funding*. The priorities for how the conservation fund is used will change during the permit term, but ODF will work with the Services and ODFW, along with species experts and other partners, to identify where and how conservation fund monies are spent. The actions described below are items currently known to benefit primarily the covered salmon and steelhead. Other actions may emerge over the course of the permit term; therefore, the items that follow should be treated as examples. The actions below are not expected to occur across the entire permit area or with great frequency; rather, they will be implemented on a case-by-case basis, as determined by ODF, during the 5-year mid-point check-in and 10-year comprehensive review.

¹⁵ Projects are focused generally on increasing instream complexity and typically consist of at least five logs or trees per structure site, with several sites per project. Other projects may include, but are not limited to, road decommissioning to reduce sedimentation, floodplain reconnection projects, and projects to promote the natural colonization of beaver.

¹⁶ High intrinsic potential is a measure of a stream's capacity to provide high-quality habitat, based on a fish species' habitat requirement.

4.7.3.2 Process-Based Restoration

PBR is a precommercial thinning process that will be implemented in the outer patches¹⁷ of RCAs that comprise densely planted conifers previously managed for timber production to increase the conservation benefit for the covered aquatic species. In their current state, trees in these patches of over-stocked stands have the potential to stagnate with respect to growth during early stand development, resulting in homogenous forests that will take longer to reach late-seral forest conditions. Prescriptions will vary, depending on the current condition and operational feasibility, with patches often making up of >500 trees per acre that are <25 years old. ODF will assess stand density, age class, and habitat potential on a case-by-case basis to determine which patches are favorable for treatment to accelerate the development of heterogenous late-seral forest structure.

ODF has identified a maximum of 3,427 acres within the permit area that have stand characteristics that could benefit from PBR to achieve late-seral structural conditions. ODF will develop a prioritization document and prioritize PBR treatments in locations adjacent to stream reaches known to support covered fish species, including the PPZ. Implementation will include a single entry, with the goal of reducing the stem density of subdominant trees. In stands with greater than 500 trees per acre, trees identified to be cut will have less than 10 inches DBH and be left on the ground to provide wildlife habitat and soil nutrients. Those locations adjacent to stream reaches that do not support covered fish species will be evaluated and prioritized according to their potential to provide conservation benefit to other covered species.

4.7.3.3 Beaver Management

Beavers create ponds and other slow-water aquatic areas that provide important habitat for salmonids. Widespread commercial trapping in the 1800s resulted in declines in the beaver population. Today, beaver populations have rebounded, with populations occupying most of their former range (Naiman et al. 1998). The presence of beavers can strongly influence salmon populations in the side channels of large alluvial rivers by building dams that create pond complexes (Malison et al. 2016). Beaver ponds and slow-water habitat created by beaver provide important summer rearing and overwintering habitat (Castro et al. 2015). Pollock et al. (2004) found that smolt production increases significantly in systems where beavers are present. In coastal Oregon streams, reaches with beaver ponds and alcoves account for 9% of the habitat but support 88% of the coho that were found in the system (Nickelson et al. 1992).

Although beavers can occur in a variety of habitats, in the permit area, they are likely to construct dams on small to medium-sized, low-gradient streams that flow through unconfined valleys, with a preference toward the lower-gradient areas with *Populus* and *Salix* species (e.g., cottonwood, and willows) (Castro et al. 2015; Suzuki and McComb 1998). Recent restoration work tends to rely on large wood to create salmon-rearing habitat. Alternative management measures that would create the same types of pool habitat required by juvenile coho would be to promote natural recolonization of unoccupied dam habitat (Epps et al. 2021) or augment existing populations of beaver through relocation (Petro et al. 2015). Increasing the number of beaver dams in key areas could create high-quality rearing habitat that promotes stream complexity and increases smolt capacity (Oregon Department of Fish and Wildlife 2009).

¹⁷ PBR is dependent on stream type but will occur outside the ERZ.

ODF will support the natural colonization and expansion of beavers in the permit area to promote watershed restoration and improvement of salmon and steelhead rearing habitat. ODF identified areas in the permit area with the potential to provide suitable beaver dam habitat, based on predictive intrinsic habitat characteristics identified by Suzuki and McComb (1998) and Petro et al. (2020). Quality beaver habitat can occur in all portions of the permit area; however, the majority of modeled suitable beaver dam habitat is in the Clatsop State Forest and eastern portion of the Tillamook State Forest.

When human-beaver conflict occurs (typically infrequent, with fewer than 10 incidents annually),¹⁸ nonlethal management actions will be pursued and documented. If a beaver is found to continually dam a particular culvert, ODF will determine if that road crossing may be modified to reduce potential safety hazards that may be associated with beaver dam construction and other obstacles to water flow and debris movement. Increasing the size of culverts or suspending roads to eliminate culverts will increase road safety, reduce road maintenance costs, and reduce the frequency of responding to beaver-related flooding of roads. Installation of a beaver co-existence device such as a flexible pond leveler or beaver deceiver will be considered. If device installation is unfeasible, beaver(s) will be live-trapped and relocated to suitable habitat identified within the appropriate watershed level (Epps et al. 2021) in the permit area, based on guidance from ODFW staff members. If ODF and ODFW determine beaver relocation is warranted to address a conflict issue, an additional 2,000 feet will be surveyed for existing beaver activity both upstream and downstream of a modeled dam habitat to encompass the average home range for a beaver family unit. To prevent potential conflict with extant beavers, relocation will not occur if evidence of active occupation is found within the surveyed areas (Petro et al. 2015).

Over the course of implementation, it may be decided that a beaver restoration project (e.g., installation of a beaver dam analog, beaver habitat enhancement) should be implemented to benefit the covered species. If such a project were proposed, it would follow *The Beaver Restoration Guidebook: Working with Beaver to Restore Streams, Wetlands, and Floodplains* (Pollock et al. 2023), or other relevant scientific literature, to develop achievable goals, strategies, and objectives that are in line with the HCPs biological goals and objectives. Promoting the occurrence of beavers in the permit area, through both passive and active management, will contribute to meeting Objective 1.2, *Stream Complexity*, by improving floodplain connectivity, stream complexity, and slow-moving rearing habitat that would benefit the covered salmon and steelhead. ODF will coordinate this work with regional partners, ODFW, and the Services to ensure beaver management actions fit into the larger context of salmonid recovery and statewide beaver management principles.

4.7.3.4 Lamprey

In the permit area, Pacific lamprey (*Entosphenus tridentatus*) are known or likely to be present in all watersheds where physical conditions allows for upstream migration by adults (i.e., no impassable culverts, dams, or other barriers). Based on distribution data provided by the StreamNet database (2020), Pacific lamprey may be present in low-gradient streams throughout the plan area. Lamprey do not return to the streams they hatched in but, rather, home in on pheromones released by larvae to reach spawning areas. Therefore, areas that do not have current larval populations may not attract returning adults (Columbia River Inter-Tribal Fish Commission 2011).

¹⁸ If emergency action is needed, it will be taken and then reported to ODFW, along with the Services.

Conservation Action 1: Establish Riparian Conservation Areas, Conservation Action 2: Riparian Equipment Restriction Zones, Conservation Action 3: Stream Complexity, Conservation Action 4: Remove or Modify Artificial Fish-Passage Barriers, Conservation Action 5: Standards for Road Improvement and Vacating, and Conservation Action 11: Road and Trail Construction and Management Measures, will benefit lamprey by improving habitat conditions and access to previously inaccessible habitat. ODF understands that lamprey provide benefits to the covered species and properly functioning aquatic systems overall and that they have cultural importance to tribal partners. As such, ODF will account for the presence of lamprey in lower-gradient stream reaches as part of stream enhancement project evaluations. If evaluations identify multiple projects that would have equal benefit, more weight may be given to a project in a location that would benefit lamprey in addition to the covered salmon and steelhead.

4.7.3.5 Selecting Stream Enhancement Projects

Stream enhancement projects will supplement benefits that will be achieved from the establishment of RCAs. The conservation actions work together to avoid, minimize, and mitigate effects on covered species.

The establishment of RCAs will minimize increases in stream temperatures, minimize sediment transfer to streams from covered activities, and facilitate the recruitment of large wood through natural tree fall and debris flow events. Therefore, the primary focus of stream enhancement projects will be to address areas that are slower to recover from disturbance or past land use or have deficient stream processes or habitat components that are required by the covered fish species. Stream enhancement projects are intended to offset the impact of the taking of covered fish species from the covered activities over the course of the permit term.

ODF will consider the following factors when identifying, planning, and implementing stream enhancement projects.

- Ensure that stream enhancement projects are distributed in a fashion that addresses covered fish species at a level commensurate with the estimated level of effect from covered activities.
- Promote the recovery of the covered fish species by addressing a population's limiting factors.
- Promote the implementation of projects identified in local, state, or federal planning documents (e.g., recovery plans and watershed plans) that would provide the greatest benefit to the covered fish species through partnerships with watershed councils, industry, non-governmental organizations, and state and federal agencies (e.g., NOAA Fisheries, USFWS, ODFW).
- Prioritize projects that advance, or provide added benefit, to previous stream enhancement projects.
- Prioritize projects that can address multiple limiting factors over projects that address a single limiting factor, where applicable.
- Implement PBR actions that create and maintain habitat. For instance, beaver habitat enhancement may be used in certain reaches to promote the creation of deep-pool and off-channel habitat for juvenile salmon.
- Consider project feasibility (e.g., site accessibility, construction cost, area of habitat gained/cost, level of risk).

- Select projects based on the best available scientific information, including watershed-level modeling, in conjunction with habitat and fish distribution data from ODFW and other sources to assess potential project benefits. Areas designated as critical habitat with high-intrinsic potential scores will be prioritized.
- Prioritize projects that occur in the permit area. However, ODF will consider projects that occur outside the permit area. ODF contribution to projects outside the permit area will most likely either be monetary contributions out of the conservation fund or be in the form of large wood donations for instream habitat enhancement projects. Projects that are located on ownerships outside the permit area will:
 - Directly benefit at least one of the covered fish species within a watershed (Hydrologic Unit Code [HUC] 10) that also includes a portion of the permit area.
 - Be done in partnership with other organizations or agencies.
 - Require the landowner(s) or manager(s) on whose ownership the project takes place to adhere to management standards in and around the project area that will ensure the project meets its objectives. Similarly, those landowner(s) or manager(s) would be required to obtain their own ESA coverage outside of the HCP.

ODF will continue to support the implementation of the Strategic Action Plans (SAPs) for the Oregon Coast coho independent populations. ODF involvement will include providing sites for restoration work, access, and materials (e.g., large wood). ODF's continued involvement in the SAPs will benefit Oregon Coast coho because projects will be designed to address their limiting factors. ODF will actively communicate with SAP owners (watershed councils) to ensure that, when possible, ODF is contributing to specific actions identified in the SAPs. These actions will occur primarily in the permit area. Actions that occur outside the permit area but are done to benefit the covered fish species in the permit area may also occur and will be counted toward ODF's conservation goal. As needed, ODF will obtain input from ODFW and the Services for implementation plans and annual operations plans to identify potential stream enhancement opportunities that could be incorporated into timber harvest and other management activities to benefit the covered fish species.

4.7.4 Conservation Action 4: Remove or Modify Artificial Fish-Passage Barriers

Conservation Action 4 is intended to support primarily the biological objective below. A complete list of all the covered activities and linkages is provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

- 1.4: Fish Passage

One of the biggest sources of salmon decline in the Pacific Northwest is the presence of numerous artificial barriers, such as small dams, culverts, dikes, or levees, that reduce or block access of salmon to large portions of their historical habitat (O'Hanley and Tomberlin 2005). Maintaining or improving fish passage through structures, such as culverts and other artificial barriers in streams, is critical to maintaining habitat connectivity (Roni et al. 2002). Reconnecting stream habitat that has been closed to salmonids is an important component when addressing impaired salmon stocks (O'Hanley and Tomberlin 2005). Removing or improving fish-passage barriers in the permit area

will benefit the covered fish species by increasing access to previously unavailable or underused habitat.

Potential fish-passage barriers will be evaluated for removal or improvement during the Implementation Planning (IP) process, which occurs as part of ODF's regular forest management planning process. ODF will prioritize improvements using physical and biological elements as well as NOAA Fisheries' recovery objectives to identify projects that will have the greatest benefit for the covered fish species. Following the prioritization process described by Roni et al. (2002), the review will identify culverts and other artificial blockages along with specific information on habitat quality and quantity and fish presence and absence above and below each barrier. This will allow for a prioritized list of culvert upgrades and end-of-life culvert replacements, based on a cost-benefit analysis within each IP cycle. All new and replacement stream crossings in fish-bearing streams will be designed to meet NOAA Fisheries (2022 or most recent) and ODFW passage criteria to maintain upstream and downstream passage for the covered fish species. If a project cannot comply with these standards, the permittee will consult with NOAA Fisheries prior to project implementation.

The following *physical elements* will be considered in the prioritization process for removal, modification, or replacement.

- Culvert outlet drops in fish-bearing streams where covered fish species are present and would benefit from improved fish passage.
- Non-embedded culverts with gradients above a 0.5% slope.
- Structures such as old log fills or puncheons.
- High washout potential (failure risk) due to an undersized structure and/or long, steady grades below a stream crossing.
- Scour, oversteepening, or other erosion around culvert inlets and outlets.
- Structural deterioration of culvert.

The following *biological elements* will be considered in the prioritization process for removal, modification or replacement.

- **Covered Species Present.** Presence, abundance, and life stages present, or expected to be present in the future, in the watershed.
- **Non-covered Species Present.** Presence, abundance, and life stages present, or expected to be present in the future, in the watershed.
- **Habitat Quantity.** Amount of suitable and complex habitat accessible to covered fish species up to an upstream artificial barrier, natural barrier, or end-of-fish use.
- **Habitat Quality.** Condition of suitable and complex stream habitat above the barrier that supports the life-history needs of covered fish species present.
- **Level of Current Fish Passage.** Passage rate (i.e., complete or partial barrier, life stages affected, seasonality).
- **Predatory and/or Nonnative Species Present.** Presence, abundance, and life stages present, or expected to be present in the future, in the watershed.

In addition to the elements above, ODF will also consider prioritizing fish-passage improvement projects, based on the following items.

- Areas identified by regional partners as priority watershed in various planning documents.
- Areas identified as critical habitat and/or have high intrinsic potential for covered fish species.
- Rapid bio-assessment data.
- Overlap with a proposed harvest unit.
- Watersheds where successful stream enhancement projects have been, or are proposed to be, implemented.
- Feasibility of implementing stream enhancement projects upstream of project area.
- Sites identified within HCAs that may provide a greater conservation benefit to covered fish species.
- Complementary fish-passage improvement projects, potentially under different ownership, in the watershed.

From 1995 to 2018, ODF replaced an average of 12 culverts a year, with the number replaced being much lower in recent years because the most significant barriers (i.e., blocking the most suitable habitat) had been replaced. Recently, fewer but more complex and costly replacements have been completed. ODF commits to repairing or replacing all identified culverts in Table 4-6 that do not currently meet fish-passage requirements to provide passage for covered fish species over the course of the 70-year permit term.

ODFW updates its fish-passage priority list every 5 years. At each update, ODF will determine if additional priority barriers have been identified by ODFW's high-priority culvert inventory in the permit area that require additional review by ODF during the IP and operations planning processes. If a priority barrier does not overlap a timber harvest operation, conservation fund dollars will be used and work will be counted as mitigation to maximize benefit to the covered fish species in the permit area.

Some fish-barrier removals or upgrades to state and federal standards will occur as part of routine haul road upgrades associated with planned harvest operations. A subset of barrier removals or upgrades will occur as targeted conservation actions outside of the harvest program. ODF's regional partners may also be interested in addressing fish-passage barriers in locations that are not planned to be harvested and, therefore, would not be likely candidates for passage upgrades as part of routine road upgrades or maintenance. In those instances, ODF may use conservation fund dollars to address fish-passage issues as part of a standalone stream enhancement project. Chapter 9, Section 9.2.2.2, *Targeted Fish Barrier Removal or Upgrades*, describes how conservation fund dollars may be used in those instances.

Table 4-6. Potential and Known Fish-Passage Barriers in the Permit Area by Independent Population

Oregon Coast Coho Population	HUC 10	Stream Name	SSBT Distance Upstream (miles)	Intrinsic Potential (IP)	Critical Habitat	In HCA
North Coast						
Nehalem	North Fork Nehalem River	Unnamed Tributary	0.50	Medium	No	No
Nehalem	Middle Nehalem River	Moore's Creek	TBD	Low	Line stops at culvert	Yes
Nehalem	Lower Nehalem River	Harliss Creek	TBD	Low/medium	Line stops at culvert	No
Tillamook Bay	Trask River	Pothole Creek	TBD	Low	Yes	No
Tillamook Bay	Kilchis River	Blu Star Creek	TBD	Low	No	Yes
Tillamook Bay	Kilchis River	White Star Creek	TBD	Low	No	Yes
Umpqua						
South Umpqua	Middle Cow Creek	McCullough Creek	0.60	N/A	Yes	Yes
South Umpqua	Middle Cow Creek	Bear Creek	0.84	N/A	Line stops at culvert	No

Source: Oregon Department of Fish and Wildlife 2019b.

HUC = Hydrologic Unit Code; SSBT = salmon, steelhead, bull trout; TBD = to be determined; IP = intrinsic potential; HCA = habitat conservation area

4.7.5 Conservation Action 5: Standards for Road Improvement and Vacating

Conservation Action 5 is intended to support primarily the biological objectives below. A complete list of all the covered activities and linkages is provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

- 1.3: Water Quality and Quantity
- 1.4: Fish Passage
- 2.1 and 3.1: Conserve and Maintain Riparian Habitat within Torrent Salamander Ranges

As described in Chapter 2, *Environmental Setting*, many of the historic logging roads that remain in the permit area were not built to current design standards and can be improved. In other cases, historic roads were located in unsuitable areas and, therefore, cannot or should not be maintained because they are unstable, unsafe, or subject to chronic erosion. Where operationally or economically feasible, these unsuitable roads will be vacated, closed, and stabilized to benefit the covered species. Requirements for road improvement and road vacating in the permit area are described in this conservation action as landscape enhancements. Conservation Action 11 describes

ODF's maintenance of existing and usable roads to ensure their continued stability to minimize sedimentation into aquatic systems.

4.7.5.1 Road Drainage Repair Projects

Roads will be repaired or improved at sites that have been determined to be high risk for the covered species due to accelerated erosion and sediment loading, changes in channel morphology, or runoff characteristics of watersheds, all of which cause secondary changes in channel morphology and affect fish habitat (Furniss et al. 1991). In addition, roads can affect aquatic salamanders through habitat loss, impairment of migration routes, and degrading stream health (Ochs et al. 2024). Objectives associated with road improvements and associated BMPs are aimed at disconnecting the road system hydrologically from stream channels. Identification and prioritization of large hydrologic disconnection projects will be done as part of each IP, and more opportunistic or immediate needs (e.g., unanticipated culvert failure) will be addressed through the operation planning process. To determine what road segments pose a risk to the covered species, ODF will use the best available data (i.e., historic inventories and watershed assessments) as a starting point to review the conditions of the road system in the permit area and conduct field inspections to identify potential erosion and landslide hazards in proposed harvest areas. Methods for identifying potential landslide areas include initial inspection of high-resolution topographic data (i.e., LiDAR), aerial photographs, and, where necessary, field survey by a geotechnical specialist to identify sites with a high likelihood of failure and delivery to a stream (Roni et al. 2002). This process will identify existing roads that should be improved or considered for removal to reduce the potential for failure or contributing sediment to the stream channel.

Several factors will affect the final priority ranking of road projects, including the need and timing of the planned uses of the road, costs and biological benefits of the project, amount and type of environmental damage that is occurring or could occur, likelihood that damage will occur, and the risk of impacts on human life/safety or private property. Factors such as the availability of funds, equipment, staff capacity, the time of the year, and potential impacts on covered species will affect the scheduling of road improvement projects.

Projects may include the following items.

- Realigning the horizontal and/or vertical alignment of the road.
- Upgrading stream crossings and culverts to meet NOAA Fisheries (2022) fish-passage criteria (Conservation Action 4: Remove or Modify Artificial Fish-Passage Barriers).
- Installing additional cross-drainage structures.
- Reshaping the roadbed or ditch line for improved surface drainage.
- Upgrading the road surface by adding new rock.
- Removing or stabilizing fill slopes that exhibit instability.
- Relocating sections of roads away from sensitive areas, such as streams or springs.
- Repairing washouts, fill or cut-slope failures, and severe damage to road surfacing.

The design of road repair projects will follow the general guidelines for road design and construction described previously and in Appendix H, *ODF Roads Manual* (Oregon Department of

Forestry 2006, or most current version). However, because of the nature of some road projects, additional engineering and design work may be needed before construction begins.

4.7.5.2 Road Vacating

Some roads may need to be improved or vacated due to their proximity to a fish-bearing stream, high erosion potential, or landslide hazards that could affect the covered species when these issues cannot be addressed with road projects. The purpose of vacating roads is to disconnect the road system hydrologically from the stream channels. Vacated forest roads will be left in a condition where road-related damage to the waters of the state is unlikely. When a road is to be vacated and taken off the active road network, erosion prevention work will be performed so that continued maintenance is not necessary. Vacated roads will have sidecast material, stream crossings, culverts, cross drains, and fills removed; unstable road and landing fills excavated; ditch and road surfaces treated to disperse runoff and prevent surface erosion; and exposed soils revegetated. Segments of a road that have near-natural levels of risk for sediment delivery can be left intact and receive minimal road drainage improvements.

During the permit term, ODF will review roads during the IP and operation planning processes to identify sections that will be improved, vacated, closed, or gated across the permit area to benefit the covered species.

4.7.6 Conservation Action 6: Establish Habitat Conservation Areas

Conservation Action 6 is intended to support primarily the biological objectives below. A complete list of all the covered activities and linkages is provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

- 2.1 and 3.1: Conserve and Maintain Riparian Habitat in Torrent Salamander Ranges
- 4.1: Conserve, Maintain, and Enhance Existing Oregon Slender Salamander Habitat
- 5.1: Conserve, Maintain, and Enhance Existing Northern Spotted Owl Habitat
- 5.2: Facilitate Northern Spotted Owl Landscape Connectivity
- 5.3: Increase the Amount of High-Quality Habitat for Northern Spotted Owl
- 6.1: Conserve, Maintain, and Enhance Existing Marbled Murrelet Nesting Habitat
- 6.2: Increase the Amount of High-Quality Habitat for Marbled Murrelet
- 7.1: Conserve, Maintain, and Enhance Occupied Red Tree Vole Habitat
- 7.2: Increase the Amount of High-Quality Habitat for Red Tree Vole
- 8.1: Conserve, Maintain, and Enhance Existing Coastal Marten Habitat
- 8.2: Increase the Amount of High-Quality Habitat for Coastal Marten

The designation, preservation, and long-term enhancement of HCAs throughout the permit area is the primary conservation action and intended to conserve, maintain, and enhance habitat for the terrestrial covered species. As described below, ODF will immediately designate upon permit issuance approximately 275,000 acres of HCAs to support the persistence of northern spotted owl,

marbled murrelet, red tree vole, Oregon slender salamander, and coastal marten, along with Columbia and Cascade torrent salamanders. These HCAs (and the portion of the RCAs within them) represent 43% of the permit area, which will be conserved, maintained, and enhanced to provide habitat for covered species throughout the permit term (Appendix F, *Habitat Conservation Area Maps*).

Ownership patterns also played a major factor in determining the location and extent of HCAs, including designating large HCAs where other public lands are lacking and ODF is the majority public landowner. Such areas occur primarily in the northern portion of the Coast Range ecoregion. Of nine HCAs greater than 5,000 acres, eight are in the Clatsop and Tillamook State Forests (Coast Range ecoregion), and one is in the Santiam State Forest (West Cascades ecoregion). HCAs between 1,000 and 5,000 acres occur throughout the permit area but are predominantly on the north coast. Smaller HCAs are found throughout the permit area but predominate on lands outside the north coast where ODF-managed lands are smaller and more scattered. These smaller HCAs are designated to protect and enhance known species occurrence or provide connectivity between federal lands within smaller patchwork ownership patterns.

The overall purpose of HCAs includes the following.

- Conserve, maintain, and enhance existing habitat for terrestrial covered species in the permit area over the permit term.
- Improve lower-quality and develop new habitat in HCAs, where necessary and where such treatments can be implemented effectively and efficiently, including expanding and connecting existing habitat to improve landscape-level habitat function.
- Limit management activities in HCAs to those intended to improve habitat quantity and quality for most of the covered species over the permit term.
- Allow for natural forest growth and development processes.
- Manage forests within HCAs to maintain and develop late-seral structure stands as they relate to specific habitat needs for individual covered species. As described under Conservation Action 7: Manage Habitat Conservation Areas, HCA standards will direct land-management activities in HCAs to improve long-term habitat values for covered species in HCAs.

4.7.6.1 Habitat Conservation Area Design Criteria

ODF designed HCAs to avoid, minimize, and mitigate for the impacts of take of terrestrial covered species to the maximum extent practicable while maintaining an economically viable harvest program (Appendix F, *Habitat Conservation Area Maps*).

The primary design criteria for HCAs are to conserve, maintain, and enhance habitat in and adjacent to existing occupied habitat as well as to increase overall habitat values for covered species at the landscape level. Over the course of the permit term, the HCAs will result in interconnected blocks of covered species' habitat to help meet the goals and objectives stated in this HCP, including supporting the persistence of covered species under changing circumstances related to climate change.

The permit area contains patches of habitat suitable for covered species that are interspersed throughout areas of less suitable habitat or areas that are unsuitable. HCAs were designed to provide both local and landscape contiguity; as a result, they contain both suitable habitat and

non-habitat areas. Suitable habitat in HCAs will be managed only as needed to maintain or accelerate development of mature habitat conditions. Lower-quality habitat and non-habitat will be allowed to develop naturally into habitat or managed to accelerate development of suitable habitat as well as expand and connect existing habitats (Conservation Action 7: Manage Habitat Conservation Areas).

ODF will use both passive management and targeted silvicultural activities to increase the quality and quantity of covered species' habitat over time in the HCAs. Improvement of covered species' habitat in HCAs will balance habitat removed from covered activities outside of HCAs over the course of the permit term.

HCAs were established by considering the following criteria and available data.

- **Occupied Habitat.** Areas where covered species are known to currently exist, including nesting locations, and occurrence data for northern spotted owl, marbled murrelet, and, where available, red tree vole.
- **Historically Occupied Habitat.** Areas where covered species have been documented in the past 30 years and where habitat remains but where the status is currently unoccupied (i.e., inactive) or unknown. Historic sites with documented occupancy or occurrence over multiple years were identified as a priority for conservation.
- **Suitable Habitat.** Areas that contain habitat suitable for covered species, as defined by the habitat distribution models in Chapter 2, *Environmental Setting*, but are currently unsurveyed or unoccupied.
- **Future Habitat Adjacent to Suitable Habitat.** Areas that do not currently contain suitable habitat but are adjacent to or close to areas with suitable habitat and can become suitable habitat efficiently and effectively, either passively or through active management. Over time, this will increase late-seral habitat amount, patch size, and connectivity, creating larger and better-connected blocks of suitable habitat than exist today.
- **Patch Size.** Areas that already contain larger blocks of suitable habitat as well as occupied habitat that is fragmented but that could be consolidated through long-term habitat development in areas between habitat patches.
- **Edge.** HCAs were designed to minimize the edge-to-area ratio and reduce "edge effects" on covered species, particularly marbled murrelets. This includes both the patch HCA shape configuration and the inclusion of unsuitable habitat adjacent to designated occupied habitat.
- **Proximity.** Areas that are in proximity to other HCAs and suitable habitat managed by federal entities.
- **Adjacency.** Areas where the permit area is adjacent to covered species occurrences and habitat located on federal lands.
- **Geographic Representativeness.** Areas that could serve to create an HCA network that is distributed across the permit area—rather than concentrated in a few areas—to maintain habitat availability across the full range of each covered species in the permit area, thereby protecting the genetic diversity within subpopulations of covered species.

4.7.6.2 Habitat Conservation Area Designations

The HCP designates HCAs that total approximately 275,000 acres, or 43% of the permit area, including portions of RCAs occurring in HCAs. Designated HCAs include blocks of habitat in the northern portion of the Oregon Coast ecoregion, an area where state lands are believed to be essential in maintaining and expanding the current distribution of both northern spotted owls and marbled murrelets (U.S. Fish and Wildlife Service 2011, 1997). Table 4-7 summarizes the acres of habitat in the permit area and the percentage of acres included in HCAs for the covered species. Additional habitat to be created over the term of the HCP is described under Conservation Action 7: Manage Habitat Conservation Areas.

4.7.6.3 Modifying Habitat Conservation Area Boundaries

HCA boundaries were selected using a desktop exercise and based on species occurrences and modeled habitat, as described above. During implementation, it may be necessary to modify the boundaries of HCAs to better align with existing operational boundaries or generally optimize how HCAs protect species occurrences or habitat. Adjustments to the boundaries of HCAs will occur only in situations where there is no net loss in acres of equal or better habitat for covered species inside a subgeographic area, representing either the north coast (Clatsop and Tillamook State Forests) or the rest of the permit area (remaining managed state forest lands). Modifications will consider known occupied habitat as the priority when applicable. Minor operational HCA adjustments will be made as needed and disclosed in the annual report (Section 8.5.1, *Annual Reporting*), including the rationale for the adjustments and confirmation that any acre of HCA removed will be replaced by one of equal or better value. If a proposed HCA boundary shift causes a current or long-term reduction in habitat acres for covered species in a subgeographic area, it will not be allowed. Total acres in HCAs in each subgeographic area will not be reduced by adjustments.

Table 4-7. Acres of Existing and Modeled Covered Species' Habitat in Habitat Conservation Areas

Species	Habitat in HCAs at Beginning of Permit Term	Percent of HCAs that Are Habitat at Beginning of Permit Term ^f	Modeled Habitat in HCAs at End of Permit Term
Northern spotted owl ^a	122,699 ^e	45%	230,968
Marbled murrelet ^b	80,905	29%	203,621
Red tree vole ^b	71,855	26%	176,005
Oregon slender salamander ^c	19,200	7%	19,200
Coastal marten ^d	27,000	10%	27,000

^a Acres include modeled nesting, roosting, and foraging habitat.

^b Acres include modeled suitable and highly suitable habitat.

^c Acres include the extent of Oregon slender salamander range in HCAs in the permit area. In addition to the 19,200 acres that will be managed as Oregon slender salamander habitat in HCAs, retention standards described in Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas, enable Oregon slender salamander to persist in areas that are subject to harvest within the species' range.

^d Any portion of the permit area from northern Lane County south to the California border, west of Interstate 5, is considered habitat. The amount of habitat will not change dramatically during the permit term unless new lands are acquired by ODF. Within that landscape, the HCAs are fixed, meaning that the amount of land inside HCAs will not change during the permit term. All of the 27,000 acres of coastal marten habitat is expected to be improved during the permit term, and habitat quality is expected to be higher at the end of the permit term than it was at the beginning.

^e Twenty-eight out of 31 active northern spotted owl activity centers are inside of HCAs.

^f HCAs make up approximately 275,000 acres. Species distribution does not cover the entire extent of HCAs; therefore, the percentage is not indicative of habitat quality. For example, Oregon slender salamander occurs only in the North Cascades, which makes up less than 15% of the permit area.

4.7.7 Conservation Action 7: Manage Habitat Conservation Areas

Conservation Action 7 is intended to support primarily the biological objectives below for increasing long-term habitat for terrestrial species and aquatic species that disperse through upland forest. A complete list of all the covered activities and linkages is provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

- 4.1: Conserve, Maintain, and Enhance Existing Oregon Slender Salamander Habitat
- 5.1: Conserve, Maintain, and Enhance Existing Northern Spotted Owl Habitat
- 5.3: Increase the Amount of High-Quality Habitat for Northern Spotted Owl
- 6.1: Conserve, Maintain, and Enhance Existing Marbled Murrelet Nesting Habitat
- 6.2: Increase the Amount of High-Quality Habitat for Marbled Murrelet
- 7.1: Conserve, Maintain, and Enhance Existing Occupied Red Tree Vole Habitat
- 7.2: Increase the Amount of High-Quality Habitat for Red Tree Vole
- 8.1: Conserve, Maintain, and Enhance Existing Coastal Marten Habitat
- 8.2: Increase the Amount of High-Quality Habitat for Coastal Marten

The overarching management objective for HCAs is to increase the quality and quantity of habitat for terrestrial covered species. Therefore, the only management actions that will occur in HCAs are those that will contribute toward achieving that objective and those that will not hinder, delay, or create uncertainty about achieving that objective (e.g., recreational activities conducted consistent with the HCP and initial take permit [ITP]). Stand management activities in HCAs will be implemented to improve habitat for covered species. Typically, this will include a variety of density management prescriptions in healthy conifer forests to ensure that late-seral structure develops more quickly. In some cases, such as stands that are dominated by hardwoods or infested with Swiss needle cast, it will be more efficient to conduct regeneration harvests and replant a species mix that will develop into covered species' habitat in a shorter time frame. Management activities in HCAs will incorporate principles and techniques of ecological forestry (Franklin et al. 2018). Partial-cut, harvest-based silvicultural prescriptions such as light to heavy thinning or variable-density thinning with patch cuts will be primary tools for advancing stand structure and habitat development. Active management implemented in HCAs will be guided by principles associated with restoring properly functioning terrestrial habitat for covered species. Stands that are selected for harvest operations will be based on the need for intervention and potential to develop habitat within the permit term. Silvicultural prescriptions in HCAs will be implemented solely for the purpose of promoting habitat development for the covered species, thereby deviating from timber-harvest and revenue-focused goals commonly pursued outside HCAs. The pace and scale of these activities is described below, along with a description of the types of stand management that will occur in HCAs. Because the intention for management activities in HCAs is to improve covered species' habitat, it follows that stand management in HCAs will be in locations that currently provide limited or no modeled habitat value for covered species. Stands that are already high-quality habitat are generally not expected to

be subject to active management. Stands that provide lower-quality habitat or no habitat will be managed more frequently to increase the quality and quantity of habitat during the permit term. Further, many of the stands in HCAs will be managed passively, allowing habitat to develop without intervention.

This section provides a discussion of which management activities can occur in species' habitat and the relative frequency of those activities. During HCP implementation, all management activities in HCAs will be disclosed in IPs and operation plans. Management activities slated for the upcoming year will be disclosed in the operation plans and HCP annual report of the preceding year. The effectiveness of management activities will be reviewed during the 5-year midpoint check-in and during the 10-year comprehensive review. Changes to management activities in response to the results of habitat monitoring will be outlined in each subsequent IP.

4.7.7.1 Management of Existing Habitat in Habitat Conservation Areas

Most management actions to improve habitat will occur in stands that contain lower-quality habitat or non-habitat (Section 4.7.7.2, *Management to Accelerate Development of Habitat in Habitat Conservation Areas*). At the landscape scale, management actions in HCAs are intended to improve the quality and quantity of habitat for covered species and enhance the function of individual HCAs as well as the overall network. Stands in HCAs that already contain high-quality habitat for covered species (e.g., nesting/roosting spotted owl habitat) are generally not expected to require active management to maintain those habitat conditions. However, on a limited basis, some small-scale treatments to create specific habitat components, such as snags or small stand gaps (0.25 to 2 acres) to increase stand heterogeneity, would occur in stands in HCAs if there is reasonable expectation that the treatment would quickly and meaningfully enhance habitat.

Insects, disease, and fire are natural components of forest ecosystems, and treatments to address these risks may entail short-term degradation of late-seral stands that are already functioning as habitat for covered species. For instance, the removal of ladder fuels can reduce canopy layering, or the removal of insect-infested trees can result in less future snag and large wood recruitment. As a result, habitat within HCAs will generally not be managed to reduce risk. Instead, treatments to reduce fire, insect, and disease risks will occur in stands adjacent to late-seral stands rather than within late-seral stands. Fire risks may increase over time due to climate change (Oregon Climate Change Research Institute 2017); therefore, actions to reduce fire risks to late-seral stands may also increase over time, but this should be partially offset by treatments in other stands and the ingrowth of additional late-seral stands in HCAs over the permit term.

Hazard tree removal entails the removal of standing trees or snags that present a hazard to employees, the public, or infrastructure (public or private). The intent of hazard tree removal is to address a specific public safety hazard; although positive or negative biological outcomes may occur where stand densities are decreased, it is not the intent of this action. Felled trees may be left as downed wood, depending on the scope and location of the hazard tree removal.

Application of conservation actions will be based on site-specific conditions, as informed by forest inventory data and baseline surveys. Specific treatments will follow measures to minimize displacement or disturbance to covered species, as outlined in Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species.

4.7.7.2 Management to Accelerate Development of Habitat in Habitat Conservation Areas

Managing stands in HCAs that are lacking habitat characteristics for covered species will help promote stand development as the forest grows. The important characteristics include large trees and snags, multistoried and multi-species canopies, and large woody material. The primary purpose of these management actions is to selectively and strategically improve and accelerate development of such habitat characteristics for terrestrial covered species that rely on late-seral forests.

There is broad professional consensus that thinning and other silvicultural treatments can accelerate the development of late-seral forest characteristics, including habitat suitable for northern spotted owls (Kuehne et al. 2015; Dodson et al. 2012; Andrews 2005). The *Revised Recovery Plan for Northern Spotted Owl* (U.S. Fish and Wildlife Service 2011) notes that thinning can be effective in accelerating development of northern spotted owl habitat, particularly in stands 50 years or older that contain uniform, densely stocked stands that are not likely to achieve habitat complexity for many decades without intervention. Newton et al. (2015) found that variable density thinning within such stands (50 to 55 years old) allowed development of some larger trees by the age of 65, along with increasing overall structural and tree species diversity. Although thinning may have short-term adverse effects on habitat quality (U.S. Fish and Wildlife Service 2011), Newton et al. (2015) reported that crown cover increased rapidly during the 15 years following thinning. In addition, these younger stands typically have lower habitat suitability; therefore, short-term effects of thinning are less impactful on covered species. ODF will manage varying types of partial cutting (i.e., variable density thinning, patch cuts) to increase vertical and horizontal spatial heterogeneity, overall tree size, structural complexity, compositional diversity, and understory development (Table 4-8). As a stand becomes older, the intensity of silviculture applied becomes generally less intensive to balance potential short-term adverse effects with long-term habitat development (Table 4-9).

In addition to increased habitat quality over time for northern spotted owl (Objective 5.3), these types of management activities will also serve to achieve biological objectives for marbled murrelets (Objective 6.2) and red tree voles (Objective 7.2) (Table 4-8). Application of management activities to accelerate development of suitable and highly suitable habitat will be based on site-specific conditions, as informed by forest inventory data and baseline surveys, and occur early in the HCP permit term to realize the benefits to these species prior to the end of the permit term. Specific treatments will also follow measures to minimize disturbance to covered species, as outlined under Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species, and be designed and intended to benefit the covered species over the permit term. Some short-term negative effects (e.g., edge effects or unknown nest disturbance) on one or more covered species may take place during stand management in HCAs for other covered species, but the long-term benefits to the terrestrial species are believed to outweigh temporary negative effects.

4.7.7.3 Pace and Scale of Stand Management Activity in Habitat Conservation Areas

The HCAs are intended to provide protection for existing covered species' habitat and be the focus of habitat improvement over time. At approximately 275,000 acres (43% of the permit area), this is a sizeable commitment to terrestrial species habitat that is designed to offset the impacts of habitat loss outside of HCAs over the permit term. Although management in HCAs for habitat improvement is an important element of the overall conservation strategy, careful planning and consideration of how to minimize effects from management actions on covered species is equally essential.

This section describes the pace and scale of management activities in three management categories: (1) healthy conifer stands, (2) Swiss needle cast stands, and (3) hardwood-dominant stands. By limiting the pace and scale of acres managed in HCAs, short-term temporary effects on species habitat can be minimized (Table 4-10). Additional restrictions on where stand-management activities can occur, relative to existing species habitat, are shown in Table 4-11. No stand-management activities will occur inside RCAs, even within HCAs. Reforestation and young stand-management practices in HCAs are described in Chapter 3, *Covered Activities*.

Sale planners, the HCP administrator, and ODF biologists will work closely, especially early in the permit term, to increase alignment and develop further operational guidance and related contract language, thereby ensuring standards will be met during harvest operations inside HCAs. Silvicultural activities inside HCAs will be focused on achieving habitat objectives for covered species, limited in pace and scale (as described above), and selected strategically to improve the overall function of habitat within HCAs while limiting short-term effects on covered species.

Table 4-8. Acreages for Stand Management Types in the HCAs during the First 30 Years of the Permit Term

HCA Stand Management Type	Potential Candidate Acres Available	Estimated Acres to Be Managed ^a	Percent of Total HCA Acres ^b
Healthy conifer thinning	70,000	45,000	16.4%
Swiss needle cast – regeneration harvest	46,000	15,000	5.5%
Hardwood-dominant stands – regeneration harvest	50,000	15,000	5.5%

^a This amount reflects the management expected to occur in the first 30 years. Additional acres may be managed after the first 30 years, contingent on USFWS review and concurrence.

^b Calculated as the estimated acres to be managed divided by the total area of HCAs (275,000 acres).

HCA = habitat conservation area

Healthy Conifer Stands

There are approximately 180,000 acres of healthy conifer stands inside of HCAs. At least 70,000 acres are potential candidates for management because they have a high original planting density, which is intended for timber production, and will persist as simple closed-canopy stands without a reduction in density or overall uniformity. To improve covered species' habitat, these stands will receive thinning and patch cuts that will increase the growth of dominant trees and allow the initiation (or reinitiation) of understory tree and shrub species, which will increase both vertical and horizontal heterogeneity, as well as species diversity, within the stand. A summary of silviculture prescriptions that will be used and the expected biological outcomes from those activities is provided in Table 4-9.

To assist in meeting the biological goals and objectives for the terrestrial covered species, ODF plans to actively manage up to 45,000 acres (16.4% of HCAs) of the 70,000 candidate acres of healthy conifer stands during the first 30 years of the permit term. Focusing management early in the permit term will allow time before the end of the permit term for stands to respond to management and better habitat to develop. On average, the 45,000 acres will be spread evenly over the 30 years (Table 4-8). To minimize effects on covered terrestrial species, management actions will follow the operational restrictions described in Conservation Action 10. Though the acres of healthy conifer

stands treated within HCAs will vary year to year, acres sold in any one year will most likely average 1,500 acres for the entire permit area and will not exceed 2,500 acres in any year or 7,500 acres across a 5-year period. Further, the 7,500 treated acres in each 5-year period will be distributed among multiple HCAs. The field staff and ODF biologists will work closely to determine legacy components (e.g., species, size, location) when drafting prescriptions in these areas.

After the first 30 years of the permit term, there will most likely be an additional 30,000 to 40,000 acres of 30- to 60-year-old (currently aged 0 to 30 years) healthy conifer stands that may be candidates for treatment, based on the current age class structure in HCAs. Opportunities to treat additional acres later in the permit term will be contingent on USFWS review and concurrence at 10-year reporting intervals and based on habitat trends (and projections), current conditions, proposed activities (pace, scale, prescriptions), and success of previous treatments (tied to adaptive management). Additional treatments would continue to follow all requirements for habitat protection in Conservation Actions 6, 7, and 10.

Swiss Needle Cast Stands

Approximately 46,000 acres in the HCAs are moderately to severely infected by Swiss needle cast stands (17% of HCAs).¹⁹ Of those, approximately 20,000 acres provide opportunities for management because they are on accessible terrain or in accessible locations (Table 4-8). The focus of management in a subset of these stands within the HCAs will be to reset stands that are stunted, due to Swiss needle cast, and will most likely not become high-quality habitat for covered species over the course of the permit term. By harvesting those stands early in the permit term, including regeneration harvests that remove significant portions of stands, ODF will be able to replant the stands with a species mix that will grow into more suitable habitat during the permit term. Regeneration prescriptions for Swiss needle cast will include the retention of other conifer and hardwood species that are unaffected by the disease. A summary of stand-management techniques to be used and the expected biological outcomes from those activities is provided in Table 4-9.

To assist in meeting the biological goals and objectives for the terrestrial covered species, ODF plans to manage 15,000 acres (5.5% of HCAs) of the 46,000 candidate acres of infected Swiss needle cast stands in HCAs during the first 30 years of the permit term. On average, the 15,000 acres will be spread evenly over the 30 years. To minimize effects on covered terrestrial species, management actions will follow the operational restrictions described in Conservation Action 10. Though the acres of Swiss needle cast stands treated in HCAs will vary year to year, the acres sold in any one year will most likely average 500 acres for the entire permit area and will not exceed 1,000 acres in

¹⁹ The severity of Swiss needle cast damage can be assessed by several methods: aerial survey, ground-based foliage retention assessments, and growth assessment. Aerial-detection surveys describe discoloration of Douglas-fir foliage in April and May as moderate (yellow) or severe (yellow-brown and sparse) and provide a very coarse qualitative estimate of where disease is severe enough to cause tree damage. Foliage (needle) retention is measured by examining individual tree branches in spring or early summer before budbreak and estimating the number of annual foliage complements present on the tree; it is the most reliable and widely used method of estimating tree volume growth loss due to Swiss needle cast (Shaw et al. 2014; Maguire et al. 2002; Maguire et al. 2011). Tree volume loss from Swiss needle cast ranges from approximately 50%, with a foliage retention of 1 or less to no loss when foliage retention is 3.5 or greater. In terms of foliage retention, disease severity is considered low when retention is 2.6–3.5 years, medium when retention is 1.6–2.5 years, and high when retention is <1.5 years (Filip et al. 2000). Crown-length to sapwood-area ratio (CL:SA) is a measure of crown sparseness and Swiss needle cast severity. It requires several tree measurements and increment coring to measure sapwood radius; it offers no advantages over foliage retention (except perhaps in large trees) and is seldom used.

any year or 5,000 acres across a 5-year period. Further, the 5,000 treated acres in each 5-year period will be distributed among multiple HCAs.

Many of the stands may require additional entries to correct trajectories or further enhance specific habitat features. Re-entry would occur farther out in the permit term and adhere to requirements for thinning healthy conifer stands detailed in Table 4-9 and Table 4-10. There may also be opportunities to treat additional Swiss needle cast–infected stands in HCAs. Opportunities for additional treatments later in the permit term will be contingent on USFWS review and concurrence at 10-year reporting intervals, based on habitat trends (and projections), current conditions, proposed activities (pace, scale, prescriptions), and success of previous treatments (tied to adaptive management). Additional treatments would continue to follow all requirements for habitat protection in Conservation Actions 6, 7, and 10.

Conifer Restoration in Hardwood-Dominant Stands

There are roughly 50,000 acres of hardwood-dominant stands inside of HCAs, primarily red alder (*Alnus rubra*) (18% of HCAs). Hardwood-dominant stands include those that have >50% hardwood species. Hardwood species have value for covered species and other wildlife; however, large expanses of red alder–dominant stands with little conifer component are unlikely to develop into suitable or highly suitable habitat for marbled murrelets or red tree voles and are unlikely to support nesting northern spotted owls over the permit term. Therefore, there will be a focus on managing a portion of hardwood-dominant stands (primarily red alder) in the first 30 years of the permit term to reforest those stands with conifer species that will grow into higher-quality habitat for covered species over time. In addition to the reforested conifer component, existing conifers will be retained where operationally feasible, and some hardwoods will also be retained in these stands during harvest. A summary of stand-management techniques that will be used and the expected biological outcomes from those activities is provided in Table 4-9.

To assist in meeting the biological goals and objectives for the terrestrial covered species, ODF plans to employ stand-management practices for up to 15,000 acres (6% of HCAs) of hardwood-dominant stands in HCAs during the first 30 years of the permit term (Table 4-8). Focusing management early in the permit term will allow time before the end of the permit term for stands to respond to management and better habitat to develop. On average, the 15,000 acres will be spread evenly over the 30 years. To minimize effects on covered terrestrial species, management actions will follow the operational restrictions described in Conservation Action 10. Though the acres of hardwood-dominant stands treated within HCAs will vary year to year, the acres sold in any one year will most likely average 500 acres for the entire permit area and will not exceed 1,000 acres in any year or 5,000 acres across a 5-year period. Further, the 5,000 treated acres in each 5-year period will be distributed among multiple HCAs. The remaining 35,000 acres of hardwood-dominated stands in HCAs that are not proposed for management over the first 30 years will provide some foraging habitat diversity and allow comparative analyses in an adaptive management framework to assess the efficacy of treatments intended to promote habitat.

Many of the treated stands may require additional entries to correct trajectories or further enhance specific habitat features. Re-entry would occur later in the permit term and adhere to the requirements for thinning healthy conifer stands detailed in Table 4-9 and Table 4-10. There may also be opportunities to treat additional hardwood-dominated stands in HCAs. Opportunities for additional treatments later in the permit term will be contingent on USFWS review and concurrence at 10-year reporting intervals, based on habitat trends (and projections), current conditions,

proposed activities (pace, scale, prescriptions), and success of previous treatments (tied to adaptive management). Additional treatments would continue to follow all requirements for habitat protection in Conservation Actions 6, 7, and 10.

Managing In Covered Species' Habitat

HCAAs were designed to conserve the highest-quality existing covered species' habitat and nearly all known occupied parts of the permit area. Therefore, stand-management activities in the highest-quality and most essential (e.g., for nesting success or to support continued occupancy) habitats in HCAAs for covered species will be rare or will not occur at all (Table 4-10). However, there are many areas of lower-quality habitat in HCAAs. Stand management activities in these less essential and lower-quality habitats in HCAAs will occur more frequently and as necessary to increase and expedite the development of stands to higher quality. Over time, HCAAs will become better habitat for terrestrial species as more acres of lower-quality habitat grow into higher-quality habitat. It is imperative to manage carefully in HCAAs so short-term harm to covered species can be minimized in favor of long-term benefits. ODF will work with the Services to gain input on implementation and adaptive management responses when making decisions about management actions inside HCAAs, especially when there are tradeoffs among species, as outlined in Chapter 8, Section 8.2.4, *U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries*, and Section 8.5.1, *Annual Reporting*. However, the specific details of which information will be regularly included in the annual reports will be developed through discussion between the Services and ODF and finalized no later than 180 days after issuance of the ITPs.

Table 4-10 outlines what types of management activities can occur in various types of covered species' habitat. The table is organized by species and linked to the species habitat models described in Chapter 2, *Environmental Setting*. Habitat suitability indices are used as a guide for the frequency and type of management activities. In some cases, no management is proposed, particularly in occupied habitat. Table 4-10 is meant as an initial guide for management in HCAAs, but stands will be evaluated in the field for suitability prior to management, especially in the initial years of the HCP. As time progresses and species habitat is better understood through improved modeling, forest inventories, and field assessments, management activities will be adapted to maximize habitat gains while minimizing short-term negative effects.

As described previously, management will be more frequent in stands with lower habitat suitability and less frequent in stands with higher habitat suitability. The frequency of management in each type and the quality of covered species' habitat are described with a percentage of total management expected to occur in a typical year (Table 4-10).

The frequency of management in covered species' habitat in HCAAs is categorized as rare, infrequent, or frequent.

- **Rare.** <5% or no more than 3,750 acres of total managed acres in HCAAs combined for all qualifying habitat types.
- **Infrequent.** <25% or no more than 18,750 acres of total managed acres in HCAAs combined for all qualifying habitat types.
- **Frequent.** >75% or at least 56,250 acres of total managed acres in HCAAs combined for all qualifying habitat types.

The frequency and type of management expected in each covered species' habitat category is shown in Table 4-10. As a blanket rule, management activities in northern spotted owl nesting and roosting habitat or marbled murrelet and red tree vole highly suitable habitat will not reduce habitat quality. Replanting in red tree vole habitat will include use of the appropriate species, including Sitka spruce and western hemlock. Management in these habitat types will be rare and precise (e.g., light thinning); therefore, the risk of reducing habitat quality is low. Management frequency and prescriptions will be more variable in northern spotted owl foraging habitat and lower-quality habitat for marbled murrelet and red tree vole. Additional constraints on where and when activities can occur in relation to covered species is shown in Table 4-10; these will follow all requirements for habitat protection in Conservation Actions 6, 7, and 10.

Table 4-9. Summary of Expected Biological Outcomes from Silvicultural Prescriptions

Stand Type	Silvicultural Prescriptions	Expected Biological Outcomes
Healthy conifer ^a	• Light thinning; retain >35% of SDI.	Improve tree growth and development of limb structure, and maintain a well-stocked stand of healthy, wind-firm trees. Maintenance and improvement of stands that buffer known occupied habitat or suitable habitat of unknown occupancy. Increase overall mature forest connectivity among suitable patches. Intended to improve buffer function and murrelet habitat development while minimizing edge effects and disturbance. Prescriptions are intended to leave approximately 50% or more of canopy cover and any legacy components.
	• Moderate thinning; thin to 25% to 35% of SDI.	Maintain growth and enhance limb and crown structure of the dominant cohort, and foster natural recruitment of minor tree and understory species. Improve trajectories for understory development, compositional diversity, and canopy layering. Development of higher-quality suitable habitat for terrestrial species and mature forest connectivity.
	• Heavy thinning; retain at least 80-square-foot basal area but <25% of SDI.	Applied to dense stands with poor vigor and diversity (e.g., off-site seed Douglas-fir plantations), particularly when a legacy component is present that can be retained. Heavily thinned areas can be underplanted with minor, shade-tolerant species to promote complex patches of early seral forest, including a dominant cohort of emergent trees with complex limb and crown structure, a well-developed midstory of codominant and subdominant species, and a diverse, patchy understory. Planting will generally not include dense monoculture stands of Douglas-fir. Position stand for future habitat development for one or more covered species.
Swiss Needle Cast Stands	• Variable density thinning; retain at least 80-square-foot basal area. Potential patch cuts are applied at a 0.25- to 2.0-acre scale or <15% of the unit.	Combines light, moderate, and heavy thinning within a stand at scales that mimic spatial heterogeneity in late-seral forests resulting from small-scale disturbances and unmanaged stand development. Variable-density thinning can be combined with patch cuts (e.g., in root-rot pockets) and underplanting to improve spatial heterogeneity, compositional diversity, understory development, canopy layering, and structural complexity of dominant and subdominant cohorts.
	• Clearcut – Tree retention across the unit in <80-square-foot basal area.	Removes majority of Swiss needle cast component while retaining largest trees available and tree species that are resistant to Swiss needle cast. Typically resulting in 5 to 10 TPA retained, prioritizing any larger (generally >18 inches), healthy Douglas-fir and other conifer. Replanting with Swiss needle cast-tolerant seed and minor conifer tree species to promote complex patches of early seral forest, resulting in a stand that is positioned for future habitat treatments to grow into habitat for covered species in an accelerated timeframe.

Stand Type	Silvicultural Prescriptions	Expected Biological Outcomes
Conifer Restoration in Hardwood-dominant Stands	Clearcut – Tree retention across the unit in <80-square-foot basal area.	The field staff and ODF biologists will work closely to determine legacy components (e.g., species, size, location) when drafting prescriptions in these areas. Removes majority of the hardwood component (primarily red alder) while retaining largest conifer trees available, as well as some hardwoods, and replanting with a mix of conifer tree species to promote complex patches of early seral forest. Remaining hardwood component provides diversity, typically resulting in 5 to 10 TPA retained, prioritizing any larger (generally >18 inches), healthy Douglas-fir and other conifer. Results in a stand that is positioned for future habitat treatments to grow into habitat for covered species in an accelerated timeframe. Treatments are intended to improve spatial heterogeneity, compositional diversity, understory development, canopy layering, and structural complexity of dominant and subdominant cohorts relative to untreated stands with similar conditions. The field staff and ODF biologists will work closely to determine legacy components and young stand management activities (e.g., species, size, location) when drafting prescriptions in these areas.
Young Stand Management	Site preparation, reforestation, manual release, precommercial thinning; applies to regeneration harvests, and may apply to patch cuts and heavy thins.	Plantings will occur at lower densities and incorporate greater proportions of minor species (western red cedar, Sitka spruce, western white pine, hemlock, true firs). Natural regeneration will be allowed to occur in some small patch cuts, and root-rot tolerant species will be planted where patch cuts are used to address infestations. If needed, alternative management plans will be filed where restocking conditions fail to meet FPA standards. Intensity of manual release operations will be reduced to allow some hardwood retention and development. These treatments are intended to promote complex early seral stand conditions that have greater potential to develop into high-quality habitat for the covered terrestrial species than more intensive production-oriented treatments and prescriptions.

^aThe field staff and ODF biologists will work closely when drafting prescriptions in these areas.

FPA = Oregon Forest Practices Act; ODF = Oregon Department of Forestry; SDI = stand density index; TPA trees per acre

Table 4-10. Summary of Management Type and Frequency in Select Covered Species' Habitat in Habitat Conservation Areas

Species	Habitat Type	HSI ^a	Habitat Characteristics (mean {range})	Frequency ^b	Rationale for Management ^c	Likely Silvicultural Activities	Expected Biological Outcomes
Northern spotted owl	Core area 250 acres around active activity centers centered in permit area.	Best available	Include best available habitat and areas of known use	Never	Preserve integrity of potential nesting and immediate post-fledging area or core use area for resident singles and nonnesting pairs.	None	Maintain integrity of core area, minimize disruption of breeding activities.
	Within 0.7 mile of active activity centers centered in permit area.	0.60–1.0	See values below for individual ranges	Rare	Current stand conditions do not ensure that 500 acres inside the permit area will exist as foraging or better habitat to support persistence.	Light thinning	Support persistence of active sites and accelerate development of structural habitat features of interest, promote understory and midstory development and diversity, enhance spatial heterogeneity.
	Nesting/roosting	0.70–1.0	Age: 113 {67–237} Height: 151 {112–209} TPA 30: 17 {9–27} DDI: 6.8 {4.7–8.4}	Rare	Decadence features, structure, or other attributes are too limited to allow stands to develop into higher-quality habitat through passive management.	Light thinning	Accelerate development of structural habitat features of interest, enhance understory development and diversity to support prey.

Species	Habitat Type	HSI ^a	Habitat Characteristics (mean {range})	Frequency ^b	Rationale for Management ^c	Likely Silvicultural Activities	Expected Biological Outcomes
		0.60–0.69	Age: 93 {52–317} Height: 142 {92–182} TPA 30: 13 {4–37} DDI: 6.1 {3.8–9.4}	Rare	Address limiting factors to improve quality (e.g., decadence features, simple structure, homogeneous landscape).	Light thinning	Accelerate development of structural habitat features of interest, promote understory and midstory development and diversity, enhance spatial heterogeneity.
	Foraging	0.40–0.59	Age: 66 {14–154} Height: 119 {65–165} TPA 30: 3 {0.0–13.9} DDI: 5.6 {3.1–6.8}	Frequent	Address dense, homogeneous stands with little canopy diversity, poor limb development, and suppressed understory cover to increase quantity and quality of nesting/roosting habitat. Large limb development benefits to other covered species (platform quality, red tree vole habitat complexity).	Variable-density thinning; moderate thinning	Accelerate development of dominant and midstory trees (canopy complexity), promote understory development and diversity, enhance structural complexity and spatial heterogeneity.

Species	Habitat Type	HSI ^a	Habitat Characteristics (mean {range})	Frequency ^b	Rationale for Management ^c	Likely Silvicultural Activities	Expected Biological Outcomes
	Dispersal or not habitat	0.00–0.39	Age: 51 {4–135} Height: 103 {40–140} TPA 30: 0.4 {0.0–9.1} DDI: 4.8 {1.5–6.4}	Frequent	Address dense, homogeneous stands with little canopy diversity, poor limb development, and suppressed understory cover to increase quantity and quality of nesting/roosting and foraging habitat. Large limb development benefits to other covered species (platform quality, red tree vole habitat complexity).	Variable-density thinning; heavy or moderate thinning; clearcut ^e	Accelerate development of dominant and midstory trees (canopy complexity), promote understory development and diversity, enhance structural complexity and spatial heterogeneity, provide for potential future habitat pathways.
Marbled murrelet	Designated occupied habitat. Includes known occupied survey areas and areas of high-quality habitat, as determined by ODF biologists, even in the absence of survey results.	Delineated based on occupied and highly suitable habitat with known or expected occupancy.	Age: 108 {80–174} Height: 153 {123–190} TPA 30: 16 {6–34} for unsurveyed areas designated as occupied. N/A for areas designated as occupied, based on survey data.	Never	Maintain and protect known occupied and other highly suitable habitat.	None	Maintain integrity of known breeding areas and other likely nesting habitat, minimize disruption of breeding activities.
	100-meter nonhabitat buffer around	<0.29	Age: 75 {40–157} Height: 130 {88–165} TPA 30: 6 {0–16}	Rare	Manage for continuous forest structure and cover, reduce edge effects,	Light thinning	Increased tree growth improves buffer function and cover to

Species	Habitat Type	HSI ^a	Habitat Characteristics (mean {range})	Frequency ^b	Rationale for Management ^c	Likely Silvicultural Activities	Expected Biological Outcomes
	designated occupied habitat.				promote interior habitat.		suitable nest trees in designated occupied habitat while minimizing short-term risks of increased predation, windthrow, or microclimatic changes that affect habitat quality.
	Highly suitable	0.80–1.0	Age: 142 {116–207} Height: 164 {145–210} TPA 30: 21 {13–30}	Never	Maintain and protect highly suitable habitat.	None	Maintain integrity of likely nesting habitat, minimize disruption of breeding activities.
	Suitable	0.50–0.79	Age: 109 {80–174} Height: 153 {123–190} TPA 30: 16 {6–34}	Infrequent	Large limb development, benefits to other covered species (platform quality, spotted owl access to prey).	Light thinning; variable-density thinning; moderate thinning	Quality of nest substrates enhanced, canopy complexity enhanced over time.
		0.30–0.49	Age: 75 {40–157} Height: 130 {88–165} TPA 30: 6 {0–15.7}	Frequent	Large limb development, benefits to other covered species (platform quality, spotted owl access to prey).	Light thinning; variable-density thinning; moderate thinning	Quality of nest substrates enhanced, canopy complexity enhanced over time.

Species	Habitat Type	HSI ^a	Habitat Characteristics (mean {range})	Frequency ^b	Rationale for Management ^c	Likely Silvicultural Activities	Expected Biological Outcomes
	Not habitat	<0.29	Age: 64 {16–119} Height: 118 {65–152} TPA 30: 2.2 {0–13}	Frequent	Address dense, homogeneous stands with little canopy diversity and limited limb development to increase quantity and enhance quality of suitable habitat.	Clearcut, ^d variable-density thinning; heavy, moderate, and light thinning	Accelerate development of dominant and midstory trees with complex limb and crown structure to improve amount and quality of suitable nesting platforms and associated cover, provide for potential future habitat pathways in non-habitat.
Red tree vole	≥ 10 acres around known nest trees with connectivity among buffered areas, larger skips incorporated in larger thinning projects.	>0.40	Age: 74 {42–157} DDI: 5.6 {3–7} TPA 30: 6 {1–16}	Never	Buffer and maintain known occupied nest trees in addition to protected habitat for northern spotted owl and marbled murrelet.	None	Protect nest tree and groups of trees around nest locations and maintain connectivity among known nest trees or other occupied habitat.
	Highly suitable	0.80–1.0	Age: 113 {76–192} DDI: 6.9 {6–8} TPA 30: 15 {11–24}	Rare	Benefits to other covered species (platform quality, spotted owl access to prey).	Light thinning	Increased spatial heterogeneity, enhanced midstory and understory development, species diversity and structural complexity.

Species	Habitat Type	HSI ^a	Habitat Characteristics (mean {range})	Frequency ^b	Rationale for Management ^c	Likely Silvicultural Activities	Expected Biological Outcomes
	Suitable	0.60–0.79	Age: 86 {68–186} DDI: 5.9 {4–8} TPA 30: 11 {6–30}	Infrequent	Benefits to other covered species (platform quality, spotted owl access to prey).	Light thinning	Increased spatial heterogeneity, enhanced midstory and understory development, planting composition includes Sitka spruce and Western hemlock where management overlaps with DPS range, and structural complexity.
		0.40–0.59	Age: 74 {42–157} DDI: 5.6 {3–7} TPA 30: 6 {1–16}	Frequent	Improve long-term quality while minimizing short-term impacts.	Variable-density thinning; moderate thinning	Increased spatial heterogeneity, enhanced midstory and understory development, appropriate species diversity and structural complexity.
	Not habitat ^d	<0.39	Age: 67 {37–135} DDI: 5.5 {1–6} TPA 30: 2.8 {0–14}	Frequent	Address dense, homogeneous stands with little canopy diversity and limited limb development to increase quantity and enhance quality of suitable habitat.	Clearcut, ^e variable-density thinning; heavy, moderate, and light thinning	Promote a dominant cohort of emergent trees with complex limb and crown structure that are appropriate

Species	Habitat Type	HSI ^a	Habitat Characteristics (mean {range})	Frequency ^b	Rationale for Management ^c	Likely Silvicultural Activities	Expected Biological Outcomes
							for the species, a well-developed midstory of codominant and subdominant species, and a diverse, patchy understory. Increase amount, quality, and connectivity of habitat.

^a HSI and related rules regarding management apply only within the range of a given covered species. Where ranges of HSIs are reported, the mean and ranges of the habitat characteristics were reported for the lowest categories. The HSIs are a planning tool derived from stand-level inventory summary statistics where available and interpolation where not; field evaluations are required to determine suitability of given stands for covered species. Sample sizes from which the means are derived vary widely (i.e., 15 to 3,500), depending on HSI category.

^b Rare = <5% or 3,750 total acres of management combined for all habitat types identified, infrequent = <25% or 18,750 total acres of management combined for all habitat types identified, and frequent = >75% or 56,250 total acres of management in HCAs combined for all habitat types identified. Management acres to be spread across the first 30 years of the permit term.

^c Management in HCAs will be focused on achieving habitat objectives for covered species and limited in pace and scale; stands will be selected strategically to improve the overall function of habitat within HCAs while limiting short-term effects on covered species. ODF will work with the Services to gain input on implementation and adaptive management responses when making decisions about management actions inside HCAs, especially when there are tradeoffs among species, as outlined in Chapter 8, Section 8.2.4, *U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries*, and Chapter 8, Section 8.5.1, *Annual Reporting*.

^d Includes potentially occupied young forests adjacent to older forests.

^e Clearcut harvests are limited to Swiss needle cast and hardwood-dominant stands.

DDI = diameter diversity index; DPS = distinct population segment; HSI = habitat suitability index; N/A = not applicable; TPA = trees per acre

4.7.8 Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas

Conservation Action 8 is intended to support primarily the objectives below. A complete list of all the covered activities and linkages is provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

- 4.2 Retain and Recruit Downed Wood to Support Oregon Slender Salamander
- 5.2 Facilitate Northern Spotted Owl Landscape Connectivity
- 6.2 Increase the Amount of High-Quality Habitat for the Marbled Murrelet
- 7.2 Increase the Amount of High-Quality Habitat for Red Tree Vole
- 8.2 Increase the Amount of High-Quality Habitat for Coast Marten

Under the HCP, approximately 324,000 acres (51%) of the permit area will be outside of HCAs or RCAs. Much of the impact (incidental take) on covered species anticipated from the HCP will result from the active management and dynamic conditions expected to occur in these portions of the permit area. This conservation action describes the approach ODF will take to manage this important component of the landscape to avoid and minimize adverse effects on covered species from the activities covered under this HCP. ODF is able to be more flexible on how lands outside of HCAs and RCAs are managed with take authorization under the HCP and permits. Most stands will be managed for timber production, with a predicted focus on growing stands that generate a product mix of predominately large and medium sawtimber. Individual harvest timing decisions will be responsive to market conditions; however, the overall management regime for areas outside of HCAs and RCAs is not the short-rotation, intensive timber production typically practiced on private industrial forest lands.

In addition to this overall management regime, ODF will commit to standards that improve landscape-level forest structure through the following measures:

- Maintaining a diversity of forest stand ages and conditions on the landscape outside of HCAs and RCAs.
- Facilitating dispersal and connectivity for northern spotted owls on the landscape outside of HCAs and RCAs.
- Retaining forest legacy features and structures during regeneration harvest.

The standards are intended to maintain and create long-term, landscape-level habitat values for covered species in the portion of the permit area that is more actively managed for timber production to support the function and connectivity between designated HCAs (Conservation Action 6: Establish Habitat Conservation Areas). As a result, many of the forest stands outside of HCAs and RCAs will continue to provide some function as habitat or in support of habitat function at the forest level.

4.7.8.1 Landscape-Level Management Standards

Maintain a Diversity of Forest Stand Ages and Conditions on the Flexibly Managed Landscape

The flexibility for managing lands outside of HCAs and RCAs with take authorization under the HCP and permits will mean that harvest rotations can coincide with habitat development, with certainty that stands can still be harvested at the appropriate time. Individual harvest timing decisions can be responsive to market conditions, and there will be less risk to harvest activities being constrained if habitat for threatened or endangered species develops prior to harvest. This, in turn, provides more habitat for a longer period of time for covered species, even if that habitat is eventually harvested.

Outside of HCAs and RCAs, most stands will be managed for timber production, with a predicted focus on growing stands that generate a product mix of predominately large and medium sawtimber. This does not preclude some stands being managed or harvested on shorter rotations; however, the overall landscape strategy for areas outside of HCAs and RCAs is not short-rotation, intensive timber production as typically practiced on private industrial forest lands. Approximately 60% of stands (based on decadal averages in the harvest model) in areas outside of HCAs and RCAs will most likely be maintained at ages less than 60 years old; approximately 75% will be less than 80 years old. Some stands will remain infeasible to harvest due to physical constraints that prevent logging or otherwise unavailable for harvest due to other existing constraints (e.g., scenic, social, access) and, thus, may grow into older age classes.

Under Conservation Action 1: Establish Riparian Conservation Areas, RCAs will be integrated into the portion of the landscape that is outside HCAs and otherwise available for timber production and harvest. These RCAs will encompass 41,200 acres (11%) of the area outside HCAs (and 6% of the permit area overall) and be allowed to develop mature forest conditions that are distributed throughout the permit area. Leave-tree strategies (Section 4.7.8.2, *Stand-Level Management Standards*) will retain and promote large live trees in harvest units while also incorporating minor species to retain within-stand species diversity. Leave-tree retention is combined with retention and supplementation of existing snags that are not a safety hazard and downed wood as part of a robust and holistic approach to legacy retention and recruitment. Thus, some habitat features may improve over time (e.g., abundance of large snags) at stand and landscape scales. Taken together, many of the forest stands outside of HCAs will continue to provide some function as habitat or in support of habitat function at the forest level.

Collectively, retention of structural habitat features and maintenance of spotted owl dispersal habitats across the actively managed portion of the permit area, the growth of trees in RCAs and inoperable areas, and the longer (than typical industrial forest management) rotation ages employed by ODF for thinning and regeneration harvests will result in a wide range of forest age and structure conditions—including older forests and some suitable habitats for covered species—outside of the HCAs. Although the locations, amounts, and longevity of these habitats outside of HCAs will be dynamic, based on ODF forest management planning, they will exist to an extent that supports connectivity and some degree of presence of covered species throughout the permit term in portions of permit area between the HCAs. Much of the impact (incidental take) on covered species anticipated from the HCP will result from the active management and dynamic conditions expected to occur in these portions of the permit area.

Maintain a Minimum Amount of Habitats that Facilitates Northern Spotted Owl Dispersal and Connectivity on the Flexibly Managed Landscape

One of the primary management standards will be the commitment to maintain northern spotted owl dispersal habitat across the permit area outside of HCAs. This HCP defines dispersal habitat the same as the criteria for dispersal habitat in the *Revised Recovery Plan for Northern Spotted Owl* (U.S. Fish and Wildlife Service 2011): stands of trees averaging 11 inches DBH or greater and at least 40% canopy closure (Appendix C, *Species Accounts*). There was an attempt to determine which habitat qualifies as dispersal habitat, using the habitat suitability models described in Chapter 2, *Environmental Setting*, and Appendix E, *Effects Analysis*. However, those models were developed specifically to identify nesting, roosting, and foraging habitat; therefore, the parameters do not translate perfectly to the habitat characteristics that typically define dispersal habitat. Nonetheless, to meet Objective 5.2, ODF will maintain a minimum 40% of the permit area outside HCAs in conditions that meet the definition of dispersal habitat for northern spotted owl. One half of that target (20%) will be in the form of 60-year-old stands and/or stands representing foraging habitat or better (e.g., nesting and roosting habitat) where RCAs less than 120 feet in width and not part of a stand that meets these standards will not be counted toward this.

The target for northern spotted owl dispersal habitat outside of HCAs is supported by recent studies. For example, Davis et al. (2016) found that a threshold of at least 40% dispersal habitat across the landscape accounted for 90% of documented northern spotted owl movements, as reported by Forsman et al. (2002). The overall percentage and spatial arrangement of dispersal habitat will vary, based largely on habitat conditions and known habitat management strategies on lands adjacent to the permit area (e.g., amount of state forest ownership and ownership/species occupancy patterns in surrounding areas outside of HCAs and RCAs). The measurement of 40% will be calculated as described in Table 4-11 and be tracked on a 10-year basis using updated IP-level modeling and field assessments of habitat quality.

Dispersal and foraging habitat, as defined, represent the minimum standards that must be met in areas outside of HCAs. ODF does not intend to manage these areas down to that minimum standard. Dispersal and foraging habitat will remain along RCAs and in leave trees and snags left in harvested stands of regenerating forest that will continue to provide some function as habitat or in support of dispersal at the forest level. In addition, a few hundred acres of small, scattered habitat patches are either current old-growth or otherwise unavailable for harvest due to other existing constraints (e.g., scenic, social, geotechnical, access) and, when combined with legacy-retention strategies, also contribute to dispersal habitat for northern spotted owl outside of HCAs. Legacy-retention strategies are detailed in Section 4.7.8.2, *Stand-Level Management Standards*. In total, approximately 41,000 acres of RCAs outside HCAs will also grow and develop more mature forest conditions in well-distributed but linear patterns across the landscape and facilitate foraging and dispersal. RCAs and operationally limited areas where harvest is currently infeasible provide approximately 54,500 acres of stands that are 40 years old or older (as of 2023). Additional stands will be grown forward prior to harvest and provide dispersal and foraging habitat in the landscape.

4.7.8.2 Stand-Level Management Standards

Retain Forest Legacy Features

Management standards are intended to retain and improve the existing structures in managed stands over time. These structures consist primarily of existing old growth, large trees and snags

(both scattered and grouped), and downed wood. The leave-tree strategy promotes large trees for retention through harvest rotations. These large trees are intended to provide future large snags and downed wood. Existing legacy snags and downed wood are retained, and hard snags and logs are supplemented if needed to ensure continuous recruitment of older decay classes of snags and downed wood farther out in the permit term. Where the ability to supplement snags or downed wood is limited (e.g., small-diameter logs), additional leave trees may be left to provide for future snags and downed wood. In older or larger-diameter stands, retention of downed wood often exceeds the standards in Table 4-11. During regeneration harvest, existing downed wood of decay class 3 and 4 (Maser et al. 1979) and snags of decay stages 3 and 5 (Cline et al. 1980) that are not a safety hazard will be retained. In addition, where available, 600 cubic feet of hard conifer logs (decay class 1 and 2), on average, per acre in each harvest unit outside RCAs will be retained, including at least an average of two logs per acre greater than 20 inches in diameter (at the largest end). The leave-tree strategy will also be applied to regeneration harvest inside of HCAs that will be completed consistent with Conservation Action 7: Manage Habitat Conservation Areas. Thus, the combined and integrated strategies are intended to manage the process of decadence and recruitment of high-value structural elements (biological legacies) through time. Each component of the holistic approach contributes to the larger goal. These standards for retention and recruitment of biological legacies are in addition to accumulation of these legacy structures under passive management in HCAs and RCAs.

Management standards have been designed to provide land managers with flexibility in developing site-specific plans. Table 4-11 summarizes the management standards that will be applied throughout the term of the HCP on lands outside HCAs. Sale planners and administrators and ODF biologists will work closely, especially early in the permit term, to increase alignment and develop further operational guidance and related contract language, ensuring standards will be met during harvest operations outside HCAs. Legacy-retention strategies are identified as triggers for adaptive management if they are not persisting on the landscape as intended (Chapter 5 [Table 5-12]). Additional triggers may be identified as part of routine annual reporting, 5-year midpoint check-ins, or as part of the 10-year HCP comprehensive reviews. New triggers may also be added in response to new science or emerging issues that influence biological outcomes in the permit area. The process of establishing new triggers is further clarified in Chapter 5, *Monitoring and Adaptive Management*.

Table 4-11. Timber Stand Management Standards Outside of Habitat Conservation Areas

Category	Management Standards
Maximum size of regeneration harvest allowed	• Per FPA: ^a 120 acres for Type 3 harvest units (i.e., clearcuts) ^b
Minimum distance between adjacent regeneration harvest units	• Per FPA: No Type 3 harvest within 300 feet of the perimeter of a prior harvest unit if the combined acreage of the harvest would exceed 120 acres in size, unless the prior harvest unit has been reforested as required by all applicable regulations and: ○ At least the minimum tree stocking required by rule is established per acre and either ○ The resultant stand of trees has attained an average height of at least 4 feet or ○ At least 48 months have elapsed since the stand was created and it is “free to grow,” as defined by the FPA.
Facilitate northern spotted owl landscape connectivity	• At least 40% of the permit area outside of HCAs will be in a condition that meets the definition of northern spotted owl dispersal habitat across the permit area at all times, with one half of that target (20%) being in the form of 60-year-old stands and/or stands representing foraging habitat or better (e.g., nesting and roosting habitat). This metric will be calculated in each of the following geographies: ○ North Coast – Clatsop and Tillamook State Forests ○ Rest of permit area – remaining state forests in the permit area • Dispersal habitat is defined as stands with at least 40% canopy cover and an average 11 inches DBH or greater. Foraging habitat varies widely across the northern spotted owl’s range and is defined as having moderate to high canopy cover (60 to more than 80%) and a diversity of tree diameters and heights. • RCAs outside of HCAs can count toward meeting this standard if they are 120 feet in width and part of a stand that is at least 60 years old and/or represents foraging habitat or better (e.g., nesting and roosting habitat). Isolated RCAs that are less than 120 feet in width and not part of a stand that meets this standard will not be counted.
Leave-tree retention	• Leave all old-growth trees, patches, and stands, as defined by the Forest Ecosystem Management Assessment Team ($\geq$ 175 years old) (Forest Ecosystem Management Assessment Team 1993). Old-growth trees will be identified in the field pre-harvest by ODF biologists and foresters using standard forest mensuration tools and techniques to ensure no old growth is harvested. • Leave all known nest trees (northern spotted owl, marbled murrelet, red tree vole) and trees surrounding known coastal marten dens (no less than 100-foot radius). • Two trees per acre will be retained within any harvest unit using regeneration harvest techniques. Trees selected for retention will be outside of RCAs ^c and assessed during each final harvest so that selected trees will not be removed in subsequent rotations and will contribute to long-term recruitment of large-diameter snags and downed wood. The following applies when determining which trees will be retained to meet the standard of two trees per acre: ○ Where additional trees are needed to meet the standard of two trees per acre once old-growth trees, known nest trees, and trees surrounding known coastal marten den sites are retained, as defined above, trees with one or more of the following characteristics will be emphasized in retention:

Category	Management Standards
	• Larger-diameter trees in the stand. • Trees from the oldest cohort of the stand. • Platform-bearing trees in marbled murrelet range. • Trees with other key habitat features (e.g., large branches, broken or forked tops, cavities). • Less common conifer species (cedar, Sitka spruce, western white pine, true firs, Pacific yew). ○ Retain an upland hardwood component where present.
Snag retention	• All existing snags of decay stages 3 through 5 (Cline et al. 1980) will be retained during harvest activities. • Where retention would constitute a safety hazard or result in a violation of state or federal law, individual trees or snags may be removed. Safety hazards can be reduced by grouping leave trees in patches around high-value snags. • Manage to provide an average of two hard snags per acre, at least 15 inches in diameter, within each regeneration harvest unit. ○ Hard snags include those in decay stages 1 and 2 (Cline et al. 1980). ○ Where fewer than two hard snags per acre exist in a planned harvest unit, additional leave-tree retention will be used to supplement snag levels following the guidelines for leave trees above. ○ Snag-creation prescriptions in harvest unit to supplement existing hard snags. Larger-diameter trees (>24-inch DBH) will be prioritized for snag creation.
Downed wood retention	• During harvest activities, retain existing down logs of decay class 3 and 4 (Maser et al. 1979^d) and large-diameter, well-decayed logs. • Where available during regeneration harvest, retain at least 600 cubic feet of hard conifer logs (decay class 1 and 2), on average, per acre in each harvest unit outside RCAs, including at least an average of two logs per acre greater than 20 inches in diameter (at the largest end). • Sales that are unable to meet the requirement for cubic feet and/or diameter due to stand species composition, small-diameter residual logs, or any other reason will be reported as part of the annual report along with an explanation of the rationale and any efforts that were taken to mitigate. Examples of potential mitigation measures could or may include: ○ Leaving hardwood logs where conifer logs are not present. ○ Additional leave trees left at the stand, sale, or basin levels. ○ Additional downed wood left on the basin level. ○ Pockets of blowdown or downed logs in vicinity of the operation left on the landscape.

^a Permit amendment will be required if FPA standards change in a manner that exceeds analysis of take.

^b Harvest Type 1 is heavy thinning. Harvest Type 2 consists of clearcuts with some residual seedlings, saplings, and poles retained and, therefore, not requiring reforestation. Harvest Type 3 consists of clearcuts with few residual trees left and, therefore, requiring reforestation.

^c Trees outside of RCA buffer widths listed in Table 4-2 and Table 4-3 may be counted toward the standard of two upland trees per acre. This includes trees retained primarily to address inner gorges, unstable slopes, and other geomorphic features.

^d Figure 44 in Maser et al. (1979) provides useful images and descriptions of log decay classes. Briefly, decay classes 1 and 2 still have intact bark and rigid structure, whereas decay classes 3 and 4 have little to no intact bark remaining on the log and the log is sagging into the ground.

4.7.9 Conservation Action 9: Strategic Terrestrial Species Actions

Conservation Action 9 is intended to support the biological objectives below. A complete list of all the covered activities and linkages is provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

- 5.1 Conserve, Maintain, and Enhance Existing Northern Spotted Owl Habitat
- 5.2 Facilitate Northern Spotted Owl Landscape Connectivity
- 5.3 Increase the Amount of High-Quality Habitat for Northern Spotted Owl

The conservation strategy will result in an increase in habitat for all the terrestrial covered species, but other factors may remain that limit the ability of covered species to take advantage of the new habitat and for populations to increase. The conservation fund, described in Chapter 9, *Costs and Funding*, will provide funding on an annual basis to address these limiting factors. The priorities for how the conservation fund is used will change during the permit term, but ODF will work with USFWS and ODFW, along with species experts and other state and federal partners, to identify where and how conservation fund monies are spent.

Expenditures will be tracked and reported annually. Use of the funds will generally fall into four categories.

- Address known stressors on species productivity and survival (e.g., barred owl on northern spotted owl).
- Research on covered species' response to management actions in HCAs.
- Implement activities to augment species populations (e.g., northern spotted owl reintroduction or translocation, red tree vole translocation).
- Gain a better understanding of species ecology or habitat use that could influence how management actions are used in HCAs (e.g., coastal marten).

Some of the specific uses of the conservation fund for terrestrial species are known, while others will emerge during the permit term. For example, the extent of use of additional funds for barred owl management efforts is not known at this time due to multiple factors.

4.7.9.1 Barred Owl Management

Regardless of the amount and type of habitat that is in the permit area, competition with barred owls continues to stress northern spotted owl populations (Spies et al. 2018; Franklin et al. 2021). Competition with established populations of barred owls is a prominent and complex threat to the long-term persistence of the northern spotted owl (U.S. Fish and Wildlife Service 2011; Lesmeister et al. 2018). Studies indicate that barred owls have a strong negative impact on northern spotted owls and have resulted in lower northern spotted owl occupancy, reduced survival, lower reproductive rate, lower detection, and even limited hybridization between the two species (Lesmeister et al. 2018; Long and Wolfe 2019; Franklin et al. 2021). Barred owls appear to co-occupy and outnumber spotted owls throughout much of the entire range of the threatened subspecies (Yackulic et al. 2012; Dugger et al. 2016, as cited by Lesmeister et al. 2018) and the

majority of the permit area. In the *Revised Recovery Plan for Northern Spotted Owl* (U.S. Fish and Wildlife Service 2011), USFWS acknowledges the need for aggressive strategies to address the threat from barred owls on spotted owls.

An analysis conducted by Wiens et al. (2021) found that barred owl removal increased survival of individual spotted owls. In some cases, nonterritorial spotted owls were found to regain territories after the barred owl occupants had been removed. Further, removal of barred owls in California stabilized spotted owl populations and halted the establishment of barred owls (Hobart et al. 2025). Although the purpose of barred owl management is to conserve the northern spotted owl, other native species that are prey for, or competitors with, barred owls will most likely benefit from barred owl removal. Some at-risk species that are potential prey for barred owls include red tree voles, western grey squirrels, foothill yellow-legged frogs, and marbled murrelets (U.S. Fish and Wildlife Service 2024b).

ODF plans to use a portion of the conservation fund to establish and implement a regional barred owl management program (Chapter 9, Section 9.2.2.4, *Contribution to Strategic Terrestrial Species Conservation Action*). The program will focus on barred owl management in the permit area and be coordinated with USFWS and other regional partners—including ODFW, BLM, and USFS—and nonfederal landowners, which may conduct barred owl management programs of their own across private, state, and federal lands. Barred owl management entails primarily removal of barred owls from habitat otherwise suitable for spotted owls. ODF's barred owl management program will be conducted to support the USFWS barred owl management strategy (U.S. Fish and Wildlife Service 2024b) and evolve over time as more information is collected on the efficacy of various techniques. ODF will dedicate a minimum of \$250,000 per year through the permit term.

Management associated with this conservation measure will be designed, budgeted, and authorized under the Migratory Bird Treaty Act (MBTA) within 2 years of ITP issuance and begin no later than the field season of the following year, assuming appropriate federal MBTA take permit(s) are in place and state and federal legal compliance issues have been addressed. The success of the program will be evaluated with USFWS during reporting at 5- and 10-year intervals. The intent is to begin focusing removal efforts within and around active northern spotted owl sites proximal to HCAs in order to create immediate conservation benefits by providing relief to existing individuals and increasing the potential for recruitment of young. These sites may provide sources for recolonization of nearby suitable habitat as barred owl removal areas expand beyond the initial known active sites. Adjustments to the approach will be made as needed to improve outcomes (e.g., locations, extent, duration, intensity) and partnerships with neighboring landowners for increased efficiency.

If barred owl permit issuance is not in place (federal MBTA) or management is found to be impractical or ineffective at reducing negative effects from barred owls on northern spotted owl populations, or highly effective and thus reducing the need, then ODF will shift the budget from barred owl management to other terrestrial management activities through coordination with USFWS, consistent with the adaptive management program described in Chapter 5, *Monitoring and Adaptive Management*.

4.7.9.2 Covered Species Reintroduction or Translocations

At some point in the future, as conservation actions are successful in producing additional habitat for, or removing threats to, covered species, there may be interest in reintroducing or translocating

covered species onto Oregon forests or creating a captive breeding program. One example is the reintroduction of spotted owls where barred owl control measures have been successful; this could apply to other covered species as well. The HCAs would be possible locations for those releases. ODF could partner with other organizations and agencies to create such a program, but it is not a covered activity in this HCP. Individuals involved with any covered species reintroduction efforts would be required to follow their own state and federal ESA compliance measures.

4.7.9.3 Conservation Action Effectiveness Research

Conservation funds may be used to strategically address research questions to more effectively execute the conservation strategy over time for covered species such as red tree voles, Oregon slender salamanders, and coastal marten and for which targeted research could improve conservation delivery.

4.7.10 Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species

Conservation Action 10 is intended to support the biological objectives below. A complete list of all the covered activities and linkages is provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

- 1.2 Stream Complexity
- 1.3 Water Quality and Quantity
- 5.1 Conserve, Maintain, and Enhance Existing Spotted Owl Habitat
- 5.2 Facilitate Northern Spotted Owl Landscape Connectivity
- 6.1 Conserve, Maintain, and Enhance Existing Marbled Murrelet Nesting Habitat
- 6.2 Increase the Amount of High-Quality Habitat for Marbled Murrelet
- 7.1 Conserve, Maintain, and Enhance Occupied Red Tree Vole Habitat
- 7.2 Increase the Amount of High-Quality Habitat for Red Tree Vole
- 8.1 Conserve, Maintain, and Enhance Existing Coastal Marten Habitat
- 8.2 Increase the Amount of High-Quality Habitat for Coastal Marten

The following operational restrictions will be followed to prevent disturbance from covered activities that may interfere with behaviors of covered species or inadvertently damage unknown nesting/denning sites. Operational restrictions described in this conservation action may be applied inside or outside of HCAs, as noted in each section below. These restrictions will be applied only to known covered species occurrences inside the permit area. Adjacent occupied areas outside of the permit area will not receive protection, including adjacent northern spotted owl activity centers, murrelet nest stands, or red tree voles nests; however, areas where the permit area is adjacent to covered species occurrences and suitable habitat were used to inform establishment of HCA locations. Unknown species sites in HCAs may have some impact, but management standards detailed in Conservation Action 7: Manage Habitat Conservation Areas, and monitoring programs for covered species (Chapter 5, *Monitoring and Adaptive Management*) are expected to minimize this.

4.7.10.1 Operational Restrictions for Northern Spotted Owls

Seasonal Restrictions Inside Habitat Conservation Areas

To minimize adverse effects on nesting northern spotted owls inside HCAs, preharvest surveys will be conducted at known active nest sites following USFWS-accepted survey protocols (U.S. Fish and Wildlife Service 2012c) to ensure covered activities that may disturb or disrupt normal spotted owl behavioral patterns will not occur within distances expected to result in take during the breeding season (between March 1 and September 30). Seasonal restrictions will also be applied to active sites identified inside HCAs through effectiveness monitoring (Chapter 5, *Monitoring and Adaptive Management*) in areas where habitat quality is improving and northern spotted owls are expected to colonize or recolonize an area. Activities near known or assumed active nests will be restricted during the breeding season for all resident-status sites (pair and single) within the specified distances from a nest tree or activity center provided in Table 4-12, unless it is determined that no nesting is occurring, nesting has failed, or the critical breeding season has ended (July 7 for Coast Range or July 15 for West Cascades) (U.S. Fish and Wildlife Service 2022), whichever occurs first. Seasonal disturbance distances applied within HCAs will not extend outside of HCA boundaries. Restrictions outside of HCAs are discussed in the section that follows.

Beyond minimizing effects from activities by using seasonal distance restrictions, as described in Table 4-12, ODF will also maintain at least 500 acres of nesting, roosting, or foraging habitat within 0.7 mile of active activity centers to provide adequate habitat and continue to support nesting northern spotted owls. To meet the 500-acre minimum standard inside the 0.7-mile activity center, the highest-quality habitat will be retained (nesting and roosting will be prioritized over foraging habitat); this will apply only to habitat inside the permit area and not habitat on adjacent lands. This will generally happen by default because the management activities allowed in nesting and roosting habitat within 0.7 mile of a nest location are minimal, as described in Conservation Action 7.

Table 4-12. Seasonal Distance Restrictions for Active Northern Spotted Owl Nest Sites in Habitat Conservation Areas during the Breeding Season^{a, b}

Covered Activity	Critical Breeding Season (March 1–July 7/15)^{c, d}	Late Breeding Season (July 8/16–September 30)
Light maintenance (e.g., road brushing and grading, clearing of downed trees, and felling of hazard trees) at campgrounds, trails, administrative facilities, and roads	No restrictions	No restrictions
Hauling ^e	No restrictions	No restrictions
Chainsaws/tree felling (excludes light maintenance, as described above)	65 yards	No restrictions
Cable yarding and heavy equipment operation for felling, logging, and loading	65 yards	No restrictions
Heavy equipment for road/trail construction, road/trail repairs, bridge construction, culvert replacements, etc.	65 yards	No restrictions
Pile-driving, rock-crushing, and screening equipment	120 yards	No restrictions
Blasting (road or trail construction) ^f	0.25 mile	100 yards

Covered Activity	Critical Breeding Season (March 1–July 7/15) ^{c, d}	Late Breeding Season (July 8/16–September 30)
Blasting (new quarry development or expansion) ^f	0.25 mile	100 yards
Burning (broadcast, pile burning)	0.25 mile	No restrictions
Other activities ^g	35 yards	35 yards

Source: U.S. Fish and Wildlife Service 2022.

^a Applies to any active nest sites, based on nest tree locations or designated activity centers if the nest site is not known. Restrictions apply only to actively nesting pairs and associated nest sites or other activity centers.

^b These restrictions apply unless ODF is under a fire, search-and-rescue, or other public emergency order in the vicinity of the active site.

^c As measured from the edge of the active nest site or activity center to the limit of the activity performed, unless ODF determines that young are not present, based on USFWS-approved survey methods, at which point distance restrictions may be lifted as noted above.

^d The critical breeding season concludes July 7 in the Coast Range and July 15 in the West Cascades (U.S. Fish and Wildlife Service 2022).

^e As defined in Chapter 3, Section 3.4.1, *Road Use*.

^f Disruption distances associated with blasting may be reduced if a site-specific evaluation by an ODF biologist finds that topographic or other features provide adequate acoustic shadowing.

^g Other activities are visual disturbances associated with any activity not described above.

ODF may deviate from these restrictions only in situations where either (1) applying these restrictions would compromise the safety of ODF staff members, contractors, or members of the public or (2) applying a more limited restriction is clearly justified, based on site conditions, such as topographic features that provide sound insulation. Deviations from these restrictions are expected to be rare and will be applied by ODF only after a site-specific review by an ODF wildlife biologist, including documentation of recommendations, and approval by ODF's HCP administrator. The ODF wildlife biologist will consider site-specific topographic features and the location of the likely nesting habitat when considering any deviations from these restrictions. Any deviations will be documented and summarized in the annual report, as described in Chapter 5, *Monitoring and Adaptive Management*. Examples include such considerations as late nesting attempts, establishment of nonbreeding status, local topography, and acoustic shadow. Once ODF determines that there is no nesting activity or that young are not present, covered activities can proceed without restriction, consistent with the HCP and permits.

Seasonal Restrictions Outside Habitat Conservation Areas

To minimize adverse effects on nesting northern spotted owls outside HCAs, preharvest surveys will be conducted at known active nest sites following USFWS-accepted survey protocols (U.S. Fish and Wildlife Service 2012) to ensure covered activities that may disturb or disrupt normal spotted owl behavioral patterns will not occur within the distances from known northern spotted owl nests and result in take during the breeding season (between March 1 and September 30). Seasonal restrictions will be applied to known active sites, including sites opportunistically located through northern spotted owl effectiveness monitoring activities (Chapter 5, *Monitoring and Adaptive Management*). Activities that modify suitable habitat will be restricted within 0.25 mile of an activity center with an active nest or where there is evidence of active nesting (e.g., juveniles), but the nest was not located during the period from March 1 through September 30 or it was determined that a pair was not nesting, or nesting failed, whichever occurs first.

Other activities will be restricted from a nest tree or activity center to the specified distances in Table 4-12 until it is determined through pre-harvest surveys at known active sites that there is no

pair present, the pair present is not nesting, any nesting attempt has failed, or the critical breeding season has ended (July 7 for Coast Range or July 15 for West Cascades) (U.S. Fish and Wildlife Service 2022), whichever occurs first. For active nests and fledglings, restrictions will extend to September 30. These restriction distances apply to areas outside HCAs.

After the expiration of seasonal restrictions, nest trees outside of HCAs will be retained in any subsequent harvest following Conservation Action 8 and the associated standards in Table 4-12.

4.7.10.2 Operational Restrictions for Marbled Murrelets

Seasonal Restrictions Inside Habitat Conservation Areas

To avoid disturbance to nesting marbled murrelet adults and chicks inside HCAs, ODF will apply seasonal restrictions for activities that may occur in or near designated occupied habitat, including highly suitable habitats with unknown occupancy, for marbled murrelets during the nesting season (April 1 to September 15) (Table 4-13). Seasonal restrictions will also be applied to occupied areas opportunistically identified through effectiveness monitoring surveys (i.e., newly designated occupied, as described in Chapter 5, *Monitoring and Adaptive Management*). Restriction distances from designated occupied habitat in HCAs will not extend beyond HCA boundaries.

ODF may deviate from these restrictions only in situations where either (1) applying these restrictions would compromise the safety of ODF staff members, contractors, or members of the public or (2) applying a more limited restriction is clearly justified, based on site conditions, such as topographic features that provide sound insulation. Deviations from these restrictions are expected to be rare and will be applied by ODF only after a site-specific review by an ODF wildlife biologist, including documentation of recommendations, and approval by ODF's HCP administrator. The ODF wildlife biologist will consider site-specific, topographic features and the location of the likely nesting habitat when considering any deviations from these restrictions. ODF will, at a minimum, avoid disturbance in the "disruption" thresholds identified by USFWS (2022) for marbled murrelet nest sites. Any deviations will be documented and summarized in the annual report, as described in Chapter 5, *Monitoring and Adaptive Management*.

Table 4-13. Seasonal Restriction Distances for Marbled Murrelet Designated Occupied Habitat ^{a, b}

Covered Activity	Where Not Allowed during the Critical Nesting Period (April 1–August 5)	Where Not Allowed for the Remainder of the Nesting Period (August 6–September 15) with Daily Timing Restrictions ^c
Light maintenance (e.g., road brushing and grading, clearing of downed trees, and felling of hazard trees) at campgrounds, trails, administrative facilities, and roads	No restrictions ^d	No restrictions
Hauling ^e	No restrictions	No restrictions
Chainsaws (excludes light maintenance, as described above)	≤ 110 yards	≤ 110 yards
Cable yarding and heavy equipment operation for felling, logging, and loading	≤ 110 yards	≤ 110 yards

Covered Activity	Where Not Allowed during the Critical Nesting Period (April 1–August 5)	Where Not Allowed for the Remainder of the Nesting Period (August 6–September 15) with Daily Timing Restrictions ^c
Heavy equipment use for construction, repairs, bridge construction, culvert replacements, etc.	≤110 yards	≤110 yards
Pile-driving, rock-crushing, and screening equipment	≤120 yards	≤120 yards
Blasting (road or trail construction) ^f	≤0.25 mile	≤0.25 mile
Blasting (quarry development) ^f	≤1 mile	≤1 mile
Burning (broadcast, pile burning)	≤0.25 mile	≤0.25 mile
Other activities ^g	35 yards	35 yards

Source: U.S. Fish and Wildlife Service 2022.

^a Distances are measured from the edge of designated occupied habitat and do not extend outside HCAs.

^b These restrictions apply unless ODF is under a fire, search-and-rescue, or other public emergency order in the vicinity of the designated occupied habitat.

^c The first work restriction stops 2 hours after sunrise; the work restriction starts again 2 hours before sunset.

^d Disturbances with no likely adverse effects and associated restrictions are not needed are based on conclusions presented in USFWS 2022.

^e As defined in Chapter 3, Section 3.4.1, *Road Use*.

^f Disruption distances associated with blasting may be reduced if a site-specific evaluation by an ODF wildlife biologist finds that topographic or other features provide adequate acoustic shadowing.

^g Other activities are visual disturbances associated with any activity not described above.

Tailhold and Guyline Anchors Inside Habitat Conservation Areas

In cable-logging operations, anchors are used to secure logging equipment (e.g., yarder towers, skyline cables) to intermediate lift trees or tail trees. Tailhold anchors are used to secure the ends of skyline cables directly onto a stump or tree using a broad notch. The skyline sometimes extends out past the unit to the farthest point that supports enough lift for the particular corridor being yarded. Depending on the design of the cable system, skylines may extend 0.25 mile or more from the tower. Guyline anchors are used to stabilize yarding towers. Typically, several guyline anchors (two to nine) extend radially 50 to 150 feet from the equipment and are attached to sound stumps or live trees by creating a broad notch.

The use of tailholds and guyline anchors is not seasonally restricted; however, the use of heavy equipment or chainsaws to install these features is prohibited within a designated occupied habitat and 100-meter buffer from April 1 through August 5. From August 6 through September 15, activities are allowed, with daily timing restrictions. Daily timing restrictions prohibit the use of heavy machinery and chainsaws within 2 hours of sunrise and 2 hours of sunset. From September 16 to March 31, activities are unrestricted. If tailholds are installed on trees or stumps from April 1 to August 5, non-mechanized methods, such as an ax, will be used when notching the tree or stump and follow the guidelines discussed in criterion 6, below.

Specific criteria will be required for all tailholds and guylines within designated occupied habitat to protect trees that contain suitable nesting platforms and associated cover trees from damage. Suitable nesting platforms include relatively flat structures ≥ 4 inches wide and 33 feet high in the live crown of a coniferous tree. Platforms can be created by a wide bare branch, epiphytes, or duff

covering a branch, mistletoe, witches' brooms, other deformities, or structures such as squirrels' nests. Cover trees are adjacent to potential nesting trees and provide vertical and horizontal cover to potential nesting platforms. Conifer trees (e.g., Douglas-fir, Sitka spruce, western hemlock, western red cedar [*Thuja plicata*]) are considered potential nesting trees, whereas cover trees can include both conifer and hardwood trees (e.g., red alder, big leaf maple [*Acer macrophyllum*]).

The protection criteria are as follows (Oregon Department of Forestry 2016).

1. Existing sound stumps will be favored as a first choice for tailholds and guyline anchors where it is safe to do so.
2. If no suitable tailhold or guyline trees exist, operational equipment such as a bulldozer, which may serve as a tailhold, or a yoder, which does not require guylines, may be used, provided no designated occupied habitat is removed or destroyed when using such equipment and appropriate disturbance timing restrictions are applied.
3. If the preferred options listed above (#1 and 2) are not available or feasible, the following trees in designated occupied habitat will not be selected for tailhold or guyline anchors.
4. Trees with potential nest platforms or immediately surrounding trees that provide cover to potential nest platforms;
5. The largest trees in areas where the number of large trees is limited, and
6. Less common conifer species (cedar, Sitka, western white pine [*Pinus monticola*], true firs, Pacific yew [*Pinus monticola*]).
7. Guylines or skylines will not be placed where they have the potential to damage platforms or platform trees when the cable is lifted or lowered.
8. No trees will be felled in the designated occupied habitat. Felling may occur within the 100-meter buffer but may not include, or damage, platform or cover trees.
9. To protect trees used as tailhold and guyline anchors, it is preferred that plates, nylon straps, or other ODF-approved devices be used to prevent damage to trees. If this is not feasible, notching of the trees to prevent cable slippage will be limited to less than one-third of the circumference of the tree.
10. An ODF biologist or a designee (appointed by ODF biologist) familiar with murrelet habitat and biology will inspect and approve all trees before use. Lead time of at least 2 weeks for all reviews or meetings with ODF representatives is required. No trees that are considered platform trees or surrounding trees that provide cover to platform trees, as determined by an ODF biologist or designee, will be damaged or harvested.
11. Relevant protection measures are detailed in sale contracts and logging plan maps. The ODF contract sale administrator will ensure the purchasers and affiliated subcontractors are aware of and adhere to these measures before and during operations. For complex projects, supplemental maps may be provided that clearly identify designated occupied habitat boundaries or boundaries may be physically marked by hand in the field.
12. During contract inspections, if any noncompliance from required protection measures is identified, operations in the affected area will be halted until appropriate additional measures are taken to ensure compliance. Additional measures may include alternative placement of equipment, using alternative equipment, adjusting the prescription or project boundary, delaying or canceling the operation, or fining the operator or purchaser.

Aquatic Restoration Projects Inside Habitat Conservation Areas

Trees that do not have the structure or characteristics used by marbled murrelets can be felled inside designated occupied habitat for aquatic restoration projects on stream segments within or

adjacent to that designated occupied habitat. Aquatic restoration projects will not fall, push, or pull trees that have the structure or characteristics used by marbled murrelets located inside designated occupied habitat. Felling or tipping of these trees may occur between August 6 and September 15, from 2 hours after sunrise until 2 hours before sunset.

The following trees will not be selected for removal during aquatic restoration projects.

- Known nest trees.
- Trees with existing nest platforms and immediately surrounding trees that provide cover to potential nest platforms.
- The largest trees in areas where the number of large trees is limited.

Trees may be felled or pushed/pulled directly into a stream or floodplain. In addition, trees may be felled and subsequently repositioned by cable, ground-based equipment, horses, or helicopters.

ODF wildlife biologists with experience in murrelet habitat will assist the ODF staff aquatic biologist in the selection of trees for removal when inside designated occupied marbled murrelet habitat. An ODF wildlife biologist with experience in murrelet habitat will approve the selected trees. The implementation of projects in designated occupied marbled murrelet habitat will be scheduled outside of April 1 through July 15. This allows in-stream tree installation during the in-water work window, which will minimize effects on covered fish species while also minimizing effects on marbled murrelet nesting behavior.

Trash Management Inside Habitat Conservation Areas

Within designated occupied marbled murrelet habitat and associated buffers, trash management and removal applies to all planned management activities. These activities will be focused in high-use areas such as campgrounds, parking lots, and trailheads. Contracts and permits related to the activities addressed in this HCP (e.g., timber sale, harvest of special forest products) will include trash management measures to minimize or eliminate potential impacts on nesting murrelets. Wildlife-proof trash disposal bins will be made available or signage, contracts, and permits will clearly state that trash is to be removed from the management activity site at the end of each day and wildlife is not to be fed. ODF will continue to seek coordination with external programs or campaigns that improve trash-management outcomes. These opportunities may include improving recreational infrastructure, including signage, or expanding educational outreach at ODF recreational and educational facilities to increase public awareness of murrelet conservation.

Seasonal Restrictions Outside Habitat Conservation Areas

To avoid disturbance to nesting marbled murrelet adults and chicks outside HCAs, ODF will apply seasonal restrictions to known existing or incidentally observed active nests outside of HCAs during the murrelet nesting season (April 1 to September 15). Distances will follow Table 4-13 and extend from known active nest trees outside of HCAs within the permit area. If the nest tree is within a planned or sold area, the harvest will be delayed through the nesting season. Post-nesting season, nest trees outside of HCAs will be retained in any subsequent harvest following Conservation Action 8 and the associated standards in Table 4-13.

4.7.10.3 Red Tree Vole Nest Trees

Most ODF lands in the range of the North Oregon Cost Distinct Population Segment have not been surveyed for red tree voles. Therefore, operational restrictions for this species will be applied to known nest trees in the permit area identified through previous external research, incidental observations, or planned passive surveys to establish baseline conditions and support effectiveness monitoring (Chapter 5, *Monitoring and Adaptive Management*). Preharvest surveys inside HCAs will not be pursued for planned management activities in red tree vole habitat, but effectiveness monitoring will be prioritized in stands of suitable habitat inside HCAs to assess red tree vole responses to modifications intended to develop larger trees with more habitat structure. Stand management activities will infrequently occur inside HCAs in older stands that provide highly suitable red tree vole habitat (e.g., in stands that also provide habitat for spotted owls and murrelets). Inside HCAs, a 10-acre block of contiguous habitat will be maintained around known red tree vole nest tree(s) during management activities, with additional consideration of connectivity among retained patches in younger stands where management would have clear long-term benefits for the covered species but short-term impacts on red tree vole occupancy. If nest trees are incidentally identified outside HCAs, they will be retained as part of the leave-tree strategy, described in Table 4-13.

4.7.10.4 Coastal Marten Den Locations

A limited number of ODF lands have been surveyed for coastal marten. Operational restrictions for coastal marten will be applied to known occupied sites in the permit area through external research (i.e., telemetry or global positioning system [GPS] for collared individuals, planned passive surveys to establish baseline conditions and support effectiveness monitoring [Chapter 5, *Monitoring and Adaptive Management*], or incidental den site observations). ODF will protect confirmed denning females and their young by limiting or preventing access and disturbance near occupied sites, including preventing the destruction of the denning structure itself (i.e., a tree, snag, log, or other structure). Denning activities are most likely to occur between March 15 and August 15; females may remain at a particular den site for days or weeks before moving to a new site. Specifically, ODF will not conduct or authorize any of the covered activities within 0.25 mile of a known occupied den site either inside or outside an HCA because those activities could result in disturbance or harm to denning martens, except where these activities may be necessary to remove an immediate threat to public safety or the activities are associated with existing recreational facilities.

Once the occupancy of a denning marten is confirmed, the occupied den site will be protected with a 0.25-mile radius buffer that excludes timber operations or other covered activities during the marten denning season (March 15 through August 15) until either the marten denning season has ended or it has been determined that the den site is unoccupied. ODF will implement protection measures within 24 hours of notification that an occupied den site has been confirmed.

Confirmed den structures will be retained on the landscape, and tree retention will be incorporated around the den structure during and post-timber harvest operations. Inside HCAs, harvest will be avoided in stands with known dens. Outside of HCAs, the standard for tree retention around a natal den structure will be no less than a 100-foot radius for the no-harvest retention area, as centered on the den.

In cases where a female marten chooses to establish a den site within 0.25 mile of an active road, road use that is under ODF control can continue, provided the volume of traffic and potential

disturbance remains at or below the level that existed in the 2 weeks before the den was detected. Considerations should be made to use alternate routes away from occupied dens when possible; where alternative roads do not exist, caution should be taken to avoid marten road mortality (e.g., reduced speed limits to <15 miles per hour).

In cases where a female marten chooses to establish a den site within 0.25 mile of an active harvest operation, yarding and hauling of felled timber may continue as long as the footprint of the habitat modification component of the activity does not move any closer to the denning marten. Tailholds and guyline anchors for timber yarding are permitted within the 0.25-mile marten den site buffer, provided that they are not within 500 feet of the occupied marten den site.

In cases where a female marten chooses to establish a den site within 0.25 mile of covered activities that do not result in habitat modification or disturbance (e.g., silvicultural surveys), those activities may continue as long as the footprint of those activities does not move any closer to the denning marten. Activities that do not pose disturbance (e.g., surveys for other wildlife species) will not be restricted, but time spent within 500 feet of a den site should be minimized or avoided entirely.

ODF will provide protection of known martens (e.g., identified by live trapping and tagging or remote trail cameras) by prohibiting ODF mountain beaver control activities within 2.5 miles of known locations. Upon discovery of a known marten, ODF will, as soon as logistically feasible, make every effort to ensure all authorized agent mountain beaver traps are tripped and not reset. Mountain beaver control activities within 2.5 miles of the den site will cease until September 30 or until a tracked individual has left the area.

4.7.10.5 Fuel Reduction

Fuel reduction efforts will be infrequent in HCAs and limited to site-specific circumstances where the integrity of the HCA is at risk from a high-probability catastrophic fire event. Fuel reduction efforts will be focused outside of HCAs (e.g., removal of ladder fuels at harvest-unit scales). Specific fuel reduction activities will be separate from general management on the landscape outside of HCAs and RCAs because the fire return interval over most of the permit area, coupled with the level of active management, has generally resulted in a fire-resilient forest, outside of extreme weather events (e.g., 2020 Labor Day fires). There may be an increased focus on fuel reductions in HCAs in the future as circumstances change, forests age, and fire frequency and severity increase. Fuel reduction efforts in HCAs will focus on mitigating the wildfire risk while minimizing effects on habitat suitability. Although layering and snag components may be reduced in these areas, they will not be eliminated. Fuel breaks, with extensive clearing of suitable habitat, will not be employed inside HCAs but may be employed external to the perimeters of HCAs to influence fire behavior and improve defensible space.

4.7.10.6 Water Drafting

All water development, maintenance, and abandonment would be performed in accordance with restrictions regarding water quality protections. Water drafting will occur only in free-flowing streams or human-created ponds as well as impoundments that are disconnected from streams at the time of drafting. Drafting locations will be screened using climate data to prioritize the use of stream reaches that have a limited modeled risk of mean August temperature increases. If current stream temperature data are available for the stream in question, that information will be used instead of modeling.

For ponds and impoundments that are not connected to streams at the time of drafting, there will be no limit on the amount of drafting (i.e., the impoundment may be depleted). When water is drafted directly out of the stream for covered activities, the stream must be deep enough so that the intake screen can be fully submerged and the water level cannot be reduced so that the intake screen becomes exposed. Generally a 2- to 3-inch pipe is used when drafting. In addition, there would not be more than a 10% reduction in stream depth, based on a visual estimation, during the period of drawdown. If a reduction in stream depth approaches 10%, drafting will cease until the volume recovers to pre-drafting levels. When drafting from a human-created pond or impoundment that is hydrologically connected to the stream at the time of drafting, there would not be more than a 10% reduction in the depth of the connected stream during the period of drawdown, and it would not become disconnected as a result of the drawdown, thereby potentially stranding fish. Drafting will not occur in locations where a temporary dam is needed to create a pool to allow drafting. Any intake used for water drafting will be screened according to the Juvenile Fish Screen Criteria for Pump Intake (National Oceanic Atmospheric Administration Fisheries 2022) for salmonid fry. This will also be protective of torrent salamanders.

To protect against the introduction of aquatic invasive species, any portion of the pipe or pump that will be in the water will be disinfected between uses, unless the uses are from the same drafting location, at a different drafting location in the same stream, or at least 48 hours after that last drafting event.

4.7.11 Conservation Action 11: Road and Trail Construction and Management Measures

Conservation Action 11 is intended to support primarily²⁰ the biological objectives below. A complete list of all the covered activities and linkages is provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

- 1.1 Riparian Wood Recruitment
- 1.3 Water Quality and Quantity
- 1.4 Fish Passage
- 2.1 and 3.1 Conserve and Maintain Riparian Habitat within Torrent Salamander Ranges

Forest roads can reduce or degrade aquatic and terrestrial wildlife habitat through habitat removal, fragmentation, and disturbance associated with road use as well as increase mortality due to vehicle/animal interactions. Forest roads that are not designed, built, and maintained according to BMPs can have particularly high potential to adversely affect fish and torrent salamander habitat. Roads and trails can degrade aquatic habitats through increased delivery of fine sediment, greater landslide frequency, and changes in stream hydrology (Furniss et al. 1991; Boston 2016). In addition, stream-crossing structures such as culverts can impede the transport and delivery of sediment and woody material to downstream reaches (Roni et al. 2002). Roads and trails in the permit area will be managed to keep as much forest land in a natural, productive condition as possible while also limiting impacts on the covered aquatic species by minimizing the removal of

²⁰ Road and trail construction and management measures may secondarily support terrestrial covered species, including northern spotted owl, marbled murrelet, red tree vole, and coastal marten, through an assessment of impacts near sensitive sites inside HCAs.

key habitat components, preventing water quality problems, minimizing disruption of natural streams, providing fish passage where roads and trails cross fish-bearing streams, reducing the risk of mortality where roads cross Columbia or Cascade torrent salamander streams, and minimizing exacerbation of natural mass-wasting processes.

Surface erosion and delivery of sediment to streams can be substantially reduced through BMPs for road design and maintenance (Roni et al. 2002). Stream processes that can be restored through road design and improvement techniques are listed in Table 4-14 and will be considered when designing new roads and improving existing road systems in the permit area to benefit the covered fish species and torrent salamanders.

Table 4-14. Processes Restored by Various Road Improvement Techniques

Road Improvement Technique	Hydrology	Sediment Delivery		Conservation Action
		Fine (sand and smaller particles)	Coarse (gravel and larger particles)	
Removal of active roads or legacy roads	X	X	X	Conservation Action 5
Culvert or stream crossing upgrades (repair unstable crossings)		X	X	Conservation Action 4
Sidecast removal or reduction		X	X	Conservation Action 11
Reduce road drainage to stream ^a	X	X		Conservation Action 11
Increase surface material thickness or hardness with crushed rock or paving		X		Conservation Action 11
Traffic reduction (unpaved roads)		X		Conservation Action 11

Source: Roni et al. 2002.

^aDrainage reduced through increased crossings and by diverting water onto forest floor.

An existing GIS overlay of the road network in the permit area will be maintained and updated, as needed, and used for planning purposes to limit impacts on the covered species. Development of new roads, as well as improvements to existing roads, will be in accordance with the standards laid out in the *Forest Roads Manual* (Oregon Department of Forestry 2006, or most current version [see Appendix H]; National Oceanic Atmospheric Administration Fisheries 2023).

4.7.11.1 Road/Trail Design to Minimize Impacts on Covered Species

Construction of road networks can lead to accelerated erosion rates in a watershed (Furniss et al. 1991). ODF planning and district staff members will solicit input from geotechnical specialists in designing roads/trails and harvest units. This input is based on interpretive geology and the use of soil and rock mechanics in slope stability analysis. It provides a rationale for risk assessment and mitigation in forest land management decisions. The use of geotechnical analysis in management decisions makes it possible to minimize the number or magnitude of management activity-induced soil movements and protect the covered fish species.

The most common causes of road-related mass movements are related to inappropriate placement and construction of road fills, inadequate road maintenance, insufficient culvert sizes, very steep hill gradients, placement or sidecast of excess materials, poor road location, removal of slope support by undercutting, and alteration of slope draining by interception and the concentration of surface and subsurface water (Wolf 1982, as cited in Furniss et al. 1991). Many of these problems with forest road construction can be traced back to poor road design. With careful siting of roads and appropriate planning to minimize the length of the roadbed needed to support timber operations and recreational access, the impacts of road construction and maintenance can be minimized.

ODF has identified the road design measures below from the *Forest Roads Manual* (Oregon Department of Forestry 2006, or most current version) and Roni et al. (2002), which will be implemented to minimize potential impacts on the covered aquatic species. The intent of these road design measures, which will also be applied to trail development, is to hydrologically disconnect the road and trail system from streams.

- Temporary and permanent roads, trails, and landings will be located on stable locations (e.g., ridge tops, stable benches, or flats and gentle to moderate side slopes) and use full-bench construction on steep slopes.
- Roads or trails that are at risk of failure, contributing sediment to streams, or a safety hazard will be improved, vacated, or relocated consistent with valid existing rights to eliminate or minimize sediment delivery.
- Roads and trails will be located away from streams, unstable areas, and sensitive resource sites (as defined by the Oregon Forest Practices Act [FPA]). Removal of old-growth trees, or trees with structures known to be important to the covered species (e.g., potential murrelet nesting platforms), will be avoided, where feasible.
- Road construction within RCAs and HCAs will occur only when other alternatives are not operationally/economically feasible.²¹
- Where crossings of fish-bearing streams occur, bridges and culverts will be designed to meet NOAA Fisheries (2022 [Appendix J]) and ODFW fish-passage laws (Oregon Revised Statutes 509.580 through 910 and OAR 635, Division 412).
- New roads and trails will use the minimum design standards practical with respect to road width, radius, and gradient. This will minimize road or trail width and the resultant cut-and-fill slopes, minimizing effects on the covered aquatic species from new road or trail construction.
- Road and trail designs will provide for proper drainage of surface water so as not to introduce runoff into streams. These measures could include the use of grade breaks, out-sloping, in-sloping, ditching, road/trail dips, water bars, and relief culverts.
- Ditches and cross-drain discharges will be directed onto the forest floor and away from streams to limit runoff and fine sediment delivery into the streams.
- Cross drains will not discharge onto unstable slopes, and full-bench construction (no sidecast fill) will be used on steep slopes to avoid sidecast failure.

²¹ Documentation of these proposed management actions will be completed by ODF through a needs assessment that includes a description of the proposed activity, alternatives reviewed, a justification for the chosen action, and BMPs. The justification for the chosen action will detail how it represents the lowest impact on the covered species.

- Armor fill slopes over culverts where needed to reduce the risk of erosion and failure in case culverts become plugged or overtopped.
- The road/trail runoff to the stream channel will be disconnected by out-sloping the road/trail approach. If out-sloping is not possible, runoff control, erosion control, and sediment-containment measures will be used. These may include using additional cross drain culverts, ditch lining, and catchment basins. Ditch flow conveyance to the stream will be prevented or reduced through cross-drain placement above the stream crossing at a distance that allows for adequate overland filtering and absorption.
- Underdrain structures will be installed when roads/trails cross or expose springs, seeps, or wet areas rather than allowing intercepted water to flow downgradient in ditch lines.
- Surface drainage structures (e.g., broad-based dips, lead-off ditches) will be armored to maintain functionality in areas of erosive and low-strength soils. Armoring will be applied along sections where evidence of gullying of the grade, ditches, or outfalls is occurring.
- New rock quarries will not be located in RCAs.

As with all covered activities, specific nesting sites for marbled murrelet or northern spotted owl will be protected, as described in Conservation Actions 6: Establish Habitat Conservation Areas, 7: Manage Habitat Conservation Areas, and 10: Operational Restrictions to Minimize Effects on Covered Species.

4.7.11.2 Road/Trail Construction and Maintenance to Minimize Impacts on Covered Aquatic Species

Once forest roads/trails are designed to minimize impacts on the covered species, ODF will build and maintain the roads/trails using techniques that will also minimize impacts on covered species. Soil erosion and stream sedimentation may occur during and following road/trail construction or maintenance. Proper construction practices will reduce erosion and stream sedimentation impacts on the covered aquatic species.

The guidelines below will be followed during road/trail construction and maintenance; additional details are provided in Appendix H of the *Forest Roads Manual* (Oregon Department of Forestry 2006, or most current version).

- Roads within or adjacent to RCAs that cannot be hydrologically disconnected (or connection mitigated), or are otherwise unsuitable for wintertime haul, will be closed to logging trucks during wintertime wet weather, as specified at the ODF district level. This includes all native surfaced roads (dirt).
- New road construction within 200 feet of stream channels will be limited by ESU for each covered fish species over a 10-year period.
- Commercial road use will be suspended where turbid runoff is likely to reach waters of the state, defined here as equal to events that lead to at least 2 inches of rain in a 24-hour period. Commercial road use will also be suspended when there is observed turbid runoff into waters of the state independent of the rainfall amount until the concern is addressed.
- In-water construction for roads and trails (e.g., stream crossings) will follow the established Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife (Oregon Department of Fish and Wildlife 2024) to minimize impacts on the covered species and their

habitat. If work needs to occur outside of the established work window, ODF will obtain appropriate approvals from the applicable agencies.

- Storage and staging areas for road/trail construction, harvest activities, HCA management, and restoration projects will be sited outside of RCAs and ERZs where the staging area or materials stored could cause erosion or contamination of waters of the United States (80 *Federal Register* 37053). Staging areas will be constructed in a manner that is hydrologically disconnected from the aquatic environment. Storage of materials with no potential to deliver contaminants, such as culverts for stream crossings, logs for stream enhancement activities, and bales of mulch for erosion control, may be stored in RCAs and ERZs.
- Road improvement and construction activities will be conducted during the dry season, April 1 through October 31. Outside of this period, ODF may allow construction through a written waiver during prolonged periods of dry weather. If rainy weather²² occurs, construction will be suspended. In circumstances where soils are saturated with water and would become muddy when disturbed, and have the potential to reach waters of the state, the soils will be allowed to drain before construction resumes. If rainy weather occurs, erosion and sediment control measures will be implemented and reinforced to ensure no sediment has the potential to reach streams.
- To reduce surface erosion, vegetation removal, soil disturbance, and clearing and grubbing will be limited to the minimum needed to construct the road or trail.
- Excess road or trail excavation materials will be disposed of at a stable site that will not contribute to sedimentation or otherwise degrade covered species' habitat.
- Roads or trails with high erosion potential will be rocked.²³ The most durable crushed rock available in the immediate area will be used when rocking a road or trail with the potential to deliver sediment to streams to reduce road/trail surface erosion and generation of sediment into adjacent water bodies.
- All road or trail drainage structures (ditches, out-sloping, culverts, water bars, dips, etc.) will be in place as soon as possible during construction of the road or trail and before the rainy season.
- On roads or trails, areas of bare soil, which could deliver sediment to waters of the state, will have effective drainage established or will be mulched and/or seeded (native species) before the start of the rainy season to reduce surface erosion. These areas include, but are not limited to, unsurfaced road grades, cut slopes, fill slopes, waste areas, borrow areas, and rock pits.
- When a road construction project is partially completed prior to the start of the rainy period (November 1), the project will be left in a condition that will minimize erosion and the sedimentation of streams during the rainy period. Drainage measures will be installed on uncompleted subgrades, such as surface smoothing, out-sloping, water-barring, and dip installation. Mulching and/or seeding (native species) will be done on all cut slopes, unarmored fill slopes, and on any other areas of bare soil where erosion and sedimentation could affect water quality. Silt fences and/or straw dams will be used near streams to prevent sedimentation. The road will be barricaded to prevent unauthorized use. Routine inspection will

²² When 2 inches of rain has occurred in a 24-hour period.

²³ Increased thickness of surfacing material has been found to reduce surface erosion by approximately 80%.

occur to ensure there is no failure in the performance of prevention and correction measures throughout the rainy season.

- The road or trail surface will be drained effectively by using crowning, in-sloping or out-sloping, grade reversals (rolling dips), and water bars or a combination of these methods. Concentrated discharge onto fill slopes will be avoided unless the fill slopes are stable and erosion proofed.
- Native seed and mulch will be applied to cut-and-fill slopes, ditch lines, and waste disposal sites with the potential for sediment delivery to wetlands, riparian reserves, floodplains, and waters of the state upon completion of construction and as early as possible to increase germination and growth. If necessary, sites will be reseeded to accomplish erosion control. Seed species will be selected that are fast growing and have adequate ability to provide ample groundcover and soil-binding properties.
- Prior to the wet season, effective road surface drainage maintenance will be performed on logging roads that were used for harvest during the season and observed to need maintenance. Ditch lines will be cleared in sections where there is lowered capacity or where the lines are obstructed by dry gravel, sediment wedges, small failures, or fluvial sediment deposition. Accumulated sediment and blockages will be removed at cross-drain inlets and outlets. Natural-surface and aggregate roads will be graded where the surface is uneven from surface erosion or vehicle rutting has the potential to deliver sediment to waters of the state. Crowning, out-sloping, or in-sloping will be restored for the road type for effective runoff. Outlets will be removed or provided for through berms on the road shoulder.
- Cleaned ditch lines and bare soils that drain directly to wetlands, floodplains, and waters of the state will be seeded with native species and mulched.
- Undercutting of cut-slopes will be avoided when cleaning ditch lines on roads or trails.

4.7.12 Conservation Action 12: Restrictions on Recreational Facilities

Conservation Action 12 is intended to support primarily the objectives below. A complete list of all the covered activities and linkages is provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

- 1.1 Riparian Wood Recruitment
- 1.3 Water Quality and Quantity
- 4.1 Conserve, Maintain, and Enhance Existing Oregon Slender Salamander Habitat
- 5.1 Conserve, Maintain, and Enhance Existing Northern Spotted Owl Habitat
- 5.2 Facilitate Northern Spotted Owl Landscape Connectivity
- 5.3 Increase the Amount of High-Quality Habitat for Northern Spotted Owl
- 6.1 Conserve, Maintain, and Enhance Existing Marbled Murrelet Nesting Habitat
- 6.2 Increase the Amount of High-Quality Habitat for Marbled Murrelet
- 7.1 Conserve, Maintain, and Enhance Occupied Red Tree Vole Habitat
- 7.2 Increase the Amount of High-Quality Habitat for Red Tree Vole

- 8.1 Conserve, Maintain, and Enhance Existing Coastal Marten Habitat
- 8.2 Increase the Amount of High-Quality Habitat for Coastal Marten

During the first 5 years of HCP implementation, ODF will develop an inventory of recreation trail and facility infrastructure that catalogs the existing trail network, campground and day-use facilities, and their current condition. Upon completion of this inventory, segments of the existing trail system and recreation facility infrastructure that have been found to be delivering sediment to the aquatic environment will be identified and prioritized for improvement. Completion of the improvements identified during the initial assessment are intended to be completed by the 20th year of the permit term. Existing recreation facilities are expected to expand, and new ones are expected to be developed over the course of the permit term, with most new facilities being developed in the North Coast ecoregion. The maintenance and expansion of existing facilities will follow the measures and timing restrictions described in Conservation Action 2: Riparian Equipment Restriction Zones, and Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species.

Development of new facilities in RCAs will be limited to boat launches and trail segments. Over the 70-year permit term, a net increase of 600 miles²⁴ of new ODF-designated trails can be developed in the permit area. Of that, a net increase of 115.5 miles may occur in RCAs and 50.5 miles in ERZs (including seasonal other streams) to facilitate stream crossings (Table 4-15). All affiliated infrastructure, such as parking and campsites, will be sited outside of the RCA. In instances where work needs to occur closer to or in water, the measures outlined in Conservation Action 3: Stream Complexity, will be followed to limit impacts on the aquatic system and covered species.

Development of new trails in HCAs will not exceed a net increase in 340.5 miles over the course of the permit term (Table 4-15). Specific nesting sites for marbled murrelet or northern spotted owl will be protected, as described in Conservation Actions 6: Establish Habitat Conservation Areas, 7: Manage Habitat Conservation Areas, and 10: Operational Restrictions to Minimize Effects on Covered Species. As opportunities arise, ODF will prioritize the relocation of trails with resource concerns or public safety issues. Relocated trails would not count toward the total planned miles of new trails allowed over the HCP permit term as long as the net total number of trail miles is not exceeded.

Table 4-15. Planned Trail Miles (Percent of Total Planned Miles), by Location

Trail Type	Planned Trail Miles in Permit Area	Planned Trail Miles in RCAs	Planned Trail Miles in ERZs (35-foot buffer of streams) ^{a, b}	Planned Trail Miles in HCAs
Motorized	250	17.5 ^a (7%)	22.5 (9%)	50 (20%)
Nonmotorized	350	98 (28%)	28 (8%)	290.5 (83%)
Total	600	115.5 (19%)	50.5 (8%)	340.5 (57%)

^a Stream crossings only.

^b Includes seasonal other streams.

ERZs = equipment restriction zones; HCAs = habitat conservation areas; RCAs = riparian conservation areas

²⁴ All trail miles are based on ODF's current best available recreation data. ODF has 80 to 90% confidence in the HCA trail values and 70 to 80% confidence in the RCA/ERZ trail values provided. However, ODF has a high level of confidence (85 to 90%) that the total planned trail miles can be developed without exceeding the planned trail miles identified within RCAs and ERZs.

The development of new recreation facilities in HCAs and RCAs is expected to include all development types described in Chapter 3, Section 3.7, *Recreation Infrastructure, Maintenance, and Operations*. The development of new shooting lanes inside HCAs and RCAs is prohibited. All other facility development will follow Conservation Action 10.

In addition to the measures outlined in Conservation Action 11: Road and Trail Construction and Management Measures, the following practices will be followed for trail design and maintenance.

- Motorized trail development in the RCA will be limited to stream crossings and occur only when other alternatives are not operationally feasible.
- Construction of trails will be suspended when soils become saturated with water that would become muddy when disturbed and that would have the potential to reach waters of the state. Soils will be allowed to drain before construction resumes. Erosion and sediment control measures will be implemented and reinforced to ensure no sediment has the potential to reach streams.
- When a trail construction project is partially completed prior to the start of the rainy period (November 1), the project will be left in a condition that will minimize erosion and the sedimentation of streams during the rainy period. Drainage measures will be installed on uncompleted subgrades, such as surface smoothing, out-sloping, water-barring, and dip installation. Erosion and sediment control measures will be implemented and reinforced to ensure no sediment has the potential to reach streams. The trail will be barricaded to prevent unauthorized use. Routine inspection will occur to ensure there is no failure in the performance of prevention and correction measures throughout the rainy season.
- Trail improvement and construction activities will be conducted during the dry season, April 1 through October 31. Construction could occur outside of this timeframe during prolonged periods of dry weather. If rainy weather²⁵ occurs, construction will be suspended. Soils that are saturated with water, that would become muddy when disturbed, and that have the potential to reach waters of the state will be allowed to drain before construction resumes. If rainy weather occurs, erosion and sediment control measures will be implemented and reinforced to ensure no sediment has the potential to reach streams.
- Prior to the wet season, effective trail surface drainage maintenance will be performed as needed on designated trails that were used, observed to have the potential to deliver sediment, and in need of maintenance.

4.7.13 Conservation Action 13: Stay-Ahead Provision

Conservation Action 12 is intended primarily to support the following objectives. A complete list of all the covered activities and linkages is provided in Appendix N, *Biological Goals and Objectives Crosswalk*.

- 5.1 Conserve, Maintain, and Enhance Existing Northern Spotted Owl Habitat
- 5.3 Increase the Amount of High-Quality Habitat for Northern Spotted Owl
- 6.1 Conserve, Maintain, and Enhance Existing Marbled Murrelet Nesting Habitat
- 6.2 Increase the Amount of High-Quality Habitat for Marbled Murrelet

²⁵ When 2 inches of rain has occurred in a 24-hour period.

- 7.1 Conserve, Maintain, and Enhance Occupied Red Tree Vole Habitat
- 7.2 Increase the Amount of High-Quality Habitat for Red Tree Vole

The ESA requires that HCPs minimize and mitigate the impacts of taking to the maximum extent practicable (ESA Section 10(a)(2)(B)(ii)). To ensure the proposed impacts are mitigated to the maximum extent practicable, the Services will consider temporal losses (if any) resulting from a delay between the time of impact relative to the time of mitigation. The stay-ahead provision will minimize or eliminate the risk of any temporal net losses of habitat associated with the impacts from covered activities; there will always be more acres of new habitat grown and maintained in the permit area than lost to harvest across the permit area—both in any 10-year implementation period and cumulatively throughout the permit term. The stay-ahead provision will be tracked by ODF on a continual basis and reported to the Services annually and during the 5-year check-in and 10-year comprehensive reviews. The primary means by which the stay-ahead provision will be documented are through modeling and monitoring of terrestrial habitat changes.

The underlying assumption in the terrestrial conservation strategy is that terrestrial habitat quality will improve over time as the forest grows and that, within the permit area, more acres of habitat and, more important, more acres of higher-quality habitat, particularly within HCAs, will grow and be maintained than will be lost to covered activities. Graphs in Chapter 6, Section 6.2.7.1, *Modeled Age Class in the Permit Area Outside of HCAs Through Time*, show the balance of acres expected on the landscape during the permit term. These graphs demonstrate that there will be no net loss of habitat; there will always be more acres of habitat grown and maintained than lost to harvest across the permit area in any 10-year implementation period and cumulatively throughout the permit term. The stay-ahead provision for the HCP requires that ODF offset modeled or assumed habitat for the covered terrestrial species lost to harvest with at least as much habitat of equivalent or better quality (as defined by the same models) grown or maintained over time in the permit area. This provision will be satisfied by a combination of protected (e.g., HCAs, RCAs) and unprotected habitats.

The monitoring program will measure the improvement of terrestrial habitat and determine whether mitigation is staying ahead of effects. The stay-ahead provision will ensure that the amount, growth, and maintenance of terrestrial habitat stays ahead (in excess) of habitat lost to covered activities.

Adjustments to how the stay-ahead provision is measured in response to landscape-scale events such as fires, storms, and pests are described in the next section.

4.7.13.1 Adjustments to the Stay-Ahead Provision

The permit area is a forested landscape and subject to natural events, as described in Chapter 2, *Environmental Setting*, and Chapter 7, *Assurances*. Fires, storms, and insect outbreaks routinely change the landscape and, along with it, the habitat quality for covered species. These natural events are part of the cycle in forest succession. HCAs will be affected by one or more of these natural phenomena during the permit term. Although the biological objectives outline the ultimate habitat commitments for the HCP, it cannot be assumed that progress toward those commitments will be linear due to these stochastic events. The potential for that to occur in the future is described in Chapter 7 in the context of historical examples of how natural events have already changed the permit area.

When these events occur, ODF will respond, as described in Chapter 7, Section 7.3.3.2, *Change in Species Habitat Quality from Fires, Storms, Invasive Species, or Disease*. The response will include an assessment of disturbance intensity and the resultant damage to covered species' habitat and the potential for regeneration of healthy forests following stand-replacing events. In some cases, restoration activities, such as reforestation, will occur to speed the recovery of species habitat, but in many cases, natural succession will be allowed to proceed. When these natural disturbances occur in HCAs, ODF will meet and confer with the Services per the implementation guidance in Chapter 8, Section 8.2.4, *U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries*, to discuss how the stay-ahead provision requirement might be evaluated, depending on the type and severity of the natural event described in Chapter 7, Section 7.3.3.2. Those HCA areas subject to the extreme disturbance may or may not be retained in the area in the stay-ahead provision calculation, depending on the pace and scale of disturbance and whether it will continue to provide habitat for covered species. These determinations will be species specific. An area that is disturbed may no longer provide habitat for one covered species but may still provide habitat for another. Many factors, including the variation in severity of disturbance, will influence those determinations.

Those acres affected by the natural disturbance will continue to be reported in 5-year and 10-year reports, but they will be reported as naturally disturbed acres or HCA habitat rehabilitation areas. Overall, there will be a new baseline set that will acknowledge the acres of terrestrial species habitat lost to a particular disturbance. An assessment will be completed to determine whether the loss of habitat quality from disturbed acres caused ODF to drop below the stay-ahead provision threshold for any of the covered terrestrial species. Adjustments will be made in subsequent 10-year implementation plans according to the details set forth in Chapter 8, Section 8.2, *Implementation Roles and Responsibilities*, to ensure that, eventually, the stay-ahead provision requirement will be met and, ultimately, the biological objectives. From that point forward, the requirement to manage toward continual improvement in habitat quality will still be enforced, only now with a new baseline.

Chapter 5

Monitoring and Adaptive Management

5.1 Monitoring and Adaptive Management Program

This chapter describes the monitoring and adaptive management framework for the Western Oregon State Forests Habitat Conservation Plan (HCP). The framework includes guidelines and recommendations that will help the Oregon Department of Forestry (ODF) develop a detailed program during the initial years of implementation. The purpose of this framework and the final monitoring program are to assess compliance with the HCP and the effectiveness of the HCP measures with respect to biological goals and objectives as well as anticipated effects. Additional details regarding both types of monitoring—compliance monitoring and effectiveness monitoring—are provided in Section 5.3, *Monitoring*.

Monitoring and adaptive management are integrated processes. Monitoring will inform changes in management actions that continually improve outcomes for covered species and their habitats. An overview of the program, monitoring and management actions, and data and reporting requirements is found below in Section 5.3, *Monitoring*, and Section 5.4, *Adaptive Management*.

The goal of this chapter is to describe the monitoring and adaptive management programs and how ODF will implement them throughout the permit term to comply with the federal Endangered Species Act (ESA) regulatory standards discussed in Section 5.2, *Regulatory Context*. The monitoring program and priorities will change as the permit term progresses to provide the best available science for adaptive management. ODF will be continually evaluating the monitoring program to ensure that the latest accepted sampling techniques and technologies are being implemented and that monitoring provides the information necessary to determine whether ODF is meeting the biological goals and objectives of the HCP. If a covered species becomes listed, ODF will work with the U.S. Fish and Wildlife Service (USFWS) to implement an accepted protocol.

The monitoring framework provided in this chapter will be implemented and reported in the annual, 5-year, and 10-year reports. The 10-year comprehensive review will ensure that any adjustments that need to be made for the subsequent decade are integrated into the 10-year implementation plan. However, should the need arise for adjustments to implementation or monitoring at some time during the 10-year planning period, ODF will coordinate with USFWS and National Oceanic and Atmospheric Administration (NOAA) Fisheries (collectively, referred to as the Services) and update the annual operations plans, as necessary.

5.2 Regulatory Context

An HCP must provide for the establishment and implementation of a monitoring program that generates the information necessary to assess compliance and verify progress toward achieving the biological goals and objectives of the HCP (50 Code of Federal Regulations [CFR] 17.22(b)(2)(A–F), 50 CFR 17.32(b)(2)(i–iii), and 50 CFR 222.307(b)(5)). Adaptive management programs are generally recommended for large programmatic plans as well as those with data gaps and scientific uncertainty that could affect how species are managed and monitored in the future. The *Habitat*

Conservation Planning and Incidental Take Permit Processing Handbook (HCP Handbook) (U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries 2016) describes adaptive management as a method for addressing uncertainty in natural resource management and states that management must be linked to measurable biological goals and monitoring.

5.3 Monitoring

Guidance for conservation planning defines monitoring as the “systematic and usually repetitive collection of information typically used to track the status of a variable or system” (Atkinson et al. 2004). The monitoring protocols outlined in the HCP are based on current best available science; however, these protocols may be updated in the future to incorporate new scientific findings, improved sampling methods, or technological advancements. As the monitoring program progresses and more information becomes available, adjustments will be made, in conjunction with the Services, to ensure monitoring remains effective and relevant. ODF will monitor and report trends in the quantity and quality of habitat for covered species over time in the permit area. In addition, ODF will conduct compliance monitoring to ensure adherence to HCP implementation and management standards as well as effectiveness monitoring to determine if conservation actions are having the intended effects on habitat conditions for covered species in the permit area. ODF will submit annual reports on these findings to the Services.

Habitat metrics will be used to determine if ODF is meeting the biological goals and objectives of the HCP. For species with well-established habitat relationships, monitoring will focus primarily on habitat conditions over time. For species whose range of habitat conditions, or response to changes in those conditions, is not well understood, ODF will conduct species and habitat monitoring to better understand those relationships and more reliably report on progress toward the biological goals and objectives. Section 5.3.3, *Monitoring Summary*, provides a crosswalk regarding how compliance and effectiveness monitoring actions apply to each biological objective. Reporting requirements are described in Chapter 8, Section 8.5, *Reporting*.

5.3.1 Compliance Monitoring

Compliance monitoring (also known as implementation monitoring) tracks the status of HCP implementation and documents adherence to the requirements of the HCP and the terms and conditions of the incidental take permits (ITPs). Compliance monitoring verifies that ODF is carrying out the terms of the HCP and ITPs. ODF will track its own compliance internally as well as that of private contractors. This will not only ensure compliance but confirm that the HCP is working as planned. ODF will provide the monitoring results to the Services, which will verify whether ODF has remained in compliance with HCP requirements (Chapter 8, Section 8.2.1.1, *Habitat Conservation Plan Administrator*). As defined in the HCP, compliance monitoring will be conducted annually and center on a checklist of items, each reflecting a specific requirement or action.

The following components will be tracked.

- Location, extent, and timing of habitat loss for covered species, ensuring that habitat loss from covered activities is appropriately balanced with increases in the quantity and quality of habitat from growth and habitat enhancement activities.
- Habitat management, including the silvicultural activities used in habitat conservation areas (HCAs).

- Restoration activities in upland and aquatic locations, including the goals and objectives, the type of project, and species expected to benefit.
- Implementation of riparian conservation areas (RCAs).
- Implementation of conservation actions, including those that involve avoidance and minimization requirements, and reporting of location, extent, and timing of conservation actions.
- Reporting of management actions and monitoring activities (e.g., the extent, type, and duration of monitoring completed).
- Tracking expenditures from the conservation fund, in total, split out by aquatic species and terrestrial species.

Each component is reviewed and reported annually as described in Chapter 8, Section 8.5.1, *Annual Reporting*.

5.3.1.1 Compliance Monitoring of Covered Activities

All planned recreation, harvest, and road-related management activities are reviewed by ODF staff members to ensure that the terms and conditions of the HCP are met. For those management activities that are carried out by private contractors, contracts are written and administered by ODF staff members to ensure compliance with the covered activities and conservation measures of the HCP.

Specific instances where HCP compliance practices cannot be implemented will be described, along with actions taken to minimize effects from the departures, as described in Chapter 8, Section 8.7, *Decision-Making in Implementation*. Data from the contract administration reports will be used by ODF during compliance monitoring and incorporated into the annual report.

Below is a checklist of items that will be tracked for each type of covered activity. During implementation, additional items may need to be tracked to report compliance more accurately. The list is meant to be an example of the types of information that will need to be monitored and included in the annual report.

Recreational Facilities

The following items will be tracked for the development of recreation facilities and reported annually.

- Location and extent of new recreation infrastructure, such as buildings, campgrounds, boat ramps, or other non-trail facilities, including whether they are inside or outside of HCAs and RCAs.
- Locations of new and ongoing trash-management sites.
- Miles of designated trails vacated and new trails constructed by trail type, including whether they are inside or outside of HCAs and RCAs.
- Number of new, decommissioned, and relocated stream crossings by trails, including location, stream type, and crossing type.
- Acres of species' habitat lost to all new recreational facilities.

Timber Harvest Activities

Timber sales will be planned to meet all HCP requirements. Contract administration will be ongoing to ensure compliance throughout the life of all sales. Upon sale completion, the timber sale close-out process will be the primary tool used to demonstrate compliance with the HCP and permits.

Following a timber harvest, during sale close-out, ODF will confirm items on the following checklist.

- Report acres managed or harvested, harvest type, and location.
- Report if activities that occurred in RCAs were consistent with conservation actions described in Chapter 4, *Conservation Strategy*.¹
- Report if acres were harvested in terrestrial species' habitat, by harvest type, or management prescription.
- Report if installed stream crossings are consistent with provisions in Chapter 4. For new crossings or rehabilitated crossings, confirm stream type and type of crossing used.
- Report if RCA restrictions (buffers, equipment, etc.) were implemented consistent with the HCP and permits.
- Report if stand management activities in HCAs were implemented consistent with Conservation Action 7: Manage Habitat Conservation Areas.
- Report if retention standards described in Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas (Chapter 4, Table 4-12), were implemented.
- Report if operations were implemented consistent with Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species.

Road Construction, Improvement, Maintenance, and Vacating Activities

The following road-related activities will be tracked in the annual report; most of these items also will be tracked as part of timber sale administration and close-out.

- Report new and upgraded stream crossing features by type (e.g., culvert, bridge) and location.
- Report miles of new road constructed, including location within or outside of RCAs and HCAs.
- Report miles of new road constructed within 200 feet of a stream channel.
- Report miles of road vacated, including location within or outside of RCAs and HCAs.
- Report miles of road surveyed for hydrological connectivity, including miles unconnected, connected, and/or connected and mitigated.
- Report miles of road improved to eliminate or reduce hydrological connections to streams.
- Provide an annual (calendar-year) list of operations temporarily suspended by ODF due to sediment delivery to waters of the state. Include a description of the sediment delivery event to determine if it was a fish stream or a salmon, steelhead, and bull trout stream, along with a description of what mitigating actions were taken (e.g., hauling suspended, ditches reopened).

¹ If activities were not consistent with requirements, a description of why will be included.

- Ensure area of soil disturbed in the equipment restriction zone (ERZ) is equal to or less than 10% of the ERZ within the harvest unit.
- Report results of turbidity monitoring.
- Report that road construction standards described in Conservation Action 11: Road and Trail Construction and Management Measures, were implemented.

5.3.1.2 Compliance Monitoring of Conservation Actions

Compliance monitoring for conservation actions differs from monitoring for covered activities. Monitoring for conservation actions tracks spending and the progress made on specific conservation efforts, while monitoring for covered activities focuses on items like road work and sediment control. This ensures both operational rules are followed and broader conservation goals are met and recorded over time.

Aquatic Conservation Actions

Monitoring the implementation of aquatic conservation actions will involve tracking both expenditures on aquatic conservation actions and the actions themselves. The conservation fund, described in Chapter 9, *Costs and Funding*, is expected to generate, on average, \$1 million per year. Implementation of the aquatic conservation strategy will, on average, require approximately \$325,000 per year (Chapter 9, Section 9.2.2.1, *Aquatic Restoration Activities*). The amount will not be the same every year. Some years will be more, while others will be less. The amount of the conservation fund that is spent on the aquatic conservation strategy will be tracked annually and evaluated to ensure that ODF has spent approximately half of the fund on aquatic enhancement projects by the end of each 10-year period. At the 5-year midpoint check-in, strategies and expenditures may be adjusted to ensure compliance by the end of the decade. In the event that a very large project cannot be accomplished within the 10-year period, aquatic conservation funds may be carried over to the subsequent 10-year period to accomplish the project. Information regarding the expected timing of those future expenditures will be described in the annual report.

The average number of aquatic enhancement projects, including prioritized barrier removal and modification projects,¹ expected each year is summarized in Conservation Action 3: Stream Complexity, and Conservation Action 4: Remove or Modify Artificial Fish-Passage Barriers. Estimates of annual averages are based on past projects and the expected level of funding under the HCP. The number of projects is not a requirement because in some years there may be one large project; in other years, there may be several small projects. ODF will demonstrate compliance with the HCP by tracking the collective implementation of enhancement projects, including the percentage of the conservation fund spent on aquatic projects annually and the number of acres harvested by the Evolutionarily Significant Unit (ESU). This information will be included in annual reports for projects completed in the reporting year and then summarized in 5-year midpoint reviews and 10-year comprehensive reviews.

Aquatic Enhancement Project Information Tracked

The following information for the aquatic enhancement project will be tracked.

- Project location (including ESU and independent population of each covered species' overlapping location).

- Project type (stream enhancement, side-channel reconnection, etc.).
- ODF-led project or partner.
- Project expenditures (including any matching partner funds tracked separately).
- Covered species that will benefit.
- Limiting factors that will be addressed.
- If the project involves barrier removal, include the following:
 - Type of barrier removed.
 - Description of improved passage (e.g., improved culvert, bridge, vacated for natural drainage).
 - Miles of suitable habitat now accessible to covered species.

Terrestrial Conservation Actions

Monitoring the implementation of terrestrial conservation actions will also involve tracking both expenditures on terrestrial actions and the actions themselves. Implementation of the terrestrial conservation strategy will, on average, require approximately half of those annual funds, approximately \$250,000 per year for barred owl management and another \$240,000 per year for habitat enhancement activities in HCAs. The actions include a combination of some management activities and some reforestation activities, following management. Not all acres treated for habitat enhancement will require active reforestation; where possible, natural regeneration will be used. In addition, some stands that are harvested will generate enough revenue to pay for reforestation activities. The funding is provided for those stands that would otherwise not be profitable to harvest, with the intent of improving them for covered species' habitat.

Similar to the aquatic strategy, the amount spent will not be the same every year. Some years will be more, while others will be less. The amount of the conservation fund that is spent on the terrestrial conservation strategy will be tracked annually and evaluated to ensure that ODF has spent approximately half of the conservation fund on terrestrial conservation actions by the end of each 10-year period. Leading up to the 5-year midpoint check-in, if too much or too little was spent on the terrestrial strategy earlier in the decade, strategies and expenditures will need to be adjusted to ensure compliance by the end of the decade. In instances where funds are being saved to implement a large project, that will be disclosed, making it clear that, even if the funds have not been expended at the end of the decade, the funds will be dedicated to a specific project in the future. In other cases, ODF may use funds outside of the HCP budget from other budget categories to complete a project sooner than would otherwise be possible using only conservation fund dollars. Those non-conservation fund dollars will be tracked so that future conservation fund dollars can be reallocated to "pay back" those budget categories from which they were borrowed.

The acres of terrestrial species management activities that occur each year will be reported annually and then further summarized at the 5-year midpoint check-in and 10-year comprehensive review.

Terrestrial Habitat Enhancement Information Tracked

The following terrestrial habitat enhancement information will be collected and reported.

- Acres treated in the following three categories:
 - Swiss needle cast restoration.
 - Hardwood to conifer restoration.
 - Healthy conifer management.
- Location of treatments.
- Rationale for treatment and expected biological outcomes.
- Covered species that will benefit.
- Any novel attributes to the management that will benefit covered species uniquely.
- Acres reforested, including location.
- Young-stand management activities, including location.
- Enhancement expenditures.

Barred Owl Management Information Tracked

The following barred owl management information will be collected and reported.

- Acres treated.
- Location of treatments.
- Number of barred owls removed.
- Spotted owl site occupancy in areas treated.
- Barred owl site occupancy in areas treated.
- Removal expenditures (e.g., training and specialized equipment, such as bioacoustic monitoring devices).

5.3.2 Effectiveness Monitoring

Effectiveness monitoring assesses the biological success of the HCP and evaluates whether the effects of implementing the conservation strategy described in Chapter 4, *Conservation Strategy*, are consistent with the assumptions and predictions made during its development (U.S. Fish and Wildlife Service and NOAA Fisheries 2016). Effectiveness monitoring assesses whether implementation of the conservation strategy is achieving the HCP's biological goals and objectives. By tracking changes in biological resources, such as forest age and habitat quality, or environmental stressors, such as water temperature, effectiveness monitoring will enable adaptive management and accountability.

A comprehensive effectiveness monitoring and adaptive management strategy will be developed in conjunction with the Services during the first 5 years of implementation, including the design/selection of monitoring protocols. Monitoring protocols will be designed and implemented during the first year of HCP implementation. To accurately measure success, thresholds and

quantitative indicators must be established prior to management actions. These may include quantitative measures, such as areas of habitat suitable for covered species. Quantifying these conditions before and after management is the basis for judging success. Specific objectives of effectiveness monitoring could include the following:

- Ensure that monitoring is conducted over a sufficient period to effectively identify and analyze trends.
- Develop and incorporate specific, measurable, and shorter-term metrics into monitoring plans that are aligned with each implementation planning cycle.
- Systematically track progress toward meeting biological objectives, ensuring that collected data enable ODF to assess achievement and adjust management actions as needed.

The subsections that follow provide an overview of monitoring activities for all covered species, summarized as aquatic and terrestrial species. The purpose of effectiveness monitoring is to determine whether the conservation actions are achieving the biological goals and objectives. As such, they are focused primarily on monitoring changes in habitat quality and quantity over time, including long-term trends in ecosystem processes, though there are a few instances where species' responses to habitat changes are also monitored.

5.3.2.1 Aquatic Habitat Monitoring

Aquatic Habitat Monitoring Methods

The aquatic monitoring program focuses on providing quantitative information on the current status and trends of aquatic habitat conditions in the permit area; it is not intended to be a measure of the production (i.e., number of fish) of the covered aquatic species in the permit area. Data from stream habitat surveys will be used as a baseline and for monitoring changes in habitat conditions resulting from aquatic conservation actions and instream enhancement projects to assess effectiveness and track trends on stream complexity in the permit area. In addition, the information gathered can be used to guide future habitat restoration efforts by identifying areas that require intervention to restore and improve instream habitat conditions. The aquatic monitoring program may, in part, rely on partnerships between local non-profit agencies and state agencies, but ODF will ultimately be responsible for ensuring their monitoring requirements are met.

Aquatic Inventories Project

The Oregon Department of Fish and Wildlife (ODFW) has been monitoring instream habitat conditions in wadable streams across western Oregon for 20 years using the Aquatic Inventories Program (AIP) as part of the *Oregon Plan for Salmon and Watersheds* (Oregon Watershed Enhancement Board 2026), first established in 1997. Sites will be chosen at random and visited on an appropriate temporal rotation to quantify the condition and characteristics of aquatic habitat over time. This sampling design enables a non-biased portrayal of the status and trends in physical habitat conditions. ODF intends to partner with ODFW by providing land access and funding to use the AIP to monitor trends in physical habitat attributes within the permit area over the course of the permit term. The AIP collects data on many habitat variables within the four variable classes (substrate, channel morphology, wood, and riparian), following the methods outlined in *Methods for Stream Habitat and Snorkel Surveys* (Oregon Department of Fish and Wildlife 2026).

For purposes of this HCP, the variables described below² and detailed in Table 5-1 will be tracked over time to determine the trajectory of habitat trends in the permit area.

- **Wood.** Volume, number of key pieces, and number of pieces.
- **Riparian.** Channel shade and density of conifers by size class.
- **Channel morphology.** Active channel width, pool frequency, and length of off-channel habitat.
- **Substrate.** Fine sediment in substrate.

Funding provided by ODF to the AIP will allow increased sampling in the permit area under the AIP, allowing status and trends reporting specific to the HCP. This funding is described in Chapter 9, *Costs and Funding*. ODFW and ODF will work together to develop and implement a monitoring program, including determining the monitoring priorities and appropriate spatial and temporal sampling scale to determine the effectiveness of conservation actions. In addition, an initial 10-year effort to monitor key Hydrologic Unit Code (HUC) 10 watersheds will be completed. The location of monitoring sites used to assess the effectiveness of instream enhancement projects will be based on previous monitoring done by ODFW in the permit area and revisited on an appropriate temporal rotation, starting when projects are completed. The results of the initial 10-year effort will then be used to identify subsequent decadal restoration goals and monitoring needs.

As with the rest of the monitoring program, the results of monitoring completed each year will be reported in the annual report. That information will then be summarized in the 5-year midpoint reporting summary and further summarized in the 10-year comprehensive reviews completed by ODF, as described in Chapter 8, *Implementation*. Due to the extent of the permit area, it is infeasible to monitor habitat trends in all watersheds. Instead, ODF will work with project partners³ at the start of each 10-year cycle to identify key watersheds for focused effectiveness monitoring over the next decade. The selection of these areas will be based on their ability to provide a large amount of information that can help future management decisions or address data gaps. Monitoring changes in riparian and aquatic conditions will provide information for tracking status and trends, based on implementation of the covered activities and natural disturbance. At the 5- and 10-year marks, monitoring and restoration goals will be assessed by ODF and the Services to determine if they are being met and ensure that they are still adequate with respect to meeting the needs of covered species or if they should be recalibrated. Proposed changes to monitoring and/or restoration will be processed in accordance with Chapter 8, Section 8.9, *Modifications to the Habitat Conservation Plan*. Any changes to monitoring and/or restoration agreed to by the Services will be documented in the annual reports, 5-year midpoint check-ins, and 10-year comprehensive reviews. It may be determined that some key watersheds should be monitored in successive 10-year periods to extend the assessment of changes in habitat conditions over time.

Turbidity Monitoring

In addition to fine sediment monitoring that will occur under the AIP, ODF will install paired turbidity monitors upstream and downstream of selected road crossings to monitor changes in instream turbidity following the construction of haul roads. Turbidity monitoring locations will occur at locations where AIP data are also being collected so that fine sediment and turbidity data can be reported for the reach. Similar monitoring will also be used upstream and downstream of

² Data will be collected as described in ODFW (2019) or more current version.

³ ODFW, NOAA Fisheries, watershed councils, tribes, and nongovernmental organizations.

new, upgraded, or decommissioned stream crossings to determine the adequacy of the prescribed management actions and best management practices (BMPs). In addition, post-harvest monitoring at select sites in year 1, 5, and 10 will identify and record any road-related landslides/debris flows, including the likely triggering event, track width, distance traversed, stream type at deposition zone, and volume of wood delivered. The AIP data will be used in conjunction with the road monitoring data to determine if changes in fine sediment inputs associated with road activities are occurring.

Water Temperature

Water temperature is a key water quality parameter for determining the suitability of aquatic habitat and an important limiting factor for the covered aquatic species. The temperature water quality standard in Oregon, as required by the Clean Water Act, is designed to protect the most temperature-sensitive beneficial use for salmonids and other coldwater species. Therefore, achieving the water quality standard for temperature (i.e., keeping management-related temperature increases above the natural baseline from exceeding 0.3 degrees Celsius [°C]) in the permit area is a key part of protecting habitat for covered aquatic species.

ODF will implement a stream temperature monitoring program in the permit area for the duration of the permit term following accepted protocols. Thermistors will be distributed accordingly within selected streams to ensure adequate data are collected, track trends in water temperature, and evaluate the water quality goals of the prescribed riparian management strategies. Previously published water temperature data will be used as a baseline, when available; additional water temperature studies, either in progress or initiated throughout the permit term, may be used to fill in data gaps when appropriate. Comprehensive data collected and analyzed will be provided to the Services in the annual reports, 5-year midpoint check-ins, and 10-year comprehensive reviews to show trends in temperature changes. If trends reported in the 5- and 10-reports show management-related temperature increases above the natural baseline and exceeding 0.3°C for more than 5 years post-management, adaptive management responses will occur, as described in Section 5.4, *Adaptive Management*.

5.3.2.2 Terrestrial Habitat Monitoring

The aim of terrestrial habitat monitoring is twofold. First, ODF will continue to monitor a subset of active northern spotted owl and known occupied marbled murrelet sites to build upon 30 years of data collection and continue to better understand the responses of these species to the conservation actions described in the HCP. Second, ODF seeks to gain a better understanding of the distribution of the remaining less studied covered species to more effectively implement conservation actions. Though success of the HCP is not tied to species numbers or population sizes (Chapter 4, Table 4-1), it is helpful to know whether the conservation actions are benefiting the species and how habitat is being used. The monitoring described for each species is designed for that purpose. Monitoring results should validate the effectiveness of the conservation strategy by confirming that habitat objectives are being achieved and covered species are responding as anticipated. However, if the objectives are not met or if the expected improvements for species are not observed, adaptive management (Section 5.4, *Adaptive Management*) may be triggered to adjust strategies and improve outcomes.

Terrestrial Habitat Monitoring Methods

Terrestrial habitat monitoring will be a means to track progress toward the biological objectives for each terrestrial species. Species monitoring is how ODF will track the response of covered species to the conservation actions.

Changes in Habitat Quantity and Quality in the Permit Area

Habitat monitoring will be conducted annually, but the results will be summarized and reported at 5-year and 10-year intervals (Table 5-1). The quantity and quality of habitat lost to covered activities will be tracked through administration of those activities (e.g., timber sale close-out). Habitat growth over time will be tracked using species habitat models that are based on forest inventory metrics. Forest inventory updates will include both current habitat conditions and 5-year projections of growth to estimate the quality and quantity of habitat. Sometimes new forest growth will be in response to management activities in HCAs; other times, it will be from passive management. In both cases, ODF will determine the quality of habitat for each of the covered terrestrial species by tracking changes in the forest characteristics that support them. Although landscape levels of habitat quality and quantity (both inside and outside of HCAs) will be summarized from habitat models, based on ODF's forest inventory, individual stand exams will be used to increase understanding of habitat characteristics over time, which will, in turn, improve the species models. Active management in HCAs will also be coupled with field measurements and monitoring that will test the efficacy of terrestrial habitat enhancement projects.

Habitat modeling described in Chapter 2, *Environmental Setting*, was based on inventory data available at the time, which was designed to be summarized at the level of the forest stand. Forest inventory methods and data as well as habitat modeling capabilities will continue to improve during the permit term, allowing habitat metrics to be summarized more precisely and at a wider variety of spatial scales (e.g., within stand habitat patches). Improved terrestrial species habitat modeling will occur with use of the new information. Regardless of changes in modeling methods, the acreage commitments in the biological goals and objectives will remain in place.

As described in Chapter 8, Section 8.5, *Reporting*, ODF will provide an update on the changes in habitat quality and quantity at each 5-year midpoint check-in and again at each 10-year comprehensive review. Not only are these timeframes appropriate for tracking changes in habitat, which are based on slow-changing forest characteristics, they also position ODF so it can make changes to the timber harvest program, if needed, in response to the updated habitat acreages. For example, the 10-year comprehensive review is intended to align with the 10-year implementation planning process that ODF undertakes to set specific harvest targets and more precisely plan where and how a harvest will occur. Tracking changes in habitat quality and quantity on 5- and 10-year cycles allows ODF to adjust current implementation plans and incorporate information into the next 10-year implementation planning cycle. If habitat is not developing as expected, then adaptive management will be triggered in consultation with the Services. Stand-management activities can be tailored to locations where habitat can be developed more quickly to make strides toward the biological objectives. If habitat is developing as planned, the harvest will most likely continue as planned, knowing that ODF is in compliance with the HCP.

Monitoring Management Activities to Accelerate Development of Habitat in Habitat Conservation Areas

As a subset of tracking habitat quantity and quality, ODF will implement and monitor stand-management activities in HCAs, as described in Conservation Action 7: *Manage Habitat Conservation Areas*, to accelerate the growth and quality of habitat. A key element of the monitoring program will be to track long-term changes, both before and after management has occurred, to determine if stand-management activities had the desired effect. The monitoring return interval will vary over time. Initial monitoring will occur every few years to determine the response of retained vegetative components and the establishment of new ones. Return intervals will then become longer as initial vegetative response slows. Although the habitat attributes collected may vary, depending on the specific enhancement objective, tracking where management occurred, what type of management occurred, and the expected outcomes will be critical to determining whether management activities were effective. As monitoring reveals whether biological outcomes are being met, ODF will use adaptive management to adjust silvicultural practices in HCAs to minimize short-term habitat degradation and maximize long-term habitat creation.

Species Monitoring

Species-specific monitoring will include a mix of occupancy surveys, acoustic monitoring, nest searches, environmental deoxyribonucleic acid (eDNA) sampling, and habitat association studies. By integrating species-specific surveys with habitat monitoring data, the program will assess the direct response of species to conservation actions. Results from species effectiveness monitoring provide essential feedback for adaptive management, ensuring that if habitat objectives are met but species do not respond as expected, management strategies can be adjusted to better support species' persistence and recovery.

5.3.3 Monitoring Summary

Monitoring is a critical component of this HCP, ensuring both compliance with permit requirements and the effectiveness of conservation actions in achieving biological goals and objectives. All monitoring actions, whether for compliance or effectiveness, are described in Appendix N, *Monitoring Tables*. This table provides a comprehensive overview of how each biological objective will be tracked and the associated conservation actions, metrics, methodologies, and reporting timeline. A summary of specific compliance and effectiveness monitoring actions and the associated covered species are provided in Table 5-1. For details on reporting requirements, see Chapter 8, *Implementation*. For adaptive management triggers and responses, see Section 5.4, *Adaptive Management*.

Table 5-1. Summary of Habitat Conservation Plan Compliance and Effectiveness Monitoring Actions

ID	Monitoring Action	Monitoring Type	Covered Species					
			Fish	OSS	NSO	MM	RTV	CM
1	Establish and maintain RCAs.	Compliance						
2	Minimize impacts associated with harvesting from ERZs.	Compliance						
3	Establish and maintain HCAs.	Compliance						
4	Conduct baseline monitoring in a subset of stands to determine covered species' occurrence and distribution.	Compliance						
5	Document silvicultural treatments in HCAs that enhance suitable habitat consistent with standards in Conservation Action 7.	Compliance						
6	Conduct pre- and post-harvest surveys to document covered species' response to harvest activities.	Effectiveness						
7	Conduct pre- and post-harvest surveys to document covered species' response to harvest activities and downed wood retention standards.	Effectiveness						
8	Document compliance of any new or expanded facility infrastructure and trail development to ensure impacts associated with siting, constructing, and using new recreational facilities are minimized.	Compliance						
9	Document if downed wood representative of decay classes 3 to 5 was retained in each unit harvested with regeneration techniques.	Compliance						
10	Document if at least 600 cubic feet of hard conifer logs representative of decay classes 1 or 2 were, on average, retained outside of RCAs in each unit harvested with regeneration techniques.	Compliance						
11	Determine effectiveness of retaining and recruiting structural features outside HCAs in a subset of stands over time.	Effectiveness						
12	Document silvicultural treatments in HCAs to develop nesting, roosting, and foraging habitat consistent with standards in Conservation Action 7.	Compliance						
13	Document any fuel reduction efforts inside HCAs.	Compliance						

ID	Monitoring Action	Monitoring Type	Covered Species					
			Fish	OSS	NSO	MM	RTV	CM
14	Document acres of nesting, roosting, and foraging habitat in the permit area at 5-year intervals over the permit term.	Effectiveness						
15	Monitor a subset of management activities and relative changes in habitat quality compared to anticipated modeled outcomes.	Effectiveness						
16	Track status of active sites in addition to previously inactive or unoccupied sites in barred owl management areas.	Effectiveness						
17	Monitor a subset of existing habitat and ingrowth of nesting, roosting, and foraging habitat inside of HCAs for spotted owl presence.	Effectiveness						
18	Document barred owl removal efforts within and around active northern spotted owl sites and proximal to HCAs.	Compliance						
19	Determine effectiveness of barred owl removal on spotted owls in permit area where removals were conducted.	Effectiveness						
20	Document compliance regarding applying seasonal restrictions for activities in or near designated habitat.	Compliance						
21	Document that all modeled or assumed habitat for the covered species lost to harvest is replaced with at least as much habitat of equivalent or better quality (as defined by the same models) grown or maintained over time within HCAs.	Compliance						
22	Maintain a minimum of 40% of the permit area outside HCAs in conditions that meet the definition of dispersal habitat for northern spotted owl. One half of that target (20%) will be in the form of 60-year-old stands and/or stands representing foraging habitat or better; RCAs less than 120 feet in width and not part of a stand that meets the standards will not be counted toward this.	Compliance						
23	Document if retention of old-growth trees, known nest trees, and groups of trees surrounding known den sites occurred during any harvest using regeneration techniques.	Compliance						
24	Document if two leave trees per acre were retained in each unit harvested with regeneration techniques.	Compliance						
25	Document if snags representative of decay classes 3 to 5 were retained in each unit harvested with regeneration techniques.	Compliance						

ID	Monitoring Action	Monitoring Type	Covered Species					
			Fish	OSS	NSO	MM	RTV	CM
26	Document if two snags representative of decay classes 1 and 2 were retained in each harvest unit using regeneration techniques.	Compliance						
27	Use all spotted owl monitoring information to assess if owls are moving across landscape.	Effectiveness						
28	Document silvicultural treatments in HCAs to develop suitable and highly suitable habitat consistent with standards in Conservation Action 7.	Compliance						
29	Document acres of suitable or highly suitable habitat in the permit area at 5-year intervals over the permit term and link relative changes in habitat quality to silvicultural treatments.	Effectiveness						
30	Monitor a subset of suitable and highly suitable habitat for marbled murrelet use during the first 20 years of the permit term.	Effectiveness						
31	After year 20, implement a monitoring effort designed to assess nesting occupancy in the permit area that will prioritize assessing nesting activity inside HCAs that have not been surveyed in the past and where occupancy is more likely as a result of increases in habitat quality and quantity.	Effectiveness						
32	Monitor a subset of management activities and relative changes in habitat quality compared to anticipated modeled outcomes.	Effectiveness						
33	Document compliance with trash-management and removal regulations for all planned activities within designated occupied habitat and associated buffers within the inland range of the covered species.	Compliance						
34	After year 20, implement a monitoring effort designed to assess nesting activity in the permit area, focusing on locations with habitat inside of HCAs that have not been surveyed in the past but where occupancy is expected due to adjacency to other occupied areas or locations where habitat quality has improved to suitable under the HCP.	Effectiveness						
35	Evaluate red tree vole response to management activities.	Effectiveness						
36	Document compliance for any forest management activities within 10 acres of known red tree vole nest trees.	Compliance						

ID	Monitoring Action	Monitoring Type	Covered Species					
			Fish	OSS	NSO	MM	RTV	CM
37	Conduct survey of coastal marten distribution in first 15 years of permit term.	Effectiveness						
38	Conduct targeted follow-up monitoring to evaluate species' response to management; locate den sites and, potentially, collar females.	Effectiveness						
39	Conduct field-based habitat surveys on a rolling basis, in a subset of stands inferred to be suitable, in order to confirm microhabitat features necessary for likely species occupancy.	Effectiveness						
40	Document if retention of old-growth trees, known den structures (i.e., tree, snag, log, other), and trees surrounding the known den site occurred during any harvest using regeneration techniques.	Compliance						
41	Document compliance of any management activities within a 0.25-mile radius of known occupied coastal marten den sites (500 feet for tailholds and guylines).	Compliance						
42	Document compliance of trapping activities for mountain beaver control within 2.5 miles of known marten locations.	Compliance						
43	Document compliance of potential unstable landforms that are potential sources of debris flows that would deliver large wood to fish-bearing streams.	Compliance						
44	Track processed-based restoration (PBR) projects and ensure proper prioritization and prescriptions were implemented.	Compliance						
45	Document annual expenditures from the conservation fund.	Compliance						
46	Track trends in natural large wood recruitment.	Effectiveness						
47	Monitor a subset of identified potential unstable landforms to determine if failure and delivery of large wood to fish-bearing streams was achieved.	Effectiveness						
48	Document trends in stand and understory conditions of PBR-treated patches.	Effectiveness						

ID	Monitoring Action	Monitoring Type	Covered Species					
			Fish	OSS	NSO	MM	RTV	CM
49	Track the number of new roads built within 200 feet of stream channels.	Compliance						
50	Confirm new recreational facility development in RCAs was limited to trails and boat ramps.	Compliance						
51	Document compliance with ODFW-recommended in-water work periods, including variances approved by ODFW.	Compliance						
52	Ensure acres harvested by ESU/DPS is part of stream enhancement prioritization.	Compliance						
53	Track stream enhancement projects and ensure proper prioritization was used.	Compliance						
54	Ensure the presence of Pacific lamprey is part of the stream enhancement project prioritization process.	Compliance						
55	Document trends in stream channel complexity associated with stream enhancement projects.	Effectiveness						
56	Track conservation fund expenditures to ensure projects meet the intent and breakdown between aquatic and terrestrial allocations.	Effectiveness						
57	Track completed stream enhancement projects within Pacific lamprey distribution.	Effectiveness						
58	Monitor current conditions and trends in riparian condition.	Effectiveness						
59	Monitor current conditions and trends in riparian function.	Effectiveness						
60	Monitor current conditions and trends in stream temperature.	Effectiveness						

ID	Monitoring Action	Monitoring Type	Covered Species					
			Fish	OSS	NSO	MM	RTV	CM
61	Monitor current conditions and trends in fine sediment.	Effectiveness						
62	Document that a needs assessment was performed for all roads/motorized trails/temporary crossings or encroachments and that other options were not economically or operationally feasible.	Compliance						
63	Review a subset of needs assessments to determine locations, purpose, frequency, and, if chosen, the option with a lesser impact on covered species that was economically or operationally feasible.	Effectiveness						
64	Monitor a subset of stream enhancement projects to determine trends in the number, temperature, and depth of pools post-project.	Effectiveness						
65	Monitor a subset of stream enhancement projects to determine current conditions and trends in fine sediment.	Effectiveness						
66	Identify roads that are at risk of hydrologic connectivity and sediment delivery to streams for improvement or vacating.	Compliance						
67	Identify roads that are chronic points of sedimentation into streams.	Compliance						
68	Identify roads that are landslide hazards in proposed harvest areas.	Compliance						
69	Monitor trends over time in the ratio of connected, mitigated, and connected but not mitigated road segments.	Effectiveness						
70	Document roads closed, gated, and/or vacated.	Effectiveness						
71	Document compliance for screening at water drafting locations and use of appropriate screen size.	Compliance						

ID	Monitoring Action	Monitoring Type	Covered Species					
			Fish	OSS	NSO	MM	RTV	CM
72	Document compliance related to road/trail construction standards.	Compliance						
73	Document temporary suspension of operations associated with sediment delivery to streams.	Compliance						
74	Document status of hydrologically disconnecting and mitigating sections of connected road/trail systems from streams.	Compliance						
75	Document miles of new trails constructed.	Compliance						
76	Document compliance of ERZ conservation actions.	Compliance						
77	Document that a needs assessment was performed for all roads/motorized trails, the road/trail was necessary, and that other options were not economically or operationally feasible.	Compliance						
78	Document the number of miles of road/trail vacated in RCAs.	Compliance						
79	Monitor a subset of road crossings for changes in turbidity following construction of haul roads.	Compliance						
80	Monitor a subset of new, upgraded, or decommissioned stream crossings for trends associated with changes in turbidity.	Compliance						
81	Monitor a subset of harvest units for changes in turbidity pre- and post-harvest.	Effectiveness						
82	Document changes to hydrologically connected roads/trails.	Effectiveness						

ID	Monitoring Action	Monitoring Type	Covered Species					
			Fish	OSS	NSO	MM	RTV	CM
83	Identify trails at risk of hydrologic connectivity and sediment delivery to streams for improvement or vacating.	Compliance						
84	Document trails that are chronic sources/points of sedimentation to streams.	Compliance						
85	Document net miles of trails for established limits within HCAs, RCAs and ERZs.	Compliance						
86	Document miles of trails vacated.	Compliance						
87	Document status of the removal or upgrade of barriers identified in Chapter 4, Section 4.7.4.	Compliance						
88	Document fish rescue/salvage projects.	Compliance						
89	Document compliance with ODFW and NOAA fish-passage criteria.	Compliance						
90	Document miles of available suitable habitat upstream resulting from the removal/upgrade of fish-passage barriers.	Effectiveness						
91	Document new, upgraded, or decommissioned stream crossings.	Compliance						

CM = coastal marten; DPS = distinct population segment; ERZ = equipment restriction zone; ESU = Evolutionarily Significant Unit; HCA = habitat conservation area; HCP = habitat conservation plan; MM = marbled murrelet; NOAA = National Oceanic and Atmospheric Administration; NSO = northern spotted owl; ODFW = Oregon Department of Fish and Wildlife; OSS = Oregon slender salamander; RCA = riparian conservation area; RTV = red tree vole

5.3.3.1 Aquatic Habitat Monitoring by Objective

This section provides an overview for covered fish monitoring—collectively, aquatic species monitoring. The biological goals and objectives for covered fish focus on physical habitat parameters, including the ecological processes that influence habitat condition. Monitoring these ecological processes and habitat variables, using the methods described in the previous section, allows ODF to determine whether progress is being made toward the biological objectives. Monitoring does not include covered species distribution or abundance surveys for covered fish species. Habitat quality and quantity are being used as a surrogate for species distribution and abundance, with a long-term objective of suitable habitat improvement and expansion in the permit area.

Objective 1.1: Riparian Wood Recruitment

The establishment of RCAs adjacent to the aquatic zone will promote the development of mature riparian forests that can contribute to large wood in streams. Large wood may also be placed in selected stream reaches through the implementation of stream enhancement projects. In addition to these measures to increase large wood recruitment in streams in the permit area, ERZs will be established adjacent to the aquatic zone and BMPs will be followed to minimize effects from covered activities inside RCAs. Specific details describing compliance and effectiveness monitoring actions, including metrics, methodologies, and reporting intervals, are summarized by biological objective and conservation action in Appendix N, *Monitoring Tables*. Data will be reported on an annual basis and include a rolling 10-year trend analysis to show the trajectory of large wood recruitment in the permit area, summarized by covered fish population, and, where necessary, at the watershed scale.

Objective 1.2: Stream Complexity

Targeted stream enhancement projects, such as large-wood or boulder-placement projects, will be implemented by qualified ODF staff members, in consultation with ODFW and local conservation partners, within key watersheds of the permit area to address limiting factors for the covered fish species by providing significant improvements to physical stream habitat elements. Project planning and design will consider basin, watershed, and species action plans and assessments; local knowledge and expertise of current habitat conditions, intrinsic potential, and stream processes; and the disturbance regime at the watershed and basin scale to identify areas best suited for enhancement (Appendix E, *Effects Analysis*). Based on project history, it is expected that, over the course of the permit term, ODF will complete approximately 440 instream improvement projects,⁴ with an average of 60 projects being completed per decade. The overall number will depend on the size and scale of each project.

Stream enhancement targets will be tied to and commensurate with the level of harvest expected in any one ESU during each implementation planning cycle. Monitoring of stream enhancement projects may be implemented under a project-specific monitoring plan using elements of the AQI stream survey protocol. The project-specific monitoring plan will be developed by qualified ODF staff members, in consultation with ODFW AQI staff members, to quantify the condition and characteristics of stream habitats pre- and post-project and assess the effectiveness of the

⁴ Projects are generally focused on increasing instream complexity and typically consist of at least five logs or trees per structure site, with several sites per project. Other projects may include, but are not limited to, road decommissioning to reduce sedimentation, floodplain reconnection, and projects to promote beaver colonization.

conservation action. Specific details describing compliance with and the effectiveness of monitoring actions, including metrics, methodologies, and reporting intervals, are summarized by biological objective and conservation action in Appendix N, *Monitoring Tables*. Results from project-specific effectiveness monitoring will be summarized and included in the HCP annual report.

Objective 1.3: Water Quality and Quantity

Protection of existing functional riparian systems and restoration of degraded systems will be implemented to protect water quality in the permit area. The establishment of RCAs adjacent to the aquatic zone, including the addition of the process protection zone, will promote the development of mature riparian forests to provide shade as well as maintain and improve stream temperatures. Inputs of fine sediments will be minimized and mitigated through the establishment of an ERZ, implementation of road construction and management BMPs, road improvement and vacating projects, and disconnection of or mitigation for hydrologically connected road systems. Specific details describing compliance and effectiveness monitoring actions, including metrics, methodologies, and reporting intervals, are summarized by biological objective and conservation action in Appendix N, *Monitoring Tables*. Data will be reported on an annual basis and include a rolling 10-year trend analysis to show the trajectory of water quality and quantity metrics in the permit area. To track watershed effects associated with harvest, the annual report will include a rolling summary of acres harvested, by HUC 10, and the percentage of each HUC 10 that is in clearcut and young-forest conditions (0 to 10 years).

Objective 1.4: Fish Passage

The removal of or upgrades to artificial fish-passage barriers in the permit area will restore connectivity to upstream habitats that could be used by covered fish for spawning and rearing as well as release substrates that have accumulated behind undersized stream crossing structures to downstream locations. A desktop and field review of ODFW's 2019 statewide fish-passage priority data identified eight barriers in the permit area where removal, modification, or replacement of the existing barrier would address connectivity issues for the covered fish species. Most fish barrier removals or upgrades will occur as part of routine haul road upgrades associated with planned harvest activities. However, barrier removals or upgrades may also occur as targeted conservation actions outside of the timber harvest program.

Specific details describing compliance and effectiveness monitoring actions, including metrics, methodologies, and reporting intervals, are summarized by biological objective and conservation action in Appendix N, *Monitoring Tables*. Monitoring and reporting will focus on compliance and effectiveness monitoring metrics, including documentation of the methods used for upgrades or removal, the number and location of barriers addressed, the benefits and extent of suitable fish habitat reconnected, and biological responses, such as increased spawning and rearing use, by covered fish species.

5.3.3.2 Terrestrial Habitat Monitoring by Species Objectives

Objective 4.1: Conserve, Maintain, and Enhance Existing Oregon Slender Salamander Habitat, and Objective 4.2: Retain and Recruit Downed Wood to Support Oregon Slender Salamander

Limited data currently exist about Oregon slender salamander within the permit area, although information regarding habitat requirements is improving (Garcia et al. 2020). Therefore, the primary goal of monitoring for Oregon slender salamander is to gain a better understanding of species distribution within the permit area of the Santiam State Forest where the species occurs and the relationship between habitat quality, timber harvest operations, and the distribution and abundance of the species on the landscape.

Monitoring for Oregon slender salamander will include baseline surveys in a subset of stands; these will be conducted over the first 10 years of the permit term, including pre- and post-harvest surveys to document species response to harvest activities. Survey locations will focus on habitat in HCAs, although habitat outside HCAs will be included as part of timber harvest effects monitoring. Surveys to determine whether Oregon slender salamander persists in managed stands will be conducted in a subset of harvested stands outside HCAs as well as managed stands inside HCAs to determine whether downed wood retention standards described in Conservation Actions 7 and 8 and Appendix N, *Monitoring Tables*, are adequately supporting the species. Monitoring will include a sufficient number of sites and replication such that the results will have enough statistical power to meaningfully inform future management decisions. The monitoring protocol, standards, and thresholds to determine potential adaptive management responses will be developed in conjunction with the Services during the first year of HCP implementation.

ODF may work with partners to set up a more rigorous study and determine whether varying amounts of downed wood, decadence management, and recruitment processes benefit the species differently, particularly over a longer period of time. With the 2020 North Cascade Fire occurring largely in Oregon slender salamander habitat, monitoring will also include an evaluation of the role fire plays in habitat quality.

Monitoring methods will be based on the best available techniques at the time monitoring occurs. Survey methods will be based on currently accepted protocols, which, at this time, follow Garcia et al. (2020). Long-term efforts will include a mix of repeat sample plots and new plots, with efforts to minimize cumulative effects in all (Otto et al. 2013; Kroll et al. 2015). Data collection will include coarse woody debris inventories, based on length, width, and decay classes (Maser and Trappe 1984).

ODF forest inventory methods will use a densified plot network, conducted in cooperation with the Forest Inventory and Analysis group of the U.S. Forest Service (USFS) Pacific Northwest Research Station. This will include data on downed wood and allow ODF to establish a baseline for downed wood in the permit area within the range of the Oregon slender salamander at the outset of the permit term from which overall trends can be monitored over time. Specific details describing compliance and effectiveness monitoring actions, including metrics, methodology, and reporting intervals, as well as their associated biological objective and conservation action, are provided in Appendix N, *Monitoring Tables*. A review of Oregon slender salamander monitoring priorities will be evaluated during each 10-year comprehensive review. ODF and other project partners, including USFWS and ODFW, will determine how best to use monitoring funds during the next 10-year period,

including, but not limited to, focused surveys and/or additional broad-scale determinations of presence or absence in the permit area.

Objective 5.1: Conserve, Maintain, and Enhance Existing Northern Spotted Owl Habitat, Objective 5.2: Facilitate Northern Spotted Owl Landscape Connectivity, and Objective 5.3: Increase the Amount of High-Quality Habitat for Northern Spotted Owl

The monitoring goals for northern spotted owl are to (1) retain understanding of site status in active sites,⁵ including informing operational restrictions for covered activities described in Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species; (2) document presence and trends in nesting, roosting, and foraging habitat both inside and outside HCAs; (3) confirm that northern spotted owl dispersal habitat conditions meet the minimum requirements described in Conservation Action 8: Conservation Actions Outside Habitat Conservation Areas and Riparian Conservation Areas; and (4) track recolonization, survival, and productivity in response to barred owl removal and stand-management activities in HCAs. Compliance and effectiveness monitoring metrics for northern spotted owl are described in Table 5-1.

To support the goals, active sites where covered activities are planned will be monitored each nesting season to inform the application of operational restrictions, in addition to monitoring a subset of active sites in the permit area to ascertain how northern spotted owls are responding to management in HCAs as well as other management actions, such as barred owl management. Monitoring northern spotted owl responses to management in HCAs will be prioritized in locations where habitat quality is improving and northern spotted owls are expected to colonize or recolonize an area. Within that, special priority will be given to areas where barred owl management is occurring to determine whether barred owl removal is resulting in an increase in northern spotted owl use. Surveys will cycle through locations with active or historical northern spotted owl use, generally over a 15- to 20-year period. Within each survey rotation, survey sites will focus on (1) nesting and roosting habitat more than foraging and dispersal habitat, (2) choosing locations with historical northern spotted owl use rather than those with no historical use, 3) prioritizing surveying areas within HCAs over those outside of HCAs, and 4) surveying areas where stand-management activities are expected in the subsequent 10-year implementation plan. In addition, monitoring will focus on HCAs that are large enough to support owls, including dispersal. Monitoring will include a sufficient number of sites and replication so that the results will have enough statistical power to meaningfully inform future management decisions.

Monitoring may include a combination of passive acoustic monitoring and active ground-based call-back surveys following guidance provided by USFWS.

Objective 6.1: Conserve, Maintain, and Enhance Existing Marbled Murrelet Nesting Habitat, and Objective 6.2: Increase the Amount of High-Quality Habitat for Marbled Murrelet

The overall monitoring goals for marbled murrelet are to track the implementation and effectiveness of all relevant conservation measures, with a focus on (1) tracking status in designated occupied habitat, including known occupied survey areas and highly suitable habitat inside HCAs;

⁵ For this HCP, active activity centers are defined as those that have been confirmed at one point and have had less than 6 consecutive years of surveys with no observations.

(2) documenting, on a larger scale, use of other suitable and highly suitable habitats inside and outside HCAs, and (3) determining marbled murrelet responses to stand-management activities in HCAs. Specific details describing compliance and effectiveness monitoring actions, including metrics, methodologies, and reporting intervals, are summarized by biological objective and conservation action in Appendix N, *Monitoring Tables*.

Monitoring methods will be based on the best available techniques at the time monitoring occurs. Monitoring is expected to be conducted primarily through passive acoustic sampling, as described by Borker et al. (2015) and Duarte et al. (2024). Passive acoustic monitoring with autonomous recording units will be based on a protocol accepted by USFWS, if available. Standard field surveys will be conducted to verify passive acoustic surveys as needed and where they are determined to be preferable to passive sampling. Field surveys will follow methods described in Pacific Seabird Group (2024) or any protocol accepted by USFWS. Monitoring will be prioritized in stands that are developing into habitat for marbled murrelets, either due to active management or passive management. Monitoring will include a sufficient number of sites and replication so that the results will have enough statistical power to meaningfully inform future management decisions.

ODF will monitor a subset of suitable and highly suitable habitat distributed across the permit area during the first 20 years of implementation, with results informing application of operational restrictions for covered activities described in Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species. Highly suitable habitat will be surveyed more frequently (e.g., 4 or 6 out of 10 years); suitable habitat will be surveyed less frequently. Monitoring locations will prioritize areas with historical marbled murrelet observations over those with no historical use, areas inside of HCAs over those outside of HCAs, and areas where stand-management activities are expected in the subsequent 10-year implementation plan over those where they are not expected. After the initial 20 years of monitoring across the permit area, the focus of monitoring will shift to assessing nesting activity inside HCAs that have not been surveyed in the past and where occupancy is expected, based on habitat conditions.

Objective 7.1: Conserve, Maintain, and Enhance Occupied Red Tree Vole Habitat, and Objective 7.2: Increase the Amount of High-Quality Habitat for Red Tree Vole

The primary goals of monitoring for red tree vole in the short term are to gain a better understanding of (1) species distribution within the permit area, with particular emphasis on presence and nest density within HCAs; (2) use of young stands and the role that forest management may play in providing young-stand habitat; and (3) how management activities and conservation actions influence the presence and nest densities of red tree voles in the permit area. Potential changes in harvest activities in red tree vole habitat could then be modified, through adaptive management, to further minimize effects on the species. Specific details describing compliance and effectiveness monitoring actions, including metrics, methodologies, and reporting intervals, are summarized by biological objective and conservation action in Appendix N, *Monitoring Tables*.

To establish baseline conditions, ODF will conduct and complete surveys of a subset of suitable and highly suitable habitat in HCAs within 20 years of permit issuance. Surveys will start within suitable and highly suitable habitat in proximity to known subpopulations and occupied stands and then expand into adjacent habitat of lower quality to gain a better understanding of habitat use. Operational restrictions will be applied to known nest trees within the permit area identified through previous external research, incidental observations, or the baseline monitoring described above. Sampling will include selectively surveying young stands for occupancy, either adjacent to

known occupied stands or adjacent to suitable or highly suitable habitat. To determine responses to management actions, monitoring sites will be selected primarily within HCAs and suitable stands outside of but adjacent to HCAs where a harvest is expected to gain information on how adjacent harvest and associated conservation actions affect species persistence. Stands within the Tillamook and Clatsop State Forests, areas where isolated subpopulations have been identified but few occurrences have been documented, will be prioritized for monitoring over stands in the Western Lane and West Oregon Districts, areas where the species is more common. Thus, surveys will begin near known occurrences on the Tillamook and Clatsop State Forests.

Monitoring methods will follow currently accepted techniques and tools at the time monitoring occurs. At the beginning of the HCP, monitoring will implement methods described in the Marks-Fife (2022) survey protocol, which includes ground-based searches for arboreal nests and climbing trees to determine if nests were built by tree voles.

Objective 8.1: Conserve, Maintain, and Enhance Existing Coastal Marten Habitat, and Objective 8.2: Increase the Amount of High-Quality Habitat for Coastal Marten

Initially, the monitoring goal for coastal marten is to gain a better understanding of species distribution and habitat use patterns in the permit area. Once a better understanding of species distribution and habitat use in the permit area is established, monitoring will focus on evaluating changes in habitat quality for coastal marten following management activities and, eventually, species' response to changes in habitat quality. Specific details describing compliance and effectiveness monitoring actions, including metrics, methodologies, and reporting intervals, are summarized by biological objective and conservation action in Appendix N, *Monitoring Tables*.

ODF will conduct a multi-species carnivore survey using passive monitoring methods that focus on marten habitat. The survey will cover the range of coastal marten in the permit area. Following completion of the multi-species carnivore surveys, ODF will identify focus areas within which to continue marten monitoring efforts. These areas will prioritize stands in HCAs where management is planned to promote understory growth as well as stands outside of HCAs. Follow-up monitoring will be conducted to determine whether management treatments achieved the desired understory species and cover and how coastal marten responded to those changes.

Monitoring methods will follow currently accepted techniques at the time monitoring occurs. Passive detection methods such as camera traps and track plate surveys, as well as scat surveys conducted by wildlife detection dogs, will be used to determine species occurrence and relative abundance following accepted survey protocols. ODF will seek appropriate recovery permits with USFWS to conduct camera trapping and track plate surveys that require the use of bait, in addition to the use of lures for monitoring coastal marten. Vegetation surveys may be conducted at camera stations to quantify habitat conditions, including the variables used in habitat models for coastal marten.

Survey methods may be supplemented by live capture and tagging led by external partners to monitor movements of tagged individuals as well as determine movement and survival. Individual tracking may also be used to conduct habitat association monitoring and identify denning, resting, and foraging features as well as understory vegetation associations.

5.4 Adaptive Management

5.4.1 Overview of Adaptive Management Strategy for the Habitat Conservation Plan

This section describes how ODF will use adaptive management to respond to monitoring results and new information. Chapter 7, *Assurances*, describes how ODF will respond to changed and unforeseen circumstances, including new species listings, species delisting, climate change, fire, wind events, invasive species, and disease. An overarching goal of the adaptive management program is to optimize implementation of the HCP and all other ODF programs that relate to or support implementation of the HCP. ODF is striving for efficiency and effectiveness on all fronts and with all programs, including how HCP implementation will adhere to that objective.

For purposes of this HCP, adaptive management is a decision-making process used to examine alternative strategies (e.g., conservation actions) to meet the biological goals and objectives and, if necessary, adjust future management and monitoring actions, based on new information (U.S. Fish and Wildlife Service and National Marine Fisheries Service 2016). Adaptive management is based on a flexible approach whereby actions can be adjusted as uncertainties become better understood or as assumptions change. Monitoring and learning from the outcomes of past actions is the foundation of adaptive management (Williams et al. 2007).

The conservation strategy of this HCP is based on the best scientific information currently available. It is expected that the conservation actions will effectively achieve the biological goals and objectives stated in Chapter 4, *Conservation Strategy*. However, there are varying degrees of certainty associated with the management techniques and conditions in the plan area. Future improvements in forest inventory methods and increased accuracy or precision in important metrics, or improvements in species habitat models, may result in different estimations of current and modeled habitat trends. Results of effectiveness monitoring may indicate that some management techniques are more or less effective than anticipated, resulting in an increase or decrease in their use or modifications in how they are implemented. Evolving science on the habitat requirements, life histories, and distributions of covered species may inform changes to the pattern of implementation of strategies on the landscape that will be implemented within the bounds of the conservation commitments. Monitoring strategies themselves may change as they are improved to better quantify or describe specific habitat metrics.

To address these uncertainties, the monitoring and adaptive management program allows ODF, in close coordination with the Services, to learn from experience and reevaluate and revise the type, extent, and location of the conservation actions when necessary to meet the biological goals and objectives of the HCP.

5.4.2 Adaptive Management Process

The adaptive management process will follow the conceptual model provided in the HCP Handbook (U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries 2016). The model includes a series of steps for identifying problems and their sources, designing and implementing responses to problems, and evaluating the effectiveness of the responses, resulting in a cycle of continuous learning and improvement (Figure 5-1).

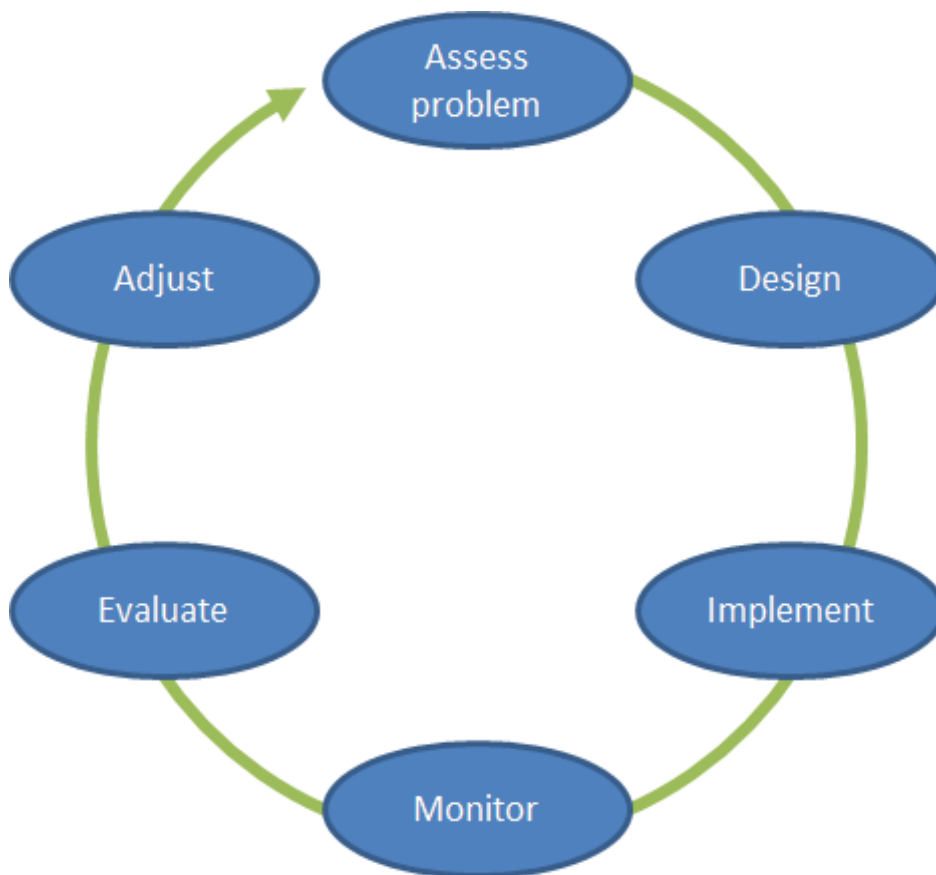


Figure 5-1. Adaptive Management Concept Model

The monitoring program will be *designed* and *implemented* as described earlier in this chapter. Monitoring results will be evaluated as described below and adjusted as necessary, following collection and an assessment of the results.

1. Monitor

- a. The monitoring and reporting program will be implemented at the district and plan-wide levels, as described in Section 5.1, *Monitoring and Adaptive Management Program*.
- b. Monitoring teams, ODF staff members, and forest management contractors will assess and identify deficiencies, lessons learned, new information, new techniques, or other opportunities for improvement, then compile and report such information and associated recommendations to the appropriate district staff members to forward to the HCP administrator. See Chapter 8, Section 8.2, *Implementation Roles and Responsibilities*, and Chapter 9, Section 9.2.1, *Plan Administration and Staffing*, for more details on the roles and duties of these positions.
- c. Monitoring results (Section 5.3.1, *Compliance Monitoring*, and Section 5.3.2, *Effectiveness Monitoring*) and associated lessons learned will be compiled and documented in annual reports that ODF will provide to the Services.
- d. ODF will provide annual reports, 5-year midpoint check-in reports, and 10-year comprehensive review reports to the Services, which are intended to evaluate compliance and effectiveness and inform adjustments going forward. It is expected that most potential

adjustments to specific management techniques will occur during 10-year comprehensive reviews; however, if modifications to management techniques are necessary at any time during the permit term, the Services will be notified and adjustments will be made with resource agency approval.

2. Evaluate

- a. The HCP administrator will evaluate this information to determine whether the conservation strategy is effective in achieving biological goals and objectives and where an adaptive management response may be appropriate.
- b. The HCP administrator will facilitate discussions among ODF staff members, the Services, and pertinent state agencies to fully understand the trends identified and evaluate options for adjustments or corrective actions. ODF and the Services will select an adaptive management response from among the alternatives that are within the scope of the conservation actions detailed in Chapter 4, *Conservation Strategy*.

3. Adjust

- a. ODF will define the corrective or adaptive management response and make adjustments at the appropriate planning level, including adjustments to budgets, operations plans, implementation plans, and policies. Adaptive management adjustments may involve modifications to the way covered activities are implemented, including the number, extent, and location of covered activities as well as project-specific designs and specifications (Section 5.4.3, *Range of Adaptive Management Adjustments*). As part of the annual report, ODF will document adjustments made to budgets, plans, policies, and covered activities.
- b. As stated above, ODF will track monitoring results and any modifications to management practices or alternative strategies selected for implementation in response to monitoring results.

ODF shall coordinate and share the results of monitoring and the effectiveness of adaptive management responses with USFWS, NOAA Fisheries, ODFW, the Department of State Lands, Department of Environmental Quality, county partners, stakeholder groups, and the public. Changes to HCP implementation per the adaptive management program must be approved by the Services prior to execution. Such coordination and approval will be documented in the annual report.

5.4.3 Range of Adaptive Management Adjustments

Before the Services can issue a permit under the HCP, there must be a clear understanding and agreement between them and ODF as to the range of adjustments to the management actions that might be warranted as a result of any adaptive management provisions (U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries 2016). The HCP Handbook further states that changes to the conservation program should be planned to minimize the need for amending the permit.⁶

The range of adaptive management adjustments is expected to focus on how covered activities, including conservation actions, are implemented and fall within operational level planning, including adjustments to annual budgets, project-specific operation plans, 10-year implementation

⁶ The HCP/ITP modification process is described in Chapter 8, Section 8.9, *Modifications to the Habitat Conservation Plan*.

plans, and operation policies, as described below. However, this expectation does not preclude the agencies from collaborating to implement modifications per the adaptive management program at any other time during the permit term or that changes to biological goals and objectives might be warranted.

- **Budgets.** Budgets are prepared both biennially and annually and have a major effect on the type and extent of management activities conducted in any given year. The HCP administrator will consider the results of monitoring and recommend adaptive management adjustments, in coordination with the Services, through the annual, 5-year, and 10-year reporting process. New information and available funding will also be considered when developing annual budgets and work plans, with the budgets adjusted accordingly.
- **Implementation Plans.** Implementation Plans are developed to detail how management strategies that are outlined in the HCP, forest management plan, or operational policies will be implemented. Implementation plans describe forest management activities for a predetermined period, typically 10 years, and are revised either at the end of the period or sooner if circumstances warrant. ODF decisions regarding implementation plans will be informed through 10-year comprehensive reviews of HCP implementation and monitoring, supplemented by annual or other periodic reporting within the implementation period. Adaptive management changes to implementation plans will include changing the type and extent of planned management activities, including specific HCP conservation activities that will be implemented in each district. The HCP administrator and the Services will, together, consider the monitoring and scientific information, HCP biological goals and objectives, and successes and challenges of past conservation actions when considering the approval of proposed habitat management activities within HCAs and enhancement activities in RCAs, along with related adaptive management adjustments to implementation plans.
- **Operation Policies.** Operation Policies are written and revised on an as-needed basis and typically include a policy statement, goals, responsibilities, and standards that provide direction to ODF forest planners in developing implementation and operation plans. In response to HCP monitoring results, ODF may revise existing policies or develop new policies, particularly where potential improvements in BMPs are identified through monitoring or when significant new science or management techniques become available.

Figure 5-2 summarizes the range of planning levels under which adaptive management will be applied, as needed, to respond to deficiencies identified through monitoring or respond to new information and management techniques.

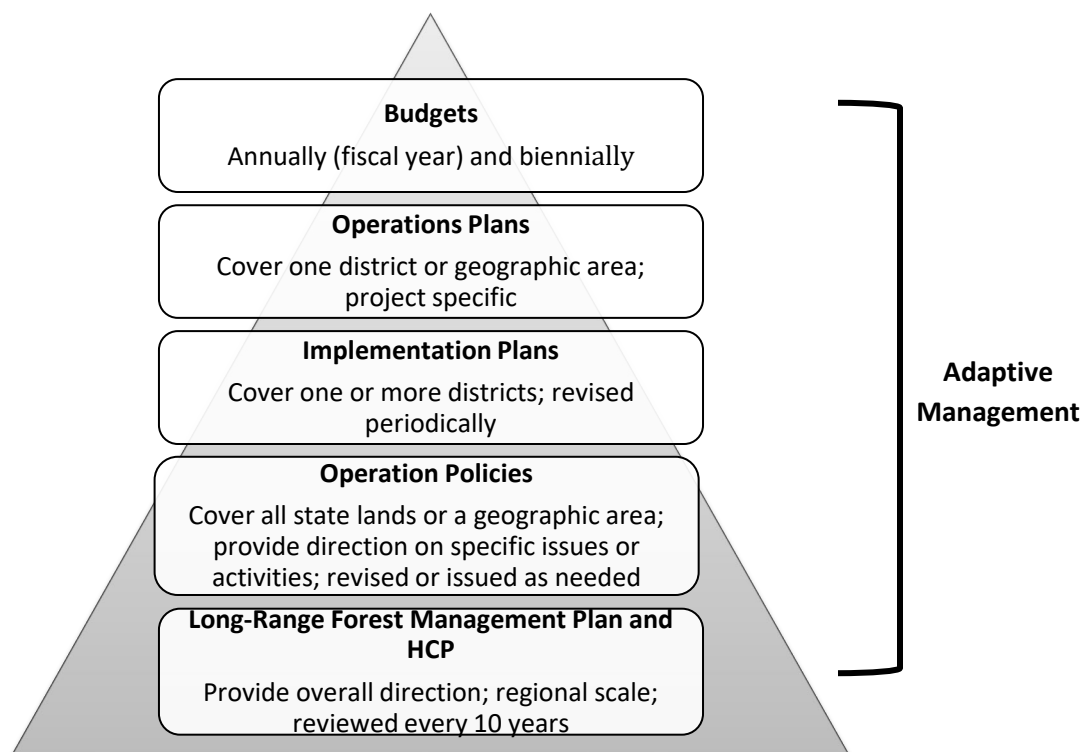


Figure 5-2. Range of Adaptive Management Adjustments within State Forest Management Planning Levels

It is important to note that the range of adaptive management responses at all planning levels falls within the range of covered activities described in Chapter 3, *Covered Activities*. Adaptive management adjustments will involve, among other potential responses, modifications to the way covered activities are implemented, including the number, extent, and location of covered activities as well as project-specific designs and specifications. Any resulting modifications will follow the process in Chapter 8, Section 8.9, *Modifications to the Habitat Conservation Plan*.

Any adaptive management adjustments made during implementation of the HCP will be coordinated with the Services according to the process outlined in Chapter 8, *Implementation*. Any adaptive management actions will be documented in the annual reports ODF prepares and submits to the Services for review and feedback for the duration of the permit. Annual reports will also include details on compliance, impacts, conservation actions, monitoring activities, and results. In addition to documenting changes through adaptive management in annual reports, ODF will complete a 5-year midpoint check-in and a 10-year comprehensive review, at which time the entire monitoring program will be assessed, along with the efficacy of conservation actions. Modifications will be implemented accordingly. If monitoring results identify the need for adaptive management, ODF will work with the Services to develop potential responses that ODF can implement.

5.4.4 Adaptive Management Triggers

Adaptive management responses will be triggered when monitoring or other information indicates the following:

- Existing practices are not achieving, or projected to not achieve, the biological goals and objectives.
- Existing practices exceed projected effectiveness and progress toward achieving the biological goals and objectives.
- Alternative practices are available that can achieve the same biological goals and objectives more efficiently and effectively.

Triggers will vary with the level of planning at which adaptive management is being considered, with major adjustments being made at the policy and implementation planning levels and more minor adjustments being made at the operations-plan and budget level (Table 5-2). Triggers may also change, based on the frequency of new monitoring results and the frequency with which data are collected or made available (e.g., degree of annual variation in baseline conditions or the timescale of the response variable). For instance, species responsiveness or detectability may vary considerably year to year, or habitat response to silvicultural activities may take many years.

Table 5-2. Adaptive Management Triggers at Different Planning Levels

Planning Level	Trigger	Adaptive Management Response
Budgets	Revenue expectations and budget fluctuations such that the conservation fund is not generating expected funding to implement conservation actions, as described in the HCP, or additional actions are needed to respond to monitoring results.	Reevaluate and reallocate budgets and identify opportunities for additional funding sources and partnerships.
Implementation Plans	Deficiencies in compliance or effectiveness identified through monitoring.	Add corrective actions to implementation plan. Adjust type, number, extent, and location of planned operations.
Operation Policies	Deficiencies in the conservation strategy identified through monitoring or based on significant new science or management techniques.	Revise existing policy, create new policy, and/or adjust conservation BMPs.

BMPs = best management practices; HCP = Western Oregon State Forests Habitat Conservation Plan

Adaptive management triggers are based on monitoring results that evaluate the effectiveness of the conservation strategy in meeting the biological goals and objectives. Triggers are designed to provide clear, measurable points at which management responses will be implemented if monitoring results indicate that conservation measures are not achieving, or are unlikely to achieve, the intended outcomes. Table 5-3 identifies conservation actions that may be subject to adaptive management. For each action, the table specifies the associated monitoring metrics, triggers, and adaptive management responses. All responses are tied to the specific conservation measures being monitored and intended to be both practicable and effective at addressing the identified issue.

All adaptive management responses will begin with a determination of the underlying causes of deficiencies/triggers identified. Although most examples focus on conditions where monitoring indicates deficiencies in achieving desired outcomes, the same framework applies when outcomes are exceeded. In such cases, adaptive management may provide opportunities for increased flexibility, provided that any adjustments remain within the scope of covered activities and continue to support achievement of biological goals and objectives. Adaptive management triggers will use methods appropriate to the data structure described. ODF will use this information to track its stay-ahead provision (Chapter 8, Section 8.5, *Reporting*) on a continual basis and report the status of the stay-ahead provision to the Services annually and during the 5-year check-in and 10-year comprehensive review.

Table 5-3. Triggers for Adaptive Management⁷

Monitoring Action	Trigger	Adaptive Management Response ^a
Aquatic		
Natural Wood Recruitment in Streams	Stream habitat surveys indicate natural wood recruitment in streams has not achieved intended results.	Evaluate potential factors associated with wood recruitment, meet with Services, and confer on appropriate adaptive management actions to be implemented, if needed.
Stream Complexity	Stream habitat surveys indicate stream enhancement projects not restoring natural processes and instream complexity.	Evaluate potential factors associated with habitat complexity trends, meet with Services, and confer on appropriate adaptive management actions to be implemented, if needed.
Fine Sediment	Sediment monitoring shows an increase from baseline in fine sediment delivery after 5 years.	Evaluate potential factors associated with increased sediment delivery, meet with Services, and confer on appropriate adaptive management actions to be implemented, if needed.
Stream Temperature	Summertime perennial stream water temperatures rising less than 0.43°F (0.24°C) above natural baseline every 10 years during the permit term.	Evaluate potential factors associated with increased stream temperature, meet with Services, and confer on appropriate adaptive actions to be implemented, if needed.
Fish Passage	Passage barrier removal or improvement projects do not achieve intended benefits.	Evaluate potential factors associated with inadequate performance, meet with Services, and confer on appropriate adaptive actions to be implemented, if needed.
Terrestrial		
Terrestrial Habitat Enhancement	Forest inventory indicates managed or unmanaged stands in HCAs have not resulted in, or are not projected to result in, the development of species' habitat conditions (Chapter 4, Section 4.6, <i>Biological Goals and Objectives</i>), as expected by year 30.	Evaluate potential factors associated with delayed development, meet with Services, and confer on appropriate adaptive actions to be implemented, if needed.

⁷ For Adaptive Management, ODF will meet and confer with the Services regarding decision-making processes, as outlined in Chapter 8, Section 8.7, *Decision-Making in Implementation*.

Monitoring Action	Trigger	Adaptive Management Response ^a
Upland Legacy Feature Retention	Effectiveness monitoring trend indicates legacy features are not persisting on the landscape and meeting HCP goals as intended.	Evaluate potential factors associated with legacy feature retention standards, meet with Services, and confer on appropriate adaptive management actions to be implemented, if needed.
Barred Owl Management	Program evaluation at the 5- and 10- year reporting intervals supports need to improve outcomes.	The permittee will evaluate success of the program with USFWS to determine if changes to removal locations, extent, duration, and/or intensity need to be adjusted.

^a ODF intends to evaluate all potential factors and actions that have the potential to affect a topic and identify how to move forward.

the Services = U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration; °F = degrees Fahrenheit; °C = degrees Celsius

New triggers may be developed in response to new science or emerging issues that influence biological outcomes in the permit area. Any new triggers will be developed in consultation with, and mutually agreed upon by, ODF and the Services.

5.4.5 Adaptive Management and Climate Change

The HCP addresses the anticipated effects of climate change in several ways. As described in Chapter 4, *Conservation Strategy*, measures to increase the resiliency of habitats and species have been incorporated into the conservation strategy, including providing adequate habitat to sustain the persistence of covered species within the permit area in the face of potential habitat losses due to fire, wind, drought, insects, and disease. In addition, proposed conservation actions are distributed throughout the planning area, across elevation gradients and diverse forest types, providing a network of areas that would continue to meet biological goals and objectives, even if portions of some areas are adversely affected by climate change.

And as described in Chapter 7, *Assurances*, climate change is also considered in anticipation of potential changed and unforeseen circumstances; the HCP includes assurances that changed circumstances due to climate change will be addressed through the triggers and associated remedial measures identified in Chapter 7.

In terms of adaptive management, the effects of climate change may be detected through monitoring results that will, in turn, trigger adaptive management responses, using the process previously described. This includes effects that may act as stressors for the covered species as well as those that present risks to the maintenance and enhancement of the quantity and quality of habitat. As such, ODF will use adaptive management to respond to climate change effects at the operational level, including adjustments to budgets, operational plans, implementation plans, and policies. Due to the broad scope and effects of climate change on covered species, adaptive management that may be necessary to respond to environmentally induced scenarios shall be coordinated with state and federal agencies as well as other major forest landowners in western Oregon, including private industrial forest landowners, federal land managers (Bureau of Land Management and USFS), tribal governments, and other natural resource agencies.

Analysis of Effects and Actions that May Result in Take

6.1 Introduction

This chapter presents the analysis of effects of the Western Oregon State Forests Habitat Conservation Plan (HCP) implementation on covered species and their habitat in the permit area. Section 6.2, *Approach and Methods*, describes the approach and methods used for the effects analysis. Sections 6.3 through 6.10 describe the effects of the covered activities on each of the covered species. Discussions of effects are grouped according to covered species with similar types of effects. For example, Section 6.3, *Effects Analysis for Covered Salmon Evolutionarily Significant Units*, discusses all effects on covered salmon, while Section 6.4, *Effects Analysis for Eulachon*, discusses effects on two covered salamanders with similar resource needs. Discussions of effects for terrestrial species are presented individually for each species.

The effects analysis for each covered species includes both adverse and beneficial effects resulting from covered activities, including effects that act directly and immediately on individuals—such as injury from tree removal—as well as effects that occur indirectly over time, such as habitat modification. It identifies the types, causes, and timing of these effects; explains how they may influence species' behavior, fitness, and viability; and outlines the conditions under which incidental take may occur. This analysis is intended to inform findings of the U.S. Fish and Wildlife Service (USFWS) and National Oceanic Atmospheric Administration (NOAA) Fisheries (collectively, referred to as the Services) regarding the amount of incidental take anticipated, rather than to project and quantify the level of take, which remains within the Services' regulatory purview.

6.1.1 Regulatory Context

This effects analysis includes mandatory elements of an HCP and information necessary for the Services to make their findings for issuance of their permits. Sections of the federal Endangered Species Act (ESA) relevant to this effects analysis are as follows.

- Section 10(a)(2)(A)(i) requires, among other requirements, that an HCP specify the impacts on covered species that will likely result from the taking.
- Sections 10(a)(2)(B)(ii) and (iv) state that the Services may only issue an incidental take permit (ITP) if, among other requirements, the applicant will minimize and mitigate the impact of the taking to the maximum extent practicable, and the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.

The Services will need to consult independently to comply with ESA Section 7 prior to issuance of the incidental take permits (ITPs). As a component of this internal consultation, the Services must prepare a written biological opinion describing how their action will affect all listed species and their designated critical habitat. The *Habitat Conservation Planning and Incidental Take Permit Processing Handbook* (HCP Handbook) (U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries 2016) recommends that an HCP include the information necessary for the Services to complete the internal consultation process under ESA Section 7, including a defined action area and associated effects at the local, recovery unit, and range-wide

scales. ESA Section 7 also requires a determination as to whether the federal action (issuance of an ITP) is likely to destroy or adversely modify designated critical habitat.

6.2 Approach and Methods

6.2.1 Determining and Defining Effects

The definition of effects used in this HCP follows the 2019 ESA rule revisions (U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries 2019), which simplified the formal definition of “effects of the action” by combining the categories of direct effects, indirect effects, and effects of interrelated and interdependent actions. The HCP considers effects without further classifying as whether the effects are considered direct or indirect or resulting from interrelated or interdependent actions. Per 50 Code of Federal Regulations (CFR) 402, as revised, effects are considered if they would meet the following two-pronged test.

- If they would not occur but for the proposed action (i.e., implementation of activities described in Chapter 3, *Covered Activities*).
- If they are reasonably certain to occur.

The effects analysis assumes that all proposed conservation actions defined in Chapter 4, *Conservation Strategy*, will be implemented as described (i.e., effects considered and identified are those that would still occur even with conservation actions, including avoidance and minimization measures, in place).

As mentioned in Section 6.1, *Introduction*, this analysis is intended to inform the Services’ analysis regarding the amount of incidental take anticipated, rather than to quantify the level of take, which remains within the Services’ regulatory purview. To inform the Services’ analysis, this chapter quantifies the level of effects anticipated over the permit term, where possible, and also identifies the pathways from covered activities to such effects.

6.2.2 Sources and Types of Effects

This analysis focuses on effects that change the condition of a covered species or its habitat. Effects can be either adverse or beneficial. Effects were determined following an “effects pathway” model described in the HCP Handbook, by which project activities are subdivided into their individual components that, in total, make up all the activities that may be needed to complete the covered activity (U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries 2016). Note that the model is not a computer model, but rather a way of systematically thinking through cause and effects. The model follows the chain of causation to effects, starting with the covered activities and associated components and stressors to resource needs of the species that are affected. The model then considers the behavioral and physical responses of individuals to those stressors and associated biological effects (e.g., reduced reproduction or survival). Next, the model considers how the biological effects on individuals would translate into population-level effects on numbers and distribution.

Effects considered here are those effects that are reasonably likely to occur after proposed avoidance and minimization measures are in place, including the level of take modeled to occur over

the permit term. The effects analysis considers implementation of the conservation strategy as part of the beneficial and net effects evaluation conducted for each covered species.

The effects analysis relies on the following.

- Application of the best available information regarding known effects of covered activities (Chapter 3, *Covered Activities*) on covered species.
- The distribution and extent of covered species and their habitats (Chapter 2, *Environmental Setting*, and Appendix C, *Species Accounts*).
- The natural history, essential behaviors, and resource requirements of covered species (Appendix C).

As described in Chapter 3, *Covered Activities*, the covered activities will occur over a wide geographic area and over a 70-year permit term. As a result, this effects analysis provides estimates of acres of habitat where terrestrial covered species habitat function will be reduced by covered activities and describes how covered activities may result in loss of ecological processes that influence the quality of covered fish and aquatic salamander habitat. Beneficial and net effects for each species were evaluated primarily to describe the extent to which loss of habitat function will be offset by the conservation actions described in Chapter 4, *Conservation Strategy*, and secondarily, the extent to which harm to individuals will be minimized or mitigated.

Adverse effects include any effects of the covered activities that adversely affect covered species or their habitat. For covered species, adverse effects may reduce the number, range, reproductive success, or survival of the covered species. Adverse effects may also affect species behavior in ways that negatively affect reproduction or survival. Adverse effects on covered species' habitat are effects that reduce the ability of the habitat to sustain the species, as a result of either reducing the quantity or quality of the habitat; this is also referred to as loss of habitat function.

Effects may also be considered beneficial, insignificant, or discountable. Beneficial effects have positive effects without any adverse effects on the species or habitat. Insignificant effects relate to the size of the impact and include those effects that are undetectable, not measurable, or cannot be evaluated. Discountable effects are those extremely unlikely to occur (U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries 1998).

6.2.3 Methods and Metrics for Calculating Effects Pathways to Take

The Oregon Department of Forestry (ODF) has determined that proposed covered activities are reasonably certain to result in take of one or more of the covered species and, therefore, is applying for ITP. ESA defines *take* as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or to attempt to engage in any such conduct (16 United States Code [USC] 1542(b)).

ODF is seeking an ITP for covered activities that may harm covered species. *Harm* in the definition of take in the ESA means an act that kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3, 222.102).

As mentioned in the introduction, this chapter identifies effects on covered species to inform the Services' ESA Section 10 findings regarding the amount of incidental take anticipated. Identifying

and quantifying the “level of take” remains within the Services’ regulatory purview. Many of the adverse impacts on covered species anticipated from the HCP will result from the dynamic conditions expected to occur in response to timber management activities in these portions of the permit area. Therefore, the amount and type of anticipated timber management activities—particularly in habitat for covered species—is a primary metric used to measure effects of covered activities on covered species. The covered fish species take is estimated based on the proportion of each Evolutionarily Significant Unit (ESU)’s distribution within the permit area, the acres of modeled harvest levels, miles of road construction, maintenance to recreation infrastructure, and implementation of conservation actions that result in take within the watersheds that overlap with each ESU.

The torrent salamander species potential take is estimated based on the proportion of each potential non-fish (Type N) stream mile within the species’ respective ranges, the acres of modeled harvest levels, miles of road construction, maintenance to recreation infrastructure, and implementation of conservation actions that result in take within their habitat ranges.

For the covered terrestrial species, habitat effects are described in terms of direct effects on individuals, such as noise disturbance and physical harm and effects on habitat that may lead to reduced survival and reproduction, including the ability to breed, feed, or seek shelter from predation or exposure to weather.

Habitat-related effects identified include the following effects.

- The expected loss, modification, and future growth of habitat, as determined by applying habitat models to the outcomes of forest-management activity modeling.
- Total acres of modeled habitat values anticipated to be modified by covered activities over the permit term.

A habitat-based approach is a common practice of USFWS in biological opinions and in the development of HCPs (U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries 2019). ODF is using habitat models to account for habitat quality and the relative probability of occupancy and associated effects on covered terrestrial species.

The habitat acres presented in this chapter are the model outputs and should not be viewed as precise predictions. Habitat estimates are based on many modeling assumptions so some variation is to be expected. The reported numbers represent the modeling outputs based on the best currently available science and information. For some of the biological goals and objectives of the HCP, there is enough uncertainty about habitat models, growth and yield projections, and future climate and disturbance regimes that ODF has identified that actual future outcomes might differ from currently modeled outcomes. These are identified in Chapter 4, *Conservation Strategy*, and in Section 6.2.7, *Modeling Habitat Harvest Inside and Outside of Habitat Conservation Areas*, of this chapter.

For northern spotted owl (*Strix occidentalis caurina*) and marbled murrelet (*Brachyramphus marmoratus*), effects are further documented in terms of the number of known active northern spotted owl territories or areas occupied by marbled murrelet that may be adversely affected under the terms and conditions of the HCP.

6.2.4 Determining Impacts of Take

The *Impacts of the Taking* section for each covered species is based on guidance provided in the HCP Handbook (U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries 2016). These sections consider effects with minimization measures in place, but prior to any compensatory mitigation. Compensatory mitigation, such as the offsetting benefits of cumulative habitat gains over time, is considered as part of the beneficial and net effects analysis.

The impact of taking considers the population-level impact that is commensurate with the species distribution and permit area. Per the HCP Handbook, determining impacts of take consists of defining the context, intensity, and duration of effects, as well as effects on reproduction, numbers, and distribution (U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries 2016).

While authorized take under ESA Section 10 pertains to individuals of a covered species and surrogate habitat indicators that describe the extent of take, the impact of the taking is assessed at the population level. This includes consideration of the species' distribution, life history, and ecological role in the permit area. The analysis does not quantify take directly but instead characterizes the biological and spatial context necessary for the Services to make determinations under both ESA Section 10 and Section 7.

6.2.5 Determining Beneficial and Net Effects

The conservation actions defined in Chapter 4, *Conservation Strategy*, outline the measures ODF will undertake to minimize effects on covered species and fully offset the impacts of taking. Minimization measures are already considered as part of the effects determination and in predicting and calculating effects. Compensatory mitigation measures have not been considered in the effects analysis because take occurs whether or not it is compensated for by mitigation. Mitigation proposed as part of conservation actions includes creating additional habitat to compensate for habitat lost or habitat with reduced function during the permit term. Therefore, for each species for which an increase in habitat quality or quantity is proposed, compared to the existing condition, the modeled "net" effect on habitat has been quantified. The timing of when such benefits would occur is described in relation to the timing of effects intended to be mitigated.

In some cases, the process of improving habitat quality may result in short-term adverse effects (e.g., thinning). Such short-term adverse effects are considered under the *Impacts of the Taking* sections.

6.2.6 Determining Effects on Critical Habitat

The *Effects on Critical Habitat* section for each species provides an analysis of the effects on critical habitat, if it has been formally designated by USFWS or NOAA Fisheries for the covered species (critical habitat may be designated only for listed species). This analysis is not a requirement for an HCP but is intended to assist the Services in their mandatory evaluation of whether the federal action of issuing a Section 10(a)(1)(B) permit may destroy or adversely modify designated critical habitat. The USFWS and NOAA Fisheries document this analysis in their respective Section 7 biological opinions to conclude their intra-service consultation. The critical habitat analysis in this HCP is provided to support the analysis in the USFWS and NOAA Fisheries biological opinions.

Effects on salmon and steelhead critical habitat are evaluated by assessing effects of HCP implementation on physical and biological features of freshwater spawning and rearing sites in stream reaches within designated critical habitat.

Critical habitat has been designated in the permit area for ESA-listed Oregon Coast coho, Southern Oregon-Northern California Coasts coho, Lower Columbia River coho, and Upper Willamette River steelhead (Chapter 2, *Environmental Setting*). Critical habitat has not been designated in the permit area for Oregon Coast Chinook and Southern Oregon-Northern California Coastal Chinook. Covered Chinook and coho salmon in the Oregon Coast and Southern Oregon-Northern California Coast ESUs overlap in distribution; thus, the effects on Oregon Coast Chinook and Southern Oregon-Northern California Coast coho critical habitat is likely to be the same for Oregon Coast and Southern Oregon-Northern California Coast Chinook habitat, should it be designated during the permit term. Critical habitat has not been designated for the Columbia torrent salamander (*Rhyacotriton kezeri*) or Cascade torrent salamander (*Rhyacotriton cascadae*), so effects on critical habitat for these species are not discussed further.

Effects on critical habitat of terrestrial species are evaluated by determining and quantifying the area (in acres) of effects on lands within designated critical habitat units, including the current condition of the lands as highly suitable, suitable, marginal, or non-habitat. Terrestrial covered species with designated critical habitat in the permit area are northern spotted owl, marbled murrelet, and coastal marten (*Martes caurina humboldtensis*). Critical habitat has not been designated for Oregon slender salamander (*Batrachoseps wrighti*) and red tree vole (*Arborimus longicaudus*).

6.2.7 Modeling Habitat Harvest Inside and Outside of Habitat Conservation Areas

Effects on habitats used by covered species are based on forest modeling and harvest scheduling scenarios that have been developed by ODF to estimate financial outcomes during forestry planning. This HCP uses modeling outcomes completed in 2020 to model timber growth on a volumetric basis, using an age-based scenario of timber harvest that models forest growth tapering off at 65 years of age, with harvest occurring approximately 5 to 15 years after that. The 2020 modeling outcomes provide an illustrative example of how harvest could occur over time, including pacing and spatial distribution. However, the 2020 modeled scenarios are not intended to predict actual harvest outcomes on the ground and may not be realized as shown. Actual forest culmination ages at harvest may be slower over the permit term due to changes in tree growth and mortality, or that operational decisions could lead to differences in rotation ages or harvest scenarios outside of habitat conservation areas (HCAs) from the 2020 modeling outcomes analyzed in this chapter. For this reason, and to facilitate take estimates by the Services, both average and maximum harvest estimates are provided; however, ODF is committed to the maximum harvest values. In spring 2021, NOAA Fisheries used the 2020 modeling in the Draft Environmental Impact Statement (EIS), both for the HCP harvest scenario and for additional alternatives considered for the Draft EIS.

The annual harvest model used in this HCP modeled harvest acres in any given 5-year interval inside HCAs could reach 2,500 acres in any year or 12,500 acres across a 5-year period during the first 30 years of the permit term (i.e., a total of 75,000 total acres over 30 years), as described in Chapter 4, Section 4.7.7.3, *Pace and Scale of Management in Habitat Conservation Areas*. Outside HCAs, the annual harvest model modeled an average of 7,000 acres per year, although those values are

anticipated to reach up to 10,000 acres per year (50,000 acres per 5-year interval) in some periods, but this could vary due to fluctuating markets, operational decisions, and tree growth and mortality.

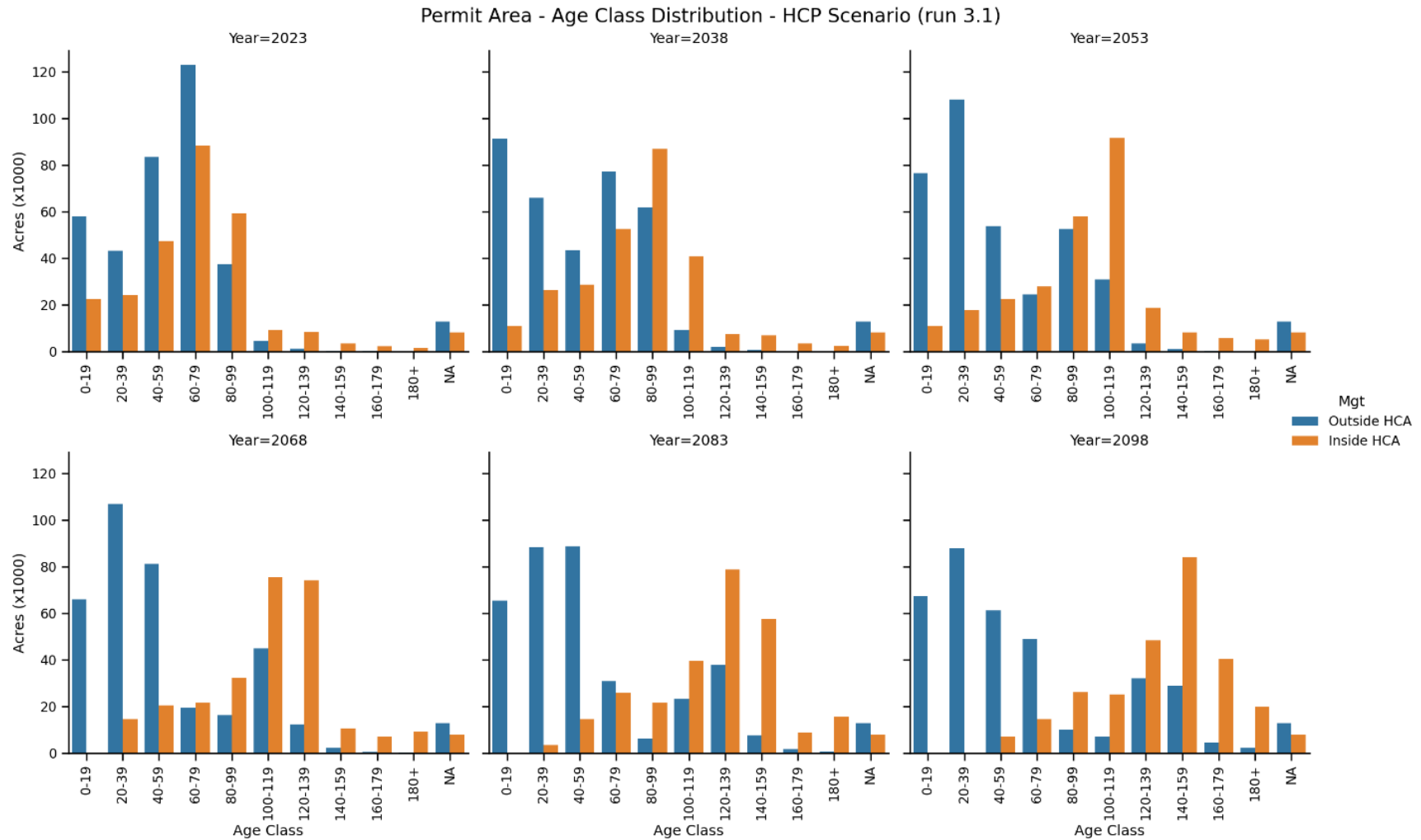
Operationally, it is anticipated that 90% of the harvest outside of HCAs will be in the form of regeneration harvest in any given 5-year interval. The intent is to have harvest levels that are sustainable over the long term. Higher levels of harvest would be episodic rather than persistent through time. Operational harvest decisions are not driven by model choices and could vary over time (i.e., exactly when and where to harvest timber or conduct habitat improvements), and data inputs (inventory updates, growth rates, etc.), and the models themselves are subject to improvements over time. All models have an inherent degree of uncertainty.

6.2.7.1 Modeled Age Class in the Permit Area Outside of Habitat Conservation Areas Through Time

The following descriptions are provided to aid the Services in understanding the landscape outside of HCAs throughout the permit term based on the modeling outcomes completed in 2020. The age classes listed below were modeled using 2023 inventory data.

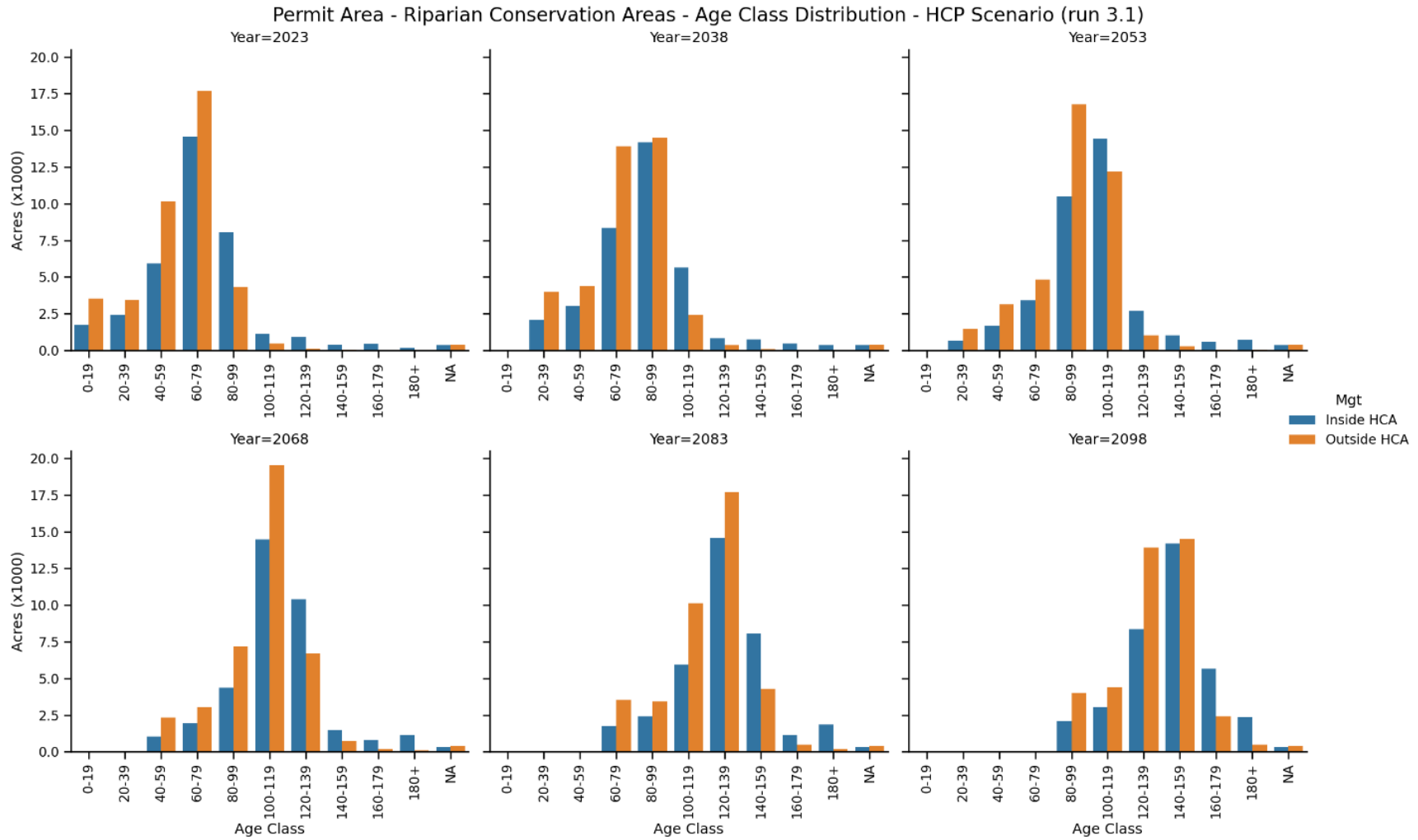
- **Age class in entire permit area outside HCAs.** Habitat outside HCAs can be seen to have mostly young regenerating stands through time; however, an average of approximately 81,000 acres of stands over 80 years old are shown to occur outside HCAs in each 5-year time period beginning in 2043. Another average of approximately 100,000 acres of stands between 40 and 79 years old occur outside HCAs over the same time period (Figure 6-1).
- **Age class in riparian conservation areas (RCAs) in permit area outside HCAs.** Habitat in all RCAs, whether inside HCAs or not, can be seen to progress through age classes through time (Figure 6-2). Outside HCAs, there is an average of approximately 34,000 acres of RCAs in each 5-year time period beginning in 2053 that are over 80 years old. The percentage of stands in each 5-year time period that are in RCAs and are over 80 years old increase from 9% of the combined values quoted above in 2023 to 45% in 2093. The locations of RCAs will remain fixed over the permit term and provide long-term dispersal or foraging habitat for covered species.
- **Age class in the operationally limited areas in the permit area outside HCAs.** Habitat in operationally limited areas are stands that are currently deemed unharvestable because they occur in areas where access is limited, or are otherwise retained in the landscape (e.g., visual barriers, geologically sensitive areas, campgrounds). Some of these stands may be harvestable in the future. Outside HCAs, there is an average of approximately 21,000 acres of operationally limited stands that are over 80 years old beginning in 2053 (Figure 6-3). The percentage of stands in each 5-year time period that are operationally limited and are over 80 years old increase from 2% of the combined values quoted above in 2023 to 26% in 2093.

In summary, the average of approximately 81,200 acres of habitat outside HCAs beginning in 2043 comprise stands over 80 years old. These are modeled to be made up of mostly RCAs (~34,000 acres) or operationally limited areas (~21,000 acres). The remainder (average of approximately 26,000 acres per decade) of stands outside HCAs that are over 80 years old are subject to harvest.



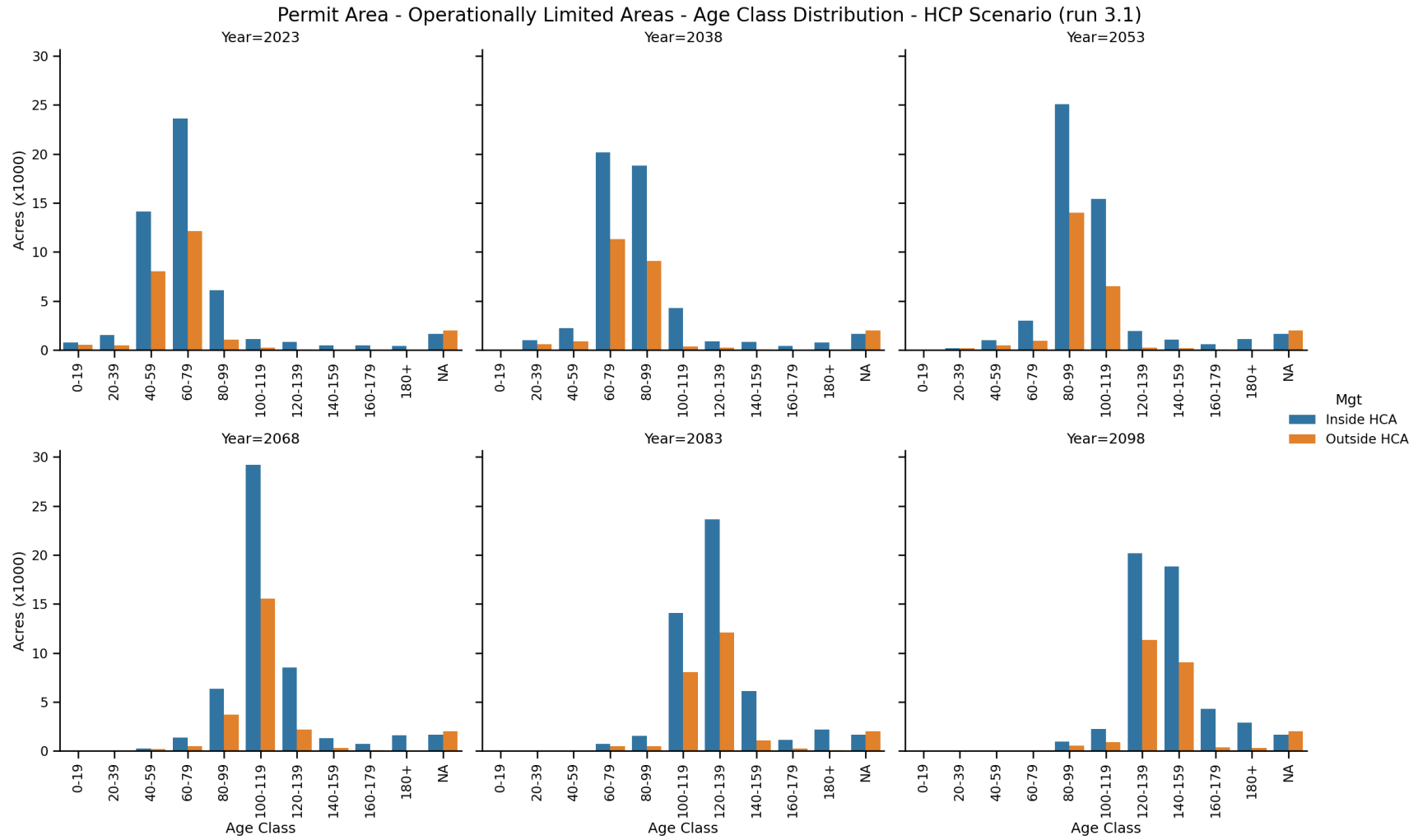
Note: The columns are total acres of each 20-year age class located either inside HCAs (in orange) or outside HCAs (in blue). Y-axis scale is to 120,000 acres.

Figure 6-1. Modeled Age Class Structure of All Stands in the Permit Area Over the Permit Term as a Result of Growth and Harvest



Note: The columns are total acres of each age class located either inside HCAs (in orange) or outside HCAs (in blue). Y-axis scale is to 20,000 acres.

Figure 6-2. Age Class Structure of the Riparian Conservation Areas in the Permit Area Over the Permit Term



Note: The columns are total acres of each age class located either inside HCAs (in orange) or outside HCAs (in blue). Y-axis scale is to 30,000 acres.

Figure 6-3. Age Class Structure of Operationally Limited Stands in the Permit Area Over the Permit Term

6.3 Effects Analysis for Covered Salmon Evolutionarily Significant Units

This section describes the effects of the covered activities on the eight ESUs of listed salmon and steelhead covered by this HCP. Many of the effects of the covered activities are the same or similar across all or most of the listed salmonid ESUs covered by this HCP. In cases where effects are similar or the same, the listed salmon and steelhead ESUs covered by this HCP are referred to as the covered salmonid species. The known range of Oregon Coast coho and spring-run Chinook, Lower Columbia River coho, and Columbia River chum have the greatest overlap with the permit area (Appendix C, *Species Accounts*). Upper Willamette River steelhead, Upper Willamette River Chinook, and Southern Oregon-Northern California Coast coho and spring-run Chinook have limited distribution in the permit area (Appendix C). Lower Columbia River Chinook fish distribution does not overlap the permit area, but waters from the permit area empty into streams within their distribution (Appendix C).

This section presents the analysis of effects of the covered activities on covered salmonid species and their habitat in the permit area. Under the ESA, “effects of the action” are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02). The conservation actions (Chapter 4, *Conservation Strategy*) in the HCP are expected to protect salmon, steelhead, and their habitat in the permit area.

Effects on the covered salmonid species, by independent population, are described here. This section also presents the cumulative effects of projects other than HCP covered activities in or near the permit area and effects on covered salmonid species’ critical habitat.

6.3.1 Sources and Types of Effects

The covered activities described in Chapter 3, *Covered Activities*, could result in the following categories of stressors on the covered salmonid species, each of which is described in more detail below.

- **Reduce large wood recruitment.** Reduction in availability of large wood for instream complexity.
- **Reduce water quality and quantity.** Reduction in function or quality of habitat because of covered activities.
- **Impede fish passage.** Reduction in access to suitable habitat due to artificial barriers (e.g., undersized culverts, large jump heights).
- **Cause mortality.** Injury or mortality of individuals because of handling or crushing by equipment, humans, or felled trees and loss or alteration of habitat features important to support successful reproduction and growth and development of salmonids.

These stressors are categorized in this manner to facilitate a meaningful assessment of the effect's pathways for the covered salmonid species. The following subsections describe the effects pathways associated with each of the stressors that result from the covered activities.

Vulnerability of the covered salmon to take by the described activities is dependent on the life stage of the salmon, their residency time in the system, their location in the system, and the timing of activities. These factors are considered below in the summary of stressors.

6.3.1.1 Large Wood Recruitment

A lack of effective large wood in streams to create and maintain suitable habitat in fish-bearing streams is common in the permit area. Reduced large wood in streams is the result of past harvest of trees in the riparian zone as well as clearing wood and logjams from river channels (Bryant 1983). Large living and dead wood in riparian zones provide important habitat for the covered salmon and steelhead. Large riparian trees that die and fall into and near streams, such as in floodplains and wetlands, regulate sediment and flow routing, influence stream-channel complexity and stability, increase pool volume and area, and provide refugia and cover for fish (Bisson et al. 1987; Gregory et al. 1987; Hicks et al. 1991; Ralph et al. 1994; Bilby and Bisson 1998). The loss of large wood is a primary limiting factor for salmonid production in almost all watersheds west of the Cascade Mountains (Appendix E, *Effects Analysis*).

Harvest in riparian areas adjacent to streams eliminates or reduces the amount of large wood available for delivery to streams resulting in a decrease of instream habitats (e.g., habitat and channel complexity, cover) used by the covered salmon and steelhead in the permit area for spawning, rearing, and migration. The effects of the HCP on large wood recruitment are expected to be minimized due to the implementation of Conservation Action 1: Establish Riparian Conservation Areas, and Conservation Action 2: Riparian Equipment Restriction Zones. Implementation of these conservation actions will retain most of the wood volume in RCAs during the 70-year permit term (TerrainWorks 2020), which will be available for recruitment into streams that support covered salmon and steelhead. Most of the large wood recruited from RCAs will come from streamside sources (i.e., RCAs adjacent to fish-bearing streams [88%]), while the remainder (12%) comes from debris flows in the upper watersheds (TerrainWorks 2020).

Large wood delivery to Type F waters and ecologically important Type N waters from potentially unstable slopes result from shallow landslides/debris flows as well as from deep-seated landslide processes. Because the HCP will retain 35-foot RCAs on both sides of any Type N stream with the potential to deliver large wood to Type F streams and a 500-foot-long, 50-foot-wide process protection zone (PPZ) at the confluence of high-energy and potential debris-flow streams and fish-bearing streams, large wood recruitment from these areas is expected to remain at or near background levels. In addition, areas with potentially unstable slopes that have the potential to deliver to a fish stream, RCAs will be expanded out to up to 170 feet (horizontal distance) to more fully encompass nearby potentially unstable slopes known as inner gorges and aquatic adjacent unstable areas, as described in Chapter 4, *Conservation Strategy*, and Appendix I, *Unstable Slopes Riparian Strategy*. This is particularly true for areas in the northern part of the permit area where high landslide frequencies make mass-wasting an important debris delivery mechanism.

Thinning and other silvicultural practices in RCAs will be limited to cable corridors and process-based restoration (PBR) actions described in Conservation Action 3: Stream Complexity. PBR will be applied to outer patches of RCAs that consist of densely planted conifers, previously managed for

timber production, but located outside the former designated riparian management areas. This action will promote tree growth in overstocked stands that would otherwise take longer to reach late-seral conditions. PBR is capped at 3,427 acres across the permit area and will occur in outer bands of RCAs. Although thinning can result in a reduction in the number of trees that could contribute to large wood in streams over time, the increase in size of remaining trees will be more effective in forming complex habitats and stay in the aquatic system for a longer period of time; therefore, this action is unlikely to reduce the potential of large wood recruitment to the stream network.

Reductions in the amount of large wood available for instream recruitment in RCAs will be associated with new road construction in the RCA, where no upland alternative is viable. In addition, new roads constructed within 200 feet of a stream channel can cause a decrease in the potential of large wood recruitment to streams. The construction of a new road will require vegetation removal that will persist until the road is vacated and trees can regrow. The acres of riparian habitat that will be protected under Conservation Action 1: Establish Riparian Conservation Areas, are shown in Table 6-1, which represents the area under the HCP that will be maintained as a source of large wood for the covered species. These acres are further split out by ESU in Section 6.3.2, *Impacts of the Taking on Salmon and Steelhead*. Over the course of the permit term, stand-age distribution in the permit area will trend toward older forests (Figure 6-4).

Table 6-1. Acres of Riparian Conservation Areas Created Under the Habitat Conservation Plan

	North Coast	South Coast	Willamette Valley	Total
Acres of habitat in RCAs	65,400	4,600	7,900	77,900
Percent of total acres	84%	6%	10%	100%

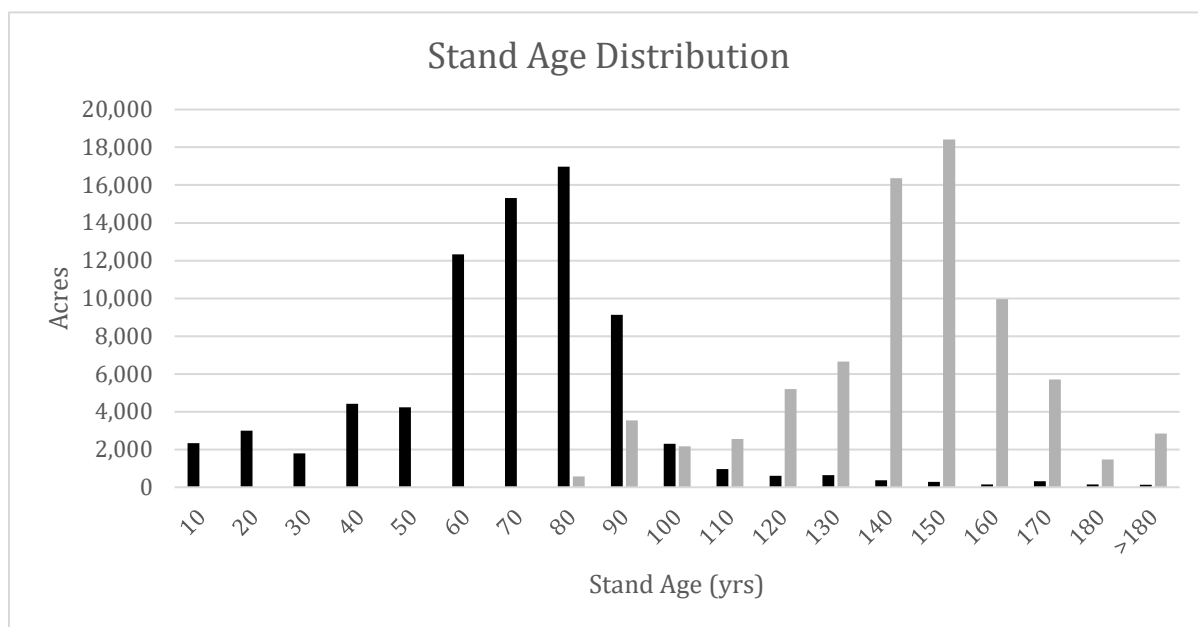


Figure 6-4. Stand-Age Distribution in Riparian Conservation Areas Near the Start (2023, black) and End (2093, gray) of the Permit Term

A diversity of riparian age classes, with the presence of mature trees, will help supply organic material (leaves, woody debris, and macroinvertebrates) and serve as an ongoing source of large wood to provide instream structure that benefits the covered salmon and steelhead.

Potential for Take to Occur

Implementation of Conservation Action 1: Establish Riparian Conservation Areas, and Conservation Action 2: Riparian Equipment Restriction Zones, will retain enough riparian forest to allow large wood to be recruited into fish-bearing streams in the permit area, including streams with high debris flow potential that are non-fish-bearing. The construction of new roads or cable corridors will result in minor reductions in the amount of large wood available for recruitment at some locations in the permit area. These actions will be governed by Conservation Action 3: Stream Complexity, and Conservation Action 11: Road and Trail Construction and Management Measures, which limits new road construction in RCAs to occur when no other viable alternative is available. This minor reduction in available large wood associated with the construction of new roads or cable corridors will be unlikely to result in take. In addition, the implementation of PBR in RCAs will result in the development of larger trees over time, leading to higher-quality large wood recruitment that will deliver instream structure into the aquatic system throughout the permit term.

6.3.1.2 Water Quality and Quantity

Riparian areas maintain ecological processes, such as regulating stream temperature and streamflow, cycling nutrients, providing organic matter, filtering chemicals and other pollutants, trapping and redistributing sediments, stabilizing stream channels and banks, absorbing and detaining floodwaters, maintaining fish habitats, and supporting the food web for a variety of biota (Buffler et al. 2005). The removal of functional riparian forests can degrade water quality and quantity, while protection and expansion of existing riparian forests can improve conditions.

The effects of timber harvest and its associated activities can affect the covered species at both a local and watershed scale. Implementation of the HCP will include protection of existing functional riparian systems and restoration of degraded riparian systems to improve potential water quality issues. Impaired, river miles account for approximately 5% of the total stream miles in the permit area, with the majority occurring in the Coast Range ecoregion. A summary of these waterbodies can be found in Chapter 2, Table 2-4 and Section 2.3.2, *Physical Setting of the Plan Area by Ecoregion*, which describes the physical landscape of the plan area by ecoregion. An assessment of the function and quality of habitat, related to water quality and quantity parameters, as a result of covered activities is presented below. Further analysis of impacts, by ESU, is provided in Appendix E, *Effects Analysis*.

Water Temperature

Fish are ectothermic (cold blooded) animals, and the environmental conditions of the stream control their body temperature. Because water temperature affects the body temperature of fish, it can regulate activity and physiological processes (Thompson and Larsen 2004). Stream temperature directly influences aquatic organisms' physiology, metabolic rates, susceptibility to disease and nonnative competitors, and life-history behaviors and influence aspects of important processes of habitat for fish and aquatic species such as nutrient cycling and productivity (Allen 1995). Interactions between external drivers of stream temperature such as air temperature, solar radiation, and wind speed and the internal structure of the stream system such as the channel,

riparian zone, hyporheic exchanges, and alluvial aquifers drive stream temperature regimes (Poole and Berman 2001).

Harvest and thinning activities adjacent to fish-bearing streams can increase summer stream temperatures through reduction of shade that results in increased solar radiation reaching the water's surface. This can also occur on small, non-fish-bearing streams that flow into fish-bearing streams, particularly in non-fish-bearing stream reaches immediately upstream of fish-bearing streams. These temperature increases, if not managed, can extend downstream into fish-bearing waters and affect the covered salmon and steelhead.

During the summer months, many of the streams that salmon juveniles inhabit are already close to harmful or lethal temperatures, with approximately 125 river miles in the Coast Range listed for temperature concerns on the Oregon Department of Environmental Quality (DEQ) 303(d) list. With the expectation of rising stream temperatures due to global climate change, increases in infection rates of juvenile salmon by parasites and competition by warm-water species may become an increasingly important stressor both for freshwater and marine survival (National Oceanic and Atmospheric Administration Fisheries 2016). Effects of rising temperature on the covered species could include physiological stress and reduced growth, disruption of life cycle timing, and increased predation and disease that could reduce survival and reproductive success (National Oceanic and Atmospheric Administration Fisheries 2016). Potential effects on water temperature from harvest and thinning activities in the permit area are expected to be reduced by maintaining RCAs adjacent to the aquatic zone (see Chapter 4, *Conservation Strategy*, for full RCA description). Stream shading and instream temperature protection will be maintained by retaining vegetation in riparian areas during adjacent harvest activities. As shown in Figure 6-4, vegetation in the riparian buffers will continue to grow over the course of the permit term, increasing the total amount of riparian shade and over time evolving into multi-layered riparian stands capable of providing adequate shade under a wide variety of provided conditions.

RCA widths vary by the presence of fish, stream size, flow duration and the potential for landslides or fluvial transport during high-energy seasonal flow events. All fish-bearing streams and large and medium non-fish-bearing perennial streams will have a 120-foot buffer (horizontal distance). The U.S. Environmental Protection Agency (EPA) (U.S. Environmental Protection Agency 2013) indicates that a 120-foot no-cut buffer is adequate to prevent riparian shade loss that would cause stream temperatures to increase.

RCAs adjacent to small non-fish-bearing perennial will be narrower than RCAs associated with fish-bearing and medium and large non-fish-bearing streams. Small perennial non-fish-bearing streams will have PPZs that extend 120 feet (horizontal distance) from the aquatic zone for the first 500 feet upstream of the end-of-fish use to protect stream temperatures in water within that 500 feet. It also allows for some temperature recovery from narrower upstream buffers as water flows from a small non-fish perennial stream into a fish-bearing stream. Upstream of the 500-foot PPZ, the buffer will be 35 feet (horizontal distance) from the aquatic zone.

The 120-foot RCA (horizontal distance) within the 500-foot PPZ at the intersection of fish-bearing and small perennial non-fish-bearing streams will help ameliorate any potential stream temperature increases from upstream and prevent any further heating to the stream. The PPZ buffer will not entirely dissipate accumulated heat from upstream reaches; however, it will allow for some stream temperature recovery prior to reaching a fish-bearing stream and prevent additional heat

accumulation within 500 feet of the fish-bearing stream.¹ The PPZ was identified based on a literature review process with the HCP Scoping Team.² A list of sources reviewed by the Scoping Team to assess how forestry activities and riparian management strategies affect downstream temperatures in the proposed PPZ is provided in Appendix E, *Effects Analysis*, and summarized below.

While the 120-foot-wide-by-500-foot-long PPZ is not expected to completely offset the effects of harvest on small non-fish-bearing stream temperature, it would result in substantial reduction of water temperature changes prior to entering fish-bearing streams. Bladon et al. (2018) found that while maximum daily stream temperatures were elevated in small, non-fish-bearing headwaters after harvest, there was no statistically significant measurable downstream warming related to upstream harvest activities on small headwaters streams.

Numerous upstream–downstream longitudinal studies examined temperature recovery downstream of single harvest units. Davis et al. (2015), in an analysis of sites from ODF's RipStream study, found that the temperature change 300 meters (984 feet) downstream of harvest units on small and medium fish-bearing streams was approximately 56% of the change at the harvest unit, on average (range of 1% to 82% of harvest unit change). However, this behavior was highly site-dependent (streams with lower gradients or greater surface area showed lower remaining temperature change magnitudes at 300 meters, demonstrating heat loss dependence on groundwater, transit time, and surface area).

Arismendi and Groom (2019), in another RipStream analysis, also showed a tendency for downstream sites to converge toward the pre-harvest equilibrium, the tendency generally strengthened with time, and post-harvest temperature regimes with wide buffers returned to behavior that was statistically similar to their pre-harvest characteristics, while sites with narrow buffers often did not. Roon et al. (2021) found that, in streams with measurable temperature increases after riparian thinning (approximately 50% removal of canopy cover), six of eight warmed study reaches continued to have measurable stream temperature increases 150 to 200 meters (320 to 656 feet) downstream of the thinned reach.

Several other studies examining the extent of stream temperature recovery toward pre-harvest conditions downstream of harvest units show incomplete downstream mitigation of single harvest unit temperature increases that were due to narrow stream buffers.

- Keith et al. (1998) shows 0.5 degrees Celsius (°C) of 5.0°C of the temperature increase remaining after 73 meters (240 feet) and 0.5°C of 6.0°C temperature increase remaining after 46 meters (151 feet).
- MacDonald et al. (1998) shows 2°C of 3.0°C increase remaining after 500 meters (1,640 feet).
- Rutherford et al. (2004) shows 0.77°C to 7.18°C increase reduced by 0.35°C to 2.51°C, over distances of 153 to 892 meters (502 to 2,926 feet).
- Wilkerson et al. (2006) (unbuffered streams) shows 1.8°C of 2.8°C increase remaining and 1.3° of 2.5°C increase remaining after 100 meters (328 feet).

¹ Non-fish-bearing streams are often higher in gradient than the use of listed species, creating additional shaded buffers above critical habitat to provide further cooling of the stream.

² The Scoping Team is composed of representatives from ODF, Oregon Department of State Lands, DEQ, ODFW, USFWS, and NOAA Fisheries.

- Zwieniecki and Newton (1999) shows study mean across sites was 0.4°C of 1.09°C increase remaining after 150 meters (492 feet).

Unlike the small non-fish-bearing streams observed by Bladon et al. (2018), some of the above studies were primarily conducted on fish-bearing streams. Non-fish-bearing headwater streams often have very high groundwater inputs, low flow volumes relative to fish-bearing streams, and substantial post-harvest flow increases so heat loss and dilution may be a greater factor in return to equilibrium than in fish-bearing streams (Moore et al. 2003; Story et al. 2003; Kibler et al. 2013). Heated water from harvested sites around non-fish-bearing headwaters can rapidly decrease in temperature and move toward pre-harvest equilibrium upon flowing through fully forested stream reaches in the absence of subsequent harvest units, depending on site conditions such as gradient and cold-water inputs. With other harvest units present, measurable cumulative heating is probable unless harvest site best management practices (BMPs) prevent substantial riparian shade loss. Cole and Newton (2013) showed cumulative temperature increases through multiple harvest units with private forest-type buffers (0 to 50 feet³), even when separated by uncut reaches, on three of four study streams. The 120-foot-wide buffers in the PPZ will likely prevent additional harvest-related heating within the 500 feet directly upstream of fish-bearing reaches.

While temperature recovery may not be total through the 500-foot PPZ, the relative total flow contribution of non-fish streams in a harvest unit to the receiving fish-bearing stream is critical. For example, a net temperature increase of 0.5°C in a non-fish stream will be undetectable ($\leq 0.2^\circ\text{C}$) in a fish stream if it provides 40% or less of the total fish-bearing stream's flow, while an increase of 1.5°C must comprise no more than 13% of the total fish-bearing stream's flow (Appendix E, *Effects Analysis*) This includes an average increase of 1°C for a 35-foot buffer, which falls within the range of responses in the longitudinal studies described above. With attenuation to 0.75°C at 500 feet, temperature increases in a fish-bearing stream may be undetectable if the non-fish-bearing streams' contributions in a particular harvest area are no more than 27% of the combined total flow of the receiving fish-bearing stream (Appendix E) based on Bladon et al. (2018), that non-fish stream contribution could be as high as 67%. Considering the range of temperature recovery responses in the literature, the semi-conservative nature of heat pollution, and the dependence on site-specific characteristics, the 500-foot PPZ provides a reasonable degree of certainty that measurable temperature impacts on fish-bearing reaches in the permit area will be avoided.

Conservation Action 11: Road and Trail Construction and Management Measures, will limit new road construction and stream crossings within RCAs and provides BMPs for roads that need to be constructed in the RCA due to no other viable alternative, and existing road improvement and vacating projects. Right-of-way clearing for road building can permanently remove an average width of 45 feet of vegetation (Appendix H, *ODF Roads Manual*) within the new road's right-of-way that would reduce stream shading due to a reduction in tree density. Management direction will limit new road construction such that roads will infrequently⁴ occur in RCAs, which limits temperature effects on adjacent streams. However, some circumstances will require new road construction in RCAs for harvest in areas outside RCAs to occur. In these instances alternatives will be explored and the option that provides the least amount of impact on the protected resource will be documented and utilized. Due to the limited amount of roads that are expected to be constructed in RCAs and the implementation of Conservation Action 11 impacts on stream shading and temperature are

³ Both sun-sided partial and two-sided.

⁴ New road construction in RCAs for harvest outside of RCAs occurs a few times annually, but generally does not occur on every State Forests district, every year (Conservation Action 2: Riparian Equipment Restriction Zones).

expected to be localized and minor and will decrease with downstream flow and shading provided by RCAs.

PBR will occur in outer segments in RCAs as described in Chapter 4, Section 4.7.3.2, *Process-Based Restoration*, to improve key riparian habitat features for the covered species. PBR may occur in all stream classification types, but the majority are located in PPZs due to the entirely new buffer requirement from past riparian management protections. Implementation would include reducing the stems per acre of sub-dominant trees in even-aged younger conifer stands that are frequently characterized by dense stands lacking in structural and compositional diversity. Trees that are retained in the RCA will achieve late-seral conditions more quickly and enhance shade and large wood recruitment to the stream. In addition, understory development in these segments will be enhanced through treatments that provide sufficient light to maintain a vigorous and diverse understory, which is most effective for trapping sediments and nutrients (Broadmeadow et al. 2004). PBR will only occur once (single entry) for each segment identified for treatment and ODF will spread out treatments in watersheds where there are greater longitudinal distances of proposed treatment areas to minimize measurable impacts on stream temperatures. Due to the short longitudinal segments proposed for treatment, ODF does not anticipate measurable impacts on overall stream temperatures but recognizes that short-term localized impacts may be realized.

Culvert replacement, installation, and removal will occur frequently⁵ in RCAs; however, in locations where stream crossings are required, small amounts of overstory vegetation may need to be removed in addition to the right-of-way. This additional removal is typically in situations where a culvert is being replaced with a larger one or a bridge that is more capable of fish passage, which can require slightly more area to sink into the stream channel. Because fish-passage work will be distributed in space and time throughout the permit area, effects associated with small decreases in shading will be localized. Further, some of this vegetation will regrow over time and provide stream shading.

Road maintenance and vacating activities could require brushing, removal of hazard trees, culvert cleaning, road resurfacing (e.g., rocking), and drainage improvements. These actions could require that trees and brush be removed; however, vegetation removed would be primarily from the understory, which usually does not affect shading. The removal of hazard trees could impact overstory vegetation that provides stream shade; however, this would occur infrequently⁶ and would not affect enough overstory vegetation in one location to cause more than a localized impact.

The implementation of Conservation Action 1: Establish Riparian Conservation Areas, Conservation Action 2: Riparian Equipment Restriction Zones, and Conservation Action 11: Road and Trail Construction and Management Measures, will keep stream shade reduction to a minimum and protect water temperature. Covered salmon and steelhead are likely to experience minor, localized increases in water temperature associated with harvest near lower-order streams that have narrower stream buffers and new road construction. Streams, and associated covered species, that are most at risk from minor increases in stream temperatures are those that are 303(d) listed for temperature. These effects are discussed by ESU in Section 6.3.2, *Impacts of the Taking on Salmon and Steelhead*.

⁵ Will occur multiple times annually. Amount of activity varies by district, dependent on habitat and forest health goals. See Conservation Action 2.

⁶ Removal of hazard trees in RCAs occurs a few times annually, but is generally does not occur in every State Forest District, every year. See Conservation Action 2.

Fine Sediment

Forestry activities, if not managed properly, can increase the input of fine sediment into the aquatic system, which degrades spawning areas, reduces pool refuge habitat, decreases winter refuge areas for juveniles, abrades gills, and impedes feeding visibility. Lakel et al. (2010) found that streamside management zones (buffers) between 25 and 100 feet are effective in trapping sediment before it can enter streams. Conservation Action 1: Establish Riparian Conservation Areas, reduces sedimentation by maintaining a buffer of 120 feet in all perennial fish-bearing streams and a buffer of 35 to 120 feet on all perennial streams, and 35 to 50 feet on seasonal streams that are potential debris flow tracks (PDFT) or high energy (HE). Other seasonal non-fish-bearing streams (i.e., not PDFT or HE) will maintain a 35-foot equipment restriction zone (ERZ) with restrictions on ground disturbance (retaining existing downed wood, limiting soil disturbance, and limiting allowed work when water is flowing or ponded water is present). There are 88.6 miles of existing roads in RCAs of the permit area. Of that, 7 miles of road are within 35 feet of a waterbody, the remaining 81.6 miles occur between 35 and 120 feet of a waterbody. Based on Lakel et al. (2010) and Rashin et al. (2007) relatively narrow RCAs were as effective in protection streams from sediment additions as were the larger zones, when roads were hydrologically disconnected, resulting in negligible sediment inputs to the aquatic system from harvest activities. ODF will implement road design measures that hydrologically disconnect the road system from streams.

Upslope routing of sediment from harvest units to seasonal non-fish channels will be reduced both by Conservation Action 2: Riparian Equipment Restriction Zones, and the general downed wood retention requirements of Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas.

Any work that needs to occur in the RCA, such as road system management activities and PBR, will follow Conservation Action 2: Riparian Equipment Restriction Zones, and maintain a 35-foot ERZ from the outer edge of the aquatic zone for all streams. This zone applies to both sides of the stream. PBR is not anticipated to result in measurable levels of fine sediment as activities would not use ground machinery and all trees felled would be left in the RCA. In addition, PBR treatments will provide site conditions that allows for understory development to capture fine sediment from the adjacent landscape. Construction of new roads in RCAs will be reduced by following Conservation Action 11: Road and Trail Construction and Management Measures, which provides measures to minimize potential impacts on the covered species. Measures such as following the *Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife* (Oregon Department of Fish and Wildlife 2024 or most recent) will ensure the covered salmon and steelhead are not directly affected by construction activities. Management direction such as siting requirements, proper drainage, and erosion-control measures will limit inputs of sediment to the aquatic system over the course of the permit term.

Ongoing use and maintenance of logging roads in the permit area will be a continual potential source of sedimentation. Similarly, an increase in the volume of truck traffic during timber harvest activities could increase the delivery of fine sediment to adjacent streams. Adding and maintaining cross drains, grading and graveling, in addition to hauling restrictions during wet weather periods, will be implemented to reduce sediment delivery to streams. However, as stated above, Conservation Action 1: Establish Riparian Conservation Areas, and Conservation Action 11: Road and Trail Construction and Management Measures, will limit inputs of sediment to the aquatic system. These actions will ensure that an adequate buffer exists between the road and stream to minimize sedimentation. They will also require that maintenance activities would occur in a manner

that will not likely result in harm of the covered salmon and steelhead, that roads that cannot be hydrologically disconnected and/or mitigated will be closed during wet weather, and that commercial road use will be suspended in areas where turbid runoff is likely to reach waters of the state.

Culvert and bridge replacement, installation, and removal has the potential to temporarily increase downstream sedimentation. To limit the effect this will have on the covered species all in-water work, including culvert and bridge replacement, installation, and removal would occur during the Oregon Department of Fish and Wildlife (ODFW) in-water work window. Following the recommended in-water work period will minimize potential impacts on covered salmon and steelhead by conducting work during the low streamflow periods reducing the potential for fine sediment entering the stream network. Timing the in-water work during the low streamflow periods, when life-history patterns such as migration and spawning probability is low, will minimize direct impacts on the covered species.

New logging roads and recreational trails allow easy public access to areas that were previously less accessible. In addition, new roads constructed within 200 feet from a stream channel can cause increased sedimentation risk and alterations to hydrology through ditch lines serving as sediment transportation mechanisms and potential peak-flow increases. Increased human activity in and around streams could affect streambank stability (Kaufmann et al. 2009). Up to 55 new miles of non-motorized trails could be developed in RCAs over the course of the permit term, with up to 32 miles occurring in ERZs to facilitate stream crossings. This equates to new trails adjacent to 0.7% of the stream miles in the permit area. Recreational activities involving horseback riding, off-highway vehicles, mountain bikes, and foot traffic can compact soil and cause the loss of vegetative structure in riparian areas, which could increase erosion and sedimentation in adjacent waterbodies (U.S. Forest Service n.d.).

The indirect effects of increased access could result in increased deposition of fine sediment on the streambed. While the specific activities of recreational users are not covered under this HCP, ODF does institute closures of unsurfaced roads and recreation infrastructure (e.g., boat ramps and trails) that have the potential to deliver sediment to the waters of the state. The maintenance or construction of new boat ramps or trail segments may occur in RCAs. Implementation of Conservation Action 11: Road and Trail Construction and Management Measures, and Conservation Action 12: Restrictions on Recreational Facilities, will ensure activities are performed in a manner that reduces sediment input and effects on the covered salmon and steelhead.

Rock quarries provide rock and gravel for road construction and management activities across the permit area. Rock quarry activities can generate sediment when pits are excavated, and the material is crushed, piled, and hauled. ODF will stabilize banks, headwalls, and other surfaces of quarries to prevent surface erosion or landslides. New rock quarries will not be located in RCAs and quarries outside of riparian areas will have road ditches disconnected from streams.

Implementation of Conservation Action 1: Establish Riparian Conservation Areas, and Conservation Action 11: Road and Trail Construction and Management Measures, will limit work on steep slopes in the permit area. Regulating timber harvesting and road and landing construction on steep, potentially unstable slopes will limit sediment input by avoiding management activities that have the potential to increase the probability of slope failures and mass-wasting events. Should those slopes fail and reach the stream network, retained trees will provide large wood to the stream, reduce the likely travel distance of resulting debris flows, and inhibit the movement of fine sediment

farther downstream while sorting and retaining coarse sediment. Habitat restoration activities implemented under Conservation Action 3: Stream Complexity, could result in harm to covered species by exposure to increased turbidity during project implementation but the magnitude and duration of exposure will be localized to the site. Stream restoration projects in the permit area may include placement of logs or whole trees in streams to create pools and to retain spawning gravels, replacement or removal of stream-crossing structures (i.e., culverts) that block fish passage, relocation or redesign of improperly located roads, stabilization of sediment sources (i.e., cutbank improvement of road drainage systems), road closure, and road decommissioning. Habitat restoration activities will follow BMPs (e.g., minimize erosion to streambanks, limit stream access points, grass seeding/tree planting post-project) to minimize fine sediment delivery to the aquatic system.

Within aquatic ecosystems, important functions of large wood include the storage, sorting, and modulation of the downstream movement of sediment. The presence of large wood in upstream reaches promotes sediment storage, which reduces fine sediment that degrades and entombs salmon redds; while in spawning areas it helps reduce bed mobility, which also helps to keep redds intact and minimize their loss through the movement of the spawning substrate during high flows (National Oceanic and Atmospheric Administration Fisheries 2016). As described in Section 6.3.1.1, *Large Wood Recruitment*, implementation of Conservation Action 1: Establish Riparian Conservation Areas, will ensure that nearly all available large wood volume in the permit area will remain in RCAs (TerrainWorks 2020), which will be available for recruitment into streams that support covered salmon and steelhead. This large wood will be available throughout the permit area and provide upstream sediment storage opportunities that will sort fine sediment and limit spawning bed entombment.

Implementation of Conservation Action 1: Establish Riparian Conservation Areas, and Conservation Action 11: Road and Trail Construction and Management Measures, would reduce effects on the covered salmon and steelhead in the permit area to localized increases in sedimentation associated with new road construction, existing road and culvert maintenance, road use, and habitat restoration activities. While implementation of these conservation actions will minimize management-related erosion and sedimentation, complete elimination of management and public recreation-related inputs is not possible.

Chemical Contaminants

If not sited properly forest roads can direct and increase the runoff of soils into waterbodies, increasing sedimentation and exposure to potential chemical spills (Gucinski et al. 2001). Stormwater runoff from impervious surfaces delivers a wide variety of pollutants to aquatic ecosystems, such as metals (e.g., copper and zinc), petroleum-related compounds (polynuclear aromatic hydrocarbons), along with the sediment washed off the road surface (Driscoll et al. 1990; Buckler and Granato 1999; Colman et al. 2001; Kayhanian et al. 2003). Pesticides and metals can be toxic to fish at high concentrations and have been shown in the laboratory to affect fish behavior even at very low concentrations. Accidental introduction of contaminants associated with timber harvest activities (e.g., fuel spills from timber harvest equipment) could result in mortality or inhibit normal behaviors of covered species that encounter these contaminants. The introduction of contaminants associated with maintenance-related activities would have similar effects.

Implementation of Conservation Action 11: Road and Trail Construction and Management Measures, would reduce the potential that activities associated with road construction and use in RCAs would

result in the runoff of contaminants into the adjacent stream. All new roads in or adjacent to RCAs will be hydrologically disconnected if possible. Roads that cannot be adequately disconnected, or are unsuitable for wintertime haul, will be suspended where turbid runoff is likely to reach waters of the state, defined here as equal to events that lead to at least 2 inches of rain in a 24-hour period. Commercial road use will also be suspended when there is observed turbid runoff into waters of the state independent of the rainfall amount until the concern is addressed. Staging and storage areas associated with construction activities in RCAs would be located outside of RCAs and ERZs to minimize leaks and spills that could enter waters of the state.

Water Quantity

Forests influence water yield through the interception of precipitation and transpiration by trees. Increased coarse sediment inputs to streams following logging can also increase the effect of low flows by shallowing and widening stream channels (Hicks et al. 1991). Conservation Action 1: Establish Riparian Conservation Areas, and Conservation Action 2: Riparian Equipment Restriction Zones, reduce this potential effect on water quantity from harvest activities in the permit area by maintaining RCAs adjacent to the aquatic zone, which includes the stream channel(s) and associated aquatic habitat features (beaver ponds, stream-associated wetlands, side channels, and the channel migration zone). This riparian vegetation will provide bank stability and prevent the shallowing and widening of a stream that can occur in its absence.

Upland timber harvest can affect streamflow. When a forest is harvested, water that is normally transpired by trees becomes available for streamflow. Post-harvest peak streamflows after fall and spring storms generally increase; however, flows associated with large mid-winter events are generally unaffected as soils are already saturated regardless of cover type (Brown n.d.). Peak flows following storms with return intervals of 6 years or more are generally insensitive to canopy removal-related flow increases. Peak flow events from more common return interval storms (e.g., those with a 2-year or smaller return interval) generally do increase in magnitude if sufficient tree cover removal occurs, e.g., 20 to 40% (Grant et al. 2008). This increase in streamflow associated with regenerating stand conditions with low live tree retention generally lasts approximately 5 to 10 years.

Once forests are over 10 years old and regrowing rapidly, they transpire more than three times the amount of water as mature forests (Moore et al. 2005). This increased transpiration can further reduce summer low flows, reducing available habitat for covered salmon and steelhead. In an analysis of 60 years of daily streamflow records from eight paired-basin experiments, Perry and Jones (2016) found that average daily streamflow in basins with 34- to 43-year-old Douglas-fir plantations was 50% lower than reference basins of 150- to 500-year-old mixed species forests, with the greatest deficit occurring in August and September. Thinning of young, replanted forests did not alleviate this effect. Thinning of mature stands by up to 50% shelterwood conditions, or the use of patch cuts of 3 acres or less, resulted in lower initial summer flow increases that did not persist. Earlier onset of low flows could reduce available habitat and alter the timing and rate of smolts' migration to the ocean for covered salmon and steelhead (Spies et al. 2018.)

The creation of RCAs under Conservation Action 1: Establish Riparian Conservation Areas, and ERZs under Conservation Action 2: Riparian Equipment Restriction Zones, will reduce runoff associated with storm events, which will limit delivery of fine sediments to the stream as well as mass soil movement (Bathurst and Iroumé 2014; Grant and Wolff 1991). Upslope routing of sediment from harvest units to seasonal channels will be reduced by both Conservation Action 2: Riparian

Equipment Restriction Zones, and the general downed wood retention requirements of Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas. Seasonal, non-fish-bearing streams that are potential debris-flow track or HE will have RCAs that extend 50 feet (horizontal distance) from the aquatic zone for the first 500 feet upstream of the end-of-fish use to capture material moving into fish-bearing streams. Upstream of the first 500 feet of the end-of-fish use, the RCA will be 35 feet. In the case of PDFT, the RCA will extend upstream to the location mapped by the geotechnical specialist or the seasonal initiation point, whichever comes first. In the case of an HE reach, the RCA will continue to the upper extent of the reach or the seasonal initiation point, whichever comes first. These areas are the most likely to deliver large wood and sediment to fish-bearing streams that would affect the covered salmon and steelhead. Debris flows that occur in the permit area would be a short-term scouring event. In the short term, these events could directly destroy redds or kill fish; however, they also introduce and redistribute spawning gravels and large wood that provide habitat for the covered species.

Peak streamflows, can be increased by road-related runoff. Construction of new roads in RCAs will be minimized to the extent possible following Conservation Action 11: Road and Trail Construction and Management Measures. Any work that needs to occur in the RCA, such as road system management activities, will follow Conservation Action 2: Riparian Equipment Restriction Zones, and maintain a 35-foot ERZ beginning from the outer edge of the aquatic zone for all streams. This zone applies to both sides of the stream. Construction of new roads in RCAs will be minimized by following Conservation Action 11, which provides measures to minimize potential impacts on the covered species. Measures such as following *Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife* (Oregon Department of Fish and Wildlife 2024 or most recent) will ensure the covered salmon and steelhead are not directly affected by construction activities. In addition, roads near a fish-bearing stream that have a high erosion potential, or landslide hazards that could affect the covered species will be evaluated for vacating. Roads that are vacated will follow the measures described in Conservation Action 5: Standards for Road Improvement and Vacating, which will fully disconnect the road from the stream, resulting in a decrease in peak flows. The implementation of these conservation actions will partially ameliorate the effects of road runoff and associated changes in peak streamflow.

The creation of RCAs under Conservation Action 1: Establish Riparian Conservation Areas, and HCAs will provide a buffer of mature trees that will ameliorate low flow condition across the permit area. This will be most beneficial in areas drained by young volcanic rocks with deep, slow groundwater systems, such as the High Cascades, that may be particularly vulnerable to declines in summer streamflow. Areas with shallow subsurface aquifers and limited potential to store water are less sensitive to changes in low flows. Limiting the proportion of each ESU in recently harvested condition will moderate changes to low and peak flows; see *Impacts of the Taking* sections below by ESU for harvest area proportion estimates and additional discussion.

ODF maintains water developments such as small water catchments, basins, and impoundments, which provide a water source for filling water trucks primarily used for road processing activities. These water developments are located at creeks and rivers, and springs. The primary method used to extract water would be portable pumps. The use of multiple pumps in a small area has the potential to deplete streamflow, which could affect the covered salmon and steelhead depending on timing. Most road processing occurs in the summer months, during low flow, but is either complete by the fall or no longer requires water from an outside source when the salmon and steelhead are returning to spawn. There would not be more than a 10% reduction in stream depth, based on visual estimation, during the period of drawdown. If a reduction in stream depth approaches 10%,

drafting will cease until volume recovers back to pre-drafting levels. Therefore, small reductions in streamflow as a result of water drafting is not likely to affect migration and spawning and have negligible impacts on rearing of the covered species.

Most water quantity effects would be minimized under Conservation Action 1: Establish Riparian Conservation Areas, Conservation Action 11: Road and Trail Construction and Management Measures, and Conservation Action 5: Standards for Road Improvement and Vacating. Salmon and steelhead are likely to experience a minor, localized decrease in water quantity associated with road-related water drafting. Similarly, salmon and steelhead would also experience localized increases in water quantity associated with storm events. These storm events can cause debris flows that enter fish-bearing streams.

6.3.1.3 Fish Passage

Stream crossings such as bridges or culverts can be migration barriers that affect the covered salmon and steelhead. Migration barriers limit or prohibit access to upstream habitat, limiting available spawning and rearing locations within the species range. Stream crossings that are replaced, installed, or removed under this HCP will be compliant with Conservation Action 4: Remove or Modify Artificial Fish-Passage Barriers, that requires new and replacement culverts meet NOAA Fisheries (2022 or most recent) and ODFW passage criteria to ensure culverts are designed to maintain hydraulic conditions, including hydrology, velocities, and slopes that pass juvenile and adult fish. Culvert replacements and upgrades will occur at those areas identified to be a passage barrier or that are at the end of their life and due for an upgrade.

Culvert replacement would create a temporary fish barrier during construction as well as decrease shading and increase sedimentation. Measures are taken to offset potential impacts, articulated in the *Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife* (Oregon Department of Fish and Wildlife 2024) or will obtain appropriate approvals from ODFW if it needs to occur outside appropriate windows. Effects of instream work are described in Section 6.3.1.2, *Water Quality and Quantity*, as are the effects associated with vegetation removal and increased sedimentation.

The removal or modification of artificial barriers in the permit area will increase fish passage to suitable habitats upstream that will be accessible to the covered salmon and steelhead for spawning and rearing resulting in additional carrying capacity.

6.3.1.4 Direct Mortality

Potential direct mortality resulting from the covered activities would be limited to exposure to high levels of fine sediment (Section 6.3.1.2, *Water Quality and Quantity*) and exposure to activities associated with in-water work, mainly construction activities related to culvert maintenance and installation, stream-crossing construction, and stream-enhancement projects. Exposure to chemical contaminants associated with harvest could also cause direct mortality, although the likelihood is low. Direct mortality is unlikely to result from effects on large wood recruitment, water temperature, and water quantity.

Direct mortality of covered fish species could occur if they are exposed to equipment, personnel, or chemicals associated with in-water work. Dewatering the stream channel is commonly associated with in-water work and will result in mortality if all fish are not removed beforehand. When needed for instream work, the stream area will be isolated, and fish will be captured, removed, and

relocated as described in Chapter 3, Section 3.10.4, *Fish Salvage*. Work area isolation and fish salvage are intended to reduce the risk of exposure of fish to instream construction work, but can result in some direct mortality. Mortality depends on the life stages exposed, capture method (e.g., seining, dip netting, or electrofishing), duration of handling, and water quality (e.g., temperature and dissolved oxygen) at the time of work area isolation and fish salvage.

As described in Conservation Action 11: Road and Trail Construction and Management Measures, in-water work will follow the established *Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife* (Oregon Department of Fish and Wildlife 2024 or most recent) or will obtain in-water work variances from ODFW if work needs to occur outside of established work windows. By adhering to ODFW in-water work windows, impacts on covered fish species will be minimized by ensuring work occurs during times when the least amount of covered species individuals are present. Work windows established by ODFW are based on district fish biologists' recommendations and are specific to the expected composition of fish species occurring in the project area and local conditions. While adhering to ODFW's in-water work windows will reduce exposure of covered fish species to work area isolation and fish salvage, it will not eliminate the risk of exposure as many of the covered species spend long periods rearing in freshwater as juveniles (e.g., Oregon Coast coho). Therefore, covered species are expected to be present during in-water work activities requiring work area isolation and fish relocation (rescue/salvage) efforts.

Capturing and handling fish increases stress levels and can cause immediate or delayed mortality depending on the methods used, which will largely be determined by site characteristics (e.g., water temperature, habitat features). For example, seining is an effective technique in deeper water areas, such as pools, with relatively even channel bottoms and smaller grained substrates such as sand or small gravels. Conversely, seining is relatively ineffective in riffles or shallow areas with coarse-grained substrates like large gravels or cobbles or significant large wood. Alternatively, electrofishing can be very effective in riffles or shallow areas but is less effective in deep pools, streams with high turbidity, or large unconfined areas. In general, there is greater risk of injury or mortality when using electrofishing equipment compared to seines or other low-impact methods (e.g., dip netting or herding). Fish that come in direct contact with electrofishing equipment or are exposed to electric shock for long periods may be injured or killed. Constant monitoring of fish for injuries and excessive recovery times ensures that electrofishing equipment is being used properly.

Seining, although less invasive, also triggers a stress response in fish (Cook et al. 2012). This can result in injury or mortality from entanglement if the net mesh size is not appropriate for the target life stage of fish. If used appropriately, seining can be a low-impact technique to efficiently capture and remove fish. Herding fish is another low-impact method for removing fish from construction areas and does not require fish to be removed from the stream. Instead, biologists walk the section of stream with a net or electrofishing equipment and push fish downstream out of the work area. This is a preferred technique because it eliminates the need to directly handle, hold, and transport fish and can significantly reduce the risk of injury mortality. However, site conditions are not always conducive to this method. In certain conditions, even highly effective and efficient capture methods cannot ensure every fish is removed from the work area. For example, in areas with high habitat complexity, fish will have an easier time evading capture by burrowing into gravel substrate or hiding under large wood. Fish that are not removed prior to construction or dewatering may be subject to desiccation or be crushed by construction equipment.

After fish are collected, they are then placed into holding tanks to recover before being released back into the stream, river, or lake. Recovery time is dependent on the capture method (e.g.,

electrofishing, seining, dip netting), water quality and fish size, condition, and species. Allowing for proper recovery is important to ensure high survival following release back into the river, stream, or lake. If fish are not allowed to fully recover, they may be more susceptible to predation, particularly in areas with high predator densities. Injury and mortality may also occur while fish are held in recovery tanks if oxygen and temperature conditions are not regulated. Monitoring and regulating oxygen and temperature conditions while holding fish in recovery tanks will ensure mortality is minimized. Additionally, if adult and juvenile fish are held in the same holding tanks adults may prey on juveniles.

Risk of mortality and injury is also dependent on species and life stages present in the work area. For example, electrofishing affects fishes differently based on body size; larger fish absorb more power than small fish of the same species and have a larger voltage gradient difference across the length of the body. Therefore, larger fish receive a much greater shock than smaller fish given the same conditions and orientation in the electrical field. Smaller fish are also able to evade capture more easily compared to larger adult fish; thus, they are more at risk to remain in the channel during dewatering. Environmental conditions can exacerbate effects from salvage efforts. For example, capture and handling effects can be amplified when conditions are at or near species thermal tolerances. Fish occupying water above thermal thresholds will be under higher levels of stress and, thus, more likely to be temporarily or permanently harmed during fish-salvage efforts. Similarly, oxygen becomes less soluble as water temperatures increase, further increasing the likelihood of adverse effects on captured and handled fish. High water temperatures are likely to be an issue in areas with in-water work windows occurring during low flow and summer periods.

There are currently eight partial or complete fish-passage barriers in the permit area with approximately 2.5 to 8.0 miles of additional suitable habitat upstream (Chapter 4, Table 4-7). These eight culverts will be replaced or retrofitted during the permit term to improve passage conditions. In addition, ODF estimates that up to 25 additional culverts or bridges may be replaced, repaired, or constructed during the permit term, resulting in some juvenile covered fish species being harmed or harassed during in-water work associated with fish-salvage efforts. Effects on adult covered fish species would not be encountered because in-water work would occur when adult covered fish species are not present. Some adults may be encountered when covered activities are taken to address emergency situations or when variances to the ODFW-recommended in-water work window are approved by ODFW and NOAA Fisheries.

Fish-salvage efforts to support road system management could cause unintentional injury to covered fish species if they are present during dewatering associated with the covered activity. In-water work activities associated with fish-passage improvement projects have the potential to affect the covered fish species by injuring or killing individual fish. In-water work will follow the established *Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife* (Oregon Department of Fish and Wildlife 2024) or appropriate approvals will be obtained from ODFW and NOAA Fisheries if work needs to occur outside ODFW-recommended in-water work windows prior to salvaging fish. ODFW-recommended in-water work windows will minimize impacts on the covered fish species and its habitat by conducting projects during time periods that avoid the vulnerable life stages of the covered fish species, including migration and spawning. However, given that some covered fish species (i.e., coho, Chinook, steelhead) typically migrate to the ocean as yearlings, meaning they spend a full year in freshwater prior to migrating, some juveniles still may be present in the permit area during in-water work windows.

6.3.2 Impacts of the Taking on Salmon and Steelhead

The following subsections provide ESU-specific assessments of implementation of the HCP. Take resulting from habitat loss and other adverse effects, described previously, is not expected to result in an adverse impact on the species' long-term persistence in the permit area for the following reasons.

- Timber harvest activities will occur outside RCAs. Implementation of the HCP will protect and enhance approximately 77,300 acres of forest in RCAs along 5,405 river and stream miles.
- Road decommissioning and culvert-replacement activities that will occur under the HCP will reduce road-related sedimentation across the permit area and remove existing barriers to improve instream habitat conditions and make additional upstream habitat accessible for the covered salmon.
- Stream enhancement projects that will occur under the HCP will focus on restoring natural processes to create habitats that improve overall conditions for the covered species and other aquatic organisms in the permit area, allowing for immediate improvements to instream complexity, while the adjacent riparian forests are developing to provide long-term benefits.

While individual actions can affect the covered species, BMPs and conservation actions identified in Chapter 3, *Covered Activities*, and Chapter 4, *Conservation Strategy*, respectively, will reduce those effects to localized effects that will be spread out across the permit area. To assess the overall impact of timber harvest on the covered salmon and steelhead, timber harvest modeling was used to predict the pace, scale, and amount of harvest over the course of the permit term. The results of this modeling exercise were used to determine if clear-cut conditions would occur in any watersheds/ESUs over the course of the permit term at proportions that could result in watershed-wide effects.

As described in Section 6.3.1, *Sources and Types of Effects*, RCAs will minimize most of the effects associated with harvest activities to the covered salmon and steelhead. However, harvest outside of RCAs can contribute to changes in watershed processes.⁷ If more than 19% to 25% of a watershed is clear-cut at any given time, elevated peak flows become measurable; however, these effects diminish as the watershed becomes larger (Grant et al. 2008; Stednick 1996). Increases in peak flow associated with storm events can cause geomorphic effects with effects being amplified in rain-on-snow watersheds (Grant et al. 2008). Flows that are large enough to alter channel morphology, bank erosion, or habitat structure have the highest likelihood of affecting fish (Grant et al. 2008).

Detailed results of the watershed analysis, by Hydrologic Unit Code (HUC) 10, are presented in Appendix E, *Effects Analysis*. The following section focuses on identifying HUC 10 watersheds, by ESU, or group of ESUs, that could experience elevated peak flows associated with timber harvest (stands <10 years old) in the permit area. The analysis focuses on the proportion of land within ODF ownership that would exhibit clear-cut conditions; however, in some instances the analysis is expanded to the larger HUC 10 for context. If an average of 20% of timber in the permit area of the HUC would be <10 years old over the course of the permit term, then effects on fish could occur. Outside the permit area it is assumed that watersheds that are primarily privately owned will have younger stands, while federally owned watersheds are likely to have older aged forests.

⁷ Annual water and sediment yield, low flows, peak flows, and water quality metrics (e.g., temperature, chemical composition).

6.3.2.1 Oregon Coast Coho and Chinook

The Oregon Coast coho ESU is made up of 27 independent and dependent populations, 13 of which have no stream miles in the permit area, and 14 populations that could be affected by harvest in their watershed (Appendix E, *Effects Analysis*). The majority of these independent populations have less than 5% of their stream miles in the permit area while the Nehalem and Tillamook Bay independent populations have 49% and 28%, respectively, of their stream miles in the permit area. The remaining 13 populations do not overlap the permit area, will not be affected by covered activities, and are, therefore, not discussed further. Effects on the 14 populations where timber harvest would occur in the permit area are discussed here. Given the high proportion of the Nehalem and Tillamook Bay Independent Populations in the permit area, impacts on those populations are also further discussed in their respective sections. Effects on Oregon Coast spring-run Chinook are expected to be the same as those described for Oregon Coast coho and are not described separately.

The Oregon Coast ESU is composed of 4,227,104 acres; the permit area encompasses 639,489 acres within this ESU and overlaps 43 HUC 10s (Appendix E, *Effects Analysis*). Rivers in the ESU flow from the mountains of the Coast Range, except for the Umpqua River, which extends east through the Coast Range to drain the Cascade Mountains (National Oceanic and Atmospheric Administration Fisheries 2016). Rivers and streams in this ESU are fed by both rainfall and snowmelt, though most systems are rain-dominated.

An assessment of potential clear-cut conditions at 5-year intervals, by HUC 10, is provided in Appendix G, *Hydrologic Unit Code 10 Analysis*. Average percent of HUC 10 watersheds in clear-cut and young forest conditions (0 to 10 years) in the permit area ranges from 0% in the Clark Branch South Umpqua River, Olalla Creek – Lookinglass Creek, and Umpqua River – Sawyers Rapids to 15% in Beaver Creek, Nestucca River, and Trask River. The distribution of clear-cuts in the permit area, across the permit term are not modeled to exceed 20% of the total forest cover. Therefore, upland harvest in the permit area is not likely to affect overall watershed process for any of the HUC 10s in the Oregon Coast Coho ESU.

Nehalem Independent Population

The Nehalem Independent Population of Oregon Coast coho (HUC 17100202) is composed of 464,777 acres; the permit area encompasses 209,569 acres within this subbasin that overlap six HUC 10s (Appendix E, *Effects Analysis*). The Nehalem Independent Population includes approximately 770 miles of fish-bearing streams and supporting aquatic habitat within the HUC, of which 215 miles (28%) occur in the permit area.

An assessment of potential clear-cut conditions at 5-year intervals, by HUC 10, is provided in Appendix E, *Effects Analysis*. Average percent of HUC 10 watersheds in clear-cut and young forest conditions (0 to 10 years) in the permit area ranges from 6% in the Salmonberry River to 16% in the Upper Nehalem River. The distribution of clear-cuts in the permit area, over the permit term, will not exceed 20% of the total forest cover for any HUC 10 in range of the Nehalem Independent Population of Oregon Coast coho at any point during the permit term. This relatively low proportion and dispersed spatial pattern of early seral conditions constrains the magnitude and extent of harvest-related changes to watershed processes that drive incidental take pathways, including alterations in large wood recruitment, water temperatures, sediment delivery, chemical contaminants, flow regimes, and overall habitat complexity.

Large Wood Recruitment

Large wood recruitment is expected to be maintained across the Nehalem Independent Population because RCAs will retain most of the riparian forest capable of providing future large wood inputs to fish-bearing streams and associated aquatic habitats. Large riparian trees provide important functions for covered salmonids by regulating sediment and flow routing, increasing channel complexity and stability, increasing pool volume and area, and providing refugia and cover for fish. The HCP identifies reduced large wood as a common existing limiting factor in western Oregon watersheds, but also indicates that implementation of Conservation Action 1, Establish Riparian Conservation Areas, and Conservation Action 2, Riparian Equipment Restriction Zones, will retain the large wood volume in RCAs during the permit term and maintain future sources of large wood recruitment to streams that support covered salmon and steelhead.

Within the Nehalem Independent Population, the limited proportion and dispersed distribution of clear-cut and young forest conditions further constrains the extent of harvest-related reductions in large wood inputs. Because no HUC 10 in the population area is expected to exceed 20% clear-cut and young forest condition during the permit term, most stream-adjacent forest and associated large wood recruitment processes will remain intact at the independent population scale. Localized reductions in future large wood recruitment could occur where new road construction, stream crossings, or cable corridors require vegetation removal within RCAs. However, the effects from new road construction in RCAs is limited to circumstances where no viable upland alternative exists and as such these actions are only expected to result in minor reductions in available large wood.

As a result, reductions in large wood recruitment are expected to be localized and limited to a small proportion of the stream network supporting the Nehalem Independent Population. These localized effects are not expected to measurably reduce channel complexity, pool formation, cover, sediment storage, or refugia at the population scale. Therefore, take associated with reduced large wood recruitment is expected to be low, spatially restricted, and unlikely to appreciably affect the abundance, productivity, spatial structure, or diversity of the Nehalem Independent Population.

Water Temperature

Harvest and thinning activities adjacent to streams can increase summer stream temperatures by reducing shade and increasing solar radiation reaching the water surface. The water temperature effect pathway is the most relevant where activities occur adjacent to coho streams or small non-fish-bearing streams that flow into coho waters. Elevated stream temperatures can affect coho by increasing physiological stress, altering growth and life-history timing, increasing susceptibility to disease, and increasing interactions with predators or warm-water competitors.

For the Nehalem Independent Population, the magnitude and spatial extent of temperature-related effects are expected to be constrained by the limited proportion of each HUC 10 in clear-cut or young forest condition and by the retention of RCAs throughout the stream network. All coho streams and large and medium non-fish-bearing perennial streams will receive 120-foot no-cut buffers, which will be adequate to prevent riparian shade loss that would cause stream temperatures to increase. Small perennial non-fish-bearing streams receive narrower upstream buffers, but a 120-foot-wide, 500-foot-long PPZ upstream of fish-bearing waters is intended to reduce potential temperature increases before water enters coho reaches.

Localized increases in stream temperature may occur downstream of treated stands, particularly near lower-order streams with narrower buffers or where road construction or stream-crossing

work removes riparian vegetation. However, because clear-cut and young forest conditions remain below 20% of total forest cover in each HUC 10 and because intact riparian cover is retained across much of the stream network, potential increases in solar radiation and stream temperature are expected to be limited in magnitude and spatial extent. Therefore, stream shade reduction will be kept to a minimum, and coho are likely to experience only minor, localized increases in water temperature associated with harvest near lower-order streams and new road construction.

Accordingly, temperature-related pathways of take for the Nehalem Independent Population are expected to be minor, localized, and limited to a small fraction of available coho rearing habitat. These effects are not expected to measurably reduce population-scale survival, productivity, or habitat availability.

Fine Sediment Delivery

Forestry activities can increase delivery of fine sediment to streams if roads, harvest units, stream crossings, or ground-disturbing activities are not properly managed. Fine sediment can degrade spawning areas, reduce pool and winter refuge habitat, abrade fish gills, and reduce feeding visibility.

Within the Nehalem Independent Population, fine sediment effects are expected to be moderated by the limited extent of disturbed upland area, the dispersed distribution of clear-cut and young forest conditions, and the implementation of RCAs, ERZs, road management standards, and erosion-control measures. RCAs reduce sedimentation by maintaining 120-foot buffers on perennial fish-bearing streams; 35- to 120-foot buffers on perennial streams; and 35- to 50-foot buffers on seasonal streams that are potential debris-flow tracks or high-energy reaches. Other seasonal non-fish-bearing streams retain a 35-foot ERZ with restrictions on ground disturbance.

The HCP also includes road-related measures intended to reduce sediment delivery, including hydrologic disconnection of roads from streams, road drainage improvements, wet-weather haul restrictions, suspension of commercial road use where turbid runoff is likely to reach waters of the state and road vacating or improvement where appropriate. In-water work associated with culvert and bridge replacement, installation, or removal may temporarily increase downstream sedimentation, but the attached document indicates that these activities would occur during ODFW in-water work windows to reduce exposure of coho during sensitive life-history periods.

Because each HUC 10 in the Nehalem Independent Population is expected to remain below 20% clear-cut and young forest condition, the fraction of each watershed actively contributing harvest-related fine sediment is expected to remain limited. Localized sediment increases may occur near new road construction, existing road and culvert maintenance, road use, habitat restoration activities, or recreational infrastructure; however, the effects analysis concludes that implementation of Conservation Action 1 and Conservation Action 11 would reduce effects to localized increases in sedimentation and that complete elimination of management- and recreation-related sediment inputs is not possible.

Therefore, fine-sediment-related take is expected to be short-term, localized, and limited to a small proportion of spawning and rearing habitat within the Nehalem Independent Population. These effects are not expected to measurably reduce population abundance, productivity, spatial structure, or diversity.

Chemical Contaminants

Chemical contaminant pathways are primarily associated with roads, vehicle and equipment use, maintenance activities, and accidental spills. It is possible that stormwater runoff from impervious surfaces can deliver pollutants such as metals, petroleum-related compounds, and sediment to aquatic ecosystems, and that accidental introduction of contaminants associated with timber harvest equipment could result in mortality or inhibit normal behaviors of coho.

Within the Nehalem Independent Population, contaminant exposure is expected to be limited by road design and management measures, hydrologic disconnection of roads from streams where possible, wet-weather haul restrictions, and restrictions on staging and storage areas. To minimize the potential for leaks and spills to enter waters of the state new roads in or adjacent to RCAs will be hydrologically disconnected if possible. Roads unsuitable for winter haul or that cannot be adequately disconnected will be suspended where turbid runoff is likely to reach waters of the state. Staging and storage areas associated with construction activities in RCAs would be located outside RCAs and ERZs.

Because clear-cut and young forest conditions are expected to remain below 20% of total forest cover in each HUC 10, and because contaminant sources are generally associated with discrete roads, staging areas, equipment operations, or construction sites, the potential exposure area is expected to be small relative to the total stream network supporting the Nehalem Independent Population. Accidental spills or contaminant releases cannot be completely avoided, but such events are expected to be infrequent, localized, and constrained by applicable conservation measures and operational controls.

Therefore, contaminant-related pathways of take are expected to affect only a small proportion of individuals and habitat within the Nehalem Independent Population. These effects are not expected to measurably affect population abundance, productivity, spatial structure, or diversity.

Water Quantity

Timber harvest can affect streamflow by altering interception, evapotranspiration, and runoff processes. Post-harvest peak streamflows, after fall and spring storms can increase, while flows associated with large mid-winter events are generally less affected because soils are already saturated. It also states that increased transpiration in regenerating young forests can reduce summer low flows, particularly as stands develop beyond the initial post-harvest period.

For the Nehalem Independent Population, these water quantity effects are expected to be limited by the low and dispersed proportion of each HUC 10 in clear-cut and young forest condition. At levels below 20% of total forest cover, the fraction of each watershed contributing altered evapotranspiration, interception, and runoff processes will be limited, reducing the likelihood of a coordinated hydrologic response that would affect streamflow conditions at the population scale. The retention of RCAs and ERZs also helps maintain riparian vegetation, bank stability, channel form, and adjacent aquatic habitat features, reducing the likelihood that harvest-related changes would result in widespread shallowing, widening, or contraction of habitat.

Road-related runoff and water drafting represent additional localized water quantity pathways. Road-related runoff can increase peak streamflows, but new road construction in RCAs will be minimized, road system work will follow ERZ requirements, and roads near coho streams with high erosion potential or landslide hazards may be evaluated for vacating. Water drafting could cause small reductions in streamflow, but drafting would cease if stream depth reduction approaches

10%; therefore, small reductions in streamflow from water drafting are not likely to affect migration and spawning and would have negligible impacts on coho rearing.

Consequently, water-quantity-related pathways of take in the Nehalem Independent Population are expected to be minor and localized. Potential effects could include localized increases in peak flow, localized reductions in low-flow habitat availability, or short-term effects associated with debris flows or water drafting. However, given the limited proportion and dispersed distribution of clear-cut and young forest conditions, these effects are not expected to measurably alter habitat availability or quality at the population scale.

Fish Passage

Fish-passage effects are associated primarily with stream crossings, primarily culverts. Stream crossings can function as migration barriers that limit or prohibit access to upstream spawning and rearing habitat. Stream crossings replaced, installed, or removed under the HCP will comply with Conservation Action 4, Remove or Modify Artificial Fish-Passage Barriers, and that new and replacement culverts must meet ODFW and NOAA Fisheries passage criteria to maintain hydraulic conditions, velocities, and slopes that pass juvenile and adult fish.

Within the Nehalem Independent Population, short-term fish-passage effects may occur during culvert replacement, installation, or removal, when construction activities temporarily interrupt movement through a work area. These effects may be accompanied by temporary increases in sedimentation or minor vegetation removal near crossings. However, such effects are expected to be localized and short in duration because they occur at discrete crossing locations and are managed through in-water work timing and related construction measures.

Over the permit term, the long-term effect of fish-passage actions is expected to be beneficial where artificial barriers are removed or modified; removal or modification of artificial barriers in the permit area will increase fish passage to suitable upstream habitats that can be used by coho for spawning and rearing, resulting in additional carrying capacity.

Therefore, take related to fish passage for the Nehalem Independent Population will be limited primarily to temporary construction-related disruption at individual project sites. These short-term effects are expected to be offset, at least in part, by long-term improvements in access to upstream habitat. As a result, fish-passage effects are not expected to measurably reduce population-scale abundance, productivity, spatial structure, or diversity.

Direct Mortality

Direct mortality may occur through several localized mechanisms associated with covered activities, including exposure to high levels of fine sediment, exposure to chemical contaminants, and in-water work associated with culvert maintenance and installation, stream-crossing construction, and stream enhancement projects. Direct mortality is unlikely to result from effects on large wood recruitment, water temperature, or water quantity, but may occur where fish are exposed to equipment, personnel, chemicals, dewatering, work-area isolation, or fish-salvage activities.

For the Nehalem Independent Population, direct mortality risk is expected to be limited because in-water work occurs at discrete locations and is managed through conservation measures intended to reduce fish exposure. In-water work will follow ODFW designated in-water work windows or obtain appropriate approvals if work must occur outside those windows. These work windows are intended to reduce exposure by scheduling activities during periods when fewer covered fish are

expected to be present or when sensitive life stages such as spawning and migration are less likely to be affected.

Fish salvage and handling may result in injury or mortality, particularly where juveniles are present during in-water work windows; capture, handling, holding, and relocation can cause stress, injury, or delayed mortality depending on capture method, duration of handling, water temperature, dissolved oxygen, fish size, life stage, and site conditions. Fish that are not successfully removed before dewatering or construction may be subject to desiccation or crushing by equipment.

However, because the affected work areas are small relative to the approximately 215 miles of fish-bearing streams in the permit area within the Nehalem Independent Population, and because such activities are distributed in space and time, direct mortality is expected to affect only a small number of individuals. The limited and dispersed extent of clear-cut and young forest conditions also constrains indirect mortality pathways associated with sediment, temperature, flow alteration, and habitat simplification. Therefore, mortality-related take is expected to be low, localized, and insufficient to measurably reduce population abundance, productivity, spatial structure, or diversity.

Summary

Taken together, the limited proportion and dispersed distribution of clear-cut and young forest conditions within HUC 10 watersheds constrain the magnitude, spatial extent, and duration of each take pathway for the Nehalem Independent Population. Because clear-cut and young forest conditions are not expected to exceed 20% of total forest cover in any HUC 10 during the permit term, watershed-scale changes to large wood recruitment, water temperature, sediment delivery, contaminant exposure, water quantity, fish passage, and direct mortality risk are expected to remain limited. Retention of RCAs, ERZs, unstable-slope protections, road and trail management measures, in-water work timing, and fish-passage standards further reduces the likelihood that covered activities will result in widespread or persistent effects to fish-bearing streams and associated aquatic habitats.

As a result, the overall amount or extent of incidental take associated with covered activities is expected to be low and distributed across a small fraction of the habitat supporting the Nehalem Independent Population. Localized effects may occur through minor reductions in future large wood recruitment, localized stream temperature increases, short-term sediment delivery, infrequent contaminant exposure, localized flow changes, temporary construction-related passage disruption, and direct mortality associated with in-water work and fish salvage. However, these effects are not expected to measurably reduce population abundance, productivity, spatial structure, or diversity, and, therefore, are not expected to appreciably diminish the viability of the Nehalem Independent Population of coho.

Tillamook Bay Independent Population

The Tillamook Bay Independent Population of Oregon Coast coho is composed of 342,363 acres; the permit area encompasses 214,980 acres within this subbasin that overlaps six HUC 10s (Appendix E, *Effects Analysis*). Rivers and streams in the Tillamook Bay watershed are primarily fed by rainfall.

An assessment of potential clear-cut conditions at 5-year intervals, by HUC 10, is provided in Appendix E, *Effects Analysis*. Average percent of HUC 10 watersheds in clear-cut and young forest conditions (0 to 10 years) in the permit area ranges from 5% in the Kilchis River and Tillamook River HUCs to 15% in the Trask River HUC. The distribution of clear-cuts in the permit area, across

the permit term, will not exceed 20% of the total forest cover for any HUC 10 in range of the Tillamook Bay Independent Population of Oregon Coast coho. This, in conjunction with the large overall size of the subbasin, indicates that upland harvest is not likely to affect overall watershed process in the Nehalem subbasin. Furthermore, watersheds located in the rain-dominated zone, such as Tillamook Bay, are less sensitive to changes in peak flows (Grant et al. 2008).

6.3.2.2 Lower Columbia River Coho, Chinook, and Columbia River Chum

Lower Columbia River coho, Chinook, and Columbia River chum ESUs have minor overlap with the permit area (Chapter 2, *Environmental Setting*, and Appendix C, *Species Accounts*). Their ESUs are composed of 325,599 acres, with 43,639 acres that overlap five HUC 10s in the permit area. The permit area is in the Coast Range ecological zone where rivers and streams are primarily fed by rainfall.

An assessment of potential clear-cut conditions at 5-year intervals, by HUC 10, is provided in Appendix E, *Effects Analysis*. Average percent of HUC 10 watersheds in clear-cut and young forest conditions (0 to 10 years) in the permit area ranges from 0% in the Salmon River HUC to 19% in the Big Creek HUC. The distribution of clear-cuts in the permit area, across the permit term, will not exceed 20% of the total forest cover. Therefore, upland harvest in the permit area is not likely to affect overall watershed process for any of the HUC 10s within the range of Lower Columbia River coho, Lower Columbia River Chinook, and Columbia River chum.

6.3.2.3 Upper Willamette River Spring Chinook and Winter Steelhead

Upper Willamette River spring-run Chinook and winter steelhead ESUs have minor overlap with the permit area (Chapter 2, *Environmental Setting*, and Appendix C, *Species Accounts*). Their ESU boundaries are not identical; therefore, total ESU and permit area acreages are not included here. Rivers and streams in the Willamette River basin are fed by rainfall and snowmelt.

An assessment of potential clear-cut conditions at 5-year intervals, by HUC 10, is provided in Appendix E, *Effects Analysis*. Average percent of HUC 10 watersheds in clear-cut and young forest conditions (0 to 10 years) in the permit area ranges from 0% in the Quartzville Creek – Green Peter Lake HUC to 21% in the Rickreall Creek – Willamette River HUC. While Rickreall Creek exceeds the 20% threshold, watershed effects are not expected as the permit area accounts for less than 1% of the overall acreage within this HUC. Therefore, upland harvest in the permit area is not likely to affect overall watershed process for any of the HUC 10s within the range of Upper Willamette River spring-run Chinook and winter steelhead.

6.3.2.4 Southern Oregon-Northern California Coasts Coho and Chinook

The Southern Oregon-Northern California Coasts coho and Chinook ESU has minor overlap with the permit area (Chapter 2, *Environmental Setting*, and Appendix C, *Species Accounts*). Their ESU is composed of 606,716 acres, with 9,295 acres that overlap 20 HUC 10s in the permit area. Rivers and streams in these watersheds are primarily fed by rainfall.

An assessment of potential clear-cut conditions at 5-year intervals, by HUC 10, is provided in Appendix E, *Effects Analysis*. Average percent of HUC 10 watersheds in clear-cut and young forest conditions (0 to 10 years) in the permit area is expected to exceed 20% of the permit area in the following HUCs: Josephine Creek – Illinois River, West Fork Illinois, Hellgate Canyon – Rogue River, and Shady Cove – Rogue River HUCs. However, the permit area represents approximately 2% of the

overall watershed for each of these HUCs. Therefore, while clear-cuts in the permit area for these HUCs will exceed a 20% average of the total forest cover over the course of the permit term, the clear-cut acreage in the permit area represents a small portion of the overall HUC 10 (Appendix G, *Hydrologic Unit Code 10 Analysis*). Consequently, upland harvest in the permit area is not likely to affect the overall watershed process for any of the HUC 10s within the range of the Southern Oregon-Northern California Coast coho.

6.3.2.5 Climate Change

Climate change is described in Chapter 2, Section 2.3.1.3, *Climate and Environmental Variability*, and is expected to result in warmer, drier summers, reduced snowpack, lower summer flows, higher summer stream temperatures, and increased winter floods. These changes could affect the covered salmon and steelhead by reducing available summer rearing habitat, increasing potential scour and egg loss in spawning habitat, increasing thermal stress, and increasing predation and disease risk. Climate change will cause the covered salmon and steelhead to be exposed to more intense winter peak flows and more severe summer low flow periods.

Higher winter streamflows increase the risk that winter peak flows and floods could damage spawning redds and wash away incubating eggs. Earlier peak streamflows could also flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and the risk of predation. Lower streamflows and warmer water temperatures during summer will degrade summer rearing conditions, in part, by increasing the prevalence and virulence of fish diseases and parasites (U.S. Global Climate Research Program 2009). Other adverse effects are likely to include altered migration patterns, accelerated embryo development, premature emergence of fry, variation in quality and quantity of tributary rearing habitat, metabolic stress when food resources are limited, and increased competition and predation risk from warm-water, nonnative species (Independent Scientific Advisory Board 2007).

Climate change effects on summer low flows may be compounded by changes in forest vegetation conditions over the course of the permit term. Climate change is expected to alter tree growth and mortality due to increasing carbon dioxide, changes in water availability, and disturbances such as drought, fire, insects, and pathogens with the magnitude of effect varying by geography and species (Spies et al. 2018). Thinning prescriptions to prevent invasive species (Chapter 3, *Covered Activities*) will be used across the permit area. These measures, which will be used to support the development of harvestable stands, also serve to increase tree resilience to future vulnerabilities associated with drought and disturbance (Spies 2018).

Halofsky et al. (2017) shows that primary adaptation strategies for fisheries and aquatic habitat should focus on storing more water on the landscape, increasing resilience to disturbance, maintaining and restoring riparian and wetland vegetation complexity, and maintaining and restoring natural thermal conditions in streams. Conservation Action 1: Establish Riparian Conservation Areas, and promoting the colonization of beaver under Conservation Action 3: Stream Complexity, will increase water storage across the permit area and provide deep pool refugia. Furthermore, Conservation Action 5: Standards for Road Improvement and Vacating, will limit the amount of new road construction in the riparian area as well as reduce the number of existing roads that contribute to chronic erosion and sedimentation of adjacent waterbodies. As described in Chapter 4, *Conservation Strategy*, RCAs are adequate to ameliorate instream warming, and harvest within each HUC 10 is not expected to exceed the 20% threshold that would result in watershed effects over the course of the permit term.

Implementation of the conservation actions will help offset climate change effects such as flow alterations and increases in instream temperatures and sedimentation in the permit area.

6.3.3 Beneficial and Net Effects on Salmon and Steelhead

This section describes how implementation of the conservation actions will achieve the biological goals and objectives to benefit the covered salmon and steelhead. The conservation actions described in Chapter 4, *Conservation Strategy*, are expected to minimize effects on covered species and fully offset the impact of the taking by maintaining and improving the natural processes necessary for salmon spawning and rearing habitat in the permit area.

The HCP is expected to have both short- and long-term benefits to the covered salmon and steelhead by achieving the following.

- Establishing a protective riparian strategy through RCAs adjacent to fish- and non-fish-bearing streams to protect riparian forests during and following harvest activities and contribute to the long-term development of large wood to benefit instream habitat over time.
- Promoting the development of older forests within RCAs and upland areas in HCAs to improve instream habitat quality.
- Limiting the construction of new roads in RCAs and having BMPs in place for road management activities will limit runoff and sediment inputs.
- Implementing stream enhancement and restoration projects to benefit habitat for the covered salmon at key locations.

The HCP covers approximately 5,405 river miles in the permit area that are within the range of the covered salmon species distribution. Limiting factors for each ESU are presented in Chapter 2 *Environmental Setting*, and Appendix C, *Species Accounts*. While limiting factors vary across ESU and independent population, the main factors limiting the listed salmon and steelhead in the permit area that ODF has the ability to affect are physical habitat quality and quantity and water quality associated with land management. Recovery plans have been developed for the covered salmon species with a goal of improving the viability of the species to the point that they meet the delisting criteria and no longer require ESA protection.

The implementation of Conservation Action 1: Establish Riparian Conservation Areas, and Conservation Action 2: Riparian Equipment Restriction Zones, will protect approximately 77,827 acres of riparian forests from harvest in the permit area. These RCAs minimize impacts on stream habitat by maintaining necessary connections between terrestrial and aquatic forest conditions and providing a buffer around streams. Streams with riparian buffers have intact vegetative cover (shading) and are not likely to have increased stream temperatures, large diurnal temperature fluctuations (Macdonald et al. 2003; Johnson and Jones 2000), or warming effects on adjacent downstream reaches. Riparian buffers provide a physical barrier that keeps logging debris (slash) from adjacent activity from reaching the stream and provides shading over the stream that maintains ambient stream temperatures (Jackson et al. 2001; Richardson et al. 2010). They also function as a filter to absorb increased nutrients and sediments following harvest from exposed or disturbed soils (Richardson et al. 2010).

Riparian buffers and other tree reserves are highly susceptible to windthrow due to increased edge effect (Hassen et al. 2005). In years following harvest, tree fall into or adjacent to the stream is

common and will affect salmonid habitat by altering stream-channel dynamics. Windthrow following harvest and the presence of a riparian buffer provide a source of large wood recruitment to streams (Hairston-Strang and Adams 1998). Large wood in streams provides collection points for spawning gravel, facilitates pool formation, and creates habitat cover (quality rearing habitat). Tree fall from the RCA creates a low risk of direct take and indirect harm of fish, through the potential crushing or disturbance of redds, creation of severe logjams that are potential barriers to upstream movement, and potential temporary increase of fine sediments.

Although there is a potential for streams to warm because of silvicultural activities, the likelihood is very small when harvest takes place outside of riparian areas. This is especially applicable to small streams because temperature increases in headwater streams are unlikely to produce substantial changes in the temperatures of larger streams into which they flow unless the total inflow of heated tributaries constitutes a significant proportion of the total flow in the receiving stream (Kibler et al. 2013; Moore et al. 2005 as cited in Reeves et al. 2016). The only silvicultural action permitted in RCAs is PBR, which will be performed as a form of aquatic habitat restoration and is not anticipated to have a measurable impact on stream temperature as described in Section 6.3.1.2, *Water Quality and Quantity*, and will, therefore, not contribute to stream warming.

Over the course of the permit term, the distribution of the forest stand age over time in RCAs will continue to develop into older forests as they will not be harvested. In addition, approximately 36,713 acres of RCAs overlap with HCAs. Where thinning occurs in RCAs (PBR) and adjacent HCAs it will promote development of late-seral forest conditions, which will benefit the covered salmon and steelhead. As trees get older and bigger, they will continue to stabilize streamside soils, provide shade, and be available for recruitment as large wood, all of which will benefit the covered fish species.

Riparian areas experiencing moderate annual climate conditions can have higher humidity and can act as a buffer against fire and as a refuge for fire-sensitive species (Halofsky and Hibbs 2008). Some studies have found fire typically occurs less frequently in riparian areas (Russell and McBride 2001; Dwire et al. 2016). The creation of RCAs in the permit area will provide resilience against climate change.

A review of Oregon forest roads after the 1996 storm (Skaugset and Wemple 1998) indicates that most of the road-related erosion in the permit area is associated with roads that were constructed during or before the 1960s. And of those roads, most erosion incidents were associated with mid-slope locations, not roads that were located on the ridge or valley bottom. Existing roads that are contributing to sedimentation will be inventoried and addressed under Conservation Action 5: Standards for Road Improvement and Vacating.

Road decommissioning can ameliorate the effect of increases in peak flows to the streams caused by new road construction by disconnecting runoff from previous roads to streams. Road decommissioning will include blocking the road, out-sloping and adding waterbars for drainage control, ripping and subsoiling the roadbed, removing culverts and re-establishing natural drainage, and replanting the roadbed. Roads that receive full decommissioning (ripping and subsoiling) will have the most beneficial effect of reducing runoff to streams. The fully decommissioned roads will provide a long-term benefit of decreasing peak flows to streams by disconnecting these roads from the stream.

Construction of new roads in RCAs will be minimized to the extent possible. When roads need to be constructed in an RCA, they will follow Conservation Action 11: Road and Trail Construction and

Management Measures, which will ensure all new roads are hydrologically disconnected to the maximum extent possible and avoid sensitive environments (e.g., streamside, mid-slope, steep slopes) to the extent feasible. Conservation actions will also ensure management direction is in place to limit the use of roads with the potential to deliver sediment to the streams during the wet season. Overall, the combination of all road-related conservation measures will result in a reduction in road-related sediment input to the aquatic system over the course of the permit term.

Implementation of Conservation Action 4: Remove or Modify Artificial Fish-Passage Barriers, and Conservation Action 11: Road and Trail Construction and Management Measures, will result in a net increase of 2.5 to 8.0 stream miles accessible to the covered salmon and steelhead by improving and removing existing barriers and ensuring all new stream crossings meet NOAA Fisheries and ODFW regulations.

Habitat restoration activities implemented under Conservation Action 3: Stream Complexity, will protect and improve watershed processes for covered salmon and steelhead. Stream enhancement projects will be focused in the permit area and will provide direct benefit to covered salmon and steelhead through the implementation of actions that address the covered species' limiting factors and promote the restoration of natural processes. However, projects may also be implemented outside the permit area if it is determined they are high priority and would benefit the covered species. The implementation of stream enhancement projects will immediately benefit the covered species while the adjacent riparian forests are developing to provide long-term benefits.

Beaver management, to benefit the covered species, will also occur under Conservation Action 3: Stream Complexity. The promotion of beaver habitat and the presence of beavers in the permit area can naturally increase stream complexity and provide high-quality rearing habitat. In addition, if natural disturbances occur in riparian areas in locations where beavers could occur and improve fish and aquatic habitat, reforestation methods that promote beaver colonization will be used. Ecosystem alterations made by beavers that would benefit the covered species include reconnected and expanded floodplains, greater hyporheic exchange, higher summer baseflows, expanded wetlands, improved water quality, increased habitat complexity, and increased prey base (Pollock et al. 2023).

Full implementation of the HCP will result in a net increase in quality of available habitat for the covered salmon species. With full implementation of the HCP, 5,405 river miles and 77,300 acres of riparian habitat will be managed toward an improved habitat condition and will minimize effects from covered activities occurring outside of RCAs. Long-term benefits in the permit area associated with implementation of the conservation actions include improved habitat, increased channel complexity, increased fish passage to spawning and rearing habitat, improved water quality conditions, and improved functioning of riparian forest, which would address limiting factors for the covered species, and improve conditions for the covered species in the permit area over the course of the 70-year permit term.

6.3.3.1 Benefits of Monitoring and Adaptive Management Program

The monitoring program described in Chapter 5, *Monitoring and Adaptive Management*, includes ODF's commitment to document trends in habitat conditions across the permit area to verify that the biological goals and objectives are met. The results of the monitoring program will provide documentation that the intended benefits to the covered salmon and steelhead habitat are being

realized. Should monitoring results indicate that biological objectives are not being realized, ODF will implement the adaptive management process described to rectify deficiencies (Chapter 5).

6.3.3.2 Net Effects

The conservation strategy includes maintaining RCAs, which will not be harvested and will develop into older forests over the permit term. RCAs will provide long-term protection and enhancement of the covered salmon and steelhead habitat that will offset timber harvest and other covered activities carried out in the permit area.

Minor, localized take associated with the covered activities will be offset through the implementation of stream enhancement projects. These projects will restore natural processes and create habitat that will improve the overall conditions for the covered species in the permit area.

6.3.4 Effects on Critical Habitat

In the permit area, designated critical habitat occurs for Oregon Coast coho, Lower Columbia River coho, Lower Columbia River Chinook, Upper Willamette River spring-run Chinook, Upper Willamette River winter steelhead, and Southern Oregon-Northern California Coasts coho (Table 6-2). There is no designated critical habitat for Oregon Coast Chinook and Southern Oregon/Northern California Chinook. in the permit area.

Table 6-2. Miles of Critical Habitat by Evolutionarily Significant Unit in the Permit Area

ESU	Total Miles of Designated Critical Habitat	Miles of Critical Habitat in Permit Area	Percent
Oregon Coast coho	6,568	435	7
Nehalem Independent Population	514	192	37
Tillamook Bay Independent Population	375	189	50
Lower Columbia River coho	3,281	25	<1
Lower Columbia River Chinook	1,314	5	<1
Columbia River chum	712	0	0
Upper Willamette River spring Chinook	1,472	3	<1
Upper Willamette River winter steelhead	1,285	14	1
Southern Oregon/Northern California Coast coho ^a	1,649	2.2	<1

^a A GIS dataset does not currently exist for Southern Oregon-Northern California Coast coho critical habitat. These numbers are based on steelhead distribution (as described in Appendix C, *Species Accounts*) and is confined to southern Oregon; stream miles in Northern California are not included.

Under the HCP, all stream miles designated as critical habitat in the permit area will be protected by RCAs.⁸ RCAs will promote the development of functional riparian forests with large trees that will provide shade, contribute to instream habitat, and improve water quality and quantity. Existing roads in RCAs will be assessed to identify locations that contribute sediment to the aquatic system and need to be hydrologically disconnected or moved. In addition, development of new roads in

⁸ Except in limited instances when designated critical habitat extends upstream of an artificial fish passage barrier. In those cases, RCAs would be implemented on the affected stream reach in accordance with Conservation Action 1: Establish Riparian Conservation Areas.

RCAs will be limited to areas where no other option is economically or operationally feasible. New and replacement road design and construction within the RCA will follow Conservation Actions 1 and 2, which include specifications for stream crossings and road buffers to minimize sedimentation. The commitment to reduce sedimentation from existing roads and limit future road development will limit potential sediment inputs to critical habitat. The commitment to improve fish passage will increase available spawning and rearing habitat in the permit area. As riparian conditions are developing in RCAs, stream enhancement projects will focus on restoring natural processes to create habitats that improve overall conditions for the covered species and other aquatic organisms in the permit area, allowing for immediate improvements to instream complexity.

While the covered activities could have minor, localized effects on critical habitat, implementation of the conservation actions identified in Chapter 4, *Conservation Strategy*, and described previously, are expected to protect the physical and biological features that support the life-history requirements of Oregon Coast coho, Lower Columbia River Chinook, Lower Columbia River Chinook, Upper Willamette River spring Chinook, Upper Willamette River winter steelhead, and Southern Oregon-Northern California Coasts coho in the permit area and would be unlikely to destroy or adversely modify critical habitat.

6.4 Effects Analysis for Eulachon

This section describes the effects of the covered activities on eulachon. Eulachon may only occur in a limited portion of the permit area. The permit area does contain a small number of tidally influenced streams along the Columbia River, where eulachon may exist now or at some point during the permit term (Appendix C, *Species Accounts*).

6.4.1 Sources and Types of Effects

Sources and types of effects would be the same as those described for salmon and steelhead in Section 6.3, *Effects and Analysis of Covered Salmon Evolutionarily Significant Units*. Eulachon occur primarily in the mainstem Columbia River and alcoves in the mouths of its tributaries. These mainstem rivers are outside the permit area and eulachon are unlikely to migrate upstream into the streams that occur in the permit area.

6.4.2 Impacts of the Taking on Eulachon

Direct effects on this species would be unlikely. However, they could be affected by changes in water quality and quantity of tributaries of the Columbia River. As described in Section 6.3, *Effects Analysis of Covered Salmon Evolutionarily Significant Units*, these changes would be minor due to implementation of the conservation actions (Chapter 4, *Conservation Strategy*) and BMPs (Chapter 3, *Covered Activities*).

6.4.3 Beneficial and Net Effects

The implementation of conservation actions to benefit the covered salmon and steelhead would benefit eulachon by providing adequate shade in the permit area to maintain/cool water temperatures that are likely to ameliorate the impact of climate change in tributaries to the Columbia River.

6.4.4 Effects on Critical Habitat

Critical habitat has not been designated for eulachon in the permit area; therefore, none will be affected.

6.5 Effects Analysis for Columbia and Cascade Torrent Salamanders

This section describes the effects of the covered activities on Columbia torrent salamander and Cascade torrent salamander. The effects analysis for these species is retained in this HCP although the decision was made to not cover these species.

In the permit area there are approximately 4,675 stream miles of potential habitat (seasonal and perennial non-fish-bearing streams) for Columbia torrent salamanders within their range. Known occurrences of Columbia torrent salamander in the permit area are in Clatsop County, on Clatsop State Forest and in Tillamook County, on Tillamook State Forest. Additional occurrences have been recorded in the vicinity of the permit area including Clatsop, Tillamook, Washington, and Yamhill Counties (Appendix C, *Species Accounts*).

The permit area includes approximately 518 stream miles of potential habitat (seasonal and perennial non-fish-bearing streams) for Cascade torrent salamander. Cascade torrent salamander in the permit area on Santiam State Forest were not detected in the limited surveys conducted by the United States Geological Service and United States Forest Service (Thurman et al. 2025). However, occurrences in the vicinity of the permit area have been recorded in Multnomah, Marion, Clackamas, Linn, and Lane Counties (Appendix C, *Species Accounts*).

6.5.1 Sources and Types of Effects

The covered activities described in Chapter 3, *Covered Activities*, could result in the following categories of stressors on the covered torrent salamander species, each of which is described in more detail here. Harm due to modification of potentially occupied habitat from timber harvest and other silvicultural activities will be the primary sources and type of take of Columbia and Cascade torrent salamanders over the permit term.

- **Direct mortality.** Injury or mortality of individuals resulting from handling or crushing by equipment, humans, or felled trees, either in occupied perennially wet riparian areas or during wet-season dispersal events near occupied streams.
- **Habitat degradation.** Reduction in the quality of habitat as a result of covered activities adjacent to or upstream from occupied habitat.
- **Habitat loss and fragmentation.** Reduction in habitat from covered activities in or adjacent to perennially wet habitat areas and resulting habitat fragmentation from covered activities.

The stressors listed above are categorized in this manner to facilitate a meaningful assessment of the effect's pathways for the covered torrent salamander species. The following sections describe the effects pathways associated from each of the stressors that result from the covered activities.

6.5.1.1 Quantifying Approach to Analyzing Effects

Habitat must be occupied by torrent salamanders to expose individuals to the effects of habitat modification. Habitat modification could occur within stream reaches and associated seeps and springs with documented occupancy or that are within the range of the species in the permit area, as these are places torrent salamanders are most likely to be present. Therefore, to quantify the level of incidental take of torrent salamanders, the HCP primarily uses the acres of habitat that will be harvested or otherwise disturbed or degraded under the HCP within the range of torrent salamanders.

6.5.1.2 Effects Pathways

As stated, modification of potentially occupied habitat will be the primary stressor acting on Columbia and Cascade torrent salamanders over the permit term. The following effects pathways lead to harm.

- Direct injury or mortality due to covered activities that involve tree felling and yarding and associated heavy equipment operation and other physical disturbance that could directly crush individual torrent salamanders in their occupied habitat and during dispersal events.
- Indirectly and over time through degradation or isolation of perennially wet habitats.

Direct Mortality Pathways

Individual torrent salamanders have limited mobility and dispersal capability and are, thus, generally incapable of moving away from stressors to find new habitat. However, during heavy rains, torrent salamanders may be found some distance from perennial waters under leaf litter, branches, and small logs during periods of wet weather. In general, torrent salamanders are apparently unable to disperse overland through dry forests (Bury and Corn 1988; Bury et al. 1991), which may limit connectivity between populations in different streams.

Timber harvest or silvicultural activities that take place in or immediately adjacent to suitable streams and disturb stream surfaces could result in direct injury or mortality of individual salamanders and their eggs. Direct injury or mortality of dispersing torrent salamanders, although likely infrequent, may occur when concurrent with wet-season dispersal outside of stream RCA buffers. Equipment and vehicles used to conduct covered activities outside of RCAs and ERZs could crush salamanders resulting in direct injury or mortality during dispersal.

Habitat Degradation

As described previously, timber harvest of occupied habitat through adjacent tree removal will likely be the primary stressor acting on torrent salamanders over the permit term. Habitat degradation through increased water temperature, sedimentation, and desiccation may result in take only if the habitat is occupied. Within HCAs, the minor amounts of harvest and thinning operations designed to set stand trajectories on the path toward improved habitats for the covered terrestrial species, are also anticipated to cause short-term negative effects early in the permit term, primarily through the removal of some forest canopy cover leading to localized desiccation of directly adjacent riparian habitats. Those habitats in HCAs will then be allowed to mature, and the localized desiccating conditions will ameliorate allowing any degraded habitats to potentially be

recolonized. Outside of HCAs, the potential degradation of potentially occupied habitats is of greater risk.

Upstream of occupied torrent salamander habitats, extensive forest harvest could lead to riparian areas unable to maintain ecological processes, such as regulating stream temperature and streamflow, cycling nutrients, providing organic matter, filtering chemicals and other pollutants, trapping and redistributing sediments, etc. The removal of functional riparian forests can degrade water quality and quantity, while protection and expansion of existing riparian forests can improve conditions.

The effects of timber harvest and its associated activities could also affect the covered torrent salamanders at both a local and watershed scale. Implementation of the HCP will include protection of existing functional riparian systems and restoration of degraded riparian systems to improve potential water quality issues. However, these benefits will be felt most within HCAs and in the lower reaches of riparian areas. Outside of HCAs, the upper reaches of seasonal Type N streams with no RCAs are afforded less protection and subject to increased habitat degradation pressures; however, they also may have less perennial water sources capable of sustaining torrent populations. An assessment of the function and quality of habitat, related to water quality and quantity parameters, as a result of covered activities is presented below. Further analysis of impacts, by HUC 10 watershed, is provided in Appendix F, *Habitat Conservation Area Maps*.

Water Quality and Quantity

Water Temperature

Because torrent salamanders are closely associated with streams and have specific requirements for clear, cold, well-shaded streams (Stebbins 1951), activities that alter stream conditions degrade the species' habitat (Thurman et al. 2025). Activities in riparian areas that remove canopy cover, such as timber harvest, timber management, and fire management, may result in increased water temperatures and decreased dissolved oxygen (Thomas et al. 1993; Blaustein et al. 1995). Torrent salamanders are highly sensitive to temperature changes (Dunham et al. 2007).

Torrent salamanders are specialized for life in cold water and are less likely to be found in streams greater than 16°C (Howell and Maggiulli 2011). Their intolerance to warm temperatures may be attributed to their highly reduced lungs and reliance on cutaneous respiration, which makes them vulnerable to desiccation (Howell and Maggiulli 2011) and more reliant on cold, well-aerated environments. Potential effects on water temperature from harvest activities in the permit area are addressed by maintaining RCAs adjacent to the aquatic zone (see Chapter 4, *Conservation Strategy*, for a full RCA description). Torrents occur in perennial waters along Type N streams; these streams will maintain at least a 35-foot horizontal vegetated buffer for the entire length. Seasonal "other" streams will not be buffered but will maintain a 35-foot ERZs. While these measures will maintain cover and shade in most torrent habitat, the buffers may not be wide enough to completely shade all channel reaches. Bladon et al. (2018) indicate that streams with a 35-foot buffer could warm by approximately 1°C; however, it is unclear if this increase in temperature would prove fatal or whether it would trigger torrent salamanders to migrate to new areas. Surveys will be used to identify where torrents occur in the permit area, and stream temperatures will be monitored in reaches where harvest activities have the potential to affect the species.

Torrent salamanders are likely to experience minor, localized increases in water temperature associated with harvest in smaller order streams that have smaller stream buffers and new road construction.

Fine Sediment

Torrent salamanders are found in shallow, fast-flowing streams with gravel and cobble present. Sedimentation associated with forest-management activities degrade habitats used by torrent salamanders by clogging interstitial spaces in the streambed, which are crucial for shelter, foraging, and reproduction. Fine sediment could clog gills and increase respiratory stress, reduce foraging efficacy due to murky conditions, and cause sublethal stress of individuals growth and reproduction (Howell and Maggiulli 2011). Expected effects associated with sedimentation from implementation of the HCP would be similar to those described for covered salmon and steelhead Section 6.3.1.2, *Water Quality and Quantity*, under *Fine Sediment*. Lakel et al. (2010) found that streamside management zones (buffers) between 25 and 100 feet are effective in trapping sediment before it can enter streams and Rashin et al. (2007) found that timber harvest BMPs, such as limiting ground disturbance near the channel, can ameliorate sediment delivery risk from harvest operations. While implementation of the conservation actions described in Section 6.5.4, *Covered Activities that Minimize and Mitigate Take*, will minimize management-related erosion and sedimentation, complete elimination of management-related inputs is likely not possible, particularly on unbuffered seasonal streams, although the ERZ and associated BMPs are anticipated to greatly reduce this risk.

Water Quantity

Forests influence water yield through the interception of precipitation and transpiration by trees. Because torrent salamanders are closely associated with streams and have specific requirements for clear, cold, well-shaded streams (Stebbins 1951), activities that alter the quantity of cold water degrade the species' habitat. Upland timber harvest in and above riparian areas that remove canopy cover, such as timber harvest, timber management, and fire management, may result in decreases in cold water during certain periods of the permit term.

When a forest is harvested, water that is normally transpired by trees becomes available for streamflow. Post-harvest streamflow's peak after fall and spring storms; however, flows associated with large mid-winter events are generally unaffected as soils are already saturated regardless of cover type (Brown 1973). Peak flows following storms with return intervals of 6 years or more are generally insensitive to canopy removal-related flow increases. Peak flow events from more common return interval storms (e.g., those with a 2-year or smaller return interval) generally do increase in magnitude if sufficient tree cover removal occurs (e.g., 20% to 40%) (Grant et al. 2008). This increase in streamflow associated with regenerating stand conditions with low live tree retention generally lasts approximately 5 to 10 years.

Once forests are over 10 years old and regrowing rapidly, they transpire more than three times the amount of water as mature forests (Moore et al. 2005). This increased transpiration can further reduce summer low flows, reducing available habitat for torrent salamanders. In an analysis of 60 years of daily streamflow records from eight paired-basin experiments, Perry and Jones (2016) found that average daily streamflow in basins with 34- to 43-year-old Douglas-fir plantations was 50% lower than reference basins of 150- to 500-year-old mixed species forests, with the greatest deficit occurring in August and September. Thinning of young, replanted forests did not alleviate this effect. Thinning of mature stands by up to 50% "shelterwood" conditions, or the use of patch cuts of 3 acres or less, resulted in lower initial summer flow increases that did not persist.

Habitat Loss and Fragmentation

One of the main threats to torrent salamanders is loss of habitat. Loss of habitat may also contribute to habitat fragmentation. Fragmentation of habitats may lead to further isolation of populations and restriction of gene flow, which makes populations more vulnerable to local extirpations. These factors are compounded by the relatively long time it takes these salamanders to reach sexual maturity (approximately 4.5 years), and the low number of eggs produced per female and the tendency for females to produce only one clutch per year (Blaustein et al. 1995; Howell and Maggiulli 2011).

Temporary habitat loss may result from the development and use of temporary access roads that cross streams. These areas, however, would be restored to pre-disturbance conditions when covered activities are complete. Roads, trails, and culverts crossing streams may also pose barriers to amphibian movements (Howell and Maggiulli 2011). Perched culverts are problematic for torrent salamander movement due to the loss of substrate continuity, increased water velocity at the downstream outflow pipe, significant drops at the outflow pipe, and lack of instream structures (e.g., quiet pool) (Howell and Maggiulli 2011). Because torrent salamanders are highly associated with the stream channel and adjacent moist ground, the salamanders will not likely move upland to navigate around the barriers that roads and culverts may present. Although it is not known to what degree, roads and trails that cross streams may also fragment habitat for Columbia and Cascade torrent salamanders (Howell and Maggiulli 2011). An inability to disperse puts populations at risk because it limits gene flow and the ability to recolonize after disturbance (Jackson 2003).

Other Stressors

Diseases in torrent salamanders are currently unknown (Howell and Maggiulli 2011); however, Jancovich et al. (1997, 2001) suggest that the *Ambystoma tigrinum* virus has been implicated in a series of mass salamander mortalities in the United States and that the disease is being spread via anthropogenic means. Although more common in frogs, salamanders have been documented with chytridiomycosis and mortalities have occurred (Scheele et al. 2019). Increased human presence in suitable Columbia and Cascade torrent salamander habitat could increase the potential for introduction of disease.

Construction of additional roads in the permit area over the course of the permit term will provide additional public access. Implementation of Conservation Action 11: Road and Trail Construction and Management Measures, will limit construction of new roads inside RCAs, and Conservation Action 5: Standards for Road Improvement and Vacating, will result in identification and vacating of existing roads inside RCAs. Overall, road miles inside RCAs, and associated public access, are not expected to increase significantly over the course of the permit term.

6.5.2 Covered Activities that May Result in Take

Any covered activity that will physically disturb perennially wet aquatic areas near stream reaches where Columbia or Cascade Torrent salamanders are present may rise to the level of take either through direct injury and mortality or through habitat modification and associated loss of the conditions or resources needed by Columbia or Cascade Torrent salamanders for breeding, feeding, and shelter. These activities include timber harvest (regeneration and thinning), road construction and maintenance, quarry work, and recreation development.

Timber harvest, including regeneration harvest and thinning, is the primary activity that is expected to rise to the level of take. Table 6-3 lists covered activities and associated types of take expected to occur over the permit term. Details regarding the effects pathways are provided in the previous subsection.

Table 6-3. Sources and Types of Take of Columbia and Cascade Torrent Salamander Expected Under the Terms of the Habitat Conservation Plan

Covered Activity	Type of Take
Regeneration harvest	Regeneration harvest and associated temporary roads, landings, yarding operations, and use of heavy equipment within or adjacent to occupied habitat is the primary source of take expected for Columbia and Cascade torrent salamanders. Take will primarily be due to risk of direct mortality or injury or exposure of individuals that are not directly killed. Habitat suitability may be reduced through harvesting above or adjacent to occupied habitat when leading to degradation through desiccation or declining water quality and quantity.
Thinning	As with regeneration harvest, thinning within or adjacent to occupied habitat could result in direct mortality, exposure, or reduced habitat suitability.
Road construction	Road construction has the potential to reduce habitat values for torrent salamanders by directly affecting stream habitats or by fragmenting migration routes along stream habitats.
Other covered activities that disturb riparian habitats	Development or maintenance of roads, drainage structures, quarries, and recreation infrastructure, including infrastructure operations, in torrent salamander habitat has the potential to result in take due to direct mortality, a decline in habitat suitability, or the inhibition of migration along stream reaches.
Controlled burning	Cole et al. (1997) found that other salamander species were able to persist following controlled burns and hypothesized that refugia in large downed wood may protect individuals from harm during burns. However, individual torrent salamanders may be injured or killed during controlled burns conducted within occupied habitat.

6.5.3 Covered Activities Not Expected to Result in Take

Data from other species of *Rhyacotriton* suggest that Columbia torrent salamanders are highly sedentary (Nussbaum and Tait 1977; Welsh and Lind 1992; Nijhuis and Kaplan 1998) and have limited dispersal capabilities, with movements typically limited to distances of 10 to 15 feet. Limited dispersal may be related to adults being sensitive to desiccation and larvae being vulnerable to changes in streamflow (Ray 1958). Surface movement is likely reduced during late summer and early autumn when surface conditions are driest (AmphibiaWeb 2019). Although the species is closely associated with its water source, in times of heavy rainfall, torrent salamanders may move away from and be found away from streams in the nearby forest floor as described above.

Covered activities, including the harvest of upland forest that is more than 50 meters from occupied Columbia and Cascade torrent salamander habitat is not expected to result in take because torrent salamanders are strongly associated with high-gradient, permanent, cool or cold-water sources, such as seeps, waterfalls, headwaters, and dispersal is thought to be rare, limited to wet periods, and limited to areas closer to perennial water sources (see Section 6.5.5.1, *Acres of Habitat Directly Removed or Degraded by Covered Activities, Dispersal Habitat*, for further discussion of this distance).

Covered activities that do not either directly or indirectly disturb perennially wet areas within the range of the Columbia and Cascade torrent salamanders, or occur further than 50 meters from them, are unlikely to cause adverse effects that rise to the level of take. Table 6-4 lists the covered activities not expected to result in take of Columbia or Cascade Torrent salamander.

Table 6-4. Covered Activities Not Expected to Result in Take of Columbia or Cascade Salamander

Covered Activity	Rationale for Determining that Mortality or Habitat Modification Would Not Result in Take
All covered activities conducted outside of Cascade and Columbia torrent salamander range and 50 meters from perennially wet habitat	Covered activities that modify habitat or could cause injury where torrent salamanders do not occur, would not result in take.
Mountain beaver control	Control of mountain beaver (<i>Aplodontia rufa</i>) would not adversely affect torrent salamanders because woody material would not be disturbed.
Slash piling	Slash piling in riparian areas of the ERZ is specifically avoided, so would not result in take.
Unmanned Aircraft Systems	No effects pathways identified.
Road System Management Activities	
Existing road system	Existing roads add to habitat fragmentation effects, which may block movements. However, the presence of existing roads is not expected to rise to the level of take because they are considered part of the environmental baseline.
Road use	Road use, including administrative, haul traffic, and recreational/public vehicle use, could conceivably result in direct injury or death of torrent salamanders, but due to the limited movements of this species, the risk is expected to be very low.
Road maintenance	Work within the road prism would not likely affect torrent salamander habitat.
Road decommissioning	Road decommissioning would not likely affect torrent salamander habitat.
Minor forest-product harvest	Harvest of forest greens would not affect habitat. Firewood collection could remove woody material from upland forest stands near roads.
Water drafting and storage	This activity is not likely to adversely affect torrent salamander habitat as water drafting BMPs, such as screening intakes, described under Conservation Action 10.
Conservation Strategy Implementation Activities	
Aquatic habitat restoration	Aquatic habitat restoration may result in minor habitat modification, such as select tree tipping, but such effects are not likely to rise to the level of take because these activities are focused on enhancing fish-bearing streams where torrent salamanders are not present.
Barred owl management	This activity is not likely to adversely affect torrent salamander habitat.
Monitoring activities	This activity is not likely to adversely affect torrent salamander habitat but could result in injury or mortality of few individuals.

6.5.4 Covered Activities that Minimize and Mitigate Take

Implementation of Conservation Action 1: Establish Riparian Conservation Areas, Conservation Action 2: Riparian Equipment Restriction Zones, Conservation Action 5: Standards for Road Improvement and Vacating, Conservation Action 6: Establish Habitat Conservation Areas, and Conservation Actions 11: Road and Trail Construction and Management Measures, will keep stream shade reduction to a minimum and protect water temperature. Implementation of Conservation Action 12: Restrictions on Recreational Facilities, would minimize effects on torrent salamanders in the permit area to minor, localized areas of habitat loss associated with new culvert installation, and road-related stream crossings. Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species, will reduce the risk of mortality from entrainment on water intake systems where water drafting occurs in torrent salamander streams.

Implementation of best practices for culvert installation and maintenance may reduce fragmentation of stream habitats; however, fish-passage criteria will only be abided by when crossings are replaced on fish-bearing streams. Surveys will be used to identify where torrents occur in the permit area.

The following protections are afforded with the implementation of Conservation Action 1: Establish Riparian Conservation Areas, Conservation Action 2: Riparian Equipment Restriction Zones, and Conservation Action 6: Establish Habitat Conservation Areas, limits work in or near RCAs and ERZs.

- (1) Large and medium non-fish-bearing streams will be treated the same as fish-bearing streams; all will have a 120-foot (horizontal distance) RCA that extends from the aquatic zone.
- (2) Small, perennial non-fish-bearing streams will retain a 120-foot RCA (horizontal distance) for the first 500 feet upstream from the end of fish use on perennial fish-bearing streams, to create a PPZ.
- (3) Upstream of the 500-foot PPZ, the buffer will be 35 feet (horizontal distance) from the aquatic zone. While these measures will maintain cover and shade in torrent habitat, the buffers may not be wide enough to completely shade some channels. Bladon et al. (2018) indicates that streams with a 35-foot buffer could warm by approximately 1°C.
- (4) Seasonal non-fish-bearing streams that are potential debris flow track or high-energy reaches that have the potential to deliver large wood to fish-bearing streams will have RCAs that extend 50 feet (horizontal distance) from the aquatic zone for the first 500 feet upstream of the end-of-fish use to recruit wood into streams from standing trees. Upstream of the 500-foot process-protection zone, the buffer will be 35 feet (horizontal distance) from the aquatic zone, to the stream initiation point in potential debris flow track or high-energy reaches.
- (3) Seasonal non-fish reaches that are not potential debris flow tracks or high-energy as described above will not have an RCA, but they will have a 35-foot equipment restriction zone (ERZ). Limited machinery access is permitted within Seasonal Other (Type N) streams and ODF intends to harvest the merchantable timber within the 35-foot ERZ on seasonal other streams while reducing impacts on the aquatic covered species. To promote persistence of the covered aquatic species and the riparian functions of the seasonal channel, ODF developed additional BMPs for Type N streams described under Conservation Action 2). Soil disturbance will be limited to 10% of the ERZ within the harvest unit. Ground based operations and one end suspension cable operations will occur when there is no flowing or ponded water in the seasonal stream. Stream-associated seeps and springs will be incorporated into the RCAs.

Conservation Action 11: Road and Trail Construction and Management Measures, will reduce the risk of mortality by developing roads away from streams and implementing buffers of undisturbed land between roads and streams.

In addition to the establishment of RCAs, ODF field staff incorporate stream-associated seeps and springs into existing RCAs, where present. In addition, it is standard practice to incorporate 35-foot RCAs on otherwise unbuffered Type N seasonal streams where perennial flow is encountered from seeps, springs, or perennial reaches of seasonal streams, where identified.⁹ Such perennial reaches are the result of either continual seep and spring inputs or due to hyporheic flows of ground water emerging through porous sediments to the surface of otherwise seasonal streams. In seasonal streams that periodically dry up, the hyporheic zone sustains aquatic ecosystems by providing a subsurface water supply that could sustain torrent salamanders when present.

6.5.5 Adverse Effects

6.5.5.1 Acres of Habitat Directly Removed or Degraded by Covered Activities

Stream Habitat Loss to Adjacent Harvest

The permit area supports an estimated 4,674 miles of potential Columbia torrent salamander stream habitat and 519 miles of potential Cascade torrent salamander stream habitat (Table 6-3). Under the HCP, take through direct mortality and habitat modification will be minimized through actions described in Section 6.5.4, *Covered Activities that Minimize and Mitigate Take*. However, harvest in stands of habitat directly adjacent to aquatic environments that may be occupied by torrent salamander has potential to directly remove or degrade those habitats.

In general, the highest densities of torrent salamanders in the permit area are expected within and near perennially wet reaches of streams and within pools, reaches, and seeps of otherwise seasonal streams based on the biology of stream-breeding torrent salamanders (Vesely and McComb 2002; Ojala-Barbour et al. 2023). A study comparing salamander density in riparian buffers on either side of streams within unlogged forests and recently logged forests (clear-cut within 5 years) found the width of the riparian buffer explained 40% of the variance in total torrent salamander abundance (Vesely and McComb 2002). The density of torrent salamanders was highest (~70%) within 0 to 10 meters (0 to 33 feet) of streams, and that 80% of torrent salamanders were within 20 meters (65.6 feet [slope distance]). The remaining 20% of detectable torrent salamanders were 40 meters (131 feet) from streams in unlogged control forests (Vesely and McComb 2002).

ERZs are present on all seasonal streams irrespective of RCA widths. Therefore, it is unlikely that instream activities related to timber harvest will have the potential to crush the majority of torrent salamanders or temporarily displace them. However, the presence of torrent salamanders outside of RCA buffers could expose them to direct impacts.

Columbia Torrent Salamander

A total of 2,150 miles (46% of stream miles) of potential Columbia torrent stream habitat are located inside of RCAs within HCAs that will be subject to limited harvest over time, harvest of shorter duration (first 30 years of the permit term), and exposure to fewer new roads or other

⁹ ODF staff may not encounter 100% of all perennial stream reaches along seasonal Type N streams where topographical obstructions prevent inspection of the entire stream reach above perennial initiation points, or where seeps and springs are not obviously associated with the riparian area evaluated during the timber unit's pre-harvest inspections and stand marking.

sources of habitat removal from covered activities. These potential stream miles will assure protection of habitats that provide sheltering, feeding, reproductive, and dispersal habitats to torrent populations (Table 6-5).

Table 6-5. Approximate Stream Miles of Perennial and Seasonal Non-Fish-Bearing Streams and Associated RCA Widths in the Range of the Covered Torrent Salamanders in the Permit Area

Species	Large (120-foot RCA)	Medium (120-foot RCA) ^a	Small (120-foot RCA) ^a	Small (35-foot RCA) ^a	Small Seasonal (0-foot RCA) ^b	Total
Columbia torrent salamander						
Inside HCA	1.1	73.7	296.5	996.0	782.2	2,149.5
Outside HCA	3.1	77.6	292.6	1,130.9	1,020.7	2,524.9
Total	4.2	151.3	589.1	2,126.9	1,802.9	4,674.4
Cascade torrent salamander						
Inside HCA	1.6	8.2	19.0	62.8	159.8	251.4
Outside HCA	0.7	7.8	12.4	66.4	180.1	267.4
Total	2.3	16	31.4	129.2	339.9	518.8

^a These stream reaches are in the known high-energy (HE), process protection zone (PPZ), or transition zones (TZ), in addition to standard buffer widths.

^b Additional buffered stream miles are anticipated once perenniality initiation points are field verified and 100-foot long TZs are allocated; as well as once additional PPZs, PDFT and HE reaches are demarcated. In addition, these buffer values will incorporate any stream-associated seeps and springs that are found in the field. This will transfer some unknown stream reach length from the small seasonal stream category to 35-foot and 50-foot RCA width categories according to details provided in Conservation Action 1.

Outside of HCAs, there are 2,525 miles (54%) of potential Columbia torrent stream habitat, 81 miles of which are buffered by 120-foot RCAs that will mature with time and provide strong buffering against sediment sources or risk or increased desiccation of the habitat. The remaining approximately 1,131 miles (24%) of small streams with 35-foot RCAs and 1,021 miles (22%) of small seasonal streams with no RCAs that could be directly harmed or degraded by timber harvest and lead to direct impacts on torrent salamanders located outside RCA widths. The 24% of potential stream mile habitat with the 35-foot RCA will likely be effective at limiting sediment delivery (Rashin et al. 2007; Lakel et al. 2010), but may not provide full buffering against increased desiccation from adjacent harvest, particularly on south facing slopes with greater sun exposure, or along reaches with greater wind exposure. This suggests that populations could be extirpated from isolated reaches of perennial waters found along seasonal Type N streams with or without the 35-foot RCAs. This effect could potentially extirpate most populations along 54% of the potential stream miles where Columbia torrent salamanders may occur. Those isolated populations could fail to reproduce due to water quality or even water quantity stress, caused by what could be two or more decades of exposure to harvest edge. This could cause a contraction of the population distribution on the landscape away from isolated headwater reaches at higher elevations to those reaches with more continuous and cooler perennial water sources at lower elevations.

However, streams outside of HCAs or larger RCAs will not exist in isolation from forest connectivity or stand buffering for the entire permit term. They will exist in a landscape of variably aged stands including young regenerating stands and stands within a large range of older age classes that will allow for dispersal among stream systems and will provide climatic buffering for most of the permit

term (assuming an average of 65-year rotations, for example). For this reason, it is important to assess the pace and scale of harvest adjacent to potential stream habitats outside HCAs.

Pace and Scale of Stream-Adjacent Harvest

An understanding of the pace and scale of harvest may yield insight into the ability for at least some portion of these unknown occupied sites that are impacted by stream-adjacent harvest to be recolonized over the permit term. An assessment of potential clear-cut conditions at 5-year intervals, by HUC 10, was prepared to evaluate the modeled pace and scale of these activities in Columbia torrent salamander potential stream-adjacent habitat.

Based on modeled habitat harvest (Section 6.7.2, *Covered Activities that May Result in Take*) in the entire geographical range of Columbia torrent salamander (not limited to stream miles), the average percent of watersheds (HUC 10) that are in clear-cut or young forest conditions (0 to 10 years since harvest) ranges from 1.1% in the Willamina Creek watershed to 91.4% in the Upper Nehalem River watershed, averaging 39.0% across 21 total watersheds.

However, only 13% of the habitat area within these HUC 10 watersheds is stream- or RCA-adjacent. This suggests that 13% of the 39%, a value of only 5%, will contain stream-adjacent clear-cut conditions at any given decade over the permit term. This amounts to a cumulative average of approximately 3,382 acres of potential torrent salamander habitat harvested from each of the 21 HUC 10 watersheds for a total of 71,039 acres across all the HUC 10 watersheds over the permit term. It is unclear how much of this stream-adjacent potential habitat contains Columbia torrent salamander populations, how degraded those aquatic habitats will be from exposure to clear-cut conditions, or how many years it may take to recolonize habitats where the torrents were extirpated until forest regrowth is able to provide buffering protection.

Cascade Torrent Salamander

A total of 251 miles (48% of stream miles) of potential Cascade torrent stream habitat are inside of RCAs within HCAs that will be subject to limited harvest over time, harvest of shorter duration (first 30 years of the permit term), and exposure to fewer new roads or other sources of habitat removal from covered activities. These potential stream miles will assure protection of habitats that provide sheltering, feeding, reproductive, and dispersal habitats to torrent populations (Table 6-5).

Outside of HCAs, there are 267 miles (52%) of potential Columbia torrent stream habitat, 21 miles of which are buffered by 120-foot RCAs that will mature with time and provide strong buffering against sediment sources or risk of increased desiccation of the habitat. The remaining approximately 66 miles (13%) of small streams with 35-foot RCAs and 180 miles (35%) of small seasonal streams with no RCAs that could be directly harmed or degraded by timber harvest and lead to direct impacts on torrents located outside RCA widths.

The 13% of potential stream mile habitat with the 35-foot RCA will likely be effective at limiting sediment delivery (Rashin et al. 2007; Lakel et al. 2010), but may not provide full buffering against increased desiccation from adjacent harvest, particularly on south facing slopes with greater sun exposure, or along reaches with greater wind exposure. This suggests that populations could be extirpated from isolated reaches of perennial waters found along seasonal Type N streams with or without the 35-foot RCAs. This effect could potentially extirpate most populations along 48% of the potential stream miles where Cascade torrent salamanders may occur. Those isolated populations could fail to reproduce due to water quality or even water quantity stress, caused by what could be

two or more decades of exposure to harvest edge. This could cause a contraction of the population distribution on the landscape away from isolated headwater reaches at higher elevations to those reaches with more continuous and cooler perennial water sources at lower elevations.

However, streams outside of HCAs or larger RCAs will not exist in isolation from forest connectivity or stand buffering for the entire permit term. They will exist in a landscape of variably aged stands including young regenerating stands and stands within a large range of older age classes that will allow for dispersal among stream systems and will provide climatic buffering for most of the permit term (assuming an average of 65-year rotations, for example). For this reason, it is important to assess the pace and scale of harvest adjacent to potential stream habitats outside HCAs.

Pace and Scale of Stream-Adjacent Harvest

An understanding of the pace and scale of harvest may yield insight into the ability for at least some portion of these unknown occupied sites that are affected by stream-adjacent harvest to be recolonized over the permit term. An assessment of potential clear-cut conditions at 5-year intervals, by HUC 10, was prepared to evaluate the pace and scale of these activities in the Cascade torrent salamander potential stream-adjacent habitat.

Based on modeled habitat harvest (Section 6.7.2, *Covered Activities that May Result in Take*) in the entire geographical range of Cascade torrent salamander (not limited to stream miles), the average percent of watersheds (HUC 10) that are in clear-cut or young forest conditions (0 to 10 years since harvest) ranges from 0.02% in the Upper Calapooia River watershed to 38.3% in the Middle North Santiam River watershed, averaging 3.3% across 14 total watersheds. However, only 7.6% of the habitat area within these HUC 10 watersheds is stream or RCA-adjacent. This suggests that 7.6% of the 3.3%, a value of only 0.25%, will contain stream-adjacent clear-cut conditions at any given decade over the permit term. This amounts to a cumulative average of approximately 406 acres of torrent salamander habitat harvested from each of the 14 HUC 10 watersheds for a total of 5,684 acres across all the HUC 10 watersheds over the permit term. It is unclear how much of this stream-adjacent potential habitat contains Cascade torrent salamander populations how degraded those aquatic habitats will be from exposure to clear-cut conditions, or how many years it may take to recolonize habitats where the torrents were extirpated, but forest regrowth is now offering buffering protection.

Additional habitat may be lost during construction of new stream crossings within the ranges of the torrent salamanders. Based on historic road construction/reconstruction data it is estimated that an average of 177 stream crossings per year will be constructed in the range of the Columbia torrent salamander. Within the range of the Cascade torrent salamander an average of 75 stream crossings are expected to be constructed per year. In general new road construction will be concentrated outside of HCAs, where most harvest will be occurring, though new roads will be built inside HCAs to facilitate management and to provide access to harvest units outside HCAs. This could amount to approximately 76 miles within Columbia torrent salamander range within HCAs and 32 miles within the range of Cascade torrent salamander. Direct mortality of torrents could occur as a result of contact with equipment, personnel, or chemicals, or are present during dewatering associated with the covered activities as described above. In-water activities such as culvert maintenance and installation, stream-crossing construction, and stream enhancement projects have the potential to crush torrent salamanders or temporarily displace them.

Dispersal Habitat

Recognizing the paucity of empirical information available on torrent salamander species in the Pacific Northwest, a 50-meter dispersal distance from water was determined to estimate potential take from covered activities outside of but adjacent to RCAs within range of these species. This distance is supported by anecdotal observations of torrents moving 50 meters from water described in Good and Wake (1992). Nussbaum and Tait (1977) noted the majority of recaptured Cascade torrent salamanders (70%) were found within 2 meters of their original location, with 22 meters representing the longest distance moved over the 4-month observation period. From 2006 to 2009, the Washington Department of Fish and Wildlife monitored torrent salamander movement as part of *the Shade Study on Washington Department of Natural Resources* (Tyson and Hayes 2024). Results from this work recorded 55% of the between year recaptures and 85% of recaptures within the same year moving less than 23 meters from the original capture site.

Acres of potential upland dispersal habitat that would be subject to thinning and harvest over the permit term were calculated by mapping the 50-meter buffer, subtracting the RCA area where harvest would not occur, and evaluating the modeled harvest scenario over the permit term (Table 6-6 and Table 6-7, Figure 6-5 and Figure 6-6). Torrent salamanders are generally not known for extensive seasonal migrations, and their movements are primarily within their localized stream and stream-associated seep habitats where they feed and breed. During rainy, wet periods, individuals might be found in upland forest settings away from streams or seepages. This suggests that they may briefly venture outside their immediate aquatic or semi-aquatic habitats during the wet season for dispersal events and this could occur during harvesting of adjacent stands when both are concurrent. Harvest activities such as thinning, regeneration harvest, and slash treatment have the potential to crush torrent salamanders or to degrade migration routes resulting from increased desiccation stress from canopy removal until the stands regenerate. Surveys of stream reaches in the Cascade Mountains of southern Washington, found the highest levels of detection in 25- to 60-year-old forests, whereas detections were lowest in 0- to 24-year-old forests, and intermediate in forests >61 years (Steele et al. 2003).

Pace and Scale

The occurrence of thinning or harvest activities inside HCAs would be infrequent, minor (~1% of dispersal habitat harvested from HCAs), and limited to the first 30 years of the permit term.¹⁰ RCAs outside of HCAs will permit riparian forest connectivity. They will exist in a landscape of variably aged stands including young regenerating stands and stands within a large range of older age classes (Section 6.2.7, *Modeling Habitat Harvest Inside and Outside of Habitat Conservation Areas*) that will allow for dispersal among stream systems.

Dispersal habitat outside of the various HCA and RCA buffer protections would be subject to one or more harvest or thinning entries over the permit term. As a result, the cumulative harvest of dispersal habitat outside of HCAs and RCAs could amount to approximately 54,179 acres (53%) or 4,493 acres (52%) over the permit term for Columbia and Cascade torrent salamanders, respectively (Table 6-6 and Table 6-7). However, the pace of this harvest, as seen by decade in Figure 6-5 and Figure 6-3, are relatively small, comprising an average of just 5% or 7% of the existing habitat outside HCAs each decade for Columbia and Cascade torrent salamanders, respectively.

¹⁰ See Conservation Action 2.

Table 6-6. Cumulative Harvest of Columbia Torrent Salamander Potential Dispersal Habitat^a Modeled Under the Habitat Conservation Plan Over the Permit Term (acres)

Location	Mapped Dispersal Habitat^b	Dispersal Habitat Thinned	Dispersal Habitat Harvested	Total Harvest of Dispersal Habitat	% Dispersal Habitat Harvested
Within HCAs	34,307	1,512	4,687	6,199	18%
Outside of HCAs	67,573	5,861	42,119	47,980	71%
Total	101,880	7,373	46,806	54,179	53%

^a This is potential habitat outside of the various RCA buffer protections on seasonal and perennial streams, but within 50 meters of the non-fish-bearing stream in the range of the species.

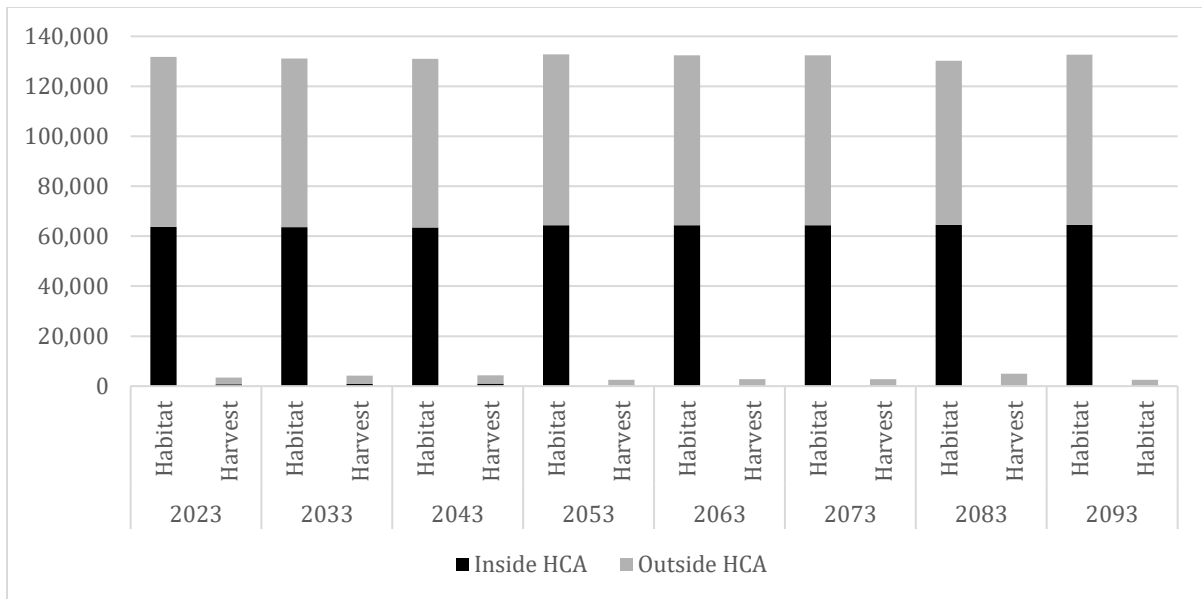
^b Cumulative harvest means that the total harvest of previous periods is added to show the running total of amount of habitat harvested for each period. Because a discrete habitat model was not developed for the torrent salamanders, the habitat range of the species is fixed at approximately 140,000 acres and does not show any age-related increase like other modeled terrestrial species.

Table 6-7. Cumulative Harvest of Cascade Torrent Salamander Potential Dispersal Habitat^a Modeled Under the Habitat Conservation Plan Over the Permit Term (acres)

Location	Dispersal Mapped Habitat^b	Dispersal Habitat Thinned	Dispersal Habitat Harvested	Total Harvest of Dispersal Habitat	% Dispersal Habitat Harvested
Within HCAs	4,513	358	0	358	8%
Outside of HCAs	4,209	2,062	2,073	4,135	98%
Total	8,722	2,420	2,073	4,493	52%

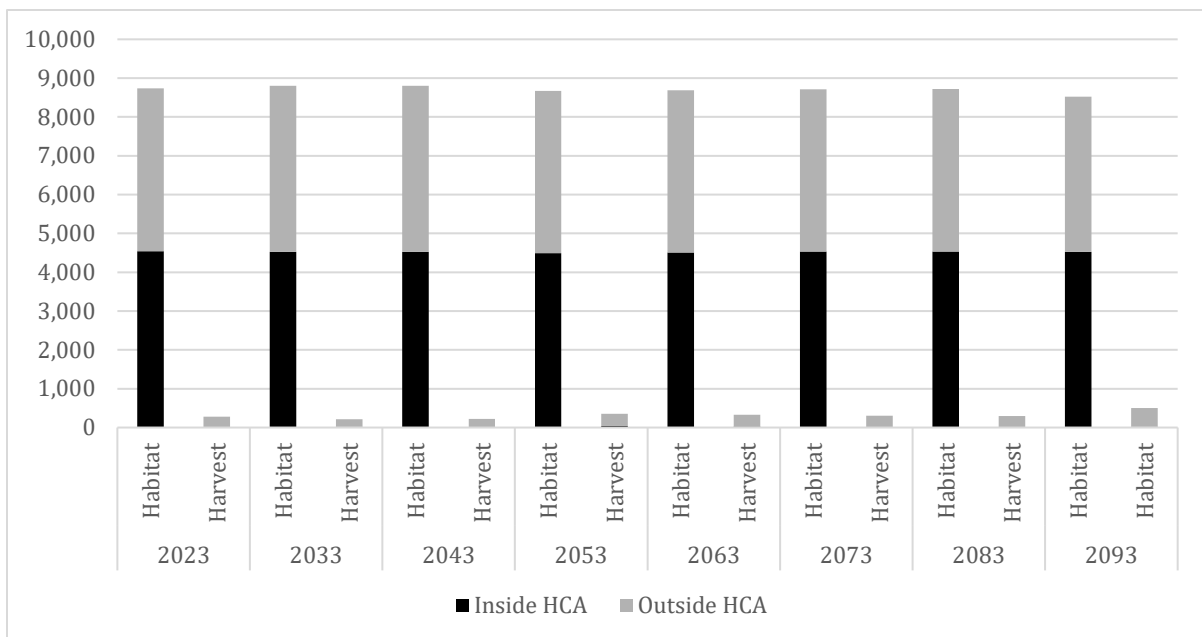
^a This is potential habitat outside of the various RCA buffer protections on seasonal and perennial streams, but within 50 meters of the non-fish-bearing stream in the range of the species.

^b Cumulative harvest means that the total harvest of previous periods is added to show the running total of amount of habitat harvested for each period. Because a discrete habitat model was not developed for the torrent salamanders, the potential habitat range of the species is fixed at approximately 16,600 acres and does not show any age-related increase like other modeled terrestrial species.



Note: Cumulative harvest means that the total harvest of previous periods is added to show the running total of amount of habitat harvested for each period. Because a discrete habitat model was not developed for the torrent salamanders, the habitat range of the species is fixed at 18,000 acres and does not show any age-related increase like other modeled terrestrial species.

Figure 6-5. Decadal Projection of Columbia Torrent Salamander Potential Dispersal Habitat Over the Permit Term (acres)



Note: Cumulative harvest means that the total harvest of previous periods is added to show the running total of amount of habitat harvested for each period. Because a discrete habitat model was not developed for the torrent salamanders, the habitat range of the species is fixed at 1,800 acres and does not show any age-related increase like other modeled terrestrial species.

Figure 6-6. Decadal Projection of Cascade Torrent Salamander Potential Dispersal Habitat Over the Permit Term (acres)

6.5.5.2 Acres of Habitat Indirectly Removed or Degraded by Covered Activities

Habitat degradation due to tree harvesting can increase solar radiation in adjacent riparian areas as well as increase wind speed and exposure to air blown in from adjacent clearings. Collectively, this can cause increases in summertime air, soil, and stream temperatures and decreases in relative humidity (Moore et al. 2005; Anderson et al. 2007). Habitat degradation due to increased desiccation is a well-known indirect effect of clear-cuts adjacent to stream buffers. Small seasonal streams with RCA buffer widths of 35 feet or no buffers (Table 6-5), and these habitats may be subjected to increased air, soil, and stream temperatures and decreases in humidity that could stress torrent salamanders and limit species occurrences in some headwater reaches outside of HCAs in the permit area.

As stated in Section 6.5.5.1, *Acres of Habitat Directly Removed or Degraded by Covered Activities*, within the range of Columbia torrent salamander, this could affect occupied habitat along 2,150 miles of small seasonal streams, a value that represents 46% of the total area of perennial and stream miles that contain potential habitat. Within the range of Cascade torrent salamander, this could affect occupied habitat along 251 miles of small seasonal streams, a value that represents 48% of the total area of perennial and stream miles that contain potential habitats. However, it is unclear whether all habitats near harvest will be equally degraded due to uncertainty in habitat occupancy at the landscape scale.

Cascade torrent salamander occupancy and relative abundance at the landscape scale was also greater in streams with northerly aspects, as compared to southerly aspects, and increased with adjacent riparian forest age. In southern Washington, Pollett et al. (2010) found an abundance of the species to be lower in unbuffered streams than in streams with buffers or in second-growth forests. In privately managed forests of southwestern Washington, Steele et al. (2003) found a relative higher abundance of Cascade torrent salamanders in streams adjacent to older forest stands. In both studies (Russell et al. 2005; Steele et al. 2003), salamanders were found in forests between 0 and 90 years old, with the highest abundance occurring in those areas containing streams surrounded by forests between 43 and 59 years old. The lowest abundance, in occupied stands, occurred in younger forest between 0 and 22 years old (Steele et al. 2003).

6.5.6 Beneficial Effects

The HCP will have positive effects on torrent salamanders by doing the following.

- Increasing the overall quality of late-successional coniferous forest habitat near streams in HCAs and RCAs by maintaining mature canopy cover directly adjacent to them.
- Protecting and improving water quality and instream habitats through buffering approximately half of potential stream habitats.
- Providing protection of seasonal reaches of perennial waters, seeps and springs, along otherwise seasonal streams.
- Protecting talus fields (including all permanently wet talus) located within inner gorge areas up to 170 feet from the stream, all of which are important habitat components for this species.

Some negative effects are expected because the riparian buffers to be implemented under the HCP will maintain stream temperatures over approximately half of the potential stream miles where they

may occur. Other seasonal stream habitats could be affected by increased water temperature due to both climate variability and decreased shade, reductions in water quantity, and increased sedimentation where no or inadequate RCA buffering exists. The HCAs, RCAs, and ERZs minimize direct impacts of timber harvesting on Columbia and Cascade torrent species (Section 6.5.4, *Covered Activities that Minimize and Mitigate Take*) and the probability of covered activities harming torrent salamanders during upland dispersal events is thought to be rare.

6.5.6.1 Management in Habitat Conservation Areas

Implementation of the actions identified and summarized under Section 6.5.4, *Covered Activities that Minimize and Mitigate Take*, will minimize and mitigate the potential effects of the covered activities on the torrent salamanders in the HCAs. The pace and scale of harvest inside HCAs would be infrequent, minor (~1% of stream-adjacent dispersal habitat harvested from HCAs), and limited to the first 30 years of the permit term. Effectively, all streams, including seasonal Type N streams with perennial reaches, will be protected by upland stands that will continue to mature and develop throughout the permit term (Section 6.2.7, *Modeling Habitat Harvest Inside and Outside of Habitat Conservation Areas*).

6.5.6.2 Management Outside Habitat Conservation Areas

Regeneration harvests and associated temporary roads, landings, yarding operations, and use of heavy equipment within or adjacent to occupied habitat is the primary source of take expected for Columbia and Cascade torrent salamanders. Implementation of Conservation Action 1: Establish Riparian Conservation Areas, and to a lesser degree, implementation of Conservation Action 2: Riparian Equipment Restriction Zones, will provide strong protections outside of HCAs for 32% and 17% of potential stream mile habitat for Columbia and Cascade torrent salamanders, respectively. That leaves a potential of 1,021 miles (22%) and 180 miles (35%) for Columbia and Cascade torrent salamanders, respectively, of small seasonal streams outside of RCAs and HCAs that could be directly harmed or degraded by timber harvest. Many perennial reaches and adjacent seeps and springs on otherwise unbuffered seasonal streams will be buffered by 35-foot RCAs when encountered during timber sale layout by ODF staff. In addition, stream networks outside of HCAs and RCAs will not exist in isolation of forest connectivity. They will exist in a landscape of variably aged stands including young regenerating stands and stands within a large range of older age classes that will allow for dispersal among stream systems (Section 6.2.7, *Modeling Habitat Harvest Inside and Outside of Habitat Conservation Areas*). Further, the slow pace and scale of stream-adjacent harvest in the ranges of the torrent salamander suggest that the potentially degraded habitats along unbuffered seasonal stream reaches with perennial water features would have minor effects on torrent populations at the landscape level, and the regeneration of forest stands could provide buffering of habitats that would maintain cooler waters for downstream populations and potentially allow for recolonization in the decades that follow the initial harvest.

6.5.7 Effects on Critical Habitat

Critical habitat has not been designated for Columbia torrent salamander or Cascade torrent salamander.

6.5.8 Net Effects

When combined with upland forest-management measures intended to promote development of mature and late-seral forest in HCAs, the riparian protection measures will minimize approximately 99% of the effects of timber harvesting on the microclimate of small streams in HCAs. Mature forest cover is beneficial to torrent salamanders because it contributes to the cool, moist microclimate required by adults. Outside of HCAs, riparian management measures will protect and promote shade, bank stability, instream habitat, and water quality in many of the watersheds where the torrent salamanders potentially occur. These stream functions are critical to the fully aquatic larval of torrent salamanders, which require cold, clear, oxygen-rich water. Road construction and maintenance measures, including road closures to the public, road abandonment, roadside vegetation, erosion control, culvert improvements, stream-crossing improvements, and road construction improvements on steep and unstable soils will protect existing water quality and stream habitat and improve continuity of riparian forests.

Approximately 1,131 miles (24%) of small streams with 35-foot RCAs and 1,021 miles (22%) of small seasonal streams with no RCAs could be directly harmed or degraded by timber harvest and lead to direct impacts on Columbia torrent salamanders located outside RCA widths. Similarly, approximately 66 miles (13%) of small streams with 35-foot RCAs and 180 miles (35%) of small seasonal streams with no RCAs could be directly harmed or degraded by timber harvest and lead to direct impacts on Cascade torrent salamanders located outside RCA widths. However, it is unclear how much of these stream habitats contain torrent salamander populations, how degraded those aquatic habitats will be from exposure to clear-cut conditions, or how many years it may take to recolonize habitats where the torrents are extirpated, but forest regrowth is now offering buffering protection.

6.6 Effects Analysis for Oregon Slender Salamander

6.6.1 Sources and Types of Effects

Covered activities that include disturbing or removing woody material used by Oregon slender salamander—including timber harvest, thinning, release treatments, roadwork, quarry work, and recreation development and maintenance—are modeled to result in the following two types of incidental take of the species.

- Harm due to direct injury or mortality, such as inadvertently crushing individuals during harvest operations.
- Harm due to habitat modification to the extent that Oregon slender salamanders have reduced survival or reproductive success in areas that are harvested and the species persists. Habitat modification may also lead to mortality over time if adequate levels of woody material are not maintained or individuals are exposed to warmer, drier conditions post-harvest.

The following sections describe the criteria and thresholds for determining when such take will occur, the effects pathways leading to take, and the specific covered activities expected to result in take, as well as those covered activities not expected to result in take.

6.6.1.1 Quantifying Approach to Analyzing Effects

Habitat must be occupied by Oregon slender salamanders to expose individuals to the effects of habitat modification. Habitat modification could occur within stands with documented occupancy or that are within the range of the species in the permit area, as these are places that Oregon slender salamander are most likely to be present. Therefore, to quantify the level of incidental take of Oregon slender salamanders, the HCP uses the acres of habitat that will be harvested or otherwise disturbed under the HCP within the range of the species.

The general sources of habitat modification and the associated thresholds used in this HCP to determine the level of take are presented in Section 6.6.5.1, *Acres of Habitat Directly Removed or Degraded by Covered Activities*. The effects pathways leading to such take are described in the next subsection. For this assessment, *modification* is considered altered habitat structure or composition so that habitat values move from highly suitable or suitable to marginal or non-habitat.

Effects Pathways

As stated, modification of occupied habitat will be the primary stressor acting on Oregon slender salamanders over the permit term. The effects pathways leading to harm due to direct injury or mortality include all covered activities that will involve tree felling and yarding and associated heavy equipment operation and other physical disturbance that could remove or break apart large downed wood and associated bark plates and moss mats or directly crush individual Oregon slender salamanders. The effects pathway includes reduced forest structure, particularly the reduction of large downed logs required by the species (Clayton and Olson 2009).

Loss of these forest structures and overstory may result in the following stressors to Oregon slender salamander.

- Reduced availability of large downed wood and associated habitat, including habitat refuges and microclimates.
- Reduced future recruitment of large downed wood and associated habitat.
- Removed bark plates and moss mats on downed logs required by Oregon slender salamander.
- Reduced availability of foraging habitat and associated prey within large decaying wood.
- Exposed downed wood habitat to sunlight and associated heating and drying (desiccation) (Garcia et al. 2020).
- Fragmented habitat and consequently isolated individuals and small groups due to limited dispersal capabilities (Clayton and Olson 2009).

Individual Oregon slender salamanders have limited mobility and dispersal capability and are, thus, generally incapable of moving away from stressors to find new habitat. The physical response to such stressors is reduced physical fitness due to increased energy outputs (e.g., stress, thermoregulation, metabolism, movement) and reduced energy inputs through prey escape. These energy costs can result in an energy deficit that translates into biological effects, including reduced physical fitness, reproduction, and survival of individual Oregon slender salamander. Harm will occur when energy deficits result in reduced reproductive success or indirect mortality of adults through starvation, exposure/desiccation (heat/cold/rain), disease, or predation. Harm may also occur if habitat is fragmented, preventing movement and associated foraging and reproductive

success. The effects pathway ends with the consideration of the biological effects on individuals within the context of regional and range-wide distribution and populations, which is discussed in Section 6.6.5, *Adverse Effects*. Figure 6-7 summarizes the general effects pathways identified for potential harm to Oregon slender salamander due to habitat modification.

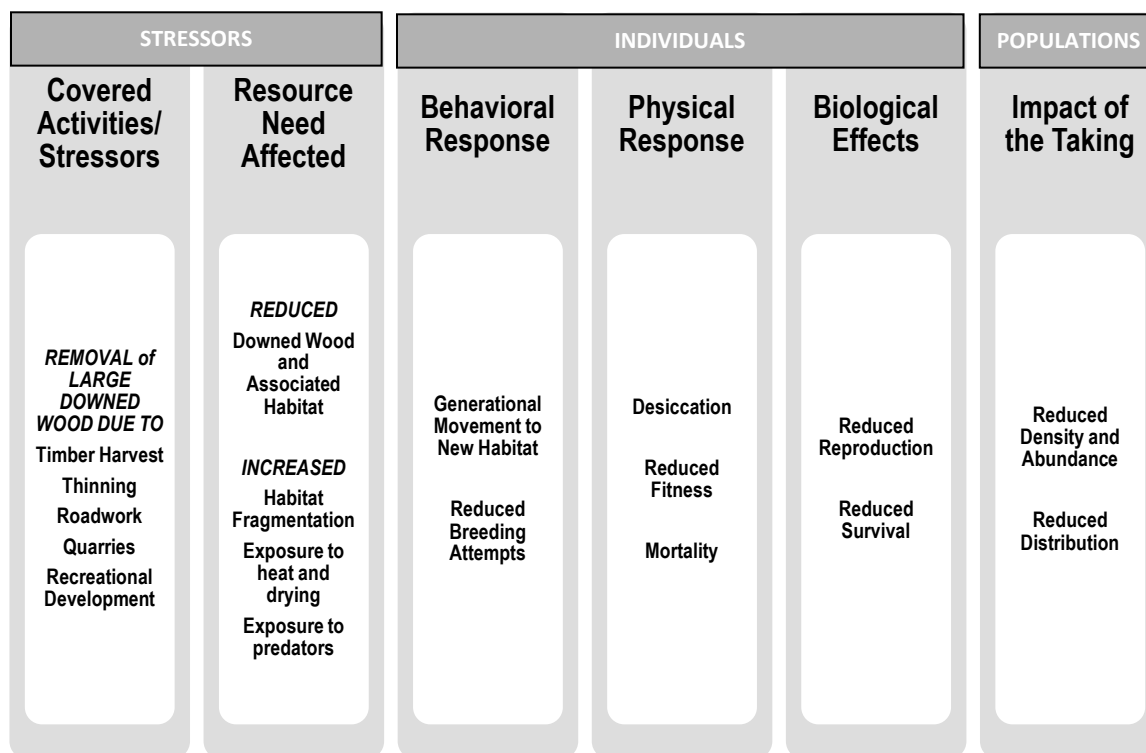


Figure 6-7. Effects Pathways for Impacts of Take of Oregon Slender Salamander via Habitat Modification

6.6.2 Covered Activities that May Result in Take

Any covered activity that will physically disturb moss and litter layers and downed wood where Oregon slender salamanders are present may rise to the level of take either through direct injury and mortality or indirectly through habitat modification and associated loss of resources needed by Oregon slender salamanders for breeding, feeding, and shelter. These activities include timber harvest (regeneration and thinning), treatments, road construction, quarry work, and recreation development and maintenance (e.g., at campgrounds, trails, trailheads).

Timber harvest, including regeneration harvest and thinning, is the primary activity that is expected to rise to the level of take. Table 6-8 lists covered activities and associated types of take expected to occur over the. Details regarding the effects pathways are provided in the previous subsection.

Table 6-8. Sources and Types of Take of Oregon Slender Salamander Expected Under the Terms of the Habitat Conservation Plan

Covered Activity	Type of Take
Regeneration harvest	Regeneration harvests and associated temporary roads, landings, yarding operations, and use of heavy equipment within suitable and highly suitable habitat is the primary source of take expected for Oregon slender salamander. Take will primarily be due to risk of direct mortality or exposure of individuals that are not directly killed. Habitat suitability may be reduced through disturbance of downed wood.
Slash piling	Mechanical piling of smaller slash after regeneration harvest could result in the disturbance of some larger pieces of downed wood. Subsequent burning of piles may result in the loss of some large downed wood and direct mortality.
Thinning	As with regeneration harvest, thinning within occupied habitat could result in direct mortality, exposure, or reduced habitat suitability.
Other covered activities that disturb large downed wood	Development of new roads, quarries, and recreation infrastructure, including infrastructure maintenance and operations, (e.g., campgrounds, trails, trailheads) within Oregon slender salamander habitat has the potential to result in take due to direct mortality or habitat loss.
Controlled burning	Cole et al. (1997) found that other salamander species were able to persist following controlled burns and hypothesized that refugia in large downed wood may protect individuals from harm during burns. However, individual Oregon slender salamanders may be injured or killed during controlled burns conducted within occupied habitat.
Hazard tree removal	Removal of hazard trees may result in minor habitat modification, such as select tree tipping or the placement of downed trees along roads. It has the potential to result in crushing injury to Oregon slender salamanders when present. However, the added wood could enhance habitat values over time.
Aquatic habitat restoration	Aquatic habitat restoration may result in minor habitat modification, such as select tree tipping or the placement of downed trees in stream channels. The use of heavy equipment could crush or injure Oregon slender salamanders when present.

6.6.3 Covered Activities Not Expected to Result in Take

Covered activities that do not disturb large woody material in known occupied or modeled suitable habitat are unlikely to cause adverse effects that rise to the level of take, particularly activities that do not include use of heavy equipment that could crush downed wood that is supporting Oregon slender salamanders. Table 6-9 lists the covered activities not expected to result in take of Oregon slender salamander.

Table 6-9. Covered Activities Not Expected to Result in Take of Oregon Slender Salamander

Covered Activity	Rationale for Determining that Mortality or Habitat Modification Would Not Result in Take
All covered activities conducted outside of Oregon slender salamander range and habitat	Covered activities that do not modify Oregon slender salamander habitat would not result in take.

Covered Activity	Rationale for Determining that Mortality or Habitat Modification Would Not Result in Take
Mountain beaver control	Control of mountain beaver (<i>Aplodontia rufa</i>) will not adversely affect Oregon slender salamanders because large woody material would not be disturbed.
Precommercial thinning and pruning	Thinning and pruning of young stands does not involve extensive disturbance of large, downed wood and is not likely to adversely affect Oregon slender salamanders or their habitat.
Road System Management Activities	
Existing road system	Existing roads add to habitat fragmentation effects, which may block movements. However, the presence of existing roads is not expected to rise to the level of take because they are considered part of the environmental baseline.
Road use	Road use, including administrative, haul traffic, and recreational/public vehicle use, could conceivably result in direct injury or death of Oregon slender salamander, but due to the limited movements of this species (Clayton and Olson 2009), the risk is expected to be extremely unlikely.
Road maintenance and hazard tree removal	Work within the road prism would not be likely to affect Oregon slender salamander habitat. This includes hazard tree removal, which would likely fall into the road prism, thus, not providing downed wood habitat in the forest.
Road decommissioning	Road decommissioning would not disturb large downed wood or otherwise adversely affect Oregon slender salamanders.
Drainage structure construction and maintenance	Drainage work occurring predominantly within the road prism would not adversely affect Oregon slender salamander habitat.
Water drafting and storage	This activity is not likely to adversely affect Oregon slender salamander habitat.
Conservation Strategy Implementation Activities:	
Barred owl management	This activity is not likely to adversely affect Oregon slender salamander habitat.
Monitoring activities	This activity is not likely to adversely affect Oregon slender salamander habitat. Any research activities that propose using destructive sampling techniques (including contractors and external research organizations) will obtain necessary clearance from Oregon Department of Fish and Wildlife.

6.6.4 Covered Activities that Minimize and Mitigate Take

The implementation of Conservation Action 1: Establish Riparian Conservation Areas, Conservation Action 2: Riparian Equipment Restriction Zones, Conservation Action 6: Establish Habitat Conservation Areas, and Conservation Action 7: Manage Habitat Conservation Areas, will limit direct impacts on Oregon slender salamanders and protect high-quality habitat in reserves, which will provide ample downed wood and mature forest that enables moist environments for Oregon slender salamanders to persist on the landscape. Implementation of Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas, will maintain a diversity of stand ages and retain forest legacy features that will contribute to downed wood outside of HCAs and RCAs.

Timber stand-management standards outside HCAs include the following management standards detailed in Chapter 4, Section 4.7.8.2, *Stand-Level Management Standards*. Also see detailed standards in Table 4-13, *Timber Stand-Management Standards Outside of Habitat Conservation Areas*.

- During harvest activities, retain existing down logs and forest legacy features during regeneration harvest.
- Where available during regeneration harvest, retain at least 600 cubic feet of hard conifer logs (decay class 1 and 2), on average, per acre in each harvest unit outside RCAs, including at least an average of two logs per acre greater than 20 inches in diameter (at the largest end).
- Sales that are unable to meet the cubic-foot or large-diameter requirement due to stand species composition, small-diameter residual logs, or any other reason will be reported as part of the annual report along with an explanation of the rationale and any efforts that were taken to mitigate. Examples of potential mitigation measures could or may include:
 - Leaving hardwood logs where conifer logs are not present.
 - Additional leave trees left at the stand, sale, or basin levels.
 - Additional downed wood left on the basin level.
 - Pockets of blowdown or downed logs in vicinity of the operation left on the landscape.

6.6.5 Adverse Effects

Quantifying direct and indirect take of Oregon slender salamanders based on habitat is complicated by the lack of data regarding a key habitat variable—downed wood—across the range of Oregon slender salamander within the permit area, as well as by uncertainty regarding the habitat requirements and effects of timber harvest on the species (Garcia et al. 2020) and altered conditions due to fires in 2020. While Oregon slender salamanders are abundant in older stands with abundant well-decayed large, downed wood, they are also common in younger stands (e.g., <60 years old) where previous disturbance (harvest, fire) has occurred (Garcia et al. 2020). Because of this and based on known occurrence and distribution of this species as present throughout the permit area in the vicinity of the Santiam State Forest, ODF assumes the species is present in all stands within the range of the Oregon slender salamander and that any harvest in such stands has the potential to take individuals. ODF took the approach of considering any timber harvest within the range of the species as habitat modification that could result in take over the 70-year permit term.

Approximately 49% (23,400 acres) of the species' range in the permit area will be in HCAs and RCAs. Habitat modification in HCAs will be limited to thinning in select stands and some conifer restoration projects. This management will follow the criteria and processes outlined under Conservation Action 7: Manage Habitat Conservation Areas. Therefore, ODF expects take to be limited in HCAs. Thinning in HCAs would occur earlier in the permit term. Most stands in HCAs would be managed passively and allowed to mature over time.

The remaining 51% (24,100 acres) of the species' range within the permit area is outside of HCAs and RCAs, and harvest there will occur consistent with Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas, and Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species. While various operational restrictions beyond the scope of this HCP will prevent the harvest of some of the 24,100 acres during the permit term, it is assumed that most areas outside of HCAs and RCAs could be thinned at

least once and subsequently harvested during the permit term, and harvest is expected to occur consistently over time on the Santiam State Forest. Annual thinning and subsequent regeneration harvest of habitat in the range of Oregon slender salamander outside of HCAs is anticipated to vary over the permit term and to average approximately 200 to 500 acres each year.¹¹ This will result in an average of approximately 344 acres of harvest per year outside of HCAs over the permit term. Some younger stands may be thinned more than once, depending on stand age at the beginning of HCP implementation, whereas other older stands may not be thinned. In all cases it is assumed that stands outside of HCAs and RCAs may be thinned once or twice before a final harvest is completed (Table 6-10).

Table 6-10 summarizes the amount of thinning or regeneration harvest that may be conducted within the range of Oregon slender salamander in the permit area over the 70-year permit term.

Table 6-10. Oregon Slender Salamander Habitat Subject to Thinning and Harvest Under the Habitat Conservation Plan Over the Permit Term ^a

Location	Habitat Thinned	Habitat Harvested	Total
Within HCAs	3,600 ^b	--	3,600
Outside of HCAs and RCAs	10,000 ^c	24,100	34,100 ^d
Total	13,600	24,100	37,700

^a Assumes presence in all 47,500 acres of the range of Oregon slender salamander that are in the permit area. Numbers rounded to nearest 100 acres.

^b 3,600 acres of habitat thinning within HCAs in the first 30 years of implementation equates to 120 acres per year.

^c There may be an average of 1.5 entries into the 10,000 acres outside HCAs and RCAs given some stands would not be thinned and others may be thinned twice over the permit term. These acres are part of the 24,100 total acres that will eventually be harvested and are double counted in the total column.

^d Outside HCAs and RCAs, the proportion of thinned versus harvested habitat that comprise this 24,100-acre range overlap are subject to change over the permit term in response to future forest-management and forest health decisions.

6.6.5.1 Acres of Habitat Directly Removed or Degraded from Covered Activities

Direct take resulting from habitat loss and other adverse effects, such as direct mortality from vehicles operating off-road in harvest units, described in Section 6.6.5, *Adverse Effects*, will occur within the following contexts and levels of intensity.

- Approximately 49% (23,400 acres) of the range of Oregon slender salamander in the permit area will be located in HCAs (19,200 acres) and RCAs (4,200 acres), where habitat conditions will improve over time (described under Section 6.6.8, *Net Effects*). Approximately 17% of Oregon slender salamander habitat in HCAs will be thinned, meaning that approximately 3,600 acres of the 19,200-acre range in HCAs but outside of RCAs will be subject to harvest or management. That will occur in the first 30 years of the permit term resulting in, on average, 120 acres per year. No regeneration harvest will occur in HCAs (or RCAs) in Oregon slender salamander habitat.

¹¹ Based on thinning projections (described in Section 6.2.7, *Modeling Habitat Harvest Inside and Outside of Habitat Conservation Areas*) adjusted proportionally to the range of Oregon slender salamander for the entire Santiam State Forest.

- Approximately 51% (24,100 acres) of the range of Oregon slender salamander habitat in the permit area is outside HCAs and RCAs, and subject to thinning and a regeneration harvest.
- Combined, approximately 58% of the Oregon slender salamander habitat will be subject to thinning or regeneration harvest over the permit term.

6.6.5.2 Acres of Habitat Indirectly Removed or Degraded from Covered Activities

Oregon slender salamanders are known to persist in harvested areas if sufficient legacy downed wood and associated habitat is retained (Garcia et al. 2020), as will occur under the HCP (Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas), so it is difficult to predict the total intensity of effect. Some individuals will likely perish, due to newly inhospitable habitat conditions, but others will persist in the stands post-harvest with both new and legacy downed wood retention. The impact of the taking from habitat modification is, therefore, not likely to eliminate Oregon slender salamanders from even those stands that are harvested. Long-term monitoring of some harvested stands, as described in Chapter 5, *Monitoring and Adaptive Management*, will increase understanding of how the species is affected by harvest-related activities and will guide retention of downed wood standards over time, thereby further minimizing effects in the future through adaptive management.

6.6.6 Beneficial Effects

Under the HCP, Oregon slender salamander populations will benefit from the following.

- Protection of occupied habitat within HCAs (Conservation Action 6: Establish Habitat Conservation Areas).
- A net increase in the quantity and quality of habitat over the permit term inside HCAs (Conservation Action 7: Manage Habitat Conservation Areas).
- Retention of legacy structure, including downed wood, in harvested stands outside HCAs (Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas).

While 24,100 acres (51%) of the permit area within the range of Oregon slender salamander is outside of HCAs and RCAs and may be subject to harvest, leave-tree and downed wood retention in those harvest units will retain some in-unit habitat for the species. As a result, harvest of those acres will not be a complete loss of habitat or habitat value. Take will primarily occur in portions of harvested habitat where covered activities result in a loss of habitat value.

6.6.6.1 Management in Habitat Conservation Areas

Under Conservation Action 6, ODF includes 23,400 acres (49%) of Oregon slender salamander range in the permit area in HCAs and RCAs where it will be managed for mature forest conditions and processes. This will result in the recruitment of additional large downed wood, potentially increasing populations sustained by the larger amount of wood over time. The average stand age at the beginning of the permit term inside HCAs is 70 to 90 years (Figure 6-8). At the end of the permit term the average stand age inside HCAs is 140 to 160 years (Figure 6-9). This increase in older, larger trees inside HCAs will result in the recruitment of higher-quality downed wood in Oregon slender salamander habitat. Additionally, ODF will supplement downed wood as part of harvest

plans or habitat improvement within HCAs, which will provide immediate recruitment of downed wood that may provide suitable habitat for Oregon slender salamander populations over the permit term. Silvicultural prescriptions in HCAs will enhance large tree development while minimizing impacts on existing downed wood, enhancing large wood recruitment and quality over the permit term relative to unmanaged conditions.

6.6.6.2 Management Outside Habitat Conservation Areas

Outside of HCAs ODF's retention standards will increase the potential for Oregon slender salamanders to persist in harvest units, even following harvest (Figure 6-8 and Figure 6-9). In addition, retention of legacy structure on the landscape will speed recruitment of more large downed wood in the future as described in Conservation Action 8. This will minimize take and improve habitat conditions. Retaining snags and emphasizing the need to select from the larger trees in the stand to determine which trees to retain as upland leave will ensure larger trees are present through subsequent rotations, and long-term recruitment will occur in the stand over time.

As described in Chapter 5, *Monitoring and Adaptive Management*, baseline monitoring under the HCP will provide a better understanding of Oregon slender salamander distribution, abundance, and habitat use in the permit area, including effects of timber harvest, silvicultural practices, and fire.

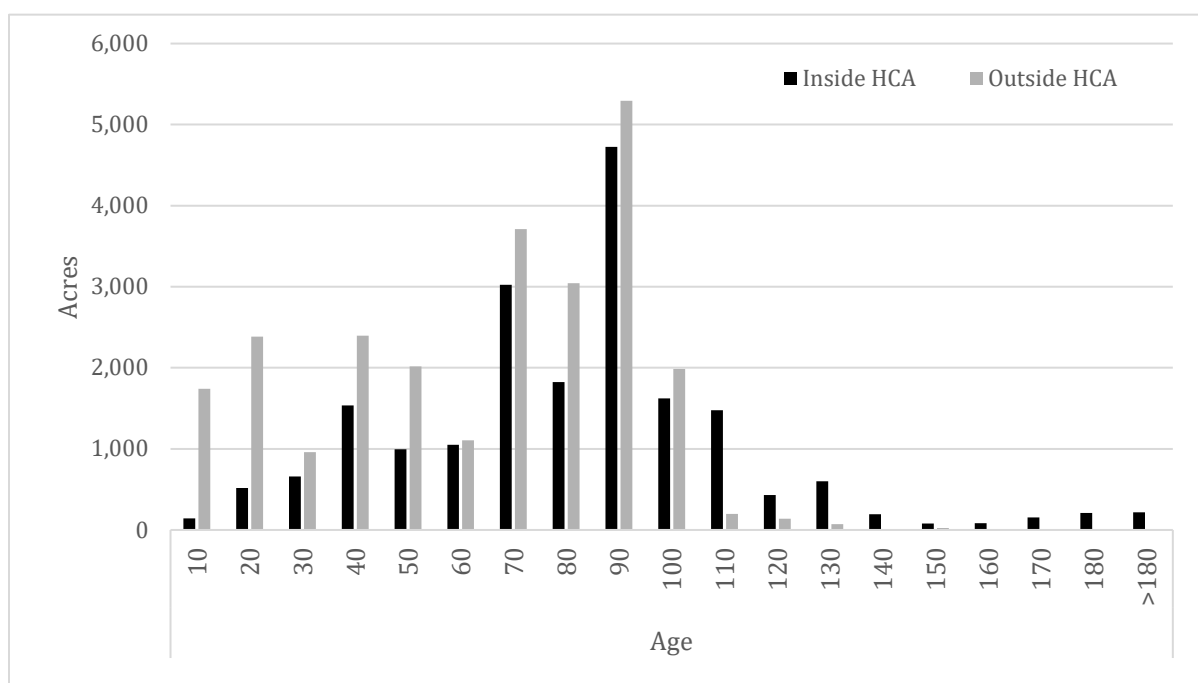


Figure 6-8. Stand-Age Distribution in Oregon Slender Salamander Habitat in 2023

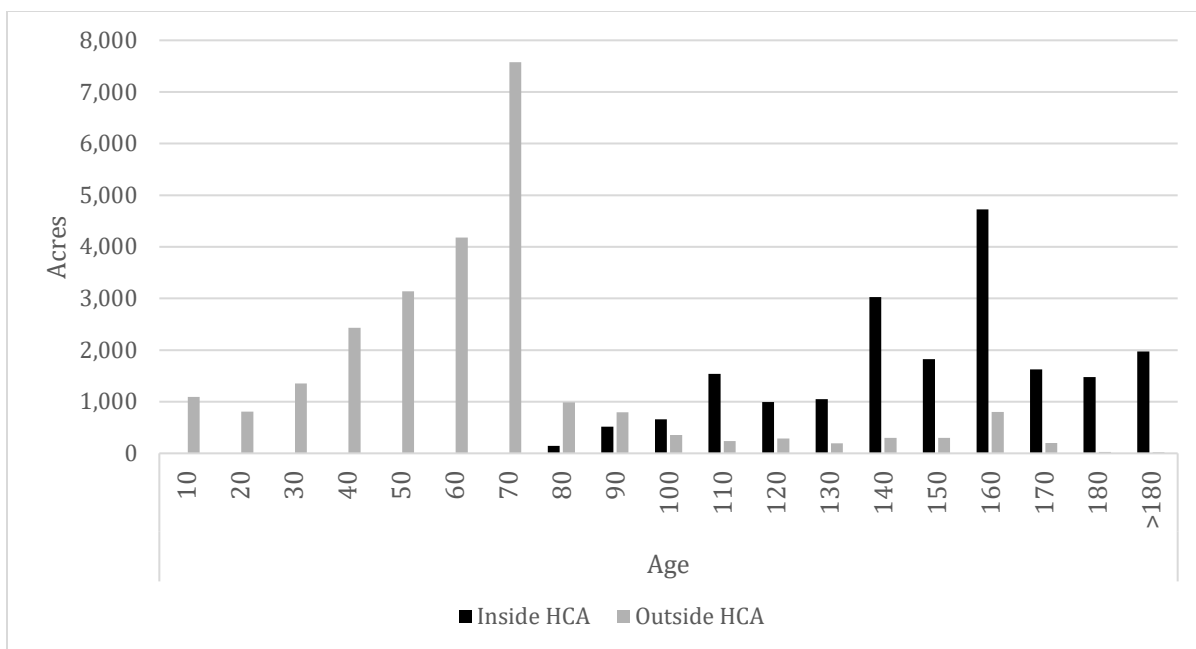


Figure 6-9. Stand-Age Distribution in Oregon Slender Salamander Habitat in 2093

6.6.7 Effects on Critical Habitat

Critical habitat has not been designated for the Oregon slender salamander.

6.6.8 Net Effects

Due to the restricted distribution and limited dispersal capabilities of the Oregon slender salamander (Clayton and Olson 2009; Garcia et al. 2020), it is important to conserve occupied habitat, or habitat that is likely to be occupied, to provide for population persistence. Contiguous potentially suitable habitat within HCAs will promote dispersal and reduce genetic isolation in a fragmented landscape. Retaining and creating downed wood of appropriate size and decay classes is necessary to ensure appropriate microhabitat conditions are present for Oregon slender salamander (Clayton and Olson 2009; Garcia et al. 2020). Leaving this substrate post-harvest will allow for the Oregon slender salamander to better persist through harvest rotations and will ameliorate many of the disturbance effects on the species, thereby supporting the occurrence or abundance of the species. Knowing that the species may persist in harvested units at some level, coupled with the retention standards implemented during harvest, combined with designation and management of HCAs, will result in a net benefit for this species over the permit term. As described in Section 6.6.6, *Beneficial Effects*, Oregon slender salamander habitat is modeled to increase over the 70-year permit term in terms of quantity and quality, resulting in net, long-term benefits to abundance and distribution in portions of the permit area within the range of the species.

6.7 Effects Analysis for Northern Spotted Owl

6.7.1 Sources and Types of Effects

6.7.1.1 Type of Effects

Effects from covered activities include the potential to harm individual northern spotted owls as follows.

- Direct injury or mortality from activities such as inadvertently destroying a nest with young or eggs.
- Behavioral or physical responses to noise and disturbance, such as unintentionally flushing an owl from a nest and exposing the young or eggs to predation or rain.
- Reduced survival and reproductive success due to habitat modification within or adjacent to habitat to the extent that owls become more susceptible to predation, abandon established territories, or have reduced reproductive success due to reduced foraging efficiency (i.e., lack of forage or expansion of home range).

6.7.1.2 Avoidance and Minimization Measures

Direct injury or mortality and disturbance of actively nesting pairs will be minimized during the nesting season through Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species. However, because knowledge regarding nesting locations is never complete, unknown nest sites could potentially be disturbed or destroyed. The HCP includes surveying and monitoring to minimize such occurrences in the HCAs (Chapter 5, Section 5.3.2.2, *Terrestrial Habitat Monitoring*). Section 6.7.4, *Covered Activities that Minimize and Mitigate Take*, lists and summarizes the specific avoidance, minimization, and mitigation measures defined as part of covered activities (Chapter 3), the conservation strategy (Chapter 4), and monitoring and adaptive management (Chapter 5).

6.7.1.3 Sources of Effects

Timber harvest and other silvicultural activities—including disturbance (e.g., noise and visual disturbance due to activity related to roadwork, harvest, yarding)—will be the primary sources of effects on northern spotted owls over the permit term. The HCP minimizes and mitigates the effects of these activities through designated HCAs (Conservation Action 6: Establish Habitat Conservation Areas) and associated management and conservation measures (Conservation Action 7: Manage Habitat Conservation Areas).

Inside of HCAs, harvest activities will occur where there are opportunities to increase the quality and quantity of habitat for covered species over the permit term, following the criteria and decision processes outlined in Conservation Action 7 and shown in Appendix H, *ODF Roads Manual*. This includes regeneration harvest in non-habitat or heavy thinning of stands of non-habitat that are unlikely to grow into nesting, roosting, or foraging habitat sooner within the permit term without silvicultural intervention. Silvicultural interventions will be designed to accelerate the development of northern spotted owl habitat in some areas.

Stands requiring this management will be treated during the first 30 years of the permit term so they are put on a trajectory to develop into habitat. In those instances, short-term effects on northern spotted owl habitat are expected to be minimal, given that operations are mostly in lower-quality habitat or areas that are non-habitat. Thinning intensity will depend on existing stand conditions and variable-density thinning may be used to accelerate the development of understory and mid-story canopy, or promote horizontal diversity necessary for nesting, roosting, or foraging habitat.

These treatments may have short-term negative effects, primarily through the removal of some forest canopy cover and reduction in prey availability (Lesmeister et al. 2018). However, thinning efforts will be conducted only at a limited scale, and effects will be offset by the creation of better habitat in less time than would occur with natural growth. In addition, as outlined in Conservation Action 7, management activities in nesting or roosting habitat will be rare or will not occur at all. However, there are many areas of lower-quality habitat in HCAs. Stand-management activities in these less-essential and lower-quality habitats in HCAs will occur more frequently as necessary to increase and expedite the development of stands to higher quality. Reforestation and young stand-management practices in HCAs are described in Chapter 3, *Covered Activities*.

Outside of HCAs and RCAs, habitat will be subject to harvest, although dispersal habitat will be maintained, as specified under Conservation Action 8.

The following subsections describe the criteria and thresholds for effects, as well as the effects pathways that may lead to take, and the specific covered activities the applicant expects to result in take, as well as those not expected to result in take.

6.7.1.4 Quantifying Approach to Analyzing Effects

To inform USFWS calculations regarding the level of incidental take of northern spotted owls, a key metric provided in this chapter is the estimated acres of nesting, roosting, and foraging habitat that will be harvested or thinned under the HCP. Not all modification of habitat will result in take. The likelihood that effects of habitat modification from timber harvest on northern spotted owls would rise to the level of take depends on existing conditions of the stand to be modified and proposed harvest specifications. Habitat must be occupied by northern spotted owls for individuals (or pairs or young) to be exposed to the effects of habitat modification. In addition, the habitat modification must be sufficiently severe so as to interfere with essential behaviors to the extent that individuals are actually harmed.

Habitat modification within stands that are modeled as nesting, roosting, or foraging habitat are most likely to result in take because individuals are most likely to be present in these areas. Therefore, modification of such modeled habitat will inform USFWS take estimates for northern spotted owls. In addition, habitat modification has landscape-level effects that may occur whether or not owls are currently present.

Other direct effects, such as noise disturbance, are provided within a quantitative context of the anticipated pace and extent of activities, including annualized and decadal harvest projections.

6.7.1.5 Effects Pathways

Covered activities can affect northern spotted owls through the following pathways.

- Directly and immediately through noise, physical disturbance, and habitat modification where covered activities are conducted near individual northern spotted owls, particularly owls that are nesting or roosting.
- Indirectly and over time through habitat modification.

Disturbance Pathways

Disturbance of a nest due to noise and visual disruptions from covered activities can cause brooding owls to flush from the nest and lead to loss of eggs due to predation or exposure and can otherwise reduce survival of eggs and chicks. Other disturbance pathways include physical disturbances that lead to direct injury, such as nest tree removal during tree felling and other habitat modifications that result in direct injuries to individuals. While the HCP includes measures to minimize and avoid such effects, the possibility of disturbing unknown nesting sites leaves nest-site disturbance a possible outcome of the HCP.

Habitat Modification Pathways

As described in Section 6.7.1, *Sources and Types of Effects*, modification of occupied habitat through tree removal will be the primary stressor acting on northern spotted owls over the permit term. Habitat modification may result in take only if the habitat is occupied and if remaining habitat is not sufficient to support the individual owls or owls that were once occupying the habitat that was modified by covered activities.

The effects pathway leading to take begins with reduced forest structure, including reduced tree density, canopy cover, canopy layers, and large trees, snags, and downed logs. Loss of these forest structures may result in the following stressors to resources.

- Elimination of large trees and associated canopy cover required for nesting.
- Elimination of perches, canopy cover, and multiple canopy layers required for roosting and foraging.
- Reduction of available prey that is associated with high levels of forest structure.
- Increased presence of competitors and predators that are able to use habitats modified by timber harvest, including great horned owls (*Bubo virginianus*), barred owls (*Strix varia*), and corvids (*Corvidae*).
- Fragmented habitat so that habitat patches become inaccessible or require additional effort and predation risk to access.
- Modified habitat that reduces the resilience of northern spotted owls to barred owl competition through landscape conversion to lower-quality fragmented forest habitats.

The behavioral response of individual owls (or pairs) to such stressors may include the following. All of these would reduce overall fitness for the species.

- **Avoidance.** Individual northern spotted owls will not nest in clear-cuts and heavily thinned stands that result in low or reduced canopy cover and fewer large trees and associated buffer

habitat. Owls may also avoid roosting or foraging in modified habitat due to reduced perches, canopy protection, lack of prey, or exposure to predators and competitors, including barred owls. Owls may also avoid habitat patches that become isolated due to habitat modification.

- **Shift nesting area or do not nest.** If suitable alternative habitat is available, established pairs may shift nest sites to new areas if a nesting site is lost or if barred owls occupy nesting areas due to habitat modification. If habitat is not available, owls may not nest for 1 or more years until a suitable nesting area is found.
- **Abandoned nesting attempts.** Established spotted owl pairs may have lower nest success due to reduced prey capture, exposure to predators near nesting areas, or disturbance. Owls may also not attempt to nest if adequate prey is not available.
- **Shift foraging areas.** Northern spotted owls may expand foraging areas to make up for lost habitat (Meiman et al. 2003), potentially using areas with lower suitability and prey base.
- **Territory abandonment.** At some point, loss of habitat may be sufficient to cause northern spotted owls to abandon established territories due to lack of habitat or to displacement by barred owls and the subsequent inability of new individuals to recolonize, or displaced individuals to find, new territories. Abandonment of a territory and search for replacement territory may or may not result in pairs splitting up. In either case, abandoning a territory to search for a new one would place tremendous stress on individuals, including increased energy expenditures (movement) and decreased energy acquisition (feeding).

All these stressors and associated behavioral responses may result in an ultimate physical response of reduced fitness due to increased energy expenditure (e.g., stress, increased time spent moving or hunting) and reduced energy capture (prey). These energy costs can result in an energy deficit that translates into biological effects, including reduced fitness, reproduction, and survival of individual northern spotted owls. Harm would occur when energy deficits result in reduced nesting successes or mortality of adults through starvation, exposure (heat/cold/rain), disease, or predation.

The effects pathway ends with the consideration of the biological effects on individuals within the context of regional and range-wide distribution and populations, which is discussed in Section 6.7.5, *Adverse Effects, Impacts of the Taking on Northern Spotted Owl*.

Figure 6-10 summarizes the general effects pathways identified for potential harm to northern spotted owls due to habitat modification.

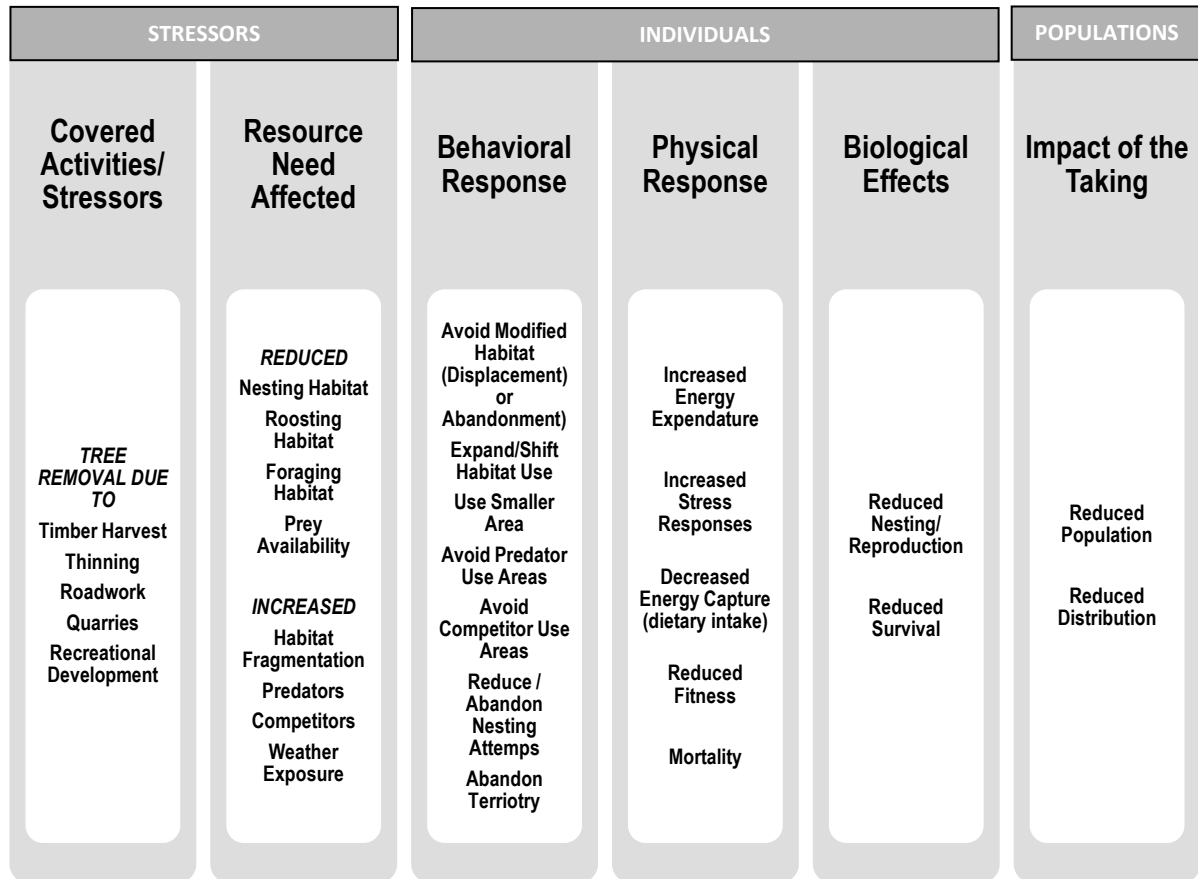


Figure 6-10. Effects Pathways Identified for Northern Spotted Owl via Habitat Modification from Covered Activities

6.7.2 Covered Activities that May Result in Take

Based on the thresholds and effects pathways described previously, effects of several covered activities may rise to the level of “take” via habitat modification when conducted within northern spotted owl habitat, including regeneration harvest, thinning, landings, road construction, quarry work, and recreation infrastructure development, maintenance, and operations (e.g., campgrounds, trails, trailheads). Table 6-11 lists covered activities and associated types of take expected to occur over the permit term.

Table 6-11. Sources and Types of Take of Northern Spotted Owl Expected from Covered Activities

Covered Activity	Source of Take	Type of Take
Regeneration harvest	Removal of nesting, roosting, or foraging habitat within/adjacent to occupied areas; felling of nest/adjacent trees; machinery/vehicles/falling materials; noise and activity during the nesting season; edge effects increasing exposure to predators and competitors;	Direct mortality or injury (egg, chick, adult); harm via significant impairment of essential behavioral patterns (nesting, roosting, foraging); nest/territory abandonment; reduced prey capture and reproductive success; increased predation/ competition risk; disturbance/ harassment

Covered Activity	Source of Take	Type of Take
Thinning	displacement to replacement habitat with higher energetic cost Removal of sufficient number/type of trees to reduce habitat quality; noise and activity disturbing birds in adjacent habitats	Reduced reproductive success; site/territory abandonment; disturbance/harassment; (in extreme cases) direct injury/mortality if nest/roost tree affected
Hazard tree removal	Targeted removal of hazard trees along roads or in public-use areas; localized habitat modification near roads	Reduced habitat value (harm via habitat modification); disturbance/harassment; effects often discountable relative to home-range scale
Road use	Vehicle traffic associated with covered activities near occupied or dispersal areas	Direct mortality (vehicle strike), including dispersing juveniles; otherwise part of baseline use
Road construction and maintenance	Heavy equipment and activity within the road prism adjacent to unknown owl presence	Disturbance/harassment; potential nest/roost abandonment if proximate and during sensitive periods
Aquatic habitat restoration	Minor habitat modification (e.g., select tree tipping/removal); disturbance near suitable habitat during implementation	Harm via habitat modification; disturbance/harassment; potential reduction in reproductive success if near active sites
Controlled burning	Smoke, noise, personnel/equipment; low likelihood during breeding season but potential for smoke drift or rare escape into adjacent habitat	Disturbance/harassment; harm via habitat modification; potential nest failure if exposure or escape occurs (no direct mortality documented in cited literature)
Other covered activities that involve tree removal	Construction/maintenance of roads, quarries, recreation infrastructure; associated operations (heavy machinery, vehicles, power tools, blasting, rock crushing; public chainsaw use for minor forest products) within or adjacent to suitable habitat	Harm via habitat modification (reduced prey availability, increased exposure to predators); disturbance/harassment; reduced reproductive success; nest/territory abandonment; (in limited circumstances) direct mortality if a nest/roost tree is struck/felled
Other covered activities that involve noise	Construction/maintenance of roads, excavation of rock quarries; associated operations (heavy machinery, vehicles, power tools, blasting, rock crushing); recreation infrastructure development, maintenance, and operations (e.g., campgrounds, trails, trailheads)	Disturbance/harassment; reduced reproductive success; nest/territory abandonment

Most habitat modification is expected to occur outside of HCAs and RCAs. Some timber harvest activities inside HCAs may also result in short-term modification of a few areas of non-habitat or dispersal-only habitat, including regeneration harvest and thinning where needed to improve long-term habitat conditions. However, silvicultural prescriptions inside of HCAs will only be carried out if such harvest would result in either a higher habitat quality later in the permit term, or a more consistent quality through the permit term (e.g., stands that would have experienced die-offs but were replanted to provide dispersal and foraging opportunities) than was present prior to the prescription. Most types of timber harvest are allowed inside of HCAs, but they will be consistent with the practices outlined in Conservation Action 7: Manage Habitat Conservation Areas. As previously mentioned, take from direct destruction of active nest sites will be minimized through

limits on management activities near known nest sites (Conservation Action 7) and seasonal timing restrictions (Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species). However, due to the dynamic nature of northern spotted owls and lack of complete and up-to-date survey data at any given moment, unknown nesting sites could be affected by covered activities.

Covered activities conducted within or adjacent to nesting, roosting, and foraging habitat are most likely to cause take because northern spotted owls are most likely to be present in such locations. Take of owls while actively dispersing is not anticipated.

Take via habitat modification may occur throughout the permit term. Take in the early years of the permit term will occur within and directly adjacent to existing habitat, while take in later years may include habitat that is currently not suitable but that has developed into habitat over time. The amount and timing of take anticipated to occur through habitat modification over the permit term is described in Section 6.7.5.1, *Acres of Habitat Directly Removed or Degraded by Covered Activities*.

6.7.3 Covered Activities Not Expected to Result in Take

This section describes covered activities where the applicant has determined that effects are not likely to raise to the level of take. However, northern spotted owls can occur anywhere in the landscape at any time, and the location of owls is often unknown. Therefore, conclusions that take is not expected does not mean that such take is categorically impossible.

Barred owl management will be implemented consistent with Conservation Action 9: Strategic Terrestrial Species Actions. Other covered activities similarly will not result in sufficient habitat modification to result in take. Table 6-12 lists the covered activities that are not expected to rise to the level of take of northern spotted owls.

Table 6-12. Covered Activities Not Expected to Result in Take of Northern Spotted Owl

Covered Activity	Rationale for Determining that Covered Activity Would Not Result in Take
Covered activities conducted in dispersal habitat	Actions in younger stands can affect dispersing or floater or non-territorial owls, but such disturbance or habitat removal can be considered discountable due to the abundance of such habitat and the ability of individuals to move to avoid the covered activity. A minimum of 40% of the landscape will be maintained as dispersal or foraging habitat (Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas), an amount that has been determined to be sufficient to maintain landscape-level connectivity for northern spotted owl dispersal (Davis et al. 2016).
Site preparation, tree planting, and release treatments	Reforestation and young stand-management activities will take place outside of nesting, roosting, and foraging habitat and are not likely to adversely affect northern spotted owls.
Mountain beaver control	Mountain beavers represent only a small and very seasonal proportion of northern spotted owl diets (Forsman 2004), and control activities will occur only in reforestation areas that are non-habitat for northern spotted owl foraging with the exception of edge habitat.
Precommercial thinning	Precommercial thinning will be conducted in young forest stands and will not occur in northern spotted owl nesting, roosting, or foraging habitat.

Covered Activity	Rationale for Determining that Covered Activity Would Not Result in Take
Existing road system	Existing roads add to habitat fragmentation effects, encourage use by predators such as great horned owls, and provide access that may encourage people to enter habitat areas. However, the presence of existing roads is not expected to rise to the level of take because they are considered part of the environmental baseline and current active sites have been established in the presence of the road system.
Road decommissioning	Road decommissioning would not adversely affect northern spotted owl habitat and may provide long-term benefits.
Drainage structure construction and maintenance	Drainage work would take place within the existing road prism (footprint) and will not adversely affect northern spotted owl habitat.
Water drafting and storage	This activity will not require large tree removal or otherwise adversely affect northern spotted owl habitat.
Barred owl management	The HCP includes ODF's commitments to support barred owl removal, and those activities will be conducted in a manner consistent with the USFWS Barred Owl Management Strategy (and associated Biological Opinion) that would not adversely affect northern spotted owls.
Monitoring activities	Monitoring is generally not expected to result in take. If any monitoring activity is determined to potentially result in take then ODF (including contractors and external research organizations) will obtain necessary clearance from USFWS and ODFW.

HCP = Western Oregon State Forests Habitat Conservation Plan; ODF = Oregon Department of Forestry; USFWS = U.S. Fish and Wildlife Service; ODFW = Oregon Department of Fish and Wildlife

6.7.4 Covered Activities that Minimize and Mitigate Take

The HCP includes several measures to minimize and mitigate effects on northern spotted owls, including measures incorporated into covered activities (Chapter 3), measures established as commitments under the conservation strategy (Chapter 4), and measures to monitor key metrics and adapt to unexpected conditions (Chapter 5).

The designation, preservation, and long-term active and passive enhancement of HCAs throughout the permit area is the primary conservation action intended to conserve, maintain, and enhance habitat for the northern spotted owl. With Conservation Action 6, ODF will immediately designate upon permit issuance approximately 275,000 acres of HCAs to support the persistence of northern spotted owl. With Conservation Action 7, ODF will manage HCAs to increase the quality and quantity of habitat for northern spotted owl. With Conservation Action 9, ODF will enhance habitat throughout the permit area through the targeted lethal removal of invasive barred owl, a known stressor of the survival and productivity of northern spotted owl (U.S. Fish and Wildlife Service 2011).

Outside of HCAs ODF will implement standards in Conservation Action 8, to maintain and create long-term, landscape-level habitat values for covered species in the portion of the permit area that is more actively managed for timber production in order to support the function and connectivity between designated HCAs. In addition, operational restrictions detailed in Conservation Actions 10 and 12, will apply restrictions for activities that may occur in or near active sites inside HCAs during the northern spotted owl nesting season, and near known nest trees outside of HCAs.

Table 6-13 summarizes minimization and mitigation measures for anticipated take of northern spotted owls, as summarized in Chapter 3, *Covered Activities*, Chapter 4, *Conservation Strategy*, and Chapter 5, *Monitoring and Adaptive Management*.

Table 6-13. Northern Spotted Owl Minimization and Mitigation Measures

Measure	Description	Category	Intended Effect (Mitigation/ Minimization)	HCP Reference
Regeneration harvest size and green-up limits	Unit size for regeneration harvest limited to 120 acres with retention and green-up requirements	Timber harvest	Reduces habitat fragmentation and preserves continuity	Ch.3 – Clear-cut Harvest; Ch.4 – CA7, CA8
Thinning for complexity	Light, moderate, heavy, variable-density thinning to accelerate stand complexity	Timber harvest	Promotes late-seral forest development used by owls	Ch.3 – Partial-Cut Harvest
Salvage restrictions	Exclude salvage from RCAs and HCAs (except hazards)	Salvage harvest	Retains critical habitats; reduces disturbance	Ch.3 – Salvage Harvest
Hazard Tree Management	Low-impact hazard tree removal methods	Hazard tree removal	Minimizes habitat damage from safety removals	Ch.3 – Hazard Tree Removal
Climate-resilient reforestation	Plant diverse, resilient species and interplanting	Reforestation	Ensures continuity of habitat and canopy cover	Ch.3 – Tree Planting; Ch.4 CA7
Roads and trails management	Vacating and stabilizing roads and trails; Citing, constructing, and managing roads	Road and trail system management	Improves habitat quality and reduces disturbance	Ch.3 – Road/Trail Vacating; Ch.4 – CA5, CA11, & CA12
Needs assessments	Require and review needs assessments for new roads and trails	Road and Trail Construction and Management	Ensures new access is a last resort and lower-impact options are used	Ch.4 – CA11 (needs assessment)
Fuels work in HCAs	Record location/extent of fuels reduction in HCAs and describe measures to minimize effects on habitat suitability	Manage HCAs	Reduces fire risk to promote fire resilient forests; maintains key habitat structures	Ch.3 – Fire Management; Ch.4 – Obj. 5.3 / CA7, CA10
Upland habitat restoration	Active management under Conservation Action 7	Conservation Strategy Implementation on Activities	Accelerates development of late-seral habitat	Ch.3 – Upland Restoration
Barred owl removal	Implement barred owl management program	Conservation Strategy Implementation on Activities	Reduces competition and predation pressure on spotted owl	Ch.3 – Barred Owl Management; Ch.4 – CA9
Nesting/roosting conservation	Conserve, maintain, enhance ≥30,600 acres of	Establish HCAs	Protects essential owl nesting/roosting sites	Ch.4 – Obj. 5.1 CA6 & CA7

Measure	Description	Category	Intended Effect (Mitigation/ Minimization)	HCP Reference
	existing nesting/roosting habitat			
Foraging habitat conservation	Conserve, maintain, enhance ≥92,000 acres of existing foraging habitat	Establish HCAs	Maintains critical food supply areas	Ch.4 – Obj. 5.1 CA6 & CA7
Riparian habitat protection	Conserve ~41,200 acres nesting/roosting/foraging in RCAs	Protected areas	Provides additional habitat continuity	Ch.4 – Obj. 5.1 CA1
Dispersal habitat standard	Maintain ≥40% of landscape as dispersal habitat outside HCAs	Targeted actions outside HCAs	Supports movement across the landscape	Ch.4 – Obj. 5.2 CA1 & CA8
Habitat acreage goals	Increase nesting/roosting between 110,000-138,000 acres; maintain 62,000 foraging	Manage HCAs	Offsets losses, expands habitat	Ch.4 – Obj. 5.3 CA7
RCA management	Manage RCAs with restrictions/buffers	Protected areas	Maintains riparian corridors for dispersal/foraging	Ch.4 – CA1 & 2
Climate-resilient HCAs	Manage habitat with climate adaptation focus	Climate adaptation	Improves resilience to fire, drought, disease	Ch.4 – Sec. 4.5
Dispersed HCAs	Place HCAs across latitudinal/elevational gradients	Climate adaptation	Spreads risk, improves resilience and redundancy	Ch.4 – Sec. 4.5
Habitat accounting (5-year)	Report nesting, roosting, and foraging acres every 5 years; compare to baseline	Effectiveness monitoring	Verifies progress toward biological goals; triggers adjustments	Ch.4 – Obj. 5.1, 5.3
Site monitoring	Monitor active/historical sites, especially in barred owl management areas	Species monitoring	Detects occupancy and recolonization	Ch.5 – Obj. 5.1
Acoustic and call-back surveys	Use passive acoustic monitoring and call-back surveys (USFWS protocols)	Survey methods	Improves detection of owl occupancy	Ch.5 – Obj. 5.1
HCA silviculture	Maintain ≥500 acres foraging or better within 0.7 mile of centers	Manage HCAs	Enhances habitat near active sites	Ch.5 – Obj. 5.1 / CA7
Legacy tree retention	Retain old-growth and known nest trees during regeneration harvest	Targeted actions outside HCAs	Preserves nesting/roosting structures	Ch.4 – Obj. 5.2 / CA7, CA8
Live tree retention	Retain ≥2 live trees per acre in regeneration harvest	Targeted actions outside HCAs	Provides long-term structural habitat features	Ch.4 – Obj. 5.2 / CA7, CA8
Snag retention	Retain ≥2 snags per acre across decay stages in regeneration harvest	Targeted actions outside HCAs	Supports prey base and habitat structure	Ch.4 – Obj. 5.2 / CA7, CA8
Retention effectiveness	Monitor effectiveness of snag/leave-tree retention	Effectiveness monitoring	Confirms adequacy of habitat features	Ch.5 & Ch.4 – Obj. 5.2 / CA8

Measure	Description	Category	Intended Effect (Mitigation/ Minimization)	HCP Reference
Seasonal restrictions inside HCAs	Apply seasonal restrictions for covered activities that may occur near known active nest sites inside HCAs during critical breeding period	Operational restrictions	Ensure covered activities that may disturb or disrupt normal spotted owl behavioral patterns will not occur within distances expected to result in take during the breeding season	Ch.4 – CA10

Ch. = Chapter; RCAs = riparian conservation areas; HCAs = habitat conservation areas; Obj. = Objective; CA = Conservation Action; USFWS = U.S. Fish and Wildlife Service

6.7.5 Adverse Effects

6.7.5.1 Acres of Habitat Directly Removed or Degraded by Covered Activities

Total Habitat Effects over Permit Term

Modeling data (as described in Appendix E, *Effects Analysis*) project that approximately 167,100 acres of northern spotted owl nesting, roosting, and foraging habitat will be harvested or thinned in the permit area over the permit term. In addition, modeling projects 164,800 acres of dispersal-only habitat (habitat suitability index [HSI] values between 0.3 and 0.4) will be harvested or thinned. The totals of estimated habitat effects include harvest or thinning within stands that are expected to develop into habitat after permit issuance. Table 6-15 provides a more specific breakdown of modeled harvest and thinning by habitat types. Habitat modification will occur both inside and outside of HCAs.

Within HCAs, habitat will only be modified in situations where short-term silvicultural activities will result in long-term increases in habitat quality. Conservation Action 7: Manage Habitat Conservation Areas, specifies how and where those activities will occur and limits the amount, proximity, and timing of activity in active sites. These areas include hardwood-dominant stands (primarily red alder [*Alnus rubra*]), conifer infected with Swiss needle cast, as well as thinning of overstocked stands to provide long-term habitat value. In addition, seasonal restrictions (Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species) will avoid disturbance of any known nest sites, although effects on sites not identified through monitoring or other means cannot be ruled out. Under Conservation Action 7, any management that occurs in nesting or roosting habitat will not result in a reduction in condition that is less than nesting and roosting.

Outside of HCAs, northern spotted owl nesting, roosting, and foraging habitat will be harvested or thinned for commercial timber production. Table 6-14 and Table 6-15 summarizes habitat that would be modified through thinning or lost through regeneration harvest over the 70-year permit term.

Table 6-14. Northern Spotted Owl Habitat Modeled to Be Harvested or Thinned Under the Habitat Conservation Plan Over the Permit Term, by 5-Year Increments (acres)

Habitat 5-Year Increment	Management Type in Northern Spotted Owl Habitat Inside HCAs					
	Dispersal or Not Habitat (HSI ≤0.39)		Foraging (HSI 0.40–0.59)		Nesting-Roosting (HSI ≥0.59)	
	Regeneration ^a	Thinning	Regeneration ^a	Thinning	Regeneration ^a	Thinning ^b
2023	2,000	2,500	3,000	4,625	-	375
2028	2,000	2,500	3,000	4,625	-	375
2033	2,000	2,500	3,000	4,625	-	375
2038	2,000	2,500	3,000	4,625	-	375
2043	2,000	2,500	3,000	4,625	-	375
2048	2,000	2,500	3,000	4,625	-	375
2053	-	-	-	-	-	-
2058	-	-	-	-	-	-
2063	-	-	-	-	-	-
2068	-	-	-	-	-	-
2073	-	-	-	-	-	-
2078	-	-	-	-	-	-
2083	-	-	-	-	-	-
2088	-	-	-	-	-	-
2093	-	-	-	-	-	-
Total	12,000	15,000	18,000	27,750	0	2,250

^a Management types and frequency in covered species habitat in HCAs are outlined in Table 4-12 where habitat suitability indices are used to guide management activities but stands will be evaluated in the field prior to management.

^b Silvicultural intervention in this habitat type inside HCAs will be limited to rare opportunities to conduct light thinning activities that will accelerate development of structural habitat features of interest and enhance spatial heterogeneity of the stand.

Outside HCAs						
Habitat	Dispersal (add outside metric)		Foraging		Nesting-Roosting	
5-Year Increment	Regeneration	Thinning	Regeneration	Thinning	Regeneration	Thinning
2023	9,657	-	16,776	-	4,941	-
2028	8,039	3,313	17,494	499	3,383	-
2033	10,678	275	15,755	135	3,619	15
2038	11,698	583	13,209	501	3,599	-
2043	9,681	319	12,529	173	3,240	-
2048	5,991	130	13,064	33	2,700	2
2053	5,887	76	8,954	143	4,453	75
2058	6,147	-	7,323	273	3,200	50
2063	9,977	115	2,942	-	1,663	62
2068	7,725	441	669	34	1,713	-
2073	8,017	1,286	1,152	24	918	508
2078	2,697	3,394	251	63	987	18
2083	667	6,799	47	387	156	204
2088	10,074	4,035	1,341	20	595	249
2093	7,740	8,095	3,026	154	237	9
Total	114,677	28,859	114,532	2,439	35,404	1,192

Table 6-15. Cumulative Northern Spotted Owl Habitat Modeled to Be Harvested or Thinned Under the Habitat Conservation Plan Over the Permit Term (acres)

Location	Habitat Thinned ^a			Habitat Harvested (Regeneration)			Total
	Nesting-Roosting	Foraging	Dispersal or Not Habitat	Nesting-Roosting	Foraging	Dispersal or Not Habitat	
Within HCAs	2,250	27,750	15,000	0	18,000	12,000	75,000
Outside of HCAs	1,192	2,439	28,859	35,404	114,532	114,677	297,103
Total	3,442	30,189	43,859	35,404	132,532	126,677	372,103

^a Habitat thinned inside HCAs will be completed consistent with Conservation Action 7: Manage Habitat Conservation Areas.

Timing of Habitat Effects

While harvest of northern spotted owl foraging and nesting-roosting habitat will occur over the entire 70-year permit term, approximately 68% (135,868 acres) of modeled habitat modification, including ingrowth, will occur within the first 20 years (2023 to 2043) of plan implementation and approximately 95% (188,806 acres) will occur within the first 40 years (2023 to 2063). This is not due to targeting habitat early in the permit term, but rather due to the current stand-age distribution and the prioritization of treatments within HCAs during the first 30 years. Take authorization afforded by the HCP and associated ITPs will authorize that habitat modification of existing habitat as well as future ingrowth habitat.

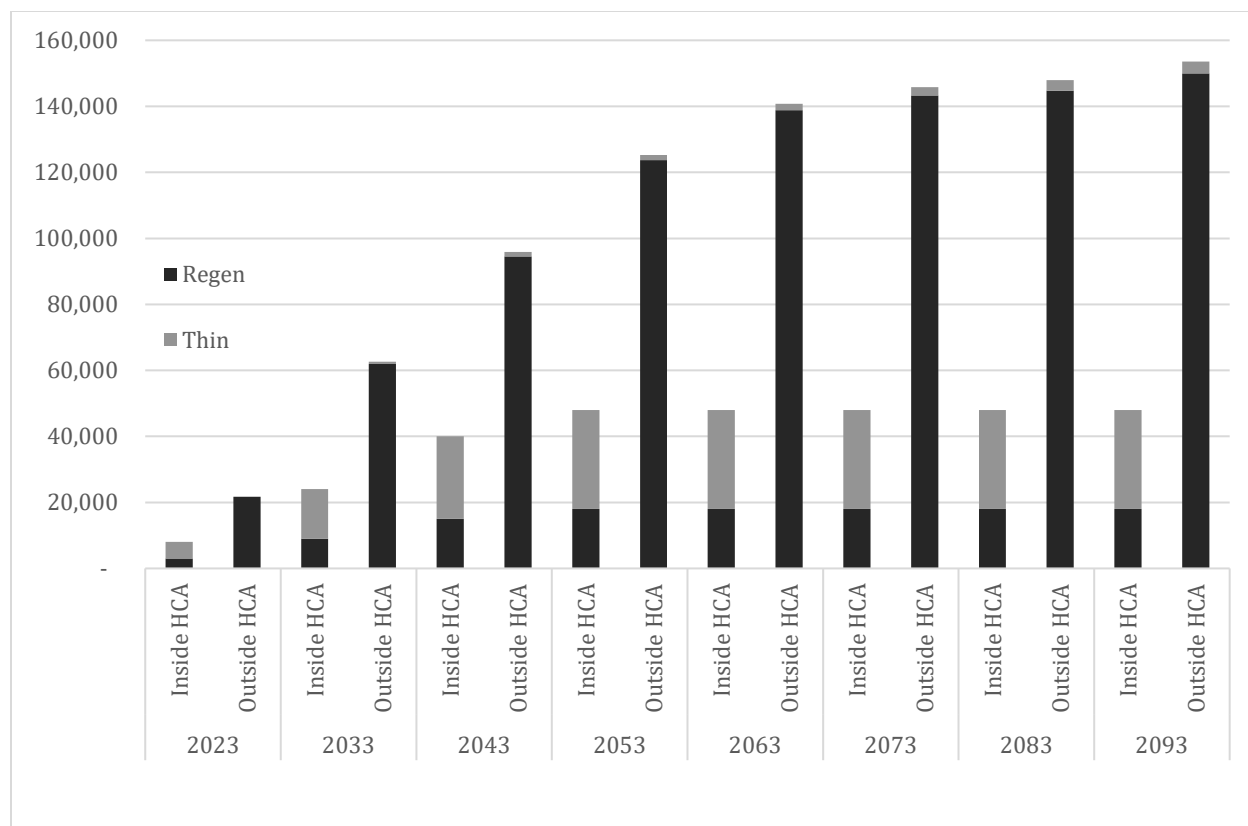
Harvest of healthy conifer stands in HCAs would only be conducted consistent with measures described in Conservation Actions 7 and 10. Though the acres of healthy conifer stands treated within HCAs will vary year to year, acres sold in any one year will likely average 2,500 acres for the entire permit area in any year or 12,500 acres across a 5-year period. Further, the 12,500 treated acres in each 5-year period will be distributed among multiple HCAs.

Ingrowth habitat is defined as habitat that is too young to support nesting spotted owls at the beginning of the permit term but matures into habitat suitable for nesting northern spotted owls and is subsequently harvested later in the permit term. Ingrowth habitat is included in the totals in Table 6-14.

Outside HCAs and other protections, approximately 66,900 acres of 80-year-old or older ingrowth habitat could be harvested later in the permit term, the majority of which (65,000 acres) will be regeneration harvests. Therefore, of the approximately 149,936 acres of harvested nesting, roosting, and foraging habitat outside HCAs (Table 6-14), approximately 44% will be of habitat that does not currently support nesting northern spotted owl, but that could later in the permit term.

As the permit term progresses past year 40, acres of habitat modified are fewer, not because less harvest is occurring, but because the age and structure of the forest outside of HCAs will have stabilized by that time. As stand age stabilizes due to harvest intervals, fewer acres outside HCAs will be developing into nesting, roosting, and foraging habitat. However, inside HCAs, nearly all of the acres will either develop into nesting, roosting, and foraging habitat, or will be on a trajectory to do so at some point in the future.

Figure 6-11 illustrates the cumulative level of northern spotted owl nesting, roosting, and foraging habitat modeled to be directly modified over the permit term (i.e., running total of acres harvested over permit term). Note that dispersal habitat is not included in the figure because habitat preservation commitments based on HSIs are not used for dispersal habitat commitments. Dispersal habitat is defined in two ways in this HCP: habitat used to model future habitat suitability and habitat used to define dispersal habitat under Objective 5.2 (40% retention of the permit area outside of HCAs as dispersal habitat in the form of 60-year old stands and/or stands representing foraging habitat or better).



Note: Cumulative harvest means that the total harvest of previous periods is added to show the running total of amount of habitat harvested for each period. The 2023 period shows model estimates made in 2020 for the year 2023.

Figure 6-11. Cumulative Northern Spotted Owl Nesting, Roosting, and Foraging Habitat Acres Modeled to Be Harvested or Thinned Under the Habitat Conservation Plan Over the Permit Term

6.7.5.2 Acres of Habitat Indirectly Removed or Degraded by Covered Activities

Figure 6-12 illustrates the decadal amounts of northern spotted owl habitat (defined here as a stand that reaches 80 years of age) in HCAs that have the potential to experience stand degradation due to edge effects caused by adjacent harvest (within 65 yards or 59 meters) over the permit term. Table 6-16 summarizes the amount of new-edge habitat that is added each decade and the resulting cumulative habitat that would be potentially modified through edge effects associated with harvests over the 70-year permit term. For instance, approximately 5,107 acres of new hard-edge habitat could be created within or along the border of HCAs during the first decade of the permit term (2023 to 2032).

Habitat modification can increase exposure to predation and competition from barred owls, great horned owls, and other species. Other edge effects may include windthrow in adjacent stands. Edge effects from stand removal on adjacent habitat would result in potential effects generally described as hard edge up to 20 years of age and soft edge up to 40 years of age. Beyond that, stands over 40 years of age are considered to no longer be propagating edge effects into adjacent habitat due to their stature and density.

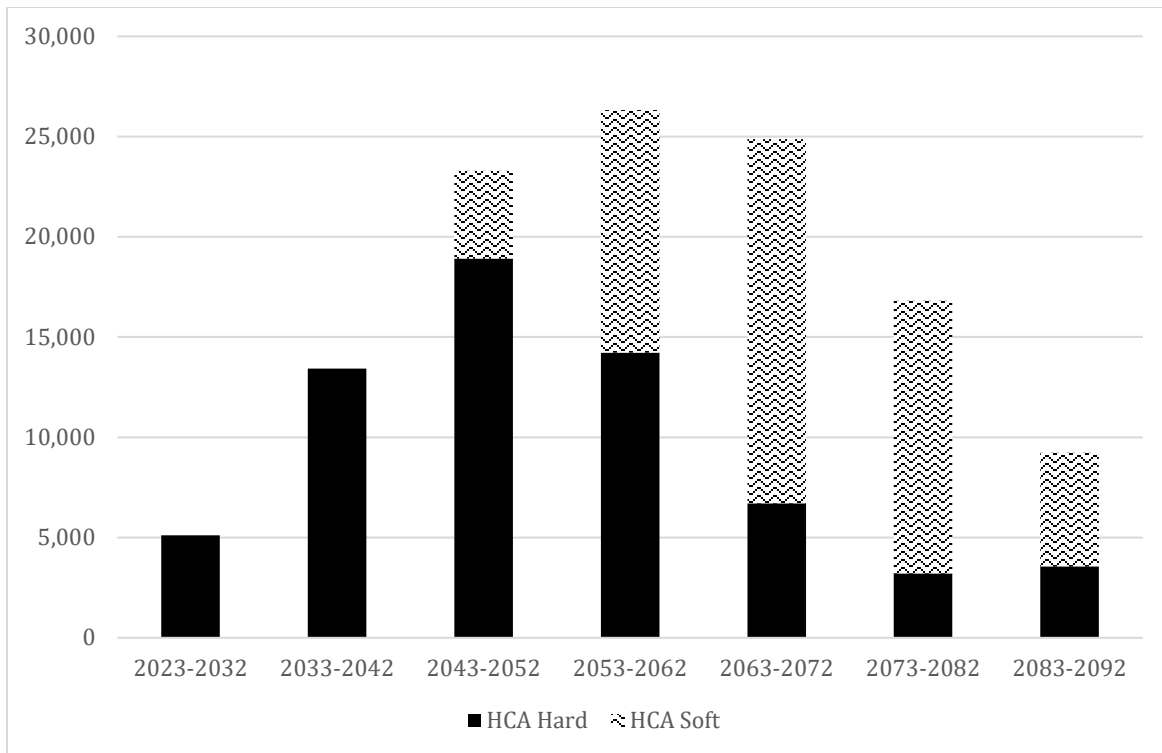


Figure 6-12. Modeled Northern Spotted Owl Edge-Effect Area Inside Habitat Conservation Areas by Decade

Table 6-16. Modeled Added Edge-Effect Areas for Northern Spotted Owl Habitat in Habitat Conservation Areas over the 70-year Permit Term

Decade of Permit Term	Added Edge ^a (acres)	Cumulative Edge (acres)
1	5,107	5,107
2	8,323	13,430
3	9,876	23,306
4	3,022	26,328
5	2,807	29,135
6	3,250	32,385
7	3,069	35,455
<i>Average acres ^b</i>	<i>5,065</i>	<i>NA</i>

^a Added edge acres include harvest include both hard and soft edged habitat and excludes edge that was created in the previous three decades that aged out after 40 years. The initial surge in edge habitat within HCAs is due to the treatments within healthy conifer stands during the first 30-years of the permit term, subsequent added edge habitat is due to modeled harvest outside of the HCAs.

^b Average acres of edge habitat over 80 years of age within 59 meters of harvests per decade.

NA = not applicable

Edge-Effect Modeling Parameter Caveats

The estimation of northern spotted owl habitat that could be subjected to edge effects is based on the harvest model scenario used in the HCP and the thinning projections within HCAs. However, the harvest model had to make the following assumptions about the age and type of stands and regenerating stands, and any interpretation of the results should consider the following caveats.

- A habitat patch becomes northern spotted owl nesting habitat if it is currently 80 years of age (as of 2020) or when it reaches 80 years of age in the permit term. Habitat is merged into discrete patches defined by the median Stand-Level Inventory (SLI) stand size (>70 acres).
- Northern spotted owl habitat edge-effect area is the area within 65 yards (59 meters) of any modeled regeneration harvest. This would include healthy conifer forest, Swiss needle cast stands, and alder stands managed in HCAs that are limited to the first 30 years of the permit term.
- Hard edges last from time of harvest to year 20, then become soft edges.
- Soft edges persist from year 21 to year 40 then are no longer considered to propagate substantial edge effects into the adjacent stand at age 41. This means edges formed during the first 50 years do not persist to the end of the permit term.
- The modeled harvest model used in the HCP was not explicitly designed to estimate edge habitat and several analytical steps were used to approximate a solution.
- Where possible, overlapping edges were not counted twice (such as along narrow RCA buffers), but some overlapping is likely, and this could result in an overestimate of potential effects. Higher tree retention decisions could shorten the duration of soft edges.

Northern Spotted Owl Active Sites Located in the Permit Area

Loss of northern spotted owl *active sites*,¹² and in some cases associated nest trees, due to covered activities is expected to be rare over the permit term. Of the 31 known northern spotted owl active sites in the permit area, all but three are included in HCAs. Management activities in HCAs will only be implemented to increase habitat quality for northern spotted owl over the permit term, so loss of activity centers due to habitat loss inside HCAs is not expected, although portions of the provincial radius for some sites fall outside of HCA designation and may be subject to harvest. Harvest of the portion of home ranges outside of HCAs could lead to loss of an activity center, particularly for those sites where a significant portion of their home range are found outside the HCAs in the Coast Range and Klamath ecoregions (Table 6-17).

The three active sites outside of HCAs would likely be degraded over time from harvest activities, likely due to a reduction in habitat quality within the sites. Two of the three active sites have a portion of the site inside one or more HCAs. Those active sites consist of two active confirmed pair sites and one resident single site. None of the three sites have had recent northern spotted owl activity. Owls were last observed at one site in 2014, at another in 2015, and at the third in 2016. Any harvest that would occur would be done consistent with Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species.

¹² *Active sites* are locations assumed to be occupied by northern spotted owl(s) based on historic survey data. Locations are centered on nest tree locations or designated activity center if nest site is not known.

Table 6-17 summarizes existing northern spotted owl active sites in the permit area and their distribution across HCAs.

Table 6-17. Active Northern Spotted Owl Sites in the Permit Area

Site	Pair	Pair Status Unknown ^a	Resident Single	Total
Inside HCA (conserved)	18	4	6	28
Outside HCA (available for harvest)	2	0	1	3
<i>Total</i>	<i>20</i>	<i>4</i>	<i>7</i>	<i>31</i>
Maximum Amount and % taken by covered activities	2 (10.0%)	0 (0%)	1 (14.3%)	3 (9.7%)

^a Active sites for which surveys indicate a suspected pair that was not confirmed based on the survey protocol criteria (U.S. Fish and Wildlife Service 2012a).

Northern Spotted Owl Activity Centers Located on Adjacent Lands

There are 142 active northern spotted owl sites with activity centers outside of the permit area but within the provincial radius¹³ of permit area lands. Using the provincial radius, active sites that overlap the permit area include 119 sites with confirmed pairs, 5 sites with pair status unknown, and 18 sites with resident single owls. As shown in Table 6-18, most (121) of these adjacent activity centers are on federal lands (Bureau of Land Management [BLM] and U.S. Forest Service [USFS]). Twelve adjacent activity centers are on state lands within the Elliott State Research Forest, and nine are on private forest lands. Activity centers on federal lands are already managed to protect spotted owls under the *Northwest Forest Plan* and associated land management plans (U.S. Department of Agriculture and U.S. Department of the Interior 1994; Bureau of Land Management 2016a, 2016b). Activity centers on the Elliott State Research Forest are covered under the 2025 ITP and the conservation strategy set forth in the Oregon Department of State Lands *Elliott State Research Forest Habitat Conservation Plan*.

The general ownership and distribution of activity centers located on adjacent lands within the provincial radius of the permit area is as follows.

- **Coast Range ecoregion.** Most (26 sites) activity centers are located in the BLM Eugene District and 12 are located on the Elliot State Research Forest.
- **Klamath ecoregion.** Fifty-seven adjacent sites are primarily on BLM lands that are distributed in alternating square mile sections with private forest lands in the BLM Medford and Roseburg Districts and in the Rouge River-Siskiyou National Forest.
- **West Cascades ecoregion.** Most (11) of the 15 adjacent sites are in the Willamette National Forest.

¹³ Activity centers are the location of a nest or daytime roost sites of a resident spotted owl or pair of spotted owls. The “provincial radius” of a circle centered on the activity center represents the approximate home range for an owl in a given geographic location. Based on guidance from USFWS, ODF uses the following provincial radii: Klamath Province (scattered lands in southwestern Oregon), 1.3 miles; Oregon Cascades (Santiam State Forest), 1.2 miles; Oregon Coast Ranges (all other ODF lands), 1.5 miles. Using the provincial radius, a circle is drawn around each activity center, creating a “site” in which habitat effects may occur.

Table 6-18. Adjacent Active Northern Spotted Owl Activity Centers Within the Provincial Radius of the Permit Area

Ecoregion and Ownership	Active Confirmed Pair	Pair Status Unknown	Resident Single	Total
Coast Range				
BLM Eugene District	21	1	4	26
Elliott State Forest	10		2	12
Other Private	8		1	9
Siuslaw National Forest	6		2	8
BLM Roseburg District	4		1	5
Subtotal	49	1	10	60
Klamath				
BLM Medford District	28	1	1	30
Rogue River-Siskiyou National Forest	11			11
BLM Roseburg District	9		1	10
Klamath National Forest	1		1	2
Umpqua National Forest	2			2
Private	1	1		2
Subtotal	52	2	3	57
West Cascades				
Willamette National Forest	9		2	11
BLM Medford District	1			1
BLM Salem District	1	1	1	3
Subtotal	11	1	3	15
Permit Area Total	119	5	18	142

BLM = Bureau of Land Management

As described in Chapter 4, *Conservation Strategy*, ODF considered adjacent northern spotted owl activity centers when selecting areas to include in HCAs (Conservation Action 6: Establish Habitat Conservation Areas), so that most of the existing nesting, roosting, and foraging habitat on permit lands near activity centers will be protected in HCAs.

Specifically, as detailed in Table 6-19, habitat to be conserved in HCAs or RCAs in the permit area that is also within the provincial radius of active sites centered on adjacent lands include, on average, the following habitat.

- 99.8% of habitat rated as 0.8 or better¹⁴ (considered nesting and roosting habitat).
- 87.5% of habitat rated between 0.6 and 0.8 (also considered nesting and roosting habitat).
- 57.7% of habitat rated between 0.4 and 0.6 (considered foraging habitat only).

¹⁴ Multifactor habitat suitability index (HSI) models rated habitat with a score ranging from 0 to 1, with 1 being the highest quality: <0.39 = Not Habitat/Dispersal-only Habitat; 0.4 – 0.59 = Foraging Habitat; 0.6 – 1.0 = Nesting/Roosting Habitat. See Appendix E, *Effects Analysis*, for more details on habitat models.

Table 6-19. Habitat Conditions in the Permit Area Within the Provincial Radius of Northern Spotted Owl Activity Centers Located on Adjacent Lands

Ecoregion – HCA Location	Number of Adjacent Sites	Habitat Suitability Rating ^a					
		Nesting and Roosting				Foraging	
		0.8–1.0		0.6–0.8		0.4–0.6	
		Acres	%	Acres	%	Acres	%
Coast Range	69	771.3		2,460.2		9,506.2	
Inside HCA		769.5	99.8%	2,208.8	89.8%	6,151.6	64.7%
Outside HCA		1.9	0.2%	251.4	10.2%	3,354.6	35.3%
Klamath	55	240.8		461.3		3,445.2	
Inside HCA		240.8	100.0%	335.9	72.8%	1,508.7	43.8%
Outside HCA				125.4	27.2%	1,936.5	56.2%
West Cascades	14	87.0		96.8		476.2	
Inside HCA		86.5	99.4%	96.8	100.0%	472.9	99.3%
Outside HCA		0.5	0.6%			3.3	0.7%
Willamette Valley	4	--		--		658.8	
Inside HCA		--	--	--	--	582.1	88.4%
Outside HCA		--	--	--	--	76.7	11.6%
Total	142	1,099.2		3,018.3		14,086.4	
Inside HCA		1,096.8	99.8%	2,641.5	87.5%	8,133.2	57.7%
Outside HCA		2.3	0.2%	376.8	12.5%	5,294.5	37.6%

^a Multifactor habitat suitability index (HSI) models rated habitat with a score ranging from 0 to 1, with 1 being the highest quality: <0.39 = Not Habitat/Dispersal-only Habitat; 0.4–0.59 = Foraging; 0.6–1.0 = Nesting/Roosting Habitat. See Appendix E, *Effects Analysis*, for more details on habitat models.

HCA = habitat conservation area

While the majority of habitat near adjacent sites will be protected within HCAs, as detailed in Table 6-20, the HCP will allow harvest of 100 acres or more within the provincial radius of 9 active sites within the Coast Range ecoregion, 16 active sites within the Klamath ecoregion, and 1 active site in the Willamette ecoregion. Although ODF considered adjacent northern spotted owl activity centers when selecting areas to include in HCAs, it should be noted that owls move and nesting activity may vary over the permit term as habitats develop, new harvest occurs, barred owl pressure is reduced, or other reasons.

Table 6-20. Northern Spotted Owl Activity Centers on Adjacent Lands with Modeled Habitat Effects Greater than 100 Acres in the Permit Area Outside of Habitat Conservation Areas

Ownership of Activity Center	Site ID	Activity Center Name	Percent of Other Ownership			Percent of Active Site Circle in Permit Area	Acres in HCA	Acres of Suitable Habitat Outside of HCAs but in Permit Area ^a		
								Nesting/Roosting	Foraging	Total
			BLM	USFS	Private					
Coast Ecoregion										
BLM Northwest Oregon District	4680	Upper Greenleaf	54	13	0	34	598	0	501	501
	2546	Knapp Creek	42	0	13	45	1,400	80	397	477
	4088	Mcvey Creek	34	0	15	50	1,421	0	714	714
	2549	Jackass Creek	48	0	39	12	0	3	430	433
	3914	Liebre Creek	42	0	13	45	1,545	80	312	392
	2548	Pataha Creek	48	0	28	24	542	121	254	375
	4688	Iron Mountain	47	0	44	9	0	0	318	318
	2313	Lower Greenleaf	50	0	42	8	91	0	109	109
Private	4474	Upper Mcvey	10	0	43	47	844	0	794	794
Klamath Ecoregion										
BLM Medford District	114	Griffin Creek	72	0	21	7	0	0	219	219
	2365	Althouse Ditch	48	0	35	17	0	40	373	413
	4039	Golconda	27	36	22	15	0	10	389	399

Ownership of Activity Center	Site ID	Activity Center Name	Percent of Other Ownership			Percent of Active Site Circle in Permit Area	Acres in HCA	Acres of Suitable Habitat Outside of HCAs but in Permit Area ^a		
			BLM	USFS	Private			Nesting/Roosting	Foraging	Total
Rogue River- Siskiyou National Forest	2634	Blind Sam	34	18	32	16	0	40	357	397
	2069	Kelseys Demise	86	0	0	14	0	0	190	190
	1947	# 7 Gulch	22	41	31	7	0	10	119	129
	2015	Bull Run	61	0	28	11	0	37	93	130
	3280	KCNA	79	0	6	15	0	0	130	130
	2361	Anderson Lookout	41	0	47	12	0	0	266	266
	2624	Wolf Creek	32	0	45	23	433	0	176	176
	4630	Burned Timber Creek	38	45	6	11	0	0	212	212
	4633	Upper Taylor	0	94	0	6	0	0	154	154
	3288	Buck Taylor	17	67	1	15	0	0	238	238
BLM Roseburg District	2195	North Lawson	24	0	66	9	4	0	213	213
	4493	Bear Windy	41	0	21	37	802	0	113	113
Willamette Ecoregion										
Private	11002	January Creek East	34	0	61	4	0	0	187	187

ID = identification; BLM = Bureau of Land Management; USFS = U.S. Forest Service; HCA = habitat conservation area

Impacts of the Taking on Northern Spotted Owls

Context, Intensity, and Duration of Impacts

Take resulting from habitat loss and other adverse effects, described in Section 6.7.5, *Adverse Effects*, would take place within the following contexts and levels of intensity.

- Approximately 28% of existing nesting-roosting habitat and 48% of existing foraging habitat will be located outside of HCAs and other protected areas (such as RCAs) and subject to harvest.
- Approximately 44% of harvested nesting, roosting, and foraging habitat outside HCAs will be from ingrowth habitat that does not currently support nesting northern spotted owl, but will later in the permit term.
- Of the approximately 372,000 acres of habitat harvested inside and outside of HCAs, an additional 10% (35,455 acres) of habitat inside HCAs could be exposed to potential edge effects over the permit term. Approximately 66% of the hard edge is created within the first three decades of the permit term and then declines to approximately 8% increases in each of the remaining four decades of the permit term as old-edge habitat softens and dissipates.
- Approximately 10% (2 pairs out of 20) of resident pair and 14% (1 out of 7) of resident single active sites with activity centers¹⁵ in the permit area will be located outside of HCAs and other protected areas and subject to loss to harvest over the permit term.
- The two active pair sites that will be lost to harvest have not had documented nesting or young, or observations of adults, in the most recent 6 years of completed protocol surveys.
- Dispersal habitat outside of HCAs will not fall below the thresholds established under Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas (40% in each sub-geographic area).

Harvest of nesting, roosting, and foraging habitat within the two active pair territories outside the HCAs will occur during the permit term. If owls are occupying this habitat at the time it is modified by covered activities, then during or following harvest, the owls may relocate to other areas or may die due to inadequate food, exposure, or predation (Section 6.7.1, *Sources and Types of Effects*). Seasonal operating restrictions will apply to management activities affecting these two activity centers, as defined in Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species.

Removal of northern spotted owl habitat outside of HCAs and RCAs will also likely result in localized reductions in habitat available for non-territorial individuals seeking to establish new territories. However, the HCAs established under Conservation Action 6: Establish Habitat Conservation Areas, as well as RCAs established under Conservation Action 1: Establish Riparian Conservation Areas, and Conservation Action 13: Stay-Ahead Provision, will support foraging and dispersal habitat. Also, any active nest sites encountered outside of HCAs will be protected during the breeding season to allow for successful fledging, as specified under Conservation Action 10. Retention standards for legacy structures (Conservation Action 8), especially the prioritization of large leave trees intended

¹⁵ Existing activity centers are defined as those activity centers that have been confirmed at one point and have had ≤6 consecutive years of surveys with no observations. Activity centers that have not been surveyed consistently during the last 6 years were assumed to have their same status as of their most recent survey history.

to persist through multiple harvests, will enhance dispersal conditions outside HCAs by providing roosting structures in younger stands. Leave patches (versus scattered individual leave trees) may also provide enhanced sheltering and foraging opportunities.

Once northern spotted owl nesting and roosting habitat is harvested outside of HCAs, those stands are likely to be harvested again before developing back into habitat, so the effects are considered to be permanent. Some habitat that is harvested early in the permit term may develop into foraging habitat by the end of the permit term, but there is no commitment in the HCP to maintain nesting or roosting habitat outside HCAs. Management in HCAs will be used to promote development of nesting, roosting, and foraging habitat as described in Conservation Action 7: Manage Habitat Conservation Areas, and Conservation Action 9: Strategic Terrestrial Species Actions, that include the broadly beneficial anticipated effect from barred owl removal. Retention standards for legacy structures (Conservation Action 8) will further enhance habitat conditions inside HCAs where regeneration harvest occurs (Conservation Action 7) by providing roosting structures in younger stands.

Habitat gains that are modeled to outpace habitat losses under the HCP and associated impacts are discussed in Section 6.7.8, *Net Effects*.

6.7.6 Beneficial Effects

The impact of the level of take just described will occur within the context of a landscape that is recovering from a history of large-scale disturbances, including fire and timber harvest, that have left relatively little high-quality northern spotted owl habitat remaining in the permit area (Chapter 2, *Environmental Setting*). In addition, the impact will occur within the context of ongoing competition with and displacement by barred owls. Recent analyses (Weins et al. 2021; Hobart et al. 2025) indicate that control of barred owls, if implemented, could enhance survival and site persistence in the permit area over the permit term and, thus, further offset the modeled impacts of take under this HCP. A summary of beneficial effects is provided in Table 6-21. Additional quantitative benefits are presented in Section 6.7.8, *Net Effects*.

Table 6-21. Beneficial Effects on Northern Spotted Owls from the Habitat Conservation Plan

Benefit	How the HCP Achieves It	Key Metrics / Commitments	HCP Reference
Secures nesting/roosting/foraging habitat in large interior blocks	Establishes and manages HCAs to hold existing nesting/roosting/foraging habitat as interior forest with reduced disturbance	HCA habitat established and tracked on a 5-year cycle	(Chapter 5 – Objective 5.1; CA6) and design context (Chapter 4 – CA6–CA7)
Grows supply and quality of owl habitat	Commits to uplift of nesting/roosting and maintenance of foraging through targeted silviculture and habitat accounting	Increase nesting/roosting to the specified target; maintain foraging; total nesting/roosting/foraging habitat acres reported every 5 years	(Chapter 4 – Objective 5.3) operationalized via monitoring (Chapter 5 – Objective 5.1)
Maintains landscape dispersal/movements	Keeps a defined proportion of the matrix outside HCAs in dispersal habitat, with at least one-half of that target	Compliance monitored	(Chapter 4 – Objective 5.2) and (Chapter 5 –

Benefit	How the HCP Achieves It	Key Metrics / Commitments	HCP Reference
and reduces fragmentation	(20%) will be in the form of 60-year-old stands and/or stands representing foraging habitat or better		Objective 5.2; CA8)
Protects function around active sites while stands develop	Directs conservation silviculture inside HCAs and requires a foraging habitat or better buffer near active activity centers; fuels work documented to minimize effects	Maintain ≥500 acres of foraging or better habitat within 0.7 mile of active centers; document and minimize effects of fuels work	(Chapter 5 – Objective 5.1; CA7)
Reduces barred owl competition	Implements a funded, coordinated barred owl removal program with periodic review and integration with species monitoring	Dedicated funding; scheduled effectiveness reviews; alignment with federal permitting	(Chapter 4 – CA9) integrated with monitoring (Chapter 5)
Limits disturbance and operational impacts in sensitive periods and places	Applies seasonal operating restrictions near active nests; uses compliance screens for recreation/access; strategically vacates/stabilizes roads and trails; restricts salvage in conservation areas	Seasonal restrictions during breeding; net reduction in chronic disturbance/access; salvage excluded in HCAs/RCAs except hazards	(Chapter 4 – CA10 and related compliance elements); implementation detail in covered activities (Chapter 3)
Retains legacy structure and tempers fragmenting effects of harvest	Requires retention of old-growth and known nest trees, live leave trees/acre, and snags/downed wood; HCAs constrain regeneration harvest locations; limits salvage	Stand-level retention standards; unit size/green-up/basal-area prescriptions; HCA designations	(Chapter 5 – Objective 5.2; CA8) implemented via (Chapter 3 – Clear-cut, Thinning, Salvage limits)
Implement adaptive management	Monitors active and historical sites with ARUs and protocol call-backs; conducts 5-year habitat accounting; compares modeled vs. observed and adjusts	Five-year reporting; adaptive adjustments where objectives are off-track	(Chapter 5 – Monitoring & Adaptive Management; Objectives 5.1–5.3)

HCA = habitat conservation area; CA = Conservation Action; RCA = riparian conservation area; ARUs = autonomous recording units

6.7.7 Effects on Critical Habitat

The permit area includes 169,058 acres of designated critical habitat for northern spotted owl (U.S. Fish and Wildlife Service 2012a, 2021), broken out by unit as follows.

- Unit 1, North Oregon Coast, 126,060 acres (73% of total northern spotted owl designated critical habitat in permit area)
- Unit 2, Oregon Coast, 30,498 acres (18%)
- Unit 9, Klamath West, 10,049 acres (6%)
- Unit 10, Klamath East, 2,451 acres (2%)

The degree to which critical habitat could be modified from covered activities relates to the type and quality of the critical habitat when the covered activity occurs. Not all critical habitat supports northern spotted owls and habitat quality is variable. The stated justification for designating stands currently not habitat as critical habitat was the need for increased and enhanced habitat and habitat connectivity to support dispersal, population growth, and buffering from competition with barred owls (U.S. Fish and Wildlife Service 2012a, 2021).

Approximately one-fourth of the land designated as critical habitat in the permit area does not currently contain northern spotted owl habitat as modeled in this HCP. Approximately 22% of the designated critical habitat meets the definition of dispersal habitat, 42% meets the definition of foraging habitat, 10% meets the definition of nesting and roosting habitat, and 25% is not habitat.

Of the critical habitat that is currently modeled as suitable, HCAs will include the following percentages of designated critical habitat.

- 75% of designated critical habitat that meets the definition of nesting and roosting habitat.
- 51% of designated critical habitat that meets the definition of foraging habitat.

In general, critical habitat in HCAs is expected to increase in habitat value during the permit term. Management activities in HCAs will be tailored to that purpose. There may be some short-term effects on critical habitat in locations where management activities occur for Swiss needle cast or to convert stands of hardwood to conifer, but over the permit term any critical habitat inside HCAs will be of higher quality than at the start of the permit term. Outside of HCAs, critical habitat may be modified, particularly in locations where critical habitat is designated in nesting, roosting, or foraging habitat.

Table 6-22 summarizes the acres of critical habitat inside and outside of HCAs, by habitat type, according to models developed for this HCP. Key summary points include the following.

- A total of 17,627 acres of critical habitat meets the HCP model criteria of nesting and roosting habitat, and 75% of those acres are located within HCAs. The 25% outside HCAs could be subject to harvest.
- Of the 71,089 acres of foraging habitat that is also critical habitat, 51% is in HCAs and will likely grow into nesting and roosting habitat during the permit term. The other 49% could be subject to harvest.

- The remainder of critical habitat is either dispersal habitat or does not currently meet minimum criteria for habitat. Habitat loss due to covered activities is not expected in dispersal-only habitat or areas that are not habitat.

Table 6-22. Northern Spotted Owl Critical Habitat and Modeled Existing Habitat Suitability in the Permit Area (acres)

Critical Habitat Unit	Breakout by Habitat Type ^a								Total
	Dispersal	% ^b	Foraging	%	Nesting/ Roosting	%	Non-Habitat	%	
1. North Oregon Coast Ranges	28,760	23	52,510	42	11,630	9	33,159	26	126,060
Critical habitat within HCAs	15,646	24	28,230	43	7,882	12	13,365	21	65,122
Critical habitat outside of HCAs	13,115	22	24,280	40	3,748	6	19,795	32	60,937
2. Oregon Coast Ranges	4,779	16	14,045	46	5,185	17	6,489	21	30,498
Critical habitat within HCAs	1,800	12	6,307	43	4,728	32	1,999	13	14,834
Critical habitat outside of HCAs	2,979	19	7,738	49	457	3	4,490	29	15,664
9. Klamath West	3,594	36	3,814	38	756	8	1,884	19	10,049
Critical habitat within HCAs	1,683	37	1,375	30	583	13	936	20	4,577
Critical habitat outside of HCAs	1,912	35	2,439	45	172	3	949	17	5,472
10. Klamath East	891	36	720	29	56	2	783	32	2,451
Critical habitat within HCAs	412	60	169	25	0	0	102	15	683
Critical habitat outside of HCAs	480	27	551	31	56	3	681	38	1,768
Total	38,026	22	71,089	42	17,627	10	42,316	25	169,058
Critical habitat within HCAs	19,541	51	36,080	51	13,193	75	16,402	39	85,216
Critical habitat outside of HCAs	18,485	49	35,008	49	4,433	25	25,914	61	83,841

^a Habitat ratings are described in Appendix E, *Effects Analysis*. Ratings scored from 0 to 1, with <0.39 = Not Habitat/Dispersal-only Habitat; 0.4–0.59 = Foraging; 0.6–1.0 = Nesting/Roosting Habitat.

^b Percent of total, by row.

HCAs = habitat conservation areas

6.7.8 Net Effects

ODF manages a small proportion (7%) of lands throughout the range of the northern spotted owl in Oregon. These ODF-managed lands have a varied influence on northern spotted owl critical habitat and demography depending on the configuration of ownership blocks and management objectives of adjacent landowners. In general, the unmitigated loss of any habitat currently occupied by

northern spotted owls is significant at the local population level, as the landscape carrying capacity has already been lowered due to a history of timber removal, fires, and barred owl encroachment; however, the level of significance varies across the permit area.

For example, the Tillamook and Clatsop State Forests on the North Coast represent large contiguous areas primarily surrounded by private industrial timberlands that implement even-aged management with short rotation ages to optimize timber production. In this landscape, ODF-managed lands have the potential for greater positive influence on northern spotted owl population dynamics on the North Coast than in other areas of the plan area.

This landscape-level management scenario also exists in the central Coast Range and in the west Cascades where ODF forests are primarily surrounded by large private industrial timberlands managing for commodity production, but these ODF-managed lands represent smaller contiguous blocks. These areas, however, are near large tracts of federal forests within each mountain range including the Siuslaw and Willamette National Forests (USFS) and scattered tracts of BLM. In these areas, ODF-managed lands play an important, complimentary role by providing landscape-level connectivity to federally managed lands and play a smaller role in influencing the northern spotted owl population dynamics in the central Coast Range. This scenario is also true in southwestern Oregon, where ODF-managed lands are even smaller and more scattered than elsewhere in the permit area, but provide landscape-level connectivity to the alternating square mile sections of federal forests managed by BLM, in addition to the larger tracts of adjacent Siuslaw, Umpqua, and Rogue-Siskiyou National Forests.

Without the management assurances and concomitant conservation actions outlined in this HCP, the potential for extirpation of northern spotted owls, especially in northwestern Oregon, is significant. The commitments to enhancing habitat in key locations of known prior occupancy, largely encompassed in the HCAs that are strategically arranged across the landscape will provide population resiliency. This is further bolstered by commitments to barred owl management in coordination with USFWS, designed to provide far greater conservation uplift to northern spotted owl populations in western Oregon than would occur without this HCP.

6.7.8.1 Management in Habitat Conservation Areas

A key consideration regarding the impact of the taking—and the associated mitigation needed to offset that taking—is the net habitat gain and loss over time, as modeled under the HCP (Section 6.2.7, *Modeling Habitat Harvest Inside and Outside Habitat Conservation Areas*). Based on the modeling conducted for this HCP, habitat gains within HCAs will outpace total losses in every 10-year period of the 70-year permit term, as habitat loss has been minimized through the establishment of the HCAs and through the increases in habitat quality in HCAs over time. For instance, the ratio of foraging habitat to nesting and roosting habitat is approximately 4:1 at the beginning of the permit term, but nesting and roosting habitat will be approximately double that of foraging habitat by the end of the permit term. Under the HCP, northern spotted owl populations will benefit from protection of 90% of existing active sites in HCAs (Conservation Action 6); reduced competition from barred owl removal efforts (Conservation Action 9); and an increased amount and quality of habitat over the permit term (Conservation Actions 6, 7, and 13). Specific benefits and net modeled outcomes are described below.

The conservation strategy (Conservation Action 6: Establish Habitat Conservation Areas, and Conservation Action 7: Manage Habitat Conservation Areas) is modeled to result in 230,944 acres of

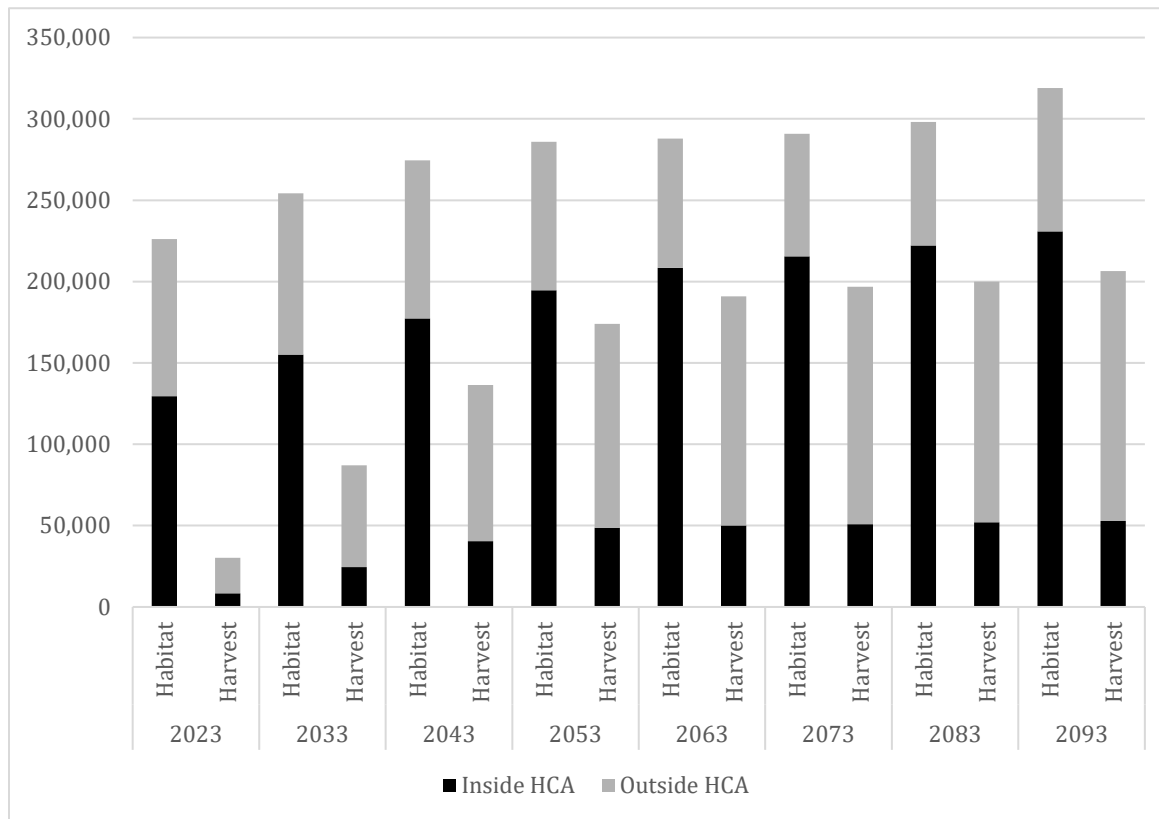
nesting, roosting, and foraging habitat within HCAs at the end of the permit term, a gain of 108,169 acres in HCAs over the 70-year permit term. Both habitat quantity and quality in HCAs is modeled to increase through passive management and some active management.

6.7.8.2 Management Outside Habitat Conservation Areas

An additional 87,975 acres of nesting, roosting, and foraging habitat is modeled to be present outside of HCAs at the end of the permit term, although these acres are modeled based on ODF's forest growth and timber harvest modeling and does not represent an ODF commitment to provide a specific amount of habitat for northern spotted owls beyond what is provided in HCAs that is required to meet connectivity requirement.

6.7.8.3 Net Effects Across the Permit Area

Figure 6-13 shows the modeled projections of cumulative habitat harvested and total habitat present over the permit term, by decade. Figure 6-14 shows the modeled change in habitat quality in the permit area during the permit term.



Notes: Modeled habitat levels show habitat and modeled cumulative harvest starting at the year indicated (e.g., 2023-2033 = first decade). Cumulative harvest is shown as nesting, roosting, and foraging habitat over the permit term (i.e., a running total accumulating over the permit term)s. Habitat projections presented in this chapter are not HCP commitments, but rather are modeled projections ODF is using to estimate the level of take and to determine appropriate avoidance, minimization, and mitigation measures needed to offset that modeled level of take.

Figure 6-13. Northern Spotted Owl Cumulative Habitat Harvested and Estimated Habitat Ingrowth, by Decade

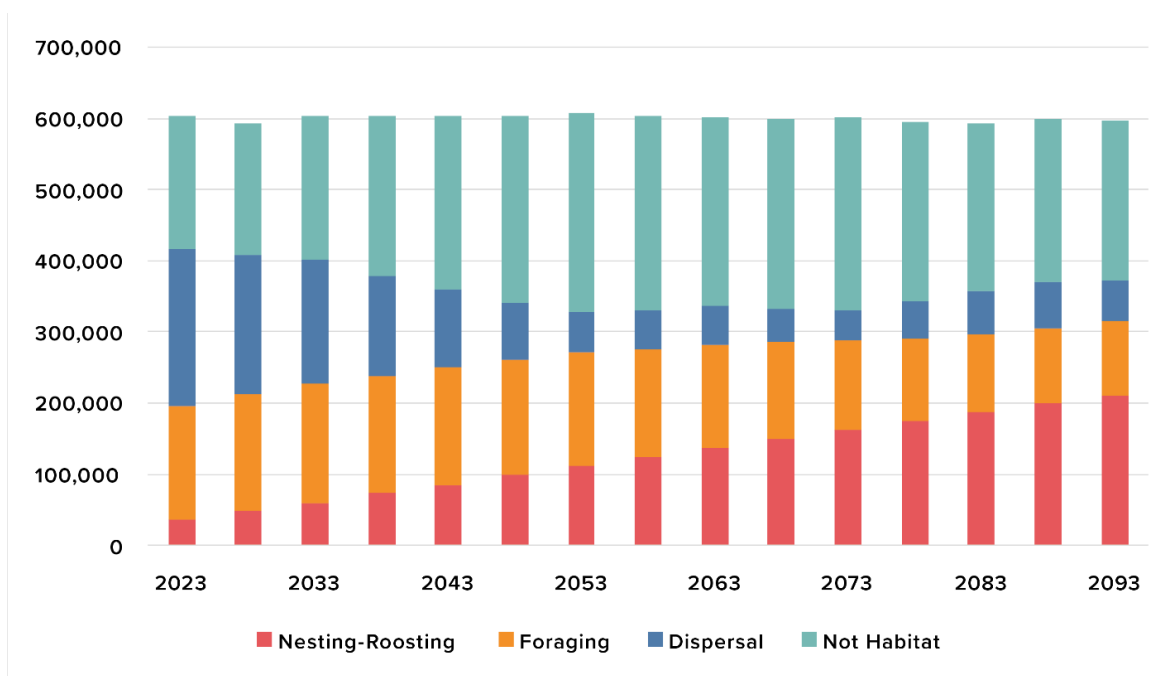


Figure 6-14. Change in Northern Spotted Owl Habitat Quality in the Permit Area Over the Permit Term, by Decade

Habitat development will be accelerated in some stands in HCAs as described under Conservation Action 7 (Chapter 4, Table 4-8). This conservation action is consistent with Recovery Action 6 of the *Revised Northern Spotted Owl Recovery Plan* (U.S. Fish and Wildlife Service 2011), which states “in moist forests managed for spotted owl habitat, land managers should implement silvicultural techniques in plantations, overstocked stands and modified younger stands to accelerate the development of structural complexity and biological diversity that will benefit spotted owl recovery.”

As noted in Chapter 4, *Conservation Strategy*, the conservation approach was developed in the context of a forested landscape that has been modified from historical conditions, particularly in the northwest portion of the permit area (i.e., the Tillamook and Clatsop State Forests). As a result, many forest stands are now dominated by densely spaced, young conifer and mixed deciduous forest (for a detailed description of current conditions and their history, see Chapter 2, *Environmental Setting*). Less than 20,000 acres of the permit area contains highly suitable habitat for northern spotted owls. However, due in part to investments made by ODF since the mid-1990s to improve forest conditions, and in part due to natural growth within stands through passive management, approximately 200,000 acres of the permit area are capable of becoming highly suitable for northern spotted owls at some point during the permit term.

The conservation strategy has been developed to anticipate this increase of habitat over time and to proactively develop an HCP that includes a significant portion of these areas to be allowed or encouraged through active management to become suitable habitat for northern spotted owls, and to maintain this habitat. This is consistent with Recovery Action 32 in the *Revised Northern Spotted Owl Recovery Plan* (U.S. Fish and Wildlife Service 2011). The benefits of developing additional habitat in HCAs is that, rather than operating on a “no-take” basis, which conserves only the minimum habitat that is necessary to avoid take of currently “active” (occupied) sites, the HCP will

proactively designate and manage habitat that is currently not suitable in order to create more suitable habitat on the landscape over time.

The extent and location of HCAs is anticipated to ensure the persistence of northern spotted owls throughout the permit area, including within the North Coast areas, which USFWS has identified as a priority for maintaining the viability of the Oregon Coast Recovery Unit (U.S. Fish and Wildlife Service 2011).

In addition, under Conservation Action 9: Strategic Terrestrial Species Actions, ODF will establish a conservation fund to fund and implement in cooperation with USFWS barred owl research and management activities in the permit area. The benefits of barred owl removal have been clearly demonstrated based on synthesis of research (Wiens et al. 2019, 2021; Hobart et al. 2025). Control of barred owls could enhance survival and site persistence in the permit area over the permit term and, thus, further offset the modeled impacts of take under this HCP. Indeed, barred owl presence in spotted owl territories was the primary factor negatively affecting apparent survival and recruitment across 11 study areas and 26 years of survey and capture-recapture data (Franklin et al. 2021).

USFWS and others have consistently stated the need to conserve and restore large areas of contiguous, high-quality habitat across the range of the northern spotted owl to prevent further population declines and to allow for the recovery of the species (Lesmeister et al. 2018; Dugger et al. 2011; Forsman et al. 2011; U.S. Fish and Wildlife Service 2011). The conservation strategy includes focusing management for species habitat improvement in contiguous areas of suitable habitat and associated active northern spotted owl nesting territories in HCAs. Designated HCAs, particularly where barred owl density is reduced, will provide long-term protection and enhancement of northern spotted owl habitat in exchange for allowable harvest in other habitat areas outside of HCAs to maintain important economic values from ODF lands in the permit area. Known nest sites in HCAs will be protected from disturbance through implementation of Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species.

As previously described, the HCP is modeled to result in a net increase in suitable habitat for northern spotted owls in the permit area over the permit term, from the 219,351 acres of nesting, roosting and/or foraging habitat (modeled as ≥ 0.4) distributed across the permit area at the start of the permit (year 2023) to approximately 318,841 acres at the end of the 70-year permit term (Table 6-23). That value represents an increase of 108,169 acres within HCAs and a modeled increase of approximately 29,383 acres of nesting/roosting habitat outside of HCAs. Maintenance of dispersal and foraging habitat requirements outside of HCAs are described in Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas. Based on the timing of modeled harvest under the HCP, a net increase in habitat will occur within each 10-year modeling period over the permit term so that growth of northern spotted owl habitat will more than offset habitat lost through harvest and thinning throughout the permit term (Conservation Action 13: Stay-Ahead Provision). Table 6-23 summarizes the net habitat outcomes under the HCP modeled to be present at the end of the permit term.

Table 6-23. Net Northern Spotted Owl Modeled Habitat Estimates from Start to End of Permit Term ^a

	Inside HCA			Outside HCA			Total		
	Foraging	Nesting/ Roosting	Total	Foraging	Nesting/ Roosting	Total	Foraging	Nesting/ Roosting	Total
Start	92,112	30,633	122,775	84,891	11,715	96,606	177,003	42,348	219,351
End	62,021	168,922	230,944	46,800	41,098	87,898	108,821	210,020	318,841
Change	-30,090 ^b	138,259	108,169	-38,090	29,383	-8,707	-68,182	167,672	99,490

^a Modeled habitat from 2023 to 2093 based on 2020 harvest model. Habitat ratings are described in Appendix E, *Effects Analysis*. Habitat suitability index (HSI) ratings scored from 0 to 1, with <0.39 = Not Habitat/Dispersal-only Habitat; 0.4–0.59 = Foraging; 0.6–1.0 = Nesting/Roosting Habitat. While habitat is modeled to develop outside of HCAs and likely will, ODF is not committing to maintaining habitat for northern spotted owls outside of HCAs other than the amount of dispersal and foraging habitat (see Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas, for a description of dispersal habitat commitments).

^b Note that much of the foraging habitat decreases can be attributed to foraging habitat developing into nesting and roosting habitat. For instance, the ratio of foraging habitat to nesting and roosting habitat is approximately 4:1 at the beginning of the permit term but nesting and roosting habitat will be approximately double that of foraging habitat by the end of the permit term.

HCA = habitat conservation area

The amount of habitat conserved and additional habitat to be developed over time is expected to fully offset the amount of habitat lost over the permit term and maintain and enhance northern spotted owl reproduction, numbers, and distribution within the permit area over the permit term.

6.8 Effects Analysis for Marbled Murrelet

6.8.1 Sources and Types of Effects

6.8.1.1 Types of Effects

Effects from covered activities include the potential to “harm” individual marbled murrelets as follows.

- Direct injury or mortality, such as inadvertently destroying a nest with eggs or young.
- Behavioral or physical responses to noise and disturbance, such as missed feedings of young due to adult murrelets avoiding the nesting areas.
- Reduced survival and reproductive success due to habitat modification due to harvests in or adjacent to nesting habitat that degrade microclimate, reduce nest success, increase nest depredation, or result in increased windthrow.

6.8.1.2 Avoidance and Minimization Measures

Disturbance near known active nest stands during the nesting season and direct injury or mortality will be minimized through seasonal operational restrictions during the nesting season (Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species).

However, unknown, nest sites could potentially be disturbed or destroyed. The HCP includes survey and monitoring to minimize such occurrences in the HCAs (Chapter 5, Section 5.3.3.2, *Terrestrial Species Habitat Monitoring*). Section 6.8.4, *Covered Activities that Minimize and Mitigate Take*, lists and summarizes the specific avoidance, minimization, and mitigation measures defined as part of

covered activities (Chapter 3), the conservation strategy (Chapter 4), and monitoring and adaptive management (Chapter 5).

6.8.1.3 Sources of Effects

Timber harvest and other silvicultural activities—including disturbance (e.g., noise and visual disturbance due to activity related to roadwork, harvest, yarding)—will be the primary sources of effects of marbled murrelets over the permit term. The HCP minimizes and mitigates effects of timber harvest through designated HCAs (Conservation Action 6: Establish Habitat Conservation Areas) and associated management and conservation measures (Conservation Action 7: Manage Habitat Conservation Areas).

Inside of HCAs, harvest activities will occur where there are opportunities to increase the quality and quantity of habitat for covered species over the permit term, following the criteria and decision processes outlined in Chapter 4, *Conservation Strategy*, under Conservation Action 7 and shown in Appendix H, *ODF Roads Manual*. This includes regeneration harvest in low-quality habitat or heavy thinning of stands of non-habitat that are unlikely to become high-quality habitat for marbled murrelets over the course of the permit term without silvicultural intervention. Yet, it remains possible that clumps of suitable trees with available nest platforms in otherwise low-quality stands could be used by marbled murrelet.

Stands requiring this management will be treated during the first 30 years of the permit term so they are put on a trajectory to develop into habitat. In those instances, short-term effects on marbled murrelet habitat are expected to be minimal, given that operations are in non-habitat.

Outside of HCAs and RCAs, habitat will be subject to harvest, as quantified in Section 6.8.5, *Adverse Effects*. The following sections describe the criteria and thresholds for determining when take will occur, the effects pathways leading to take, and the specific covered activities expected to result in take, as well as those not expected to result in take.

6.8.1.4 Quantifying Approach to Analyzing Effects

To inform USFWS calculations regarding the level of incidental take of marbled murrelet, a key metric provided in this chapter is acres of suitable and highly suitable habitat that will be harvested or otherwise disturbed under the HCP due to covered activities. Harm due to habitat modification from timber harvest is the primary source and type of take of marbled murrelets ODF anticipates occurring over the permit term. While take through habitat modification has been minimized through designated HCAs (Conservation Action 6: Establish Habitat Conservation Areas), habitat outside of HCAs and RCAs will be subject to harvest under the HCP. The modeled level and type of take is described in Section 6.8.2, *Covered Activities that May Result in Take*. The effects pathways leading to such take are described in the next subsection.

6.8.1.5 Effects Pathways

The effects pathways leading to take begin with reduced forest structure, including large trees and associated nesting platforms and reduced tree density, canopy cover, and canopy layers. Loss of these forest structures may result in the following stressors to resources.

- Directly and immediately through noise and physical disturbance where covered activities are conducted near individual marbled murrelet nests or when eliminating trees with platforms

that are required for nesting (Nelson and Wilson 2002), either through direct harvest or subsequent windthrow events along harvest edges.

- Indirectly and over time through habitat modification. Create “hard edges” (recent clear-cuts) near nest trees or stands, increasing exposure to nest predators (Malt and Lank 2007) and reducing microclimate conditions needed to support nesting platforms (van Rooyen et al. 2011). Microclimate effects on moss can occur within 150 feet of hard edges, possibly further in areas with greater wind exposure (Raphael et al. 2018).

Cutting down known active nest trees or stands during the nesting season will be avoided through the conservation measures described in Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species. Therefore, effects of modified nesting habitat will not be realized until murrelets return to nest. The behavioral response of individual marbled murrelets (or pairs) to such stressors may include the following.

- **Continued use.** In situations where nest trees are retained but edge habitat is created near the nest location, then birds returning to nest may still use the tree, but the eggs and young could be lost due to increased predation risks created by the modified habitat.
- **Abandonment of nest site.** Adults returning to stands that have been significantly modified by timber harvest or other covered activities may seek a new nest location or may forego nesting for the year. If seeking a new nest location, the pair would likely expend considerable energy and may acquire less energy due to less time spent foraging. The pair or individuals may or may not find a suitable replacement nest location. In addition, loss of a nest site could affect pair bonds. In any case, the likely biological effect is assumed to be lost reproductive success for at least 1 year.

The effects pathway ends with consideration of the biological effects on individuals within the context of regional and range-wide distribution and populations. Because available nesting habitat and associated reproduction levels is considered a limiting factor in current population numbers (Raphael et al. 2018), loss of nest locations or increased predation risk could reduce local population levels through reduced nesting and production of young. Such population-level effects are discussed under Section 6.8.5, *Adverse Effects, Impacts of the Taking on Marbled Murrelet*.

Figure 6-15 summarizes the potential effects pathways from covered activities, on individual murrelets, through to population-level effects.

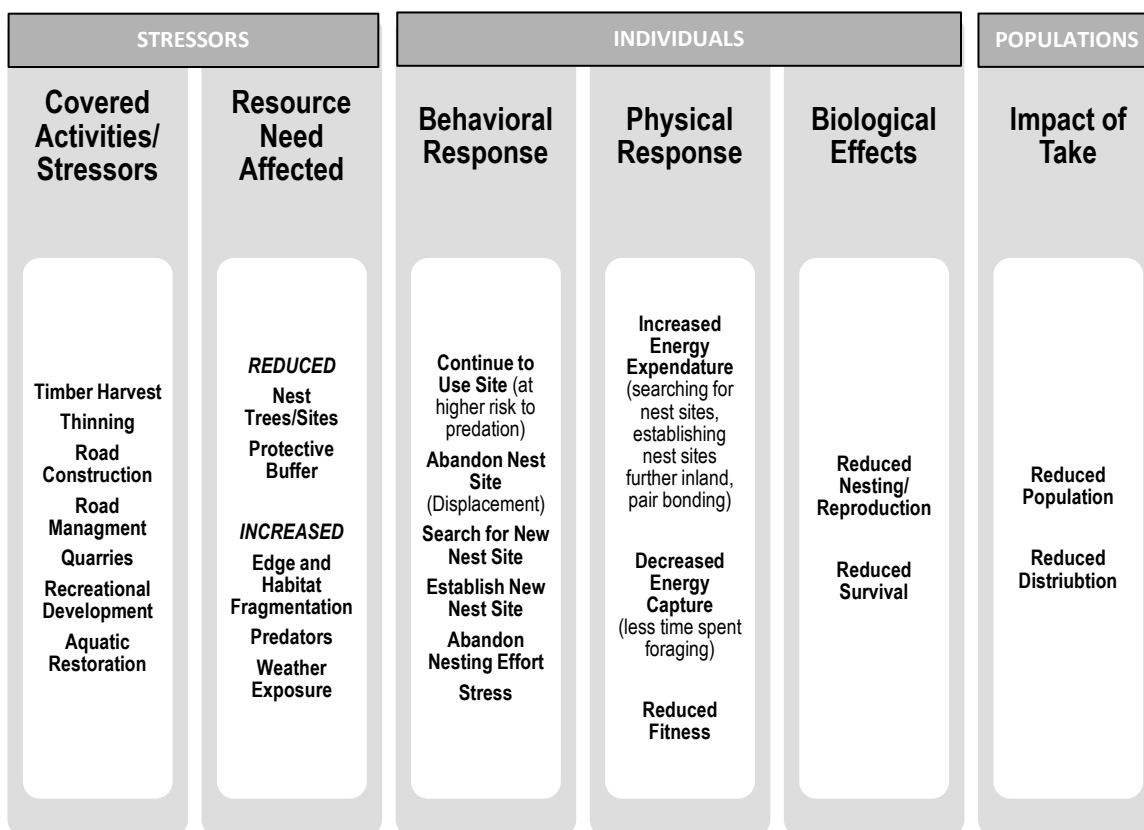


Figure 6-15. Effects Pathways Identified for Marbled Murrelets via Habitat Modification from Covered Activities

6.8.2 Covered Activities that May Result in Take

Harm via timber harvest and associated modification of habitat outside HCAs will be the primary source and type of take of marbled murrelets. These effects will be minimized through implementation of Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas, and Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species.

There could also be instances where harvest occurs outside HCAs in stands that have supported nesting marbled murrelets and the occupancy was yet undiscovered. These effects will be minimized following the implementation of Conservation Action 10, but not fully avoided if murrelet occupancy outside HCAs is unknown. Other covered activities may also include tree removal that could modify marbled murrelet habitat if conducted in such habitat, including new road construction, landings, and development of new quarries and recreation infrastructure, maintenance, and operations (e.g., campgrounds, trails, trailheads).

Even in instances where these activities do not result in habitat loss, they may result in habitat degradation through the creation of more habitat edge and less interior habitat. This, in turn, results in an increased risk of blowdown and microclimatic effects, including increased use by corvids (ravens, jays, and crows) and to a lesser extent, hawks. Similarly, establishment of recreation infrastructure has the added potential for take by attracting corvid populations, which may, in turn,

increase predation risks to marbled murrelets nesting near such areas (Malt and Lank 2007; Walker and Marzluff 2015; Raphael et al. 2018).

These effects would be minimized because when management activities occur in HCAs they will follow the provisions described in Conservation Action 7 and implementation of Conservation Action 10. Silvicultural prescriptions inside of HCAs will only be carried out if the harvest action will result in higher habitat quality over the permit term. These areas include hardwood-dominated stands comprising primarily red alder with little or no conifer component, or those infected with Swiss needle cast that have limited potential to provide habitat value during the permit term. These managed stands will achieve a higher level of suitability than the non-habitat or marginally suitable habitat stand they replaced.

Take via habitat modification may occur throughout the permit term. As with northern spotted owl, take in the early years of the permit will occur within existing suitable habitat outside of HCAs, while take in later years may include habitat that is currently not suitable but that has developed over time. The amount and timing of take anticipated to occur through habitat modification over the permit term is described in Section 6.8.5, *Adverse Effects*, and Section 6.8.7, *Effects on Critical Habitat*.

Not all habitat modification will result in take. As with other covered terrestrial species, the likelihood that effects of habitat modification from timber harvest on marbled murrelets will rise to the level of take depends on existing conditions of the stand to be modified and proposed harvest specifications. Habitat must be used at some point -by nesting marbled murrelets for nesting murrelets to be exposed to the effects of habitat modification, although it may not occur every year (i.e., annual variation of actual nesting in occupied habitat). In addition, the habitat modification must be sufficiently severe to interfere with nesting to the extent that individuals or their eggs or young are harmed. Habitat modification will be most likely to result in take in stands that are modeled as suitable or highly suitable, as these are places that are most likely to support marbled murrelet nesting. Table 6-24 summarizes covered activities and associated type of take expected to occur under the permit terms and conditions.

Table 6-24. Sources and Types of Take of Marbled Murrelet Expected Under the Habitat Conservation Plan

Covered Activity	Source of Take	Type of Take
Regeneration harvest	Removal of habitat within/adjacent to occupied stands; removal near or including the nest tree; operations during nesting season; noise/activities; edge effects (windthrow); elevated predator access near edges; displacement to alternate habitat with higher energy cost	Direct mortality (felling/striking nest, egg, chick, incubating adult); nest abandonment; reduced reproductive success/productivity; increased predation risk; harm via habitat modification and displacement
Thinning	Thinning within/adjacent to potential habitat or occupied stands; felling of nest tree or platform tree; removal of trees that reduce habitat value and elevate predation risk; noise/activities disturbing birds in adjacent habitat	Direct mortality (egg/chick/adult at nest); nest abandonment; reduced reproductive success; increased predation risk; disturbance/harassment

Covered Activity	Source of Take	Type of Take
Hazard tree removal	Targeted removal of hazard trees along roads or in public-use areas; localized habitat modification near roads	Reduced habitat value (harm via habitat modification); disturbance/harassment; effects often discountable relative to home-range scale
Road use	Vehicle traffic near nest sites; murrelets rarely at ground level but collision risk exists	Direct mortality (vehicle strike), rare but possible; otherwise part of baseline use
Road construction and maintenance	Habitat removal in occupied/suitable/highly suitable habitat; potential nest-tree removal; increased habitat edge; (mitigations: avoid new roads in designated occupied/suitable/highly suitable habitat in HCAs; do not remove platform-bearing trees where construction occurs)	Habitat modification (loss/edge effects); increased predation risk; reduced reproductive success; nest abandonment; potential direct mortality if nest tree affected
Aquatic habitat restoration	Minor habitat modification (e.g., select tree tipping/removal); disturbance near habitat; (strategic terrestrial conservation actions minimize where near species habitat)	Habitat modification; disturbance/harassment; reduced reproductive success risk
Controlled burning	Smoke and operational disturbance; low likelihood during breeding season but potential for smoke drift or escaped fire into suitable habitat	Disturbance/harassment; habitat modification; possible nest failure if exposure occurs
Other covered activities that involve tree removal	Construction/maintenance of roads, quarries, recreation infrastructure; associated operations (heavy machinery, vehicles, power tools, blasting, rock crushing; public chainsaw use for minor forest products) within or adjacent to suitable habitat	Harm via habitat modification (reduced prey availability, increased exposure to predators); disturbance/harassment; reduced reproductive success; nest/territory abandonment; (in limited circumstances) direct mortality if a nest/roost tree is struck/felled
Other covered activities that involve noise	Construction/maintenance of roads, excavation of rock quarries; associated operations (heavy machinery, vehicles, power tools, blasting, rock crushing); recreation infrastructure, development, and operations (e.g., campgrounds, trails, trailheads in occupied/suitable/highly suitable habitat; potential nest-tree felling; attractants (trash) increasing predator numbers)	Disturbance/harassment; reduced reproductive success; nest/territory abandonment; increased predation risk (corvid attraction)

HCAs = habitat conservation areas

6.8.3 Covered Activities Not Expected to Result in Take

This section describes covered activities where the applicant has determined that effects are not likely to raise to the level of take. Effects of covered activities conducted more than 100 meters (328 feet) from designated occupied habitat and suitable or highly suitable habitat are expected to be minor because most significant physical and biological effects on murrelet nesting stands (e.g., windthrow, loss of moss for nesting substrate, reduced canopy cover, increased predation) are

believed to occur within this distance (U.S. Fish and Wildlife Service 2019a). Table 6-25 lists covered activities that are not expected to rise to the level of take of marbled murrelets.

Table 6-25. Covered Activities Not Expected to Result in Take of Marbled Murrelets

Covered Activity	Rationale for Determining that Covered Activity Will Not Result in Take
Site preparation, tree planting, and release treatments	Reforestation and young stand-management activities will take place outside of and, at least seasonally, more than 100 meters (328 feet) distant from suitable habitat and are likely to have minimal or no effects on marbled murrelets.
Mountain beaver control	Mountain beaver damage control will occur primarily in reforestation areas that are non-habitat for marbled murrelets. Treatments that include an area surrounding the reforestation area may intersect habitat for marbled murrelets but are not expected to result in take.
Thinning	Commercial thinning conducted within stands that do not contain suitable habitat and are not adjacent to occupied stands would have little to no effect on nesting marbled murrelets.
Precommercial thinning and pruning	Precommercial thinning will take place in young stands outside of and, at least seasonally, more than 100 meters (328 feet) distant from suitable habitat and are likely to have minimal or no effects on marbled murrelets.
Existing road system	The presence of existing roads is not expected to rise to the level of take because they are considered part of the environmental baseline and current nest locations have been established in the presence of the road system.
Road management	Removal of hazard trees along roads has the potential to reduce habitat values for marbled murrelets. However, minimization and avoidance measures will protect known nest locations.
Road use	Marbled murrelets rarely fly at ground level and are not expected to be at risk of collisions with vehicles outside of suitable habitat.
Road maintenance	Maintenance (brushing, grubbing, grading) within the road prism is an ongoing low-intensity activity not anticipated to adversely affect nesting marbled murrelets.
Road decommissioning	Road decommissioning will not adversely affect murrelet habitat and may improve habitat conditions over time by reducing hard-edge effects and reducing human use.
Water drafting and storage	This activity is not likely to adversely affect nesting marbled murrelets or their eggs or young.
Monitoring activities	Monitoring is generally not expected to result in take. If any monitoring activity is determined to potentially result in take, then ODF (including contractors and external research organizations) will obtain necessary clearance with USFWS (or the research organization will, if a different entity).

HCP = Western Oregon State Forests Habitat Conservation Plan; ODF = Oregon Department of Forestry; USFWS = U.S. Fish and Wildlife Service

6.8.4 Covered Activities that Minimize and Mitigate Take

The HCP includes several measures to minimize and mitigate effects on marbled murrelet, including measures incorporated into covered activities (Chapter 3), measures established as commitments

under the conservation strategy (Chapter 4), and measures to monitor and adapt to changing conditions (Chapter 5).

The designation, preservation, and long-term active and passive enhancement of HCAs throughout the permit area is the primary conservation action intended to conserve, maintain, and enhance habitat for the marbled murrelet. With Conservation Action 6, ODF will immediately designate upon permit issuance approximately 63,000 acres of HCAs to support the persistence of marbled murrelet within suitable and highly suitable habitat. With Conservation Action 7, ODF will manage HCAs to increase the quality and quantity of habitat for marbled murrelet.

Outside of HCAs, ODF will implement standards in Conservation Action 8 to maintain and create long-term, landscape-level habitat values for covered species in the portion of the permit area that is more actively managed for timber production to support the function and connectivity between designated HCAs. In addition, operational restrictions detailed in Conservation Actions 10 and 12, such as trash management and minimizing road construction impacts, will apply restrictions for activities that may occur in or near designated occupied habitat inside HCAs during the murrelet nesting season and near known nest trees outside of HCAs.

Table 6-26 summarizes minimization and mitigation measures for anticipated take of marbled murrelet, as summarized from Chapter 3, *Covered Activities*, Chapter 4, *Conservation Strategy*, and Chapter 5, *Monitoring and Adaptive Management*.

Table 6-26. Marbled Murrelet Minimization and Mitigation Measures

Title	Measure/Action	Category	Intended Effect (Mitigation/ Minimization)	Reference
Suitable and highly suitable habitat conservation	Establish HCAs that include 78,585 acres of existing suitable and 2,320 acres of existing highly suitable murrelet nesting habitat (including occupied)	Establish HCAs	Secures core nesting habitat to reduce disturbance and loss	Ch.4 – Obj. 6.1 / CA6
HCA enhancement targets	Increase habitat by ≥54,000 acres suitable and ≥44,000 acres highly suitable over the permit term (totals: 134,000 suitable; 70,000 highly suitable)	Manage HCAs	Offsets risk and increases long-term nesting capacity	Ch.4 – Obj. 6.2
HCA silviculture (tracking)	Document acres/type of silvicultural activity in HCAs by suitability class	Manage HCAs	Ensures treatments accelerate—and do not degrade—nesting habitat	Ch.5 – Obj. 6.1 and Obj. 6.2 / CA7
Fuels work in HCAs	Record location/extent of fuels reduction in HCAs and describe measures to minimize effects on habitat suitability	Manage HCAs	Reduces fire risk to promote fire resilient forests; maintains key habitat structure	Ch.3 – Fire Management; Ch.5 – Obj. 6.2 / CA7, CA10
Occupied habitat trash control	Trash management and removal required for all	Operational restriction	Reduces corvid attraction and	Ch.4 – CA10

Title	Measure/Action	Category	Intended Effect (Mitigation/ Minimization)	Reference
	planned activities within designated occupied habitat and buffers		predation risk to eggs/nestlings	
Tailhold and guyline anchors	Specific criteria required for all tailholds and guylines within designated occupied habitat	Operational restrictions	Protect trees that contain suitable nesting platforms and associated cover trees from damage	Ch.4 – CA10
Aquatic restoration project limits	Aquatic restoration projects will not fall, push, or pull trees that have the structure or characteristics used by marbled murrelets located inside designated occupied habitat	Operational restrictions	Protect trees that contain suitable nesting platforms	Ch.4 – CA10
Recreation limits (compliance)	Inventory, track, and limit new/expanded facilities and trails consistent with CA6/CA7/CA10 measures	Recreation management	Minimizes disturbance, noise, access pressure near occupied/suitable habitat	Ch.5 – CA12
Whole-landscape HCA network	Establish and actively manage HCAs as a conservation area	Protected areas	Concentrates large, interior forest patches with nesting platforms	Ch.4 – CA6 and CA7
Acoustic monitoring program	Passive acoustic monitoring plus follow-up field surveys using accepted protocols; survey suitable/highly suitable habitat by year 20	Effectiveness monitoring	Detects occupancy trends; validates habitat development strategy	Ch.5 – Obj. 6.1 and Obj. 6.2
Post-year-20 occupancy checks	Ongoing monitoring after year 20 to assess occupancy in improving habitat (e.g., stands with platform trees)	Effectiveness monitoring	Confirms realized nesting in newly matured habitat	Ch.5 – Obj. 6.1 and Obj. 6.2
Manage for patch interior	Track patch size and interior: edge metrics during HCA management	Habitat configuration	Reduces edge effects, predation, and microclimate degradation	Ch.5 – Obj. 6.2 / CA7
Legacy and leave trees	Retain live leave trees and legacy trees within regeneration units	Timber harvest	Sustains structural complexity and recruitment of future platform trees	Ch.3 – Clear-Cut Harvest; Ch.4-CA7, CA8

Title	Measure/Action	Category	Intended Effect (Mitigation/ Minimization)	Reference
Clear-cut size and green-up	Limit clear-cuts (e.g., ≤120 acres) with green-up/retention standards	Timber harvest	Avoids large, contiguous habitat loss; maintains landscape continuity	Ch.3 – Clear-Cut Harvest/Ch.4-CA8
Thinning for complexity	Use variable-density/light-moderate-heavy thinning to accelerate vertical/horizontal structure	Stand development	Accelerate development of late-seral attributes that support nesting platforms	Ch.3 – Partial-Cut Harvest; Ch4. CA7
Salvage restrictions	Exclude salvage from RCAs and HCAs (hazard exceptions only)	Salvage harvest	Retains critical structures and reduces disturbance in key habitats	Ch.3 – Salvage Harvest
Low-impact hazard work	Apply low-impact methods for hazard tree removal	Hazard tree management	Limits collateral damage to canopy and legacy structures	Ch.3 – Hazard Tree Removal
Climate-resilient reforestation	Plant diverse, climate-resilient species; use interplanting to maintain stocking	Reforestation	Sustains long-term forest continuity toward future nesting habitat	Ch.3 – Tree Planting/Interplanting; Ch.4 CA7
Controlled burning limits	Restrict controlled burning to uplands, not RCAs	Fire management	Protects riparian-adjacent mature forest attributes and microclimate	Ch.3 – Fire Management
Seasonal operational restrictions	Apply limited operating periods within specified distances of known or designated occupied MAMU habitats (Table 4-14)	Operational restrictions	Minimizes disturbance and project externalities near sensitive areas	Ch.4– CA10 (and related compliance items)
Habitat accounting (5-year)	Report habitat acres by suitability class every 5 years; compare to baseline	Effectiveness monitoring	Verifies progress toward acreage goals; triggers adjustment	Ch.4 – Obj. 6.1 & 6.2
Recreation mileage caps	Track net trail miles (by type) and location relative to RCAs/ERZs/HCAs	Compliance monitoring	Prevents incremental increase of disturbance footprint	Ch.4 – CA12
Needs assessments	Require and review needs assessments for new roads and trails	Road and trail construction and management	Ensures new access is a last resort and lower-impact options are used	Ch.4 – CA11 (needs assessment)
Barred owl management	Coordinate barred owl control where it overlaps murrelet habitat with timing restrictions to avoid	Strategic terrestrial species conservation actions	Reduces noise disturbance during removal; reduces potential predation	Ch.4 – CA9, CA10

Title	Measure/Action	Category	Intended Effect (Mitigation/ Minimization)	Reference
	nesting seasons and/or twilight active periods		pressure on marbled murrelet	

HCA = habitat conservation area; MAMU = marbled murrelet; Obj. = Objective; CA = Conservation Action; RCA = riparian conservation area; ERZ = equipment restriction zone; DBH = diameter at breast height; BMPs = best management practices; FPA = Forest Practices Act

6.8.5 Adverse Effects

6.8.5.1 Acres of Habitat Directly Removed or Degraded by Covered Activities

Quantity and Timing of Habitat Effects

Based on timber harvest and forest growth modeling, harvest or thinning activities will occur in approximately 104,551 acres of modeled suitable or highly suitable marbled murrelet habitat over the 70-year permit term. The totals of estimated habitat effects include harvest or thinning in stands that have developed into habitat after permit issuance. Habitat modification will occur inside and outside of HCAs.

Modification of marbled murrelet habitat in HCAs will only be done in situations where those short-term silvicultural actions will result in long-term increases in habitat quality. Management activities in HCAs will be conducted consistent with the provision in Conservation Action 7, including no management in designated occupied habitat. In suitable habitat with an HSI value between 0.50 and 0.79, management will be infrequent and limited to thinning. In suitable habitat with an HSI range between 0.30 and 0.49, management will be more frequent but limited to light, moderate, and variable-density thinning treatments.

Outside of HCAs, suitable and highly suitable habitat could be harvested or thinned for timber production. The habitat modification would be authorized by the HCP and associated ITPs. Table 6-27 and Table 6-28 summarize the suitable and highly suitable habitat that will be modified through thinning or lost through regeneration harvest over the 70-year permit term.

Effects on marbled murrelet are most likely to occur in modeled habitat in in Tillamook and Clatsop State Forests and scattered ODF lands in the central and southern Coast Range, and less likely to occur in the eastern section of Tillamook State Forest based on species range, forest characteristics, and past survey history. No effects are expected in the Santiam State Forest located outside the species range, while minimal effects are likely to occur on scattered ODF lands in southwestern Oregon that have limited overlap with the species range.

Table 6-27. Marbled Murrelet Habitat Modeled to Be Harvested or Thinned Under the Habitat Conservation Plan Over the Permit Term, by 5-Year Increments (acres)

Inside HCAs				
Habitat Type	Suitable (HSI 0.30–0.79)		Highly Suitable (HSI ≥0.8)	
Mgt. Type	Regeneration	Thinning	Regeneration	Thinning
2023	-	7,500	-	-
2028	-	7,500	-	-
2033	-	7,500	-	-
2038	-	7,500	-	-
2043	-	7,500	-	-
2048	-	7,500	-	-
2053	-	-	-	-
2058	-	-	-	-
2063	-	-	-	-
2068	-	-	-	-
2073	-	-	-	-
2078	-	-	-	-
2083	-	-	-	-
2088	-	-	-	-
2093	-	-	-	-
Total	0	45,000	0	0

Outside of HCAs				
Habitat Type	Suitable (HSI 0.30–0.79)		Highly Suitable (HSI ≥0.8)	
Mgt. Type	Regeneration	Thinning	Regeneration	Thinning
2023	14,848	0	29	-
2028	12,776	47	18	-
2033	12,139	22	13	-
2038	11,574	-	5	-
2043	11,587	-	12	-
2048	11,633	33	177	-
2053	10,214	-	1	-
2058	7,909	170	70	-
2063	3,504	-	-	-
2068	2,093	-	29	-
2073	1,826	-	-	-
2078	824	-	30	-
2083	74	108	4	-
2088	732	-	-	-
2093	2,038	9	-	-
Total	103,773	389	388	0

Table 6-28. Cumulative Marbled Murrelet Habitat Modeled to Be Harvested or Thinned Under the Habitat Conservation Plan Over the Permit Term (acres)

Location	Habitat Thinned ^a		Habitat Harvested (Regeneration)		Total
	Suitable	Highly Suitable	Suitable	Highly Suitable	
Within HCAs	45,000	--	--	--	45,000
Outside of HCAs	389	--	103,773	388	104,551
Total	45,389	--	103,773	388	149,551

^a Habitat thinned inside HCAs will be completed consistent with Conservation Action 7: Manage Habitat Conservation Areas.

While harvest of marbled murrelet habitat will occur over the entire 70-year permit term, approximately 67% of modeled habitat modification (100,571 acres) will occur within the first 20 years of plan implementation, and approximately 95% (141,784 acres) will occur within the first 40 years. This is not due to targeting habitat early in the permit term, but rather due to the current stand-age distribution and the prioritization of treatments within HCAs during the first 30 years. During the first 40 years of the permit term some areas outside HCAs that are not currently habitat will grow into habitat prior to harvest. Take authorization afforded by the HCP and associated ITPs will authorize that habitat modification of existing habitat as well as future ingrowth habitat.

Ingrowth habitat is defined as habitat that is too young to support nesting marbled murrelets at the beginning of the permit term but matures into habitat suitable for nesting marbled murrelets and is subsequently harvested later in the permit term. Ingrowth habitat is included in the totals in Table 6-29.

Outside HCAs and other protections, approximately 19,128 acres of 100-year-old or older ingrowth habitat could be harvested later in the permit term, the majority of which (17,038 acres) are modeled to be regeneration harvests. Therefore, of the approximately 104,551 acres of harvested habitat outside HCAs (Table 6-29), approximately 18% will be of habitat that does not currently support nesting marbled murrelet, but could later in the permit term.

As the permit term progresses, past year 40, acres of habitat modified are fewer, not because less harvest is occurring, but because the age and structure of the forest outside of HCAs will have stabilized by then.

Figure 6-16 illustrates the cumulative level of marbled murrelet suitable and highly suitable habitat modeled to be modified over the permit term (i.e., running total of acres harvested over the permit term inside and outside of HCAs).

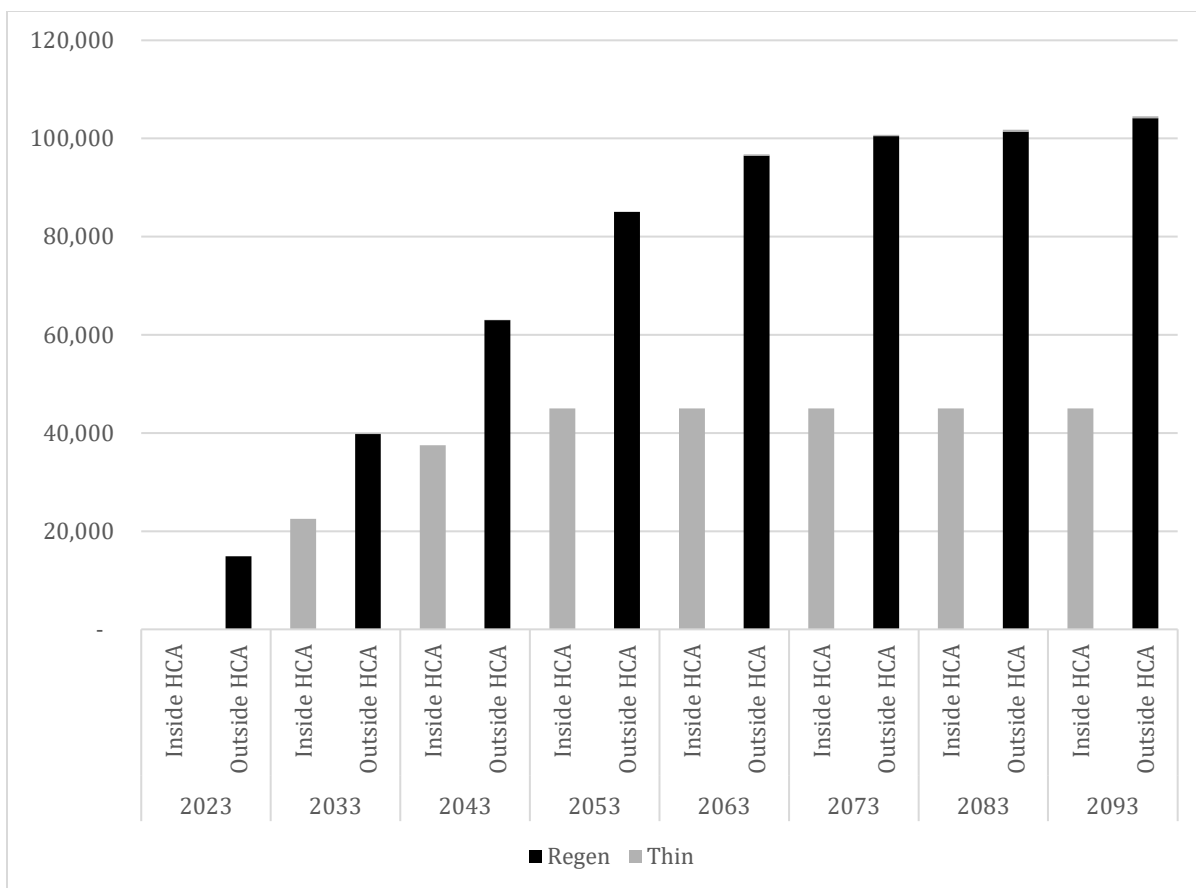


Figure 6-16. Cumulative Marbled Murrelet Suitable and Highly Suitable Habitat Modeled to Be Harvested or Thinned Under the Habitat Conservation Plan Over the Permit Term (acres)

Marbled Murrelet Nesting Sites

Loss of occupied nesting habitat is expected to be rare over the permit term, because the majority of occupied sites are in HCAs. Of the 363 survey detections indicating marbled murrelet occupancy in the permit area, all but four are included in HCAs (note that three of the four detections are from one survey location). By definition, management activities in HCAs will be implemented to increase habitat quantity for marbled murrelets and other terrestrial covered species over the permit term, so loss of nest trees inside HCAs is not expected. It is expected that occupied stands outside of HCAs could be lost over time, likely due to a reduction in habitat quality in the stand, although habitat within stream buffers and other inoperable lands will be retained. However, under Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Areas, leave-tree commitments will retain platform-bearing trees and associated cover trees near known nest trees. In addition, Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species, harvest of known nesting habitat will be avoided during the nesting season as long as nesting persists. Additionally, ODF has surveyed the majority of highly suitable marbled murrelet habitat in the permit area over the last 30 years and estimates potential loss of less than 400 acres of highly suitable habitat of unknown occupancy over the 70-year permit term. Harvest of lower-quality habitat of unknown occupancy status is where most habitat modification will occur and, therefore, the primary source of potential take outside of HCAs.

Table 6-29 summarizes the results of marbled murrelet surveys that have been conducted over the permit area over many years (Appendix C, *Species Accounts*).

Table 6-29. Marbled Murrelet Survey Results Within the Permit Area Including Those Inside and Outside Habitat Conservation Areas

Location	Significant ^a	% in HCA	Presence – Visual ^b	% in HCA	Presence – Audio ^c	% in HCA	Total
Inside HCA	359	99	248	84	620	87	1,227
Outside HCA	4	-	47	-	96	-	147
Total ^d	363	-	295	-	716	-	1,374

^a Significant observations are assumed active nesting sites.

^b Presence – Visual indicates the possibility of nesting, but birds observed may be traveling to other stands.

^c Presence – Audio indicates the possibility that the surveyed stand is occupied, but calls are frequently heard far away from nesting areas, so not a strong indicator of nesting. See Evans Mack (2003) for details on survey protocol and result classification.

^d In many cases, there are multiple observations at a single survey area and sometimes in multiple years.

HCA = habitat conservation area

6.8.5.2 Acres of Habitat Indirectly Removed or Degraded by Covered Activities

Figure 6-17 illustrates the decadal amounts of marbled murrelet habitat (defined here as a stand that reaches 100 years of age) in HCAs that has the potential to experience stand degradation due to edge effects caused by adjacent regeneration harvest (within 100 meters [328 feet]) over the permit term. Table 6-30 summarizes the amount of new-edge habitat that is added each decade and the resulting cumulative habitat that would be potentially modified through edge effects associated with regeneration harvests over the 70-year permit term.

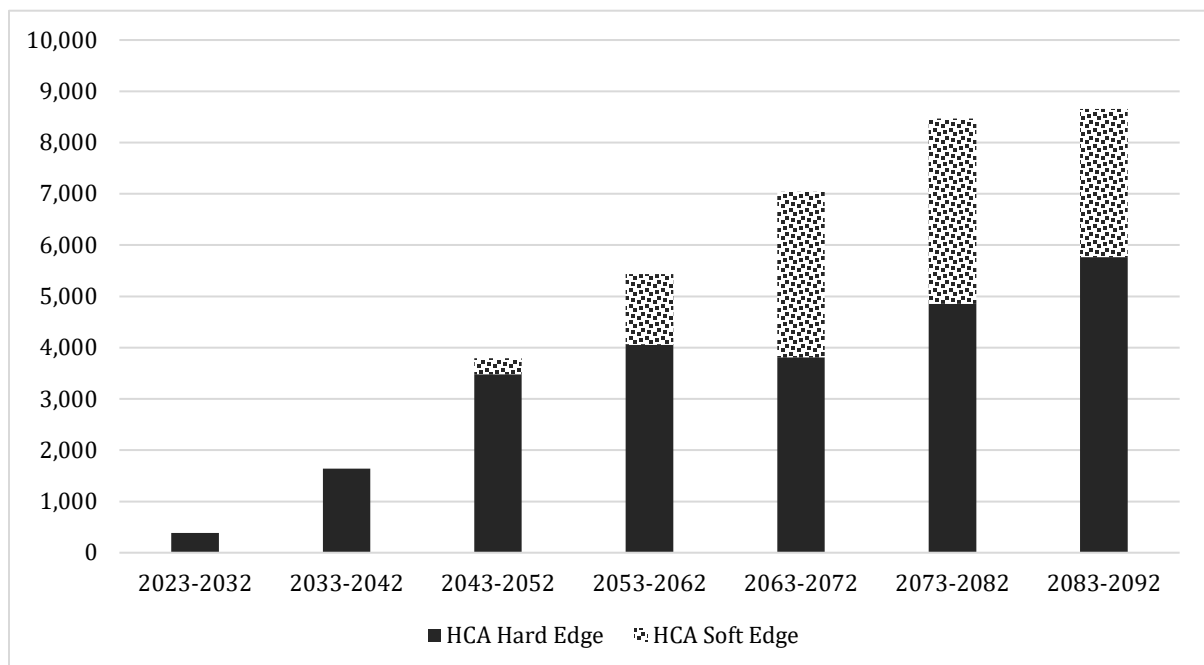


Figure 6-17. Modeled Marbled Murrelet Edge-Effect Area in Habitat Conservation Areas

Eggs and chicks of marbled murrelets may face mortality from nest-site predation due to regenerative harvesting creating abrupt edges near their occupied nesting areas. Predators such as ravens, crows, and jays are known to target marbled murrelet eggs and young (Golightly and Schneider 2011; Falxa and Raphael 2016). The *Marbled Murrelet Recovery Plan* (U.S. Fish and Wildlife Service 1997) suggests maintaining buffer zones of 300 to 600 feet to protect and enhance habitats around these nesting sites. However, a literature review by Lorenz et al. (2021) indicates that nests located within 50 to 60 meters (164 to 197 feet) of edges are particularly vulnerable to predation and failure due to edge effects.

Table 6-30. Modeled Added and Cumulative Edge-Effect Acres for Regeneration Harvest Within 100 Meters (328 feet) of Marbled Murrelet Habitat in Habitat Conservation Areas Over the Permit Term

Decade of Permit Term	Added Edge ^a (acres)	Cumulative Edge (acres)
1	387	387
2	1,249	1,637
3	2,158	3,795
4	1,643	5,438
5	1,897	7,335
6	2,444	9,779
7	2,278	12,056
Average acres of edge habitat per decade	1,722	NA

^a Added edge acres include harvest include both hard and soft edged habitat and excludes edge that was created in the previous three decades that aged out after 40 years.

NA = not applicable

In addition to nest-site depredation from corvids that may increase along new-edge habitat, regeneration harvest would leave nest trees vulnerable to windthrow by eliminating wind protection that was provided by the harvested stand (Falxa and Raphael 2016). Additionally, harvest of adjacent stands can also reduce humidity levels in habitat, which can hinder the growth and development of mossy branches essential for marbled murrelet nest sites (Van Rooyen et al. 2011).

Some level of edge effect could occur at the affected site for up to 40 years after regeneration occurs to create a softer edge and less direct access to nesting stands for predators, with most impacts expected to occur during the first 10 years. Van Rooyen et al. (2011) considered hard edges to be those created by recent clear-cuts 5 to 11 years old and soft edges to be those where regenerating stands are 17 to 39 years old. For the purposes of determining the amount of take, this HCP assumes harvested edges will transition from hard edge to soft edge after 20 years, and from soft edge to no edge after 40 years.

Edge-Effect Modeling Parameters and Caveats

The estimation of marbled murrelet habitat that could be subjected to edge effects is based on the harvest model scenario used in the HCP. However, the harvest model had to make several assumptions about the age and type of stands and regenerating stands, and any interpretation of the results should consider the following caveats.

- A habitat patch becomes marbled murrelet habitat if it is 100 years of age (as of 2020) or when it reaches 100 years of age during the permit term. Habitat is merged into discrete patches defined by the median SLI stand size (>70 acres).
- Marbled murrelet habitat edge-effect area is the area within 100 meters (328 feet) of any modeled regeneration harvest. This would include Swiss needle cast stands, and alder stands managed in HCAs that are limited to the first 30 years of the permit term. Note that a light thinning implemented adjacent to designated occupied or highly suitable habitat would retain continuous cover (≥50% canopy) thereby softening edges and maintaining interior microclimate (Chapter 3, Section 3.2.2, *Partial-Cut Harvest*; Chapter 4, Table 4-12).
- Hard edges last from time of harvest to year 20, then become soft edges.
- Soft edges persist from year 21 to year 40 then are no longer considered to cause edge effects at age 41. This means edges formed during the first 50 years do not persist to the end of the permit term.
- The modeled harvest model used in the HCP was not explicitly designed to estimate edge habitat and several analytical steps were used to force what should be considered a rough solution.
- Where possible, overlapping edges were not counted twice (such as along narrow RCA buffers), but some overlapping is likely, and this could result in an overestimate of potential effects.

6.8.5.3 Impacts of the Taking on Marbled Murrelet

Context, Intensity, and Duration of Impacts

Take resulting from habitat loss and other adverse effects, described in Section 6.8.2, *Covered Activities that May Result in Take*, will occur within the following contexts and levels of intensity.

- Approximately 40% of existing habitat is located outside of HCAs and will be subject to harvest (approximately 2% of existing habitat in the permit area is rated as highly suitable, and 98% of that 2% is within HCAs). These areas include a mix of previously surveyed (with presence only or presumed absence) and unsurveyed habitat.
- Approximately 18% of harvested habitat outside HCAs will be from ingrowth habitat that does not currently support nesting marbled murrelet, but could later in the permit term.
- Of the approximate 149,551 acres of habitat harvested inside and outside of HCAs, an additional 11% (12,056 acres) of habitat harvested inside HCAs could be exposed to potential edge effects over the permit term.
- One occupied marbled murrelet site (<1% of all known occupied locations) in the permit area will also be located outside of HCAs and subject to harvest, though any harvest that occurs will follow Conservation Action 10 to avoid harvest during the nesting season.

Once suitable marbled murrelet nesting habitat is harvested outside of HCAs, it is likely to be harvested again before developing back into habitat, so the effects are considered to be permanent. And if stands are not subsequently harvested, they will be unlikely to develop into habitat by the end of the permit term. However, leave-tree commitments under Conservation Action 10 may result in patches of suitable nesting habitat developing over time outside of HCAs. In addition, some modification due to thinning will be temporary. All modifications within HCAs will be temporary and will be implemented consistent with the provisions in Conservation Action 7.

Habitat gains that are modeled to outpace habitat losses under the HCP and associated impacts are discussed in Section 6.8.6, *Beneficial Effects*, and Section 6.8.8, *Net Effects*.

6.8.6 Beneficial Effects

Under the HCP, marbled murrelet populations will primarily benefit from protection of most existing designated occupied habitat within HCAs (Conservation Action 6: Establish Habitat Conservation Areas), and an increased amount and quality of nesting habitat over the permit term (Conservation Action 6 and Conservation Action 7: Manage Habitat Conservation Areas). Table 6-31 summarizes the major components of the conservation strategy intended to benefit marbled murrelets in the permit area. Additional quantitative benefits are presented in Section 6.8.8, *Net Effects*.

Table 6-31. Beneficial Effects on Marbled Murrelet from the HCP

Benefit	How the HCP Achieves It	Key Metrics / Commitments	HCP Reference
Secures core nesting habitat in large interior blocks	Establishes and manages HCAs to hold occupied, highly suitable, and suitable nesting habitat as interior forest with reduced disturbance	Baseline inside HCAs includes ~78,600 acres suitable and ~2,300 acres highly suitable	(Chapter 4 – Objective 6.1; CA6, CA7)
Expands the quantity and quality of nesting habitat in HCAs	Uses targeted silviculture and long-term habitat accounting to increase suitable and highly suitable habitat over the permit term	Increase suitable and highly suitable to specified targets; habitat acres reported every 5 years	(Chapter 4 – Objective 6.2; CA7)
Support platform recruitment	Retains old-growth trees, known nest trees, large leave trees, and snags; applies variable-density thinning and other prescriptions that promote large platform-bearing crowns	Treatments documented by suitability class; retention and salvage limits retain legacy structure	(Chapter 4 – Objective 6.2; CA7, CA8) implemented via covered activities (Chapter 3 – Clear-cut/Partial Cut/Thinning/Salvage limits)
Reduces nest predation risk	Trash management in occupied habitat and buffers to deter corvids; food/garbage management associated with covered activities	Trash removal/containment requirements in occupied habitat and buffers	(Chapter 4 – CA10)

Benefit	How the HCP Achieves It	Key Metrics / Commitments	HCP Reference
Limits disturbance footprint in sensitive areas	Compliance screens and limits on new/expanded recreation facilities and trails near HCAs/RCAs/ERZ; seasonal/operational restrictions where specified	Track net trail miles by type and proximity; constrain siting and expansion	(Chapter 4 – CA12) with habitat context (Chapter 4 – CA1–CA2; CA6, CA7)
Sustains connectivity and reduces edge effects	Manages RCAs and designs HCAs to maximize patch interior; tracks interior: edge metrics and patch size	Interior/edge metrics monitored to guard against fragmentation	(Chapter 4 – Objective 6.2; CA7) and (Chapter 4 – CA1, CA2)
Increases resilience to fire, drought, and insects	Climate-smart HCA distribution across latitudinal/elevational gradients	HCA placement across gradients; fuels treatments tracked and constrained	(Chapter 4 – Section 4.5) and (Chapter 4 – Objective 6.2; CA7)
Limits disturbance and operational impacts in HCAs	Applies seasonal operating restrictions near designated occupied habitat; uses compliance screens for recreation/ access; strategically vacates/stabilizes roads and trails; restricts salvage in conservation areas	Seasonal restrictions during nesting period and/or daily timing restrictions; net reduction in chronic disturbance/access; salvage excluded in HCAs/RCAs except hazards	(Chapter 4 – CA10 and related compliance elements); implementation detail in covered activities (Chapter 3)
Controls chronic access impacts	Vacates/stabilizes unneeded roads/trails; requires needs assessments for new access	Track location and mileage; apply needs assessment and crossing standards	(Chapter 4 – CA11, CA12) implemented via covered activities (Chapter 3 – Road System Management; Road/Trail Vacating)
Implement Adaptive Management	Passive acoustic monitoring with follow-up surveys; survey all suitable/highly suitable habitat by year 20; 5-year habitat accounting by suitability class; adaptive adjustments	Year-20 survey coverage; re-occurring 5-year reports; habitat accounting; adaptive management triggers	(Chapter 5 – Objectives 6.1–6.2; Monitoring & Adaptive Management)

HCAs = habitat conservation areas; CA = Conservation Action; RCAs = riparian conservation areas; ERZ = equipment restriction zone

6.8.7 Effects on Critical Habitat

USFWS has designated critical habitat for marbled murrelets on approximately 1.5 million acres in Oregon (U.S. Fish and Wildlife Service 2016), of which 163,160 acres (11%) are in the permit area. Critical habitat has been designated by unit and subunit. Of the total marbled murrelet critical habitat designated in the permit area, 82% (133,808 acres) is in Unit OR-01, and 16% (25,607 acres) is within Unit OR-03, both of which are located in the north Oregon Coast area. Approximately 2% (3,400 acres) is within Unit OR-02, also located in the north Oregon Coast area and less than 1% is located in in OR-04 (213 acres) and OR-07 (33 acres), located in the central and southern Oregon Coast areas, respectively.

While ODF considered marbled murrelet designated critical habitat when delineating HCAs, the two do not completely overlap. This is because ODF used actual species occurrence, existing suitable habitat, and connectivity as primary drivers for HCA delineation. In addition, approximately 63% of the land designated as critical habitat in the permit area does not currently support marbled murrelet nesting habitat as modeled in this HCP. Approximately 32% of the designated critical habitat currently meets the definition of suitable habitat, and only 6% meets the definition of highly suitable.

Of the critical habitat that is currently modeled as suitable, HCAs will include the following percentages.

- 88% of designated critical habitat that meets the definition of highly suitable.
- 67% of designated critical habitat that meets the definition of suitable habitat.

In general, critical habitat located in HCAs is expected to increase in habitat value during the permit term. Management activities in HCAs will be tailored to that purpose. There may be some short-term effects on critical habitat in locations where management activities occur, but over the permit term any critical habitat inside HCAs will be higher quality than at the start of the permit term. Outside of HCAs critical habitat may be modified, particularly in locations where critical habitat is designated in suitable or highly suitable habitat. Table 6-32 summarizes the acres of critical habitat inside and outside of HCAs by habitat type, according to models developed for this HCP. A total of 10,130 acres of critical habitat meets the HCP model criteria of highly suitable habitat, and 88% of those acres are inside HCAs. The 12% outside HCAs could be subject to harvest if not in RCAs. Of the 49,477 acres of suitable habitat that is also critical habitat, 67% is in HCAs and will likely grow into highly suitable habitat during the permit term. The other 33% could be subject to harvest if outside of RCAs. The remainder of critical habitat does not currently meet minimum criteria for habitat as modeled by this HCP.

Table 6-32. Marbled Murrelet Critical Habitat and Modeled Existing Habitat Suitability (acres)

Critical Habitat Unit	Breakout by Habitat Suitability ^a						Total
	Highly Suitable	% ^b	Suitable	%	Non-Habitat	%	
OR-01	6,902	5	43,359	32	83,547	62	133,808
Critical habitat in HCAs	6,233	7	29,876	35	49,671	58	85,780
Critical habitat outside HCAs	669	1	13,483	28	33,876	71	48,028
OR-02	129	4	722	21	2,550	75	3,400
Critical habitat in HCAs	129	4	720	21	2,511	75	3,360
Critical habitat outside HCAs	--	0	2	5	38	95	40
OR-03	3,050	12	5,324	21	17,233	67	25,607
Critical habitat in HCAs	2,584	25	3,025	29	4,846	46	10,455
Critical habitat outside HCAs	466	3	2,299	15	12,387	82	15,152
OR-04	46	21	66	31	101	47	213
Critical habitat in HCAs	46	41	35	31	32	29	112
Critical habitat outside HCAs	0	0	32	32	69	68	101
OR-07	3	10	6	17	24	73	33
Critical habitat in HCAs	3	10	6	17	24	73	33

Critical Habitat Unit	Breakout by Habitat Suitability ^a						Total
	Highly Suitable	% ^b	Suitable	%	Non-Habitat	%	
Critical habitat outside HCAs	--	--	--	--	--	--	--
Total	10,130	6	49,477	30	103,454	63	163,061
Critical habitat in HCAs	8,866	88	32,942	67	54,573	53	96,381
Critical habitat outside HCAs	1,135	11	15,816	32	46,370	45	63,321

^a Habitat ratings are described in Appendix E *Effects Analysis*. Ratings scored from 0 to 1, with <0.29 = Not Habitat; 0.3–0.79 = suitable; and 0.8–1.0 = highly suitable.

^b Percent of total (far right column).

HCAs = habitat conservation areas

6.8.8 Net Effects

Demographic support to marbled murrelet throughout their inland range is complicated due to historical conditions of the forested landscape (e.g., stand replacing wildfires and logging practices) and contemporary forest-management objectives that vary based on adjacent landownership. ODF-managed lands constitute less than 4% of forested lands in the Oregon Coast Range. Nevertheless, these areas disproportionally represent approximately 16% of existing murrelet habitat within the species inland range. Known nesting is concentrated throughout Tillamook State Forest (northwest portion of permit area) and ODF-managed lands in the central Oregon Coast Range.

The Tillamook State Forest is a large continuous area surrounded by private industrial forests that often lack tracts of large interior habitat and minimal habitat edge. Smaller blocks of ODF-managed lands in the central Oregon Coast Range are also adjacent to private industrial forests; however, these lands in select areas border federal forests managed by the Siuslaw National Forest and BLM. ODF-managed lands located further south along the coast within the species inland range represent scattered tracts due to the alternating square mile sections of federal forests managed by BLM, in addition to larger tracts managed by Siuslaw and Siskiyou National Forests.

Recognizing the landscape-level variation in management and distribution of forested lands within the inland marbled murrelet range, the conservation strategy is expected to develop larger blocks of habitat inside HCAs capable of supporting higher densities of nesting pairs on ODF-managed lands. These areas will serve as strongholds for this species as habitat quality and quantity increases overtime; however, the influence on marbled murrelet population dynamics may be complicated by the life-history stages of this species that requires both terrestrial and marine habitat. Despite benefits to the marbled murrelet through protection of existing nesting habitat and long-term increases in late-seral stand development in the permit area, the conservation strategy has no ability to influence marine habitat threats (e.g., forage fish availability, gillnet entanglement, ocean acidity). Nonetheless, the combination of the conservation strategy's avoidance, minimization, and mitigation measures are expected to have a net beneficial effect on marbled murrelet that supports the persistence of this species through increases in nesting habitat capacity distributed throughout its inland range within the permit area.

6.8.8.1 Management in Habitat Conservation Areas

As stated in Chapter 4, *Conservation Strategy*, the conservation approach was developed in the context of a forested landscape that has been modified from historical conditions, particularly in the northwest portion of the permit area (i.e., the Tillamook and Clatsop State Forests). As a result,

many forest stands are now dominated by densely spaced, young conifer, and mixed deciduous forest (for additional details regarding current forest conditions, see Chapter 2, *Environmental Setting*), and the permit area currently contains relatively little highly suitable habitat for marbled murrelets. However, many existing forest stands are within a sufficiently mature level of development that it is capable of becoming habitat suitable for marbled murrelet nesting over the 70-year permit term. The conservation strategy has been developed to anticipate this increase of habitat over time. The conservation strategy was also developed to include a significant portion of these areas to be allowed to become suitable habitat for marbled murrelets through establishment of HCAs and a moderate level of active management to maintain and enhance habitat over the permit term.

The conservation strategy (particularly Conservation Actions 6 and 7) is modeled to result in approximately 203,622 acres of marbled murrelet suitable and highly suitable nesting habitat in HCAs at the end of the permit term (Table 6-33), with increases in habitat quantity and quality through passive management and some active management. This represents a potential net gain of approximately 122,717 acres of habitat in HCAs. In addition to a net increase in acreage, the conservation strategy is modeled to improve habitat conditions through increased patch size and decreased exposure of existing and future nesting sites to edge effects.

6.8.8.2 Management Outside Habitat Conservation Areas

Models also project an additional approximately 23,193 acres of marbled murrelet suitable and highly suitable nesting habitat developing outside of HCAs at the end of the permit term, although these acres are modeled based on forest growth and timber harvest modeling and do not represent an ODF commitment to provide habitat for marbled murrelets beyond that provided in HCAs (Chapter 4, *Conservation Strategy*, for specific commitments). Acres outside of HCAs will also be subject to harvest.

6.8.8.3 Net Effects Across the Permit Area

Figure 6-18 shows the modeled cumulative habitat harvested and total habitat modeled to be present over the permit term, by decade. Figure 6-19 shows the modeled habitat conditions in the permit area over the permit term.

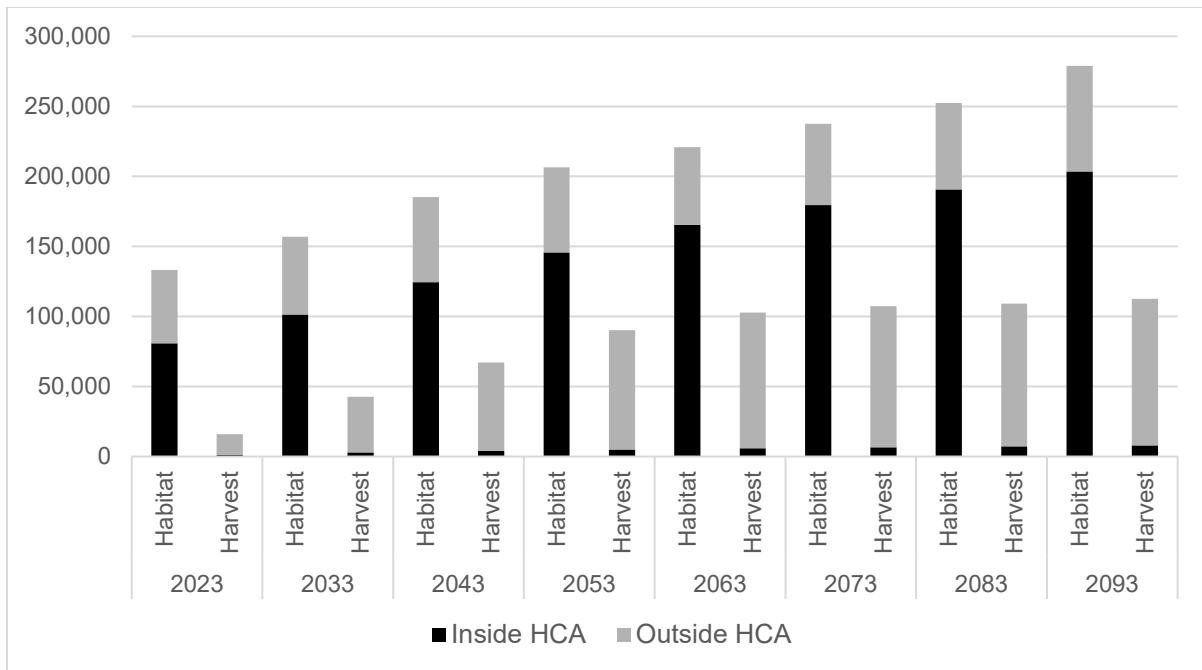


Figure 6-18. Marbled Murrelet Cumulative Habitat Harvested and Modeled Habitat Ingrowth Over the Permit Term, by Decade

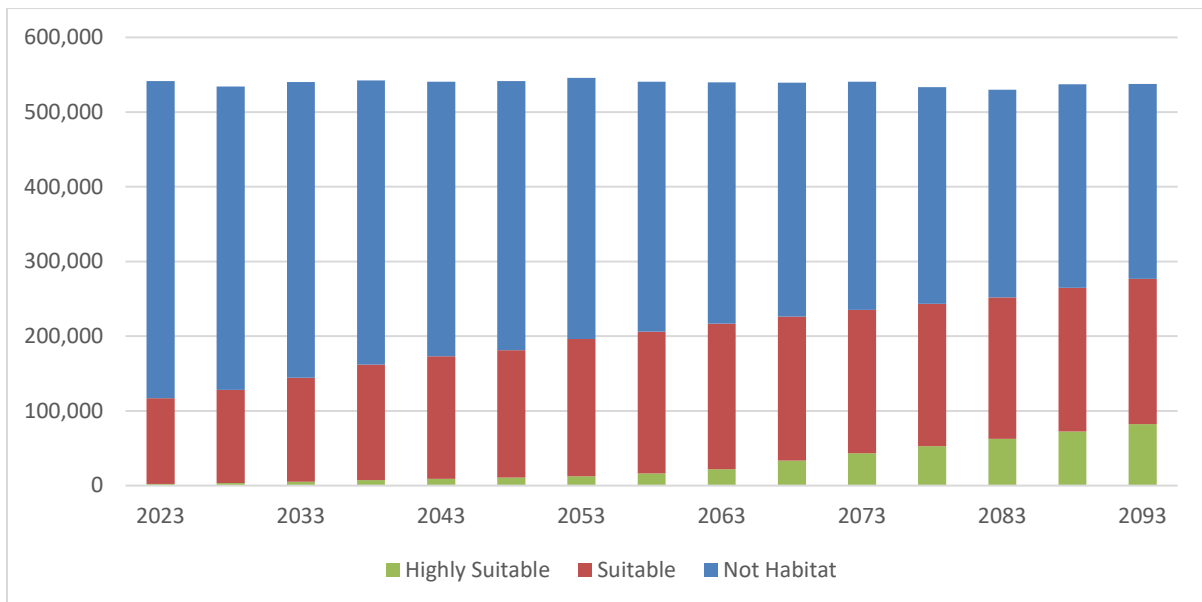


Figure 6-19. Change in Marbled Murrelet Habitat Quality Over Permit Term, by Decade

As previously shown in Figure 6-19 and as detailed in Table 6-33, the HCP is modeled to result in a net increase in suitable habitat for marbled murrelets over the permit term, thereby fully offsetting habitat modification that is modeled to occur under the terms and conditions of the HCP.

Table 6-33. Net Marbled Murrelet Modeled Habitat Modeled From Start to End of Permit Term ^a

	Inside HCA			Outside HCA			Total		
	Suitable	Highly Suitable	Total	Suitable	Highly Suitable	Total	Suitable	Highly Suitable	Total
Start Habitat	78,585	2,320	80,905	52,053	53	52,106	130,638	2,373	133,011
End Habitat	133,627	69,995	203,622	63,087	12,212	75,299	196,714	82,207	278,921
Change	55,042	67,675	122,717	11,034	12,159	23,193	66,076	79,834	145,910

^a Habitat suitability indices are described in Appendix E, *Effects Analysis*. Ratings scored from 0 to 1, with <0.29 = Not habitat; 0.3–0.79 = Suitable, and 0.8–1.0 = Highly Suitable

Areas in designated HCAs will provide long-term protection and enhancement of marbled murrelet habitat in exchange for allowable harvest in other habitat areas outside of HCAs to maintain important economic values from ODF lands in the permit area. The amount of habitat conserved and additional habitat to be developed over time is expected to maintain and enhance marbled murrelet opportunities for nesting in the permit area over the permit term.

6.9 Effects Analysis for Red Tree Vole, North Oregon Coast Distinct Population Segment

6.9.1 Sources and Types of Effects

6.9.1.1 Types of Effects

Effects from covered activities include the potential to harm individual red tree voles as follows.

- Direct injury or mortality, such as inadvertently killing individuals during harvest operations.
- Habitat modification to the extent that red tree voles have reduced survival or reproductive success.

The following sections describe the thresholds for determining when such take will occur, the effects pathways leading to take, and the specific covered activities expected to result in take, as well as those covered activities not expected to result in take.

6.9.1.2 Avoidance and Minimization Measures

Disturbance near known nest trees will be minimized through seasonal operational restrictions (Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species). Inside HCAs, a 10-acre block of contiguous habitat will be maintained around known red tree vole nest trees. Nest trees identified outside of HCAs will be retained as part of the leave-tree strategy described in Chapter 4 (Table 4-13). Despite these actions, unknown, nest trees could potentially be disturbed or destroyed. The HCP includes survey and baseline monitoring to minimize such occurrences in the HCAs (Chapter 5, Section 5.3.3.2, *Objective 7.1: Conserve, Maintain, and Enhance Occupied Red Tree Vole Habitat*). Section 6.7.4, *Covered Activities that Minimize and Mitigate Take*, lists and summarizes the specific avoidance, minimization, and mitigation measures defined as part of covered activities (Chapter 3), the conservation strategy (Chapter 4), and monitoring and adaptive management (Chapter 5).

6.9.1.3 Sources of Effects

Timber harvest and other silvicultural activities will be the primary sources of effects on red tree voles over the permit term. The HCP minimizes and mitigates the effects of these activities through designated HCAs (Conservation Action 6: Establish Habitat Conservation Areas) and associated management and conservation measures (Conservation Action 7: Manage Habitat Conservation Areas).

Inside of HCAs, harvest activities will occur where there are opportunities to increase the quality and quantity of habitat for covered species over the permit term, following the criteria and decision processes outlined in Conservation Action 7) and shown in Appendix H, *ODF Roads Manual*.

6.9.1.4 Quantifying Approach to Analyzing Effects

Habitat must be occupied by red tree voles to expose individuals to the effects of habitat modification. Therefore, habitat modification in known occupied stands or stands that are modeled as suitable or highly suitable are most likely to affect red tree voles, because these are places that red tree voles are most likely to be present. Therefore, the HCP uses modification of suitable and highly suitable habitat as a primary metric of effects on red tree voles.

6.9.1.5 Effects Pathways

The effects pathways leading to harm due to direct injury or mortality include all covered activities that will involve felling trees occupied by red tree voles, including timber harvest, thinning, roadwork, quarry work, and recreational infrastructure development and maintenance.

Because red tree voles spend nearly their entire lives in tree canopies, individuals will not likely be able to flee tree-felling operations and could fall with the tree, either being directly injured, killed, or forced to flee and find new habitat. Surviving individuals could be subject to stress, increased energy expenditure, decreased food intake, and risk of mortality due to predation and starvation. If survivors are able to relocate, effects could include reduced reproductive effort and success as well as costs associated with reduced resources by moving to potentially lower-quality habitat.

The effects pathway ends with the consideration of the biological effects on individuals within the context of regional and range-wide distribution and populations, as discussed in Section 6.9.5, *Adverse Effects, Impacts of the Taking on Red Tree Vole*.

Figure 6-20 summarizes the general effects pathways identified for potential harm to red tree voles due to habitat modification.

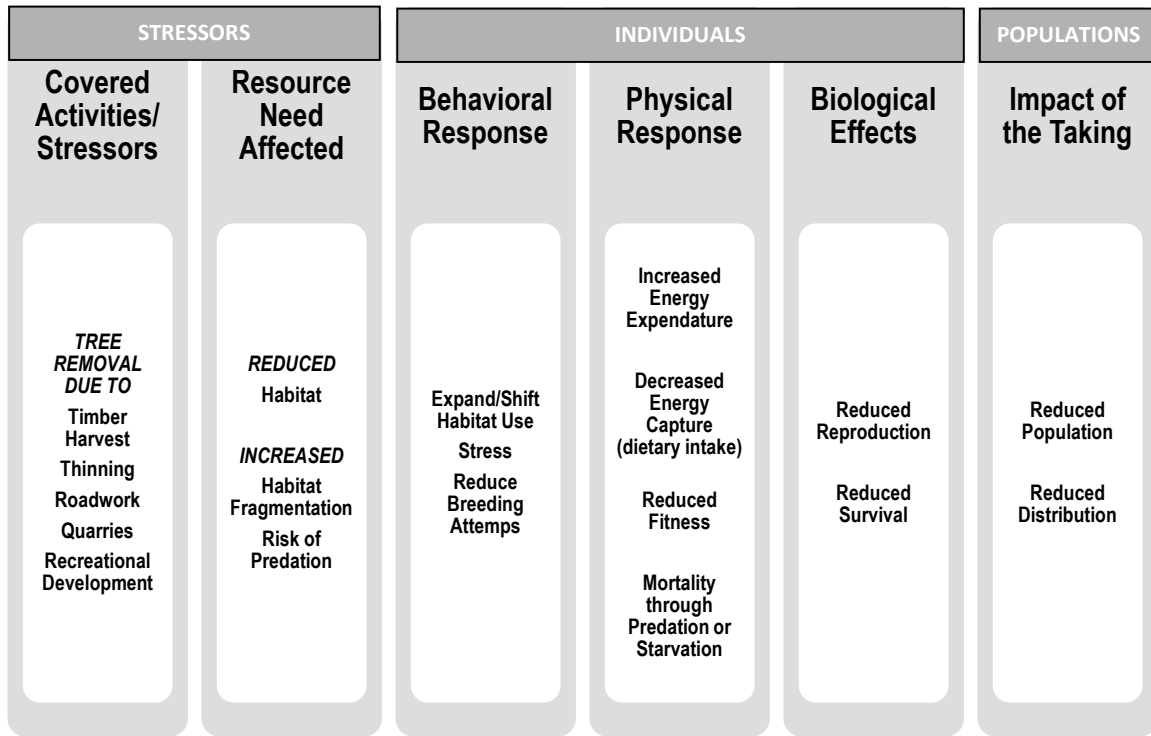


Figure 6-20. Effects Pathways Identified for Red Tree Vole via Habitat Modification from Covered Activities

6.9.2 Covered Activities that May Result in Take

Any covered activity that would remove trees where red tree voles are present may rise to the level of take either through direct injury and mortality or through habitat modification and associated loss of resources needed by red tree voles for breeding, feeding, and shelter. These activities include timber harvest (regeneration and thinning), road construction, quarry work, and recreation infrastructure development, maintenance, and operations (e.g., campgrounds, trails, trailheads).

Timber harvest, including regeneration harvest and thinning, is the primary activity that is expected to rise to the level of take. Table 6-34 lists covered activities and associated types of take expected to occur over the permit term. Details regarding the effects pathways are provided in the previous subsection.

Table 6-34. Sources and Types of Take of Red Tree Vole Expected from Covered Activities

Covered Activity	Source of Take	Type of Take
Regeneration harvest	Regeneration harvests and associated temporary roads, landings, yarding operations, and use of heavy equipment in suitable habitat is the primary source of take expected for red tree voles.	Direct mortality or injury; expand/shift habitat use; stress; reduced breeding attempts; increased energy expenditure; decreased energy capture; reduced fitness; mortality through predation or starvation; reduced reproduction and survival.

Covered Activity	Source of Take	Type of Take
Precommercial thinning and pruning	Precommercial thinning occurs in young stands (generally 10-20 years post-planting). While red tree vole use is less likely in such young stands, the potential for individuals being present and associated risk of take remains in stands that may be slightly older.	Direct mortality or injury; expand/shift habitat use; stress; reduced breeding attempts; increased energy expenditure; decreased energy capture; reduced fitness; mortality through predation or starvation; reduced reproduction and survival.
Thinning	As with regeneration harvest, thinning in occupied habitat could result in direct mortality or reduced habitat suitability. Because red tree voles may use younger forest, commercial thinning of even young stands might affect individual red tree voles.	Direct mortality or injury; expand/shift habitat use; stress; reduced breeding attempts; increased energy expenditure; decreased energy capture; reduced fitness; mortality through predation or starvation; reduced reproduction and survival.
Road use	Road use, including administrative, haul traffic, and recreational/public vehicle use, is not likely to be a significant source of mortality to red tree voles because they spend almost their entire lives in trees. However, potential roadkill of individuals over the permit term cannot be ruled out.	Direct mortality (vehicle strike), including dispersing juveniles.
Road construction	New road construction in occupied suitable habitat will reduce habitat as well as fragment habitat and isolate individuals.	Direct mortality or injury; expand/shift habitat use; stress; reduced breeding attempts; increased energy expenditure; decreased energy capture; reduced fitness; mortality through predation or starvation; reduced reproduction and survival.
Road management	Hazard tree removal and any other tree removal required for road maintenance can remove trees used by red tree voles.	Direct mortality or injury; expand/shift habitat use; stress; reduced breeding attempts; increased energy expenditure; decreased energy capture; reduced fitness; mortality through predation or starvation; reduced reproduction and survival.
Controlled burning	Burning will typically occur away from red tree vole habitat, although portions of burn areas could be occupied and individuals affected.	Direct mortality or injury; expand/shift habitat use; stress; reduced breeding attempts; increased energy expenditure; decreased energy capture; reduced fitness; mortality through predation or starvation; reduced reproduction and survival.
Aquatic habitat restoration	Aquatic habitat restoration may result in minor habitat modification, such as select tree tipping or removal, which has the potential to harm individual red tree voles.	Direct mortality or injury; expand/shift habitat use; stress; reduced breeding attempts; increased energy expenditure;

Covered Activity	Source of Take	Type of Take
		decreased energy capture; reduced fitness; mortality through predation or starvation; reduced reproduction and survival.
Other covered activities outside of HCAs and RCAs	Development of new quarries and recreation infrastructure as well as infrastructure maintenance and operations (e.g., campgrounds, trails, trailheads) in occupied red tree vole habitat is expected to result in take due to harassment, direct mortality, or habitat modification.	Direct mortality or injury; expand/shift habitat use; stress; reduced breeding attempts; increased energy expenditure; decreased energy capture; reduced fitness; mortality through predation or starvation; reduced reproduction and survival.

6.9.3 Covered Activities Not Expected to Result in Take

Covered activities that do not remove trees within modeled suitable habitat are unlikely to cause adverse effects that rise to the level of take. Table 6-35 lists the covered activities not expected to result in take of red tree voles.

Table 6-35. Covered Activities Not Expected to Result in Take of Red Tree Voles

Covered Activity	Rationale for Determining that Covered Activity Would Not Result in Take
Site preparation, tree planting, and release treatments (e.g., noxious weeds or hardwoods)	Site preparation such as piling, and other reforestation activities will take place outside of suitable habitat and are not likely to adversely affect red tree voles. Release treatments in stands less than 20 years old are unlikely to affect red tree voles.
Mountain beaver control	Control of mountain beaver will not have any effect on red tree voles because habitat would not be disturbed.
Existing road system	Existing roads add to habitat fragmentation effects that may block movements. However, the presence of existing roads is not expected to rise to the level of take because they are considered part of the environmental baseline.
Road maintenance	Work within the road prism would not be likely to affect red tree vole habitat.
Road Decommissioning	Road decommissioning would not adversely affect red tree vole habitat and may provide benefits at some point in the future.
Drainage structure construction and maintenance	Drainage work would not adversely affect red tree vole habitat.
Water drafting and storage	This activity is not likely to adversely affect red tree vole habitat.
Barred owl management	Barred owl management would have no effect on red tree vole habitat. Predation levels may be reduced and considered a beneficial effect.
Monitoring activities	Monitoring is generally not expected to result in take. If any monitoring activity is determined to likely result in take (e.g., tree climbing activities), then ODF will obtain necessary clearance with USFWS (or the research organization will, if a different entity).

ODF = Oregon Department of Forestry; USFWS = U.S. Fish and Wildlife Service

6.9.4 Covered Activities that Minimize and Mitigate Take

The HCP includes several measures to minimize and mitigate effects on red tree voles, including measures incorporated into covered activities (Chapter 3), measures established as commitments under the conservation strategy (Chapter 4), and measures to monitor key metrics and adapt to unexpected conditions (Chapter 5).

The designation, preservation, and long-term active and passive enhancement of HCAs throughout the permit area is the primary conservation action intended to conserve, maintain, and enhance habitat for the red tree vole. With Conservation Action 6, ODF will immediately designate upon permit issuance approximately 71,800 acres of HCAs to support the persistence of red tree voles. With Conservation Action 7, ODF will manage HCAs to increase the quality and quantity of habitat for red tree voles.

Outside of HCAs, ODF will implement standards in Conservation Action 8, to maintain and create long-term, landscape-level habitat values for covered species in the portion of the permit area that is more actively managed for timber production to support the function and connectivity between designated HCAs. Table 6-36 summarizes minimization and mitigation measures for anticipated take of red tree voles, as summarized from Chapter 3, *Covered Activities*, Chapter 4, *Conservation Strategy*, and Chapter 5, *Monitoring and Adaptive Management*.

Table 6-36. Red Tree Vole Minimization and Mitigation Measures

Measure	Description	Category	Intended Effect (Mitigation/ Minimization)	HCP Reference
Clear-cut size and green-up limits	Clear-cut limited to 120 acres with retention and green-up requirements	Timber harvest	Limits habitat fragmentation	Ch.3 – Clear-cut Harvest; Ch.4 – CA7, CA8
Thinning for complexity	Light, moderate, heavy, variable thinning to accelerate stand complexity	Manage HCAs	Promotes late-seral forest development and canopy cover used by red tree voles	Ch.3 – Thinning; Ch.4 CA7
Salvage restrictions	Exclude salvage from RCAs and HCAs (except hazards)	Salvage harvest	Retains habitats; reduces disturbance	Ch.3 – Salvage Harvest
Hazard tree removal	Low-impact hazard tree removal methods	Hazard tree management	Minimizes habitat damage from safety removals	Ch.3 – Hazard Tree Removal
Sustainable reforestation	Plant diverse, resilient species with interplanting, that are suitable forage for Red Tree Vole in the range of their DPS	Reforestation	Ensures continuity of habitat and canopy cover	Ch.3 – Tree Planting; Ch.4 CA7
Road and trail management	Vacating and stabilizing roads and trails; Citing, constructing, and managing roads	Road and trail system management	Improves habitat quality and reduces disturbance	Ch.3 – Road/Trail Vacating; Ch.4 – CA5, CA11, CA12

Measure	Description	Category	Intended Effect (Mitigation/ Minimization)	HCP Reference
Fuels work in HCAs	Record location/extent of fuels reduction in HCAs and describe measures to minimize effects on habitat suitability	Manage HCAs	Reduces fire risk to promote fire resilient forests; maintains key habitat structures	Ch.3 – Fire Management; Ch.4 – Obj. 7.2 / CA7, CA10
Upland habitat restoration	Active management under Conservation Action 7	Habitat restoration	Accelerates development of late-seral habitat	Ch.3 – Upland Restoration; Ch. CA7
Dispersal habitat standard	Maintain ≥40% of landscape as dispersal habitat outside HCAs	Targeted actions outside HCAs	While intended for northern spotted owls, this measure will also support red tree vole movement across the landscape	Ch.4 – Obj. 5.2, CA8
Habitat acreage goals	Within HCAs, conserve, maintain, and enhance at least 61,200 acres of existing suitable habitat and 10,600 acres of existing highly suitable habitat, for a total of 71,800 acres of red tree vole habitat (as of 2023)	Manage HCAs	Offsets losses, expands habitat values	Ch.4 – Obj. 7.1
HCA network	Establish and manage HCAs	Protected areas	Concentrates large habitat blocks for voles	Ch.4 – CA6, CA7
RCA management	Manage RCAs with restrictions/buffers	Protected areas	Maintains riparian corridors and landscape connectivity	Ch.4 – CA1, CA 2
Resilient HCAs	Place HCAs across latitudinal/elevational gradients dispersed across the permit area	Sustainable adaptation	Improves resilience to fire, drought, disease with spread risk	Ch.4 – Sec. 4.5
Habitat accounting (5-year)	Report suitable and highly suitable acres every 5 years; compare to baseline	Effectiveness monitoring	Verifies progress toward biological goals; triggers adjustments	Ch.4 – Obj. 7.1, 7.2
Activity surveys	Monitor active/inactive sites	Species monitoring	Detects occupancy	Ch.4 – Obj. 7.1, 7.2
HCA silviculture	Track silvicultural treatments in HCAs	Habitat management	Enhances habitat near active sites	Ch.4 – Obj. 7.1, 7.2 / CA7
Legacy tree retention	Retain old-growth and known nest trees during regeneration harvest	Retention standard	Retains structure and trees that may continue to support red tree voles and accelerate their return to the	Ch.6 – Obj. 7.2 / CA7, CA8

Measure	Description	Category	Intended Effect (Mitigation/ Minimization)	HCP Reference
Live tree retention	Retain ≥2 live trees per acre in regeneration harvest	Retention standard	adjacent stand following harvest Provides long-term structural habitat features	Ch.4 – Obj. 7.2 / CA7, CA8
Implement Adaptive Management	Survey all suitable/highly suitable habitat by year 20; 5-year habitat accounting by suitability class; adaptive adjustments	Adaptive management	Establish baseline from which it is possible to determine responses to management actions	Ch.4 – Obj 7.1, 7.2

Ch. = Chapter; DBH = diameter at breast height; RCAs = riparian conservation areas; HCAs = habitat conservation areas; CA = Conservation Action; Obj. = Objective

6.9.5 Adverse Effects

6.9.5.1 Acres of Habitat Directly Removed or Degraded by Covered Activities

Modeled Suitable and Highly Suitable Habitat

Based on timber harvest and forest growth modeling, approximately 134,386 acres of suitable and highly suitable red tree vole habitat will be harvested over the permit term. As with the other terrestrial species, not all of this modeled habitat will be suitable at the outset of the permit. Some stands will grow into habitat as time progresses and the forest develops characteristics indicative of suitable or highly suitable habitat. Habitat modification will occur inside and outside of HCAs.

Inside of HCAs, habitat modification will only be done in situations where those short-term silvicultural actions will result in long-term increases in habitat quality and will avoid known nest trees detected during planned surveys outlined in Chapter 5, Section 5.3.3.2, *Objective 7.1: Conserve, Maintain, and Enhance Occupied Red Tree Vole Habitat*. Under those circumstances it is unlikely, but still possible, for there to be a loss or reduction in suitability of suitable or highly suitable habitat during the thinning of approximately 45,000 acres of modeled habitat within HCAs.

Outside of HCAs, suitable and highly suitable habitat will be harvested or thinned for commercial forestry production consistent with provisions in Conservation Action 10: Operational Restrictions to Minimize Effects on Covered Species, to protect nest trees that are incidentally identified with a leave-tree strategy. Table 6-37 and Table 6-38 summarizes the suitable and highly suitable habitat that will be modified through thinning or lost through regeneration harvest over the permit term.

Once suitable red tree vole habitat is harvested outside of HCAs, it is likely to be harvested again before being developed back into high-quality habitat, so the effects are considered to be permanent, although red tree voles will likely recolonize some younger stands, and this is discussed in Section 6.9.5.2, *Potentially Occupied Young Forest Stands*.

Table 6-37. Red Tree Vole Modeled Habitat Acres Estimated to be Harvested or Thinned Under the Habitat Conservation Plan Over the Permit Term, by 5-Year Increments

Inside HCAs				
Habitat Type	Suitable (HSI 0.40-0.79)		Highly Suitable (HSI ≥0.8)	
Mgt. Type	Regeneration	Thinning	Regeneration	Thinning
2023	-	7,125	-	375
2028	-	7,125	-	375
2033	-	7,125	-	375
2038	-	7,125	-	375
2043	-	7,125	-	375
2048	-	7,125	-	375
2053	-	-	-	-
2058	-	-	-	-
2063	-	-	-	-
2068	-	-	-	-
2073	-	-	-	-
2078	-	-	-	-
2083	-	-	-	-
2088	-	-	-	-
2093	-	-	-	-
Total	0	42,750	0	2,250

Outside HCAs				
Habitat Type	Suitable (HSI 0.40-0.79)		Highly Suitable (HSI ≥0.8)	
Mgt. Type	Regeneration	Thinning	Regeneration	Thinning
2023	12,672	-	1,044	-
2028	12,291	47	87	-
2033	10,293	29	67	-
2038	9,737	-	122	-
2043	9,318	-	434	-
2048	9,154	33	340	-
2053	7,973	-	631	-
2058	6,221	170	357	-
2063	2,238	-	271	-
2068	832	-	812	-
2073	1,323	24	167	-
2078	537	-	30	-
2083	13	37	-	-
2088	420	-	-	-
2093	1,653	9	-	-
Total	84,675	350	4,361	-

Table 6-38. Cumulative Acres of Red Tree Vole Modeled Habitat Estimated to be Harvested or Thinned Under the Habitat Conservation Plan Over the Permit Term

Location	Habitat Thinned ^a		Habitat Harvested (Regeneration)		Total
	Highly Suitable	Suitable	Highly Suitable	Suitable	
Within HCAs	2,250	42,750	--	--	45,000
Outside of HCAs	--	350	4,361	84,675	89,386
Total	2,250	43,099	4,362	84,675	134,386

^a 45,000 acres of thinning in healthy conifer stands are proposed in HCAs over the permit term (Conservation Action 7). Much of that is likely to occur in young stands on the North Coast, within the range of red tree voles. Occupancy of young stands by red tree voles is not well understood, but these thinning activities could result in take. Habitat thinned inside HCAs will be completed consistent with Conservation Action 7.

While harvest of red tree vole modeled habitat will occur over the entire 70-year permit term, about 69% of modeled habitat modification (91,767 acres) will occur within the first 20 years (2023 to 2043) of plan implementation and approximately 95% (126,279 acres) will occur within the first 40 years (2023 to 2063). This is not due to targeting habitat early in the permit term, but rather due to the current stand-age distribution and the prioritization of treatments within HCAs during the first 30 years. As the permit term progresses, past year 40, acres of suitable habitat modified are fewer, not because less harvest is occurring, but because the age and structure of the forest outside of HCAs will have stabilized by then and will no longer be developing into suitable habitat.

Potentially Occupied Young Forest Stands

As discussed in Appendix C, *Species Accounts*, and Chapter 2, Section 2.5.2.4, *Red Tree Vole*, red tree voles occur primarily in structurally complex late-seral conifer or mixed conifer-hardwood forests (Dunk and Hawley 2009; U.S. Fish and Wildlife Service 2011; Forsman et al. 2016; Rosenberg et al. 2016; Linnell et al. 2017; Johnston and Moskal 2017). However, red tree voles have also been found in young forests (<80 years old) located near complex late-seral conifer forests (Price et al. 2015; Linnell et al. 2017; Piasecki et al. 2026). The role of young forests in supporting viable red tree vole populations remains unclear; however, they may provide connectivity to older forests where more stable vole populations exist (Linnell et al. 2017; Piasecki et al. 2026). Nevertheless, red tree voles are sensitive to habitat fragmentation when stands are harvested or commercially thinned (Martin and McComb 2002; Forsman et al. 2016; Linnell et al. 2017; Rosenberg 2019).

Table 6-39 shows the estimated pace and scale of harvest in potentially occupied young forest stands in the permit area. Thinning inside HCAs is limited to the first 30 years of the permit term, whereas regeneration harvest and thinning outside HCAs will take place across the permit term.

Table 6-39. Modeled Harvest of Potentially Occupied Young Forest Stands within 1.4 Kilometer of Suitable or Potentially Suitable Red Tree Vole Habitat

Decade	Age Class 20-39 Years Old			
	Outside HCAs		Inside HCAs	
	Regeneration	Thinning	Regeneration	Thinning
2023-2032	--	192	--	175
2033-2042	--	194	--	350
2043-2052	--	1,406	--	350

Age Class 20-39 Years Old				
Decade	Outside HCAs		Inside HCAs	
	Regeneration	Thinning	Regeneration	Thinning
2053-2062	--	3,765	--	--
2063-2072	--	5,194	--	--
2073-2082	--	4,320	--	--
2083-2092	--	3,601	--	--
<i>Subtotal</i>	--	<i>18,672</i>	--	<i>875</i>

Potentially Occupied Young Forest Stands Modeling Parameters and Caveats

- The age class bins of 20-39 (as of 2023) shown in Table 6-39 represent stands that have a potential to support red tree voles when near complex late-seral conifer forests. Potential impacts to older stands are already represented within the HSI categories shown as harvested in Table 6-37 and Table 6-38.
- Stands with potential to be occupied must be 49 acres (20 hectares) in size and within 1.4 kilometers from suitable or highly suitable habitat within or adjacent to the permit area.
- Stands outside the permit area that were within 1.4 kilometers of federal land were assumed to be suitable or highly suitable habitat and therefore included.
- These younger stands are presumed to have lower density occupation, lower reproductive success, and lower persistence in the landscape relative to suitable or highly suitable habitat.
- The likelihood of harvest or thinning within stands with an age class of 20-39 is considered negligible due to typical treatment scenarios and entry frequency during stand maturation. However, some stands could be entered for thinning.

Summary of Red Tree Vole Habitat Loss and Modification

Figure 6-21 illustrates the cumulative level of red tree vole modeled habitat to be modified over the permit term.

Take resulting from this habitat loss and other adverse effects, described above, will occur within the following contexts and levels of intensity.

- Approximately 40% of existing modeled habitat is located outside of HCAs and will be subject to harvest.
- Habitats outside of HCAs that will be harvested are suitable habitat (rather than highly suitable) and are located in smaller and more fragmented habitat patches than habitat to be conserved in HCAs.
- Through implementation of the HCP monitoring program inside HCAs and restrictions on covered activities described in Conservation Action 10, take of active red tree vole nest trees will be minimized.

All modifications inside of HCAs will be temporary, although development of desired suitable habitat characteristics may not be achieved in all stands in HCAs by the end of the permit term.

Habitat gains that are modeled to outpace habitat losses under the HCP and associated net impacts are discussed in Section 6.9.6, *Beneficial Effects*, and Section 6.9.8, *Net Effects*.

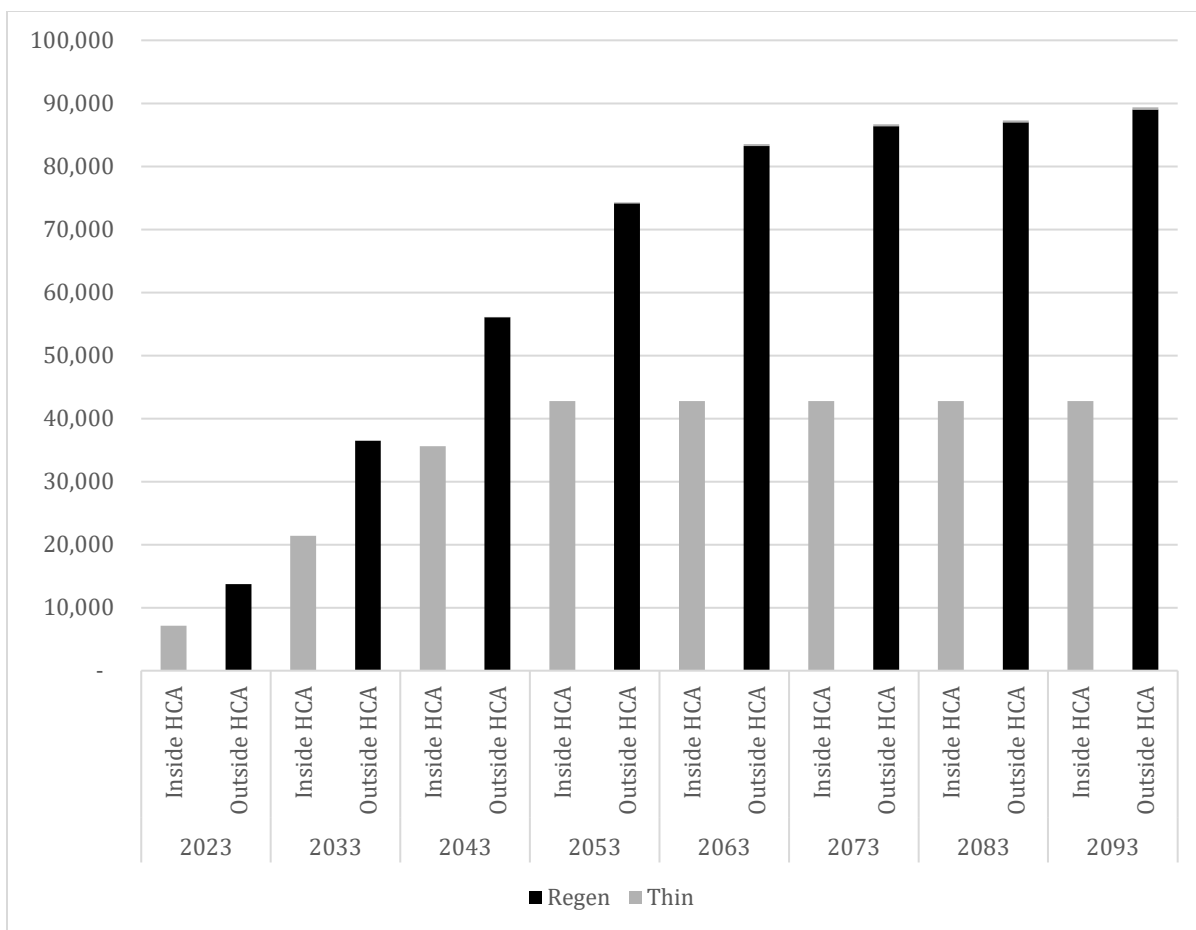


Figure 6-21. Cumulative Acres of Red Tree Vole Suitable and Highly Suitable Habitat Modeled to Be Harvested or Thinned Under the Habitat Conservation Plan Over the Permit Term

6.9.5.2 Acres of Habitat Indirectly Removed or Degraded by Covered Activities

Although no quantitative edge analysis has been completed for the red tree vole, the species is expected to experience similar indirect effects from covered activities—including thinning and harvest—as those described for northern spotted owl and marbled murrelet. For northern spotted owls, edge effects were evaluated within about 60 meters of harvests, while for marbled murrelets, they were modeled within about 100 meters (328 feet). A comparable 60 to 100-meter (197- to 328-foot) zone of influence can be assumed for this effects analysis.

Within such distances of recent harvest activity, vole habitat will be subjected to edge-related changes in microclimate, such as increased wind, reduced humidity, and increase the risk of windthrow to trees used by voles. In addition, predators may increase along edges, increasing encounter risk for voles. These effects are most pronounced in the first two decades after harvest (hard edge), diminish between 20 and 40 years (soft edge), and are assumed negligible after 40 years.

Inside HCAs, the proportion of red tree vole habitat exposed to edges will likely fall between the estimates for northern spotted owl (about 16,000 acres) and marbled murrelet (about 12,000

acres). Outside HCAs, smaller but widespread edge zones are expected adjacent to regeneration harvest units, particularly where vole-suitable canopy structure occurs.

Overall, effects associated with created edges are best characterized as functional degradation of habitat near harvest edges, rather than outright loss. Retaining legacy trees, maintaining canopy cover in leave areas, and avoiding repeated hard-edge creation along the same boundary are expected to reduce indirect impacts until regeneration moderates edge conditions.

6.9.6 Beneficial Effects

The HCP includes several measures to minimize and mitigate effects on red tree voles, including measures incorporated into covered activities (Chapter 3), measures established as commitments under the conservation strategy (Chapter 4), and measures to monitor key metrics and adapt to unexpected conditions (Chapter 5).

Under the HCP, red tree vole populations will benefit from 1) protection of occupied habitat within HCAs (Conservation Action 6: Establish Habitat Conservation Areas), 2) a net increase in the quantity and quality of habitat over the permit term inside HCAs (Conservation Action 7: Manage Habitat Conservation Areas), and 3) retention of legacy structure, including live leave trees, in harvested stands (Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas).

Establishment of the HCAs will immediately conserve and maintain at least 61,200 acres of all existing suitable habitat and 10,600 acres of highly suitable habitat, for a total of 71,800 acres of modeled red tree vole habitat (as of 2023) (Figure 6-22; Table 6-40). These include all locations which include areas where occupancy has been previously documented (as of 2020). In addition, there will be an average of 41,707 acres of younger forest (age 20 to 59) present within the HCAs in any given 5-year increment that may also serve as potentially occupied habitat and/or migration corridors, depending on distance to occupied stands (Figure 6-1). A portion of these HCAs will be subject to enhancement treatments limited to using silvicultural actions to develop larger trees with more habitat structure over time, including an overall increase in canopy connectivity within the range of the species. Habitat enhancement activities in HCAs where the permit area is adjacent to mature habitat on federal lands will provide additional habitat in areas where red tree voles are known or likely to exist, expanding local populations and associated resilience and long-term persistence of the species. Some short-term negative effects (e.g., edge effects or unknown nest disturbance) to red tree voles may take place during stand management in HCAs, but the long-term population benefits to this species are believed to outweigh temporary negative effects.

Given the longevity of the permit term, model projections suggest total red tree vole-suitable and highly suitable habitat in HCAs could reach 176,000 acres, a net increase of 104,000 acres (detailed in Chapter 4, Section 4.6.8, *Goal 7: Support the Persistence of Red Tree Vole*). Expansion of existing known red tree voles in HCAs would enable recovery within the northern part of the distinct population segment (DPS) (including northern Tillamook State Forest and all of Clatsop State Forest) due to their landscape position improving the connectivity of older forests through time.

While 47,484 acres (40%) of the permit area within the range of red tree vole is outside of HCAs and RCAs may be subject to harvest, leave-tree retention in those harvest units will retain some in-unit habitat for the species. As a result, harvest of those acres will not be a complete loss of habitat or habitat value.

As detailed in Chapter 5, Section 5.3.3.2, *Terrestrial Habitat Monitoring by Species Objectives*, monitoring efforts early in the permit term will establish baseline conditions and determine responses to management actions, ODF will conduct and complete surveys of a subset of suitable and highly suitable habitat within HCAs on the North Coast within 20 years of permit issuance, as well as post-harvest surveys outside of HCAs. Surveys will start within suitable and highly suitable habitat in proximity to known subpopulations and occupied stands and expand into adjacent habitat of lower quality to gain a better understanding of habitat use. The program will facilitate future translocation and monitoring of red tree voles in portions of the permit area where they no longer exist while also facilitating the cooperation and collaboration among land managers and federal and state wildlife agencies in furthering red tree vole conservation in western Oregon.

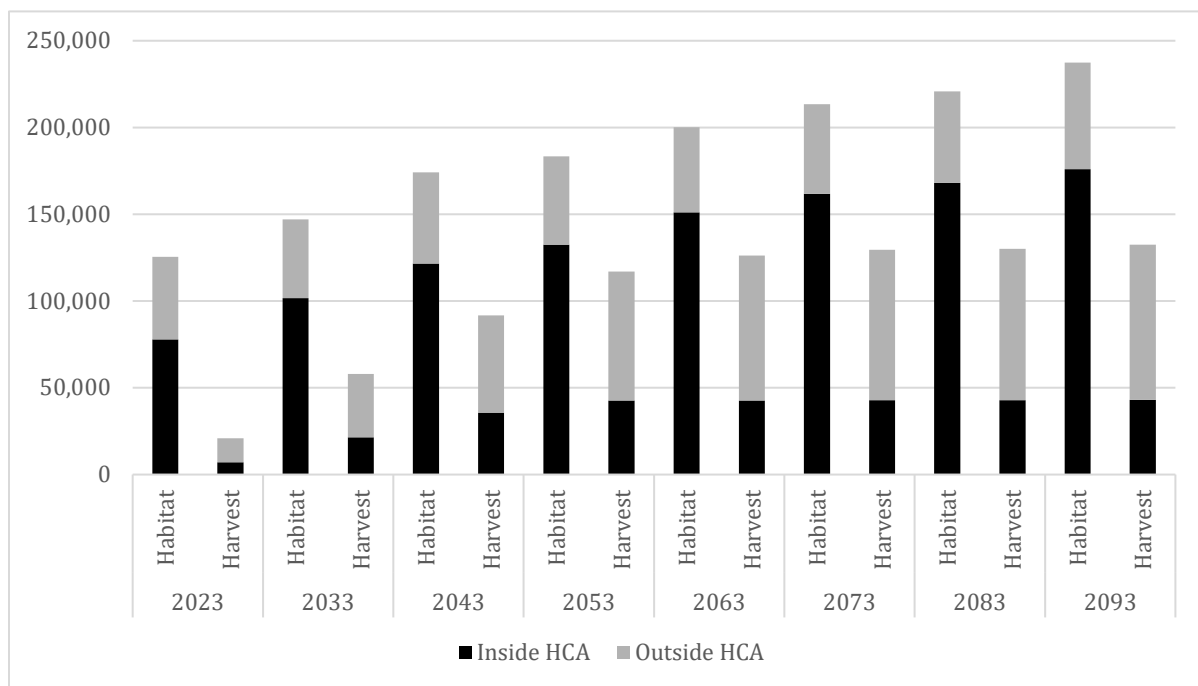


Figure 6-22. Red Tree Vole Cumulative Modeled Habitat Harvested and Estimated Modeled Habitat Ingrowth, by Decade

In addition to habitat gains, control of barred owls has the potential to benefit red tree voles through reduced predation pressure from barred owls. However, a substantial increase in northern spotted owls could negate those gains because red tree voles comprise a much larger proportion of their diet compared to barred owls in Washington and Oregon (Baumbusch 2023). Despite the low proportion in individual diets, barred owls' higher densities and greater energetic demands (larger body mass, bigger broods) mean they are likely to consume more red tree voles overall across the landscape during the earlier part of the permit term until barred owl removal efforts take effect.

6.9.7 Effects on Critical Habitat

No critical habitat has been designated for red tree voles.

6.9.8 Net Effects

The conservation strategy (Conservation Action 6: Establish Habitat Conservation Areas, and Conservation Action 7: Manage Habitat Conservation Areas) is estimated to result in habitat development outpacing losses, increasing over time to a total of 176,005 acres of suitable/highly suitable habitat modeled for red tree voles within strategically located HCAs by the end of the permit term, an increase of 104,150 acres in the HCAs over the existing 119,339 acres of habitat distributed throughout the permit area (Table 6-40; Figure 6-23). Models estimate 13,968 acres of additional suitable habitat developing outside of HCAs by the end of the permit term (Table 6-40).

Recognizing red tree vole occupancy has been documented in young forests (<80 years old) near older forests (Johnston and Moskal 2017; Linnell et al. 2017), impacts to red tree vole populations potentially occupying unsurveyed young forests will be offset by habitat ingrowth elsewhere in the permit area based on rotation age and ability to provide connectivity to older forests overtime due to their proximity.

Red tree vole populations within the North Coast DPS in the permit area are patchy and isolated despite the larger blocks of ODF-managed lands. Known occurrences on the North Coast are limited to select areas along the western edge or southern portions of Tillamook State Forest or centrally on Clatsop State Forest where most of the larger patches of higher-quality habitat exist. Historic disturbances such as the Tillamook burns or extensive timber harvest likely explain the current range of red tree vole populations that impacted this species through habitat loss and fragmentation overtime. Outside of the permit on the North Coast, existing red tree voles are limited to nearby federal forests managed by BLM or Siuslaw National Forest. Recognizing red tree voles have limited dispersal distances and small home ranges (U.S. Fish and Wildlife Service 2023b), the species may have limited capabilities to connect with other populations distributed throughout existing habitat in this northern section of their range. Yet, increases in suitable and highly suitable habitat inside the HCAs over the permit term will not only bolster existing habitat levels for this species but support larger effective population sizes better able to withstand future large-scale disturbances like wildfires. Further, long-term support for future red tree vole populations in this area improves population viability for those that exclusively forage on Sitka spruce and western hemlock unlike elsewhere within their range in Oregon.

Smaller contiguous blocks of ODF-managed lands in the central Oregon Coast Range are primarily bordered by large private industrial timberlands managed for commodity production. Yet, large tracts of federal forests including scattered tracts of BLM and the Siuslaw National Forests exist adjacent to the permit area closer to the southern end of the red tree vole DPS. and. In these areas, ODF-managed lands play an important, complimentary role by providing landscape-level connectivity to older forests on federally managed lands. For example, Linnell et al. (2017) analyzed habitat and landscape-level factors affecting habitat suitability for the North Oregon Coast DPS and found that suitable habitat is positively correlated with old forest (≥ 80 years old) and the suitability of young forest (<80 years old) was negatively correlated with distance from large patches of old forest and recent disturbance. Models found that if old forests contracted to only federal land (a 1.4% decrease regionally), average distance to nearest patch would increase from 3.1 kilometers to 11.1 kilometers. Alternatively, if there was an increase (1.4% in old forest of patches randomly distributed in the landscape), average distance between patches would be reduced by 1.8 kilometers. The authors conclude that even a small amount of restored or regenerated old forest would improve connectivity and increase population resiliency (Linnell et al. 2017).

Without the management assurances and concomitant conservation actions outlined in this HCP, the potential for further red tree vole range contraction, especially in northwestern Oregon, is significant. Commitments to enhancing habitat in key locations of known prior occupancy, largely encompassed in the HCAs that are strategically arranged across the landscape will provide population resiliency. Further, commitments to barred owl management in coordination with USFWS, may provide greater conservation uplift to current red tree vole populations dispersed throughout the North Coast DPS through reduced predation pressure.

Table 6-40. Net Red Tree Vole Modeled Habitat Projections Throughout the Permit Term ^a

	Inside HCA			Outside HCA			Total		
	Suitable	Highly Suitable	Total	Suitable	Highly Suitable	Total	Suitable	Highly Suitable	Total
Start habitat	60,191	10,664	71,855	46,057	1,427	47,484	107,248	12,090	119,339
End habitat	98,089	77,916	176,005	48,806	12,646	61,452	146,895	90,562	237,457
Change	36,897	67,252	104,150	2,749	11,219	13,968	39,646	78,472	118,118

^a Habitat suitability indices are described in Appendix E, *Effects Analysis*. Habitat Suitability Index scores ranged from 0 to 1, with <0.39 = Not habitat; 0.4–0.79 = Suitable, and 0.8–1.0 = Highly Suitable. Note that potential red tree vole use of young forests are not captured in this modeling.

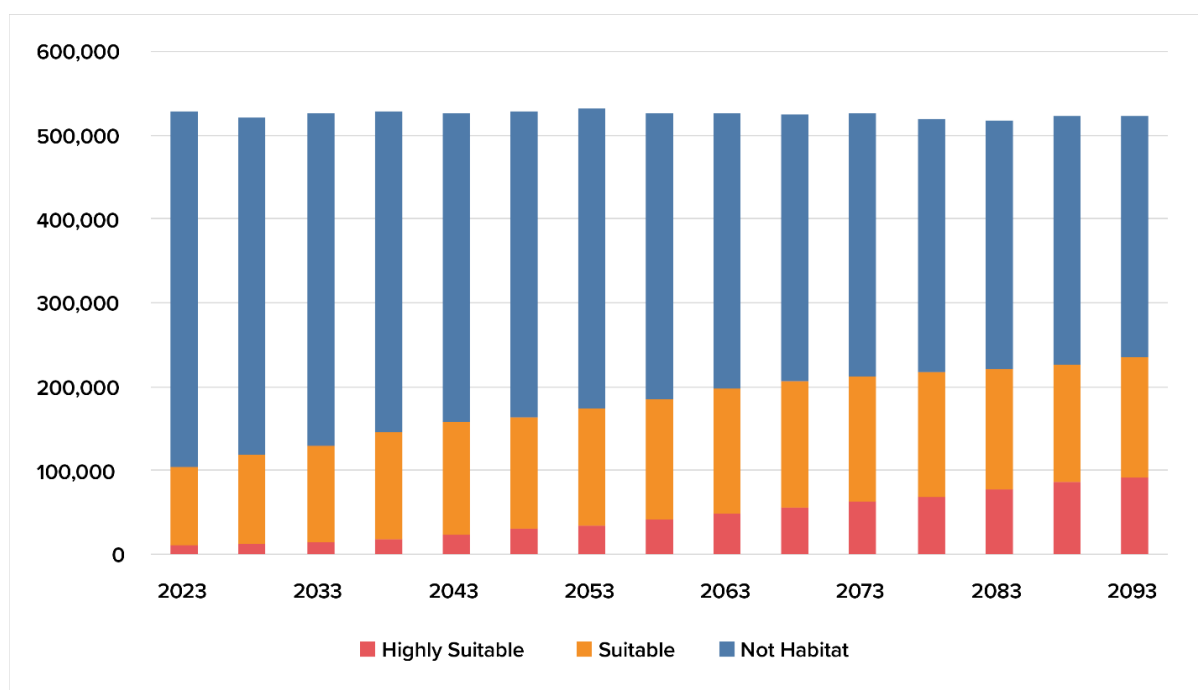


Figure 6-23. Change in Red Tree Vole Modeled Habitat Quality in Permit Area Over Permit Term, by Decade

6.10 Effects Analysis for Coastal Marten

6.10.1 Sources and Types of Effects

All covered activities that involve tree removal or reduction in understory cover—including timber harvest, thinning, roadwork, road use, quarry work, and recreational infrastructure development and maintenance—have the potential to result in three types of incidental take of coastal marten.

- Direct injury or mortality via roadkill or destroying a den with young during harvest operations.
- Harm due to habitat modification to the extent that individual coastal martens have reduced survival or reproductive success.
- Harm due to disturbance of unknown den sites due to nearby harvest activities during the coastal marten denning season (March 15 through August 15).

Because coastal marten are believed to be absent from approximately 90% of the permit area (Appendix C, *Species Accounts*), covered activities will have limited effects on behaviors, habitat use, or survival of individuals over the permit term. Coastal marten covered area includes all ODF-managed lands from the northern boundary of Lane County south to the California border and west of Interstate 5 (49,987 acres). Distribution therein is not well understood. There are extant populations in dunes, areas of far western Lane and Coos Counties but none were documented inland during recent survey efforts. South of the Coquille River the inland population is better defined but data are still limited. This HCP takes a conservative approach to assessing effects on coastal marten by generally defining the coastal marten covered area, where the species has the potential to occur. For more details see Chapter 2, *Environmental Setting*.

This HCP assumes that any timber harvest in this area will have adverse effects on suitable habitat. This is due to limited information about how coastal martens respond to harvest and the relative density of coastal martens in suitable habitat. However, adverse effects onto habitat do not always result in take if the covered species is not present or harmed by the potentially adverse effects.

6.10.1.1 Quantifying Approach to Analyzing Effects

Habitat must be occupied by coastal marten to expose individuals to the effects of habitat modification. In practice, this means covered activities occurring in an established home range or in areas otherwise important to dispersing individuals. Therefore, habitat modification in stands that are most likely to support coastal marten at some time over the permit term has the highest potential to affect the species. The HCP uses modification of habitat and implementation of covered activities inside the coastal marten covered area as a primary metric of take for coastal marten.

Table 6-41 summarizes the general sources of habitat modification and the associated thresholds used in this HCP to determine the level of take presented in Section 6.10.5.1, *Acres of Habitat Directly Removed or Degraded by Covered Activities*.

6.10.1.2 Effects Pathways

The effects pathways leading to harm due to direct injury or mortality include all covered activities that will physically disturb denning habitat, including harvesting, yarding, clearing, and grading associated with timber harvest, and the operation of motor vehicles.

The effects pathway of harm due to habitat modification begins with covered activities that reduce forest structure, particularly large trees, snags, downed logs, and a dense understory of shrubs (Slauson et al. 2019a, 2019b). Regeneration harvest is assumed to have adverse effects on suitable habitat. Thinning that removes important habitat features (denning structures, understory shrub cover) may have adverse effects on suitable habitat, though these effects would be shorter term if reduced canopy cover in turn promotes increased understory development while retaining potential denning structures. Acres of effect are estimated based on policy-level harvest modeling. Harvest that removes or disturbs active maternal den sites is assumed to result in take of individual martens. In the HCP, loss of habitat is used as a surrogate, assuming that if suitable habitat exists in a stand and it is harvested, there is the potential for den sites to be affected.

Based on the *USFWS Coastal Marten Species Status Assessment* (U.S. Fish and Wildlife Service 2018) and on the most recent habitat modeling study for coastal marten (Slauson et al. 2019b), loss of these forest structures and canopy cover may result in the following stressors to resources required by coastal marten.

- Reduced volume of large downed wood, snags, live trees with suitable cavities, and associated resting, denning, and foraging habitat.
- Reduced future recruitment of large downed wood and associated habitat.
- Reduced shrub layers and associated foraging habitat and cover from predators.
- Reduced prey densities due to loss of cover and food required by prey species (e.g., berries, truffles, seeds).
- Increased exposure to predators that use more general habitat requirements, particularly bobcat (*Lynx rufus rufus*).
- Increased exposure to competitors, including bobcat, gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), and western spotted skunk (*Spilogale gracilis*).
- Fragmented habitat and consequently remove landscape-level habitat requirements and isolate individuals or local populations.

The behavioral response of individual coastal marten to such stressors may include avoiding disturbed areas and using a smaller area, expanding foraging into new adjacent areas, or abandoning an existing territory altogether. Using a smaller area would reduce prey intake. Expanding use or moving to a new area would expose individuals to increased predation risks and lack of food. The ultimate physical response to all these behavioral responses would likely include reduced physical fitness due to increased energy expenditure (e.g., stress, increased time spent hunting and moving) and reduced energy capture (prey). These energy costs can result in an energy deficit that translates into biological effects, including reduced reproduction and survival. Harm would occur when energy deficits result in reduced reproductive success or direct mortality of adults through starvation, exposure (heat/cold/rain), or disease. Harm may also occur if habitat is fragmented, preventing movement and associated foraging and reproductive success. Direct harm could also occur as individuals are predated while crossing fragmented habitat.

The effects pathway ends with the consideration of the biological effects on individuals within the context of regional and range-wide distribution and populations, which is discussed in Section 6.10.5, *Adverse Effects*.

Figure 6-24 shows the general effects pathways identified for potential harm to coastal martens due to habitat modification.

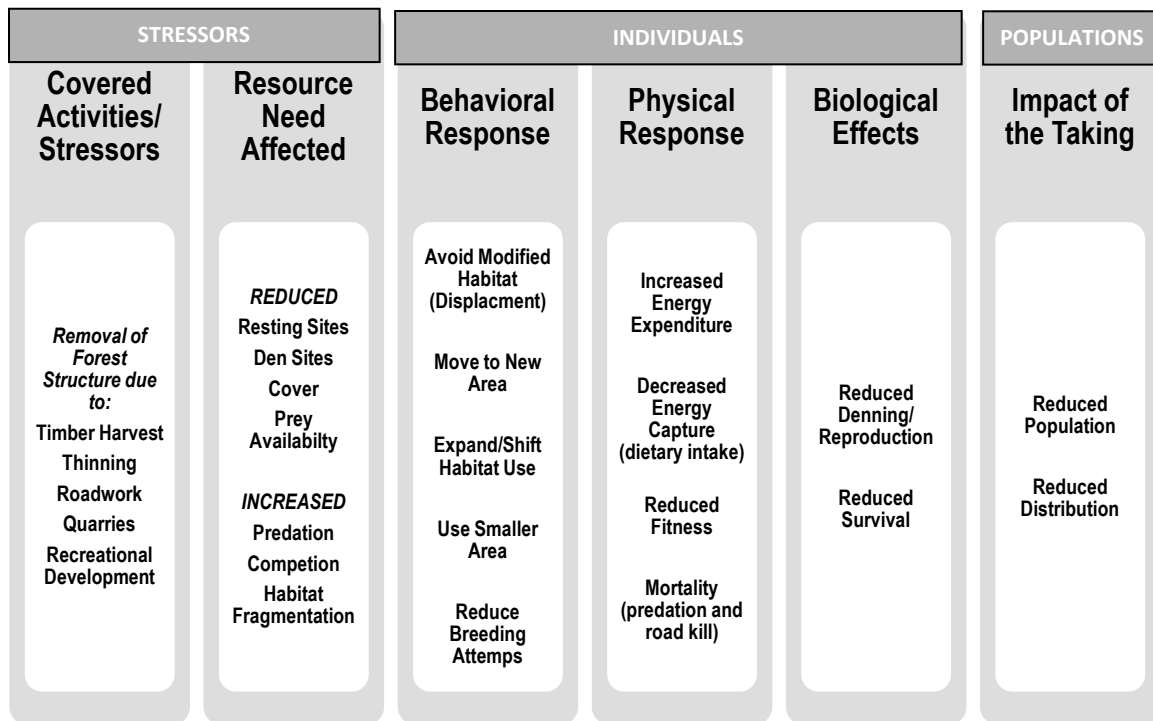


Figure 6-24. Effects Pathways Identified for Coastal Martens via Habitat Modification from Covered Activities

6.10.2 Covered Activities that May Result in Take

Any covered activity that will physically disturb habitats where coastal martens are present may rise to the level of take either through direct injury and mortality (e.g., strike by motor vehicle) or through habitat modification and associated loss of resources needed by coastal marten for breeding, feeding, and shelter. Timber harvest, including regeneration harvest, and thinning, is the primary activity that is expected to rise to the level of take. Table 6-41 lists covered activities and associated types of take expected to occur over the permit term. Details regarding the effects pathways are provided in the previous subsection.

Table 6-41. Sources and Types of Take of Coastal Marten Expected from Covered Activities

Covered Activity	Source of Take	Type of Take
Regeneration harvest	Regeneration harvests and associated temporary roads, landings, yarding operations, and use of heavy equipment within suitable habitat is the primary source of direct take expected for coastal marten. Indirect take could result from degradation of edge habitat that could attract predators of coastal marten.	Direct mortality or injury; expand/shift habitat use; stress; reduced breeding attempts; increased energy expenditure; decreased energy capture; reduced fitness; mortality through predation or starvation; reduced denning, reproduction and survival.

Covered Activity	Source of Take	Type of Take
Thinning	As with regeneration harvest, thinning in occupied habitat could result in take via habitat modification if it results in the removal of understory cover. Indirect take could result from degradation of edge habitat that could attract predators of coastal marten.	Direct mortality or injury; expand/shift habitat use; stress; reduced breeding attempts; increased energy expenditure; decreased energy capture; reduced fitness; mortality through predation or starvation; reduced denning, reproduction and survival.
Mountain beaver control	Control of mountain beavers could cause direct injury or mortality in occupied habitat, even though this would be rare but possible; control activity is concentrated in the Tillamook and Clatsop State Forests. Mountain beaver control will not modify coastal marten habitat.	Direct mortality or injury.
Road construction and maintenance	New road construction in occupied or suitable habitat will reduce available habitat and could be a source of direct mortality from vehicle strikes. Road work could adversely affect coastal marten habitat or disturb nearby (<0.25 mile) unknown den sites and it is occurring during the denning season (March 15 to August 15).	Direct mortality or injury; expand/shift habitat use; stress; increased energy expenditure; decreased energy capture; reduced fitness; mortality through predation or starvation; reduced denning and survival.
Drainage structure construction and maintenance	Drainage work could adversely affect coastal marten habitat or disturb nearby (<0.25 mile) unknown den sites and it is occurring during the denning season (March 15 to August 15).	Direct mortality or injury; expand/shift habitat use; stress; increased energy expenditure; decreased energy capture; reduced fitness; mortality through predation or starvation; reduced denning and survival.
Road Use	Direct injury or mortality from vehicle strikes associated with covered activities near occupied or suitable habitat in the range of the species. Individual actions of members of the public are not covered.	Direct mortality or injury; expand/shift habitat use; stress; reduced breeding attempts; increased energy expenditure; decreased energy capture; reduced fitness; mortality through predation or starvation; reduced denning, reproduction and survival.
Other covered activities outside of HCAs and RCAs	Development of new quarries and recreation infrastructure, including maintenance and operations, as well as aquatic restoration, pile burning, or other covered activities within 0.25 mile of unknown occupied but suitable coastal marten habitat is expected to result in take due to direct mortality, disturbance during denning season (March 15 to August 15), or habitat modification. ODF will not conduct or authorize any of the	Direct mortality or injury; expand/shift habitat use; stress; reduced breeding attempts; increased energy expenditure; decreased energy capture; reduced fitness; mortality through predation or starvation; reduced denning and survival.

Covered Activity	Source of Take	Type of Take
	covered activities within 0.25 mile of a known occupied den site located either inside or outside an HCA, unless certain operations are already underway (Chapter 4, Section 4.7.10.4, <i>Coastal Martin Den Locations</i>).	

6.10.3 Covered Activities Not Expected Result in Take

Covered activities that do not directly strike coastal marten individuals or disturb suitable habitat are unlikely to cause adverse effects that rise to the level of take. Table 6-42 lists covered activities not expected to modify suitable habitat and result in take of coastal marten over the permit term.

Table 6-42. Covered Activities Not Expected to Result in Take of Coastal Marten

Covered Activity	Rationale for Determining that Covered Activity Would Not Result in Take
All covered activities conducted outside of suitable habitat	Covered activities that do not modify suitable habitat or occur outside of 0.25 mile from suitable habitat would not result in take.
Site preparation, tree planting, and release treatments	Site preparation, and other reforestation and young stand-management activities that do not substantially modify stand characteristics or occur outside of 0.25 mile of suitable habitat are not likely to adversely affect coastal martens.
Existing road system	Continued use of existing roads outside occupied or suitable habitat is not expected to rise to the level of take in this HCP because they are considered part of the environmental baseline.
Road maintenance	Work within the road prism would not be likely to affect coastal marten habitat or disturb nearby (0.25 mile) den sites unless it is an unknown den site and it is occurring during the denning season (March 15 to August 15).
Road decommissioning	Road decommissioning would not adversely affect coastal marten habitat.
Drainage structure construction and maintenance	Drainage work would not adversely affect coastal marten habitat or disturb nearby (0.25 mile) den sites unless it is an unknown den site and it is occurring during the denning season (March 15 to August 15).
Water drafting and storage	This activity is not likely to adversely affect coastal marten habitat.
Barred owl management	Barred owl management would have no effect on coastal marten habitat. Prey base may increase in some areas.
Monitoring activities	Monitoring is not likely to adversely affect coastal marten habitat or otherwise harm individuals. If any monitoring activity is determined to potentially result in take, then ODF (including contractors and external research organizations) will obtain necessary clearance with USFWS (or the research organization will, if a different entity).

6.10.4 Covered Activities that Minimize and Mitigation Take

Implementation of Conservation Action 1: Establish Riparian Conservation Areas, Conservation Action 6: Establish Habitat Conservation Areas, and Conservation Action 7: Manage Habitat Conservation Areas, will limit direct impacts on coastal martens and protect high-quality habitat in

reserves, which will provide high-quality habitat for coastal martens to colonize and persist on the landscape. HCAs and RCAs will include 27,000 acres (54% of the range of coastal marten in the permit area) of suitable habitat. Short-term impacts from covered activities inside HCAs that remove or reduce understory shrub cover that provide coastal marten protection from predators and influence prey densities will be mitigated through the accelerated development of understory habitat from the initial canopy cover reductions. These habitat modifications will be completed consistent with Conservation Action 7 and Goal 8: *Support the Persistence of Coastal Marten*.

Implementation of Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas, will maintain a diversity of stand ages and retain forest legacy features that will contribute to older standing snags and downed wood outside of HCAs and RCAs. Direct effects on coastal marten den sites will be minimized by identifying those locations during monitoring, described in Chapter 5, *Monitoring and Adaptive Management*, and implementing restrictions on covered activities within 0.25 mile of known coastal marten dens, through implementation of Conservation Action 10: *Operational Restrictions to Minimize Effects on Covered Species*. Furthermore, ODF will provide protection of known martens (e.g., identified by live trapping and tagging, or remote trail cameras) by prohibiting ODF mountain beaver control activities within 2.5 miles of known locations. Upon discovery of a known marten, ODF will, as soon as logistically feasible, make every effort to ensure all authorized agent mountain beaver traps are tripped and not reset. Mountain beaver control activities within 2.5 miles of the den site will cease until September 30 or until a tracked individual has left the area.

Confirmed den structures will be retained on the landscape, and tree retention will be incorporated around the den structure during and post timber harvest operations. Inside HCAs, harvest will be avoided in stands with known dens. Outside of HCAs, the standard for tree retention around a natal den structure will be a no-less-than 100-foot radius no-harvest retention area, centered on the den (Chapter 4, Section 4.7.10.4, *Coastal Marten Den Locations*).

Direct effects on coastal marten den sites will be minimized by identifying those locations during monitoring, described in Chapter 5, Section 5.3.2.2, *Terrestrial Habitat Monitoring*, and implementing restrictions on covered activities in locations where coastal marten dens are known, through implementation of Conservation Action 10. Following completion of the multi-species carnivore surveys, ODF will identify focus areas within which to continue marten monitoring efforts. These areas will prioritize stands in HCAs as well as stands outside of HCAs where management is planned to promote understory growth.

6.10.5 Adverse Effects

6.10.5.1 Acres of Habitat Directly Removed or Degraded by Covered Activities

Coastal martens are vulnerable to predation and increased competition in habitats that have been subject to either high-moderate severity fires or intensive logging in the last 40 years, because both of these events remove the structural characteristics of the landscape that provide predator escape cover (canopy cover, shrub cover, etc.) (U.S. Fish and Wildlife Service 2023a). Habitat modification will occur inside and outside of HCAs, though the majority of harvest will occur outside HCAs. Based on the boundaries of the coastal marten covered area (approximately 50,000 acres), and timber harvest and forest growth modeling expected to occur within that range, approximately 23,000 acres of the roughly 50,000 acres (46%) of suitable coastal marten habitat could be subjected to

harvest outside of HCAs or RCAs over the permit term (Table 6-43). This equates to an average 5-year harvest amount of approximately 1,643 acres over the permit term, although rates are anticipated to reach 2,500 acres in most 5-year increments, and to occasionally reach upward of 3,300 acres in any given 5-year period, depending on operational considerations.

Approximately 5,000 acres of the remaining 27,000 acres of suitable habitat in the permit area are inside HCAs and will be subject to thinning or harvest during the first 30 years of the permit term, at an average rate of approximately 170 acres per year, although rates may reach 350 acres per year depending on operational considerations. Inside of HCAs, habitat modification will only be done in situations where those short-term silvicultural actions will result in long-term increases in habitat quality while minimizing impacts on existing habitat features. As such, the 5,000 acres of suitable habitat subject to management within HCAs will not be in mature forest. Most of these stands represent lower-quality habitat at the outset of the permit because of their young age, poor stand health, and/or hardwood composition. Management of them will be conducted consistent with Conservation Action 7 and an improved understanding of their population in the permit area.

Some stands will grow into mature forest habitat as time progresses and the forest develops more mature stand characteristics, including snags, downed hollow logs, and other resting, hiding, and denning structures. Canopy gaps in maturing forest promotes a robust understory cover of soft mast (fruit) producing species that supports foraging and cover. All management activities inside HCAs will be implemented with coastal marten habitat needs as a priority.

Table 6-43. Coastal Marten Acres of Suitable Habitat Subject to Harvest or Thinning Under the Habitat Conservation Plan Over the Permit Term

Location	Suitable Habitat	Subject to Harvest or Management
Within HCAs or RCAs	27,000	5,000 ^{a, b}
Outside of HCAs or RCAs	23,000	23,000 ^c
Total	50,000	28,000 ^c

^a While 27,000 acres of suitable habitat are inside HCAs, only roughly 19% of HCAs will be subject to management or harvest during the permit term.

^b Suitable habitat will be subject to thinning and rarely regeneration harvest inside HCAs. Any management or harvest will be completed consistent with the provision in Conservation Action 7: *Manage Habitat Conservation Areas*.

^c Not all acres shown are likely to be harvested. Some are inoperable or otherwise not economically viable. HCAs = habitat conservation areas; RCAs = riparian conservation areas

Harvest is expected to occur consistently over the course of the permit term. Without a habitat model linked to a timber harvest model it is not possible to determine exactly when harvest is likely to occur in the coastal marten covered area. ODF would harvest in the southern Oregon Coast Range and southwestern Oregon, the only parts of the permit area where coastal marten habitat is assumed to occur, every year. With the estimate of 28,000 acres harvested during the permit term, a simple assumption would be that approximately 400 acres would be harvested per year on average, although this might be slightly higher during the first 30 years of the permit term when management in the HCAs is taking place, and some 5-year periods could see harvest rates of 450-to-800 acres in 5-year periods, particularly during the first 30-years, due to operational decisions.

Take resulting from this habitat loss and other adverse effects, described above, will occur within the following contexts and levels of intensity.

- All areas within the range of coastal marten are considered suitable habitat, with approximately 50,000 acres (8%) of the permit area defining the coastal marten covered area.
- Approximately 54% (27,000 acres) of suitable habitat in the permit area will be conserved in HCAs and RCAs.
- Approximately 46% (23,000 acres) of suitable habitat in the permit area will be subject to harvest.
- Approximately 10% (5,000 acres) of suitable habitat in the permit area will be subject to stand management in HCAs.

With over 50% of current coastal marten habitat inside HCAs or RCAs, the conservation strategy provides a habitat stronghold for the species within southwestern Oregon. Management inside HCAs will be completed with coastal marten habitat development as a priority. Outside of HCAs harvest activities will modify forest structure but largely leave intact many of the forest attributes that coastal marten rely upon, including a dense understory cover, downed wood, and snags. Any harvest activities that occur outside HCAs will be completed consistent with Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas, which dictates retention standards for downed wood and snags.

6.10.5.2 Acres of Habitat Indirectly Removed or Degraded by Covered Activities

Coastal martens are known to be sensitive to habitat fragmentation and associated predation in cutover landscapes (U.S. Fish and Wildlife Service 2023a). Higher levels of predation are thought to be associated with human-induced changes in forest landscapes that increase the likelihood of contact between martens and predators such as bobcats (*Lynx rufus*) and mountain lions (*Puma concolor*) (U.S. Fish and Wildlife Service 2023a). Bobcats are thought to be their predominant predator, accounting for 40% of marten mortalities in one study (Slauson, In prep, as cited in U.S. Fish and Wildlife Service 2023a). That study also indicated that bobcats are generalist predators that prefer hunting in regenerating harvested stands less than 30 years old and to be nearly absent from landscapes comprising a mix of 40 to 60-year-old regenerating stands as well as older forests, otherwise described as primarily unmanaged mid-to-late-successional stands (Slauson, In prep, as cited in U.S. Fish and Wildlife Service 2023a).

Combined, the evidence suggests that habitat adjacent to the approximately 28,000 acres of stands managed or harvested from the permit area could be considered degraded due to attraction of bobcats up to 40 years post-harvest. Increases in predation pressure could lead to direct mortality or adverse effects on individual martens during efforts to avoid predation leading to increased energy costs of traveling through their fragmented home range as they avoid these openings (Moriarty et al. 2015).

Some individuals will likely perish due to vehicle strikes, newly inhospitable habitat conditions, or predation pressures; however, others will persist in older stands with legacy features and in HCAs. Long-term monitoring of some harvested stands, as described in Chapter 5, *Monitoring and Adaptive Management*, will increase understanding of how the species is affected by harvest-related activities, should individuals be detected in the permit area.

6.10.6 Beneficial Effects

6.10.6.1 Management in Habitat Conservation Areas

With 54% of the current coastal marten range inside HCAs or RCAs, the majority of coastal marten habitat in the permit area will develop into higher-quality habitat throughout the permit term through passive management and some active management in 19% of the coastal marten range inside HCAs to address high conifer stocking densities or treat severely infected Swiss needle cast stands following details described in Conservation Action 7. Any regeneration harvest conducted inside HCAs within the covered marten area will also include implementation of retention standards outlined in Conservation Action 8. The average stand age at the beginning of the permit term inside HCAs is 70 to 90 years (Figure 6-25). At the end of the permit term, the average stand age inside HCAs is 130 to 150 years old (Figure 6-26). This general increase in mature forest condition will increase the habitat quantity and quality for coastal martens.

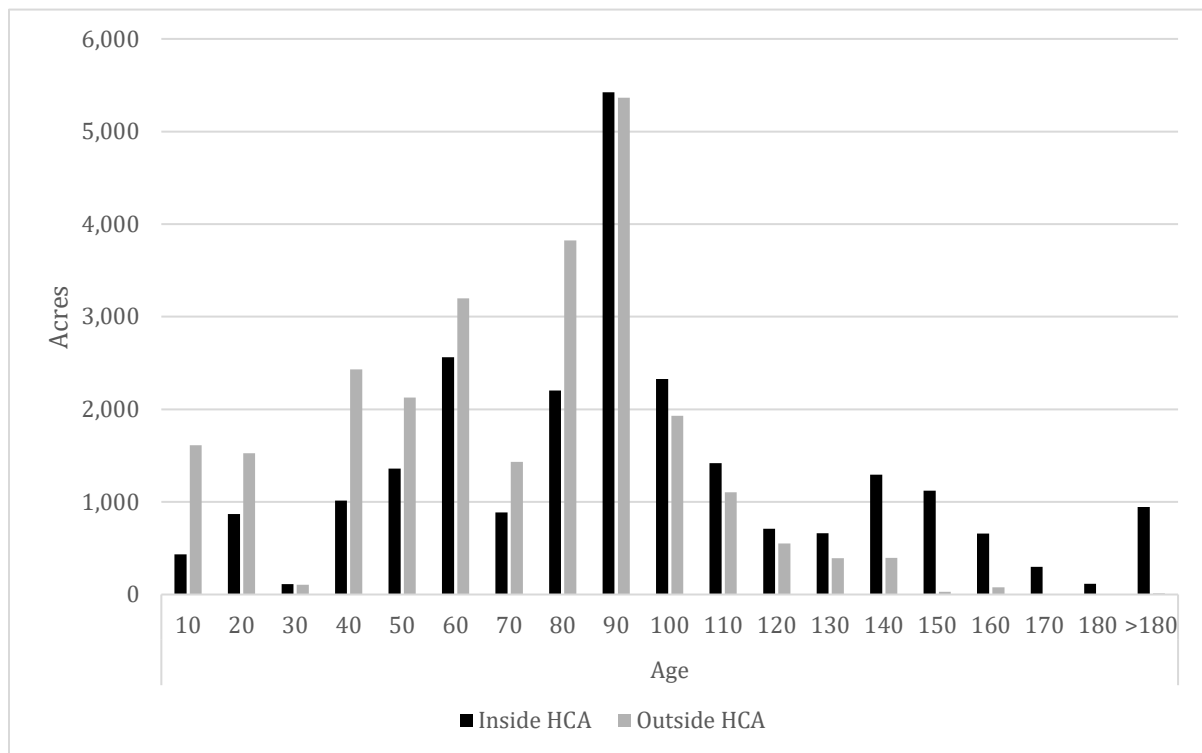


Figure 6-25. Stand-Age Distribution Within Coastal Marten Range in 2023

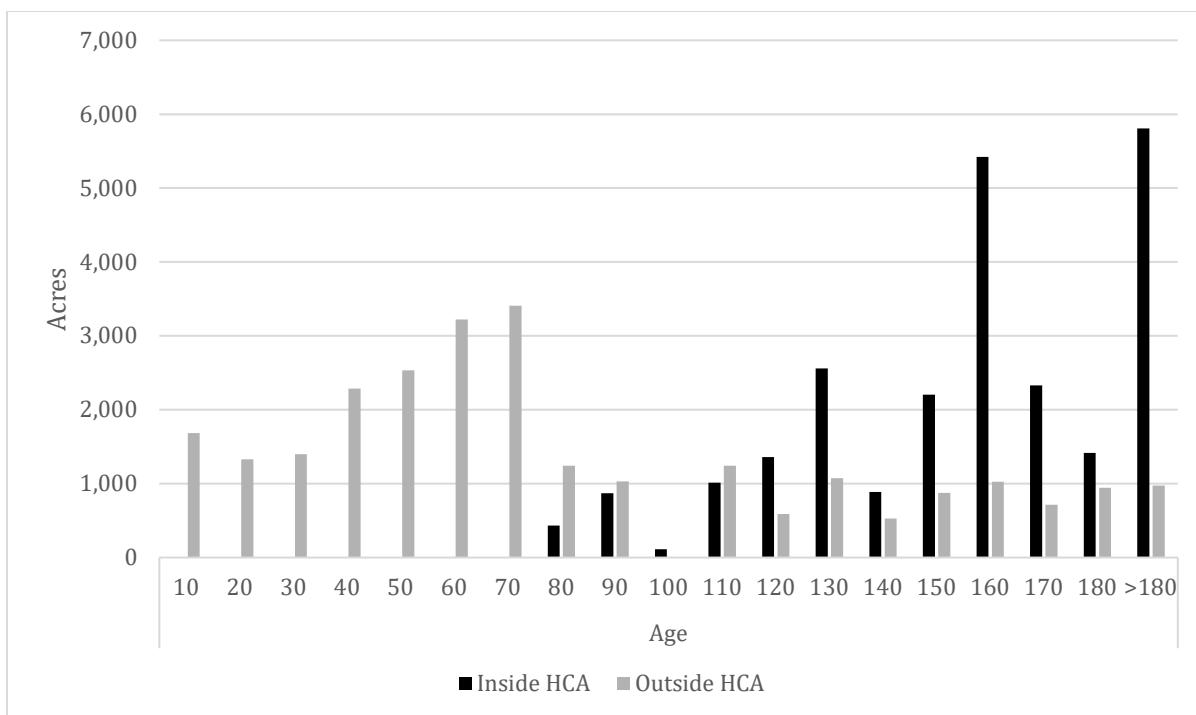


Figure 6-26. Stand-Age Distribution Within Coastal Marten Range in 2093

6.10.6.2 Management Outside Habitat Conservation Areas

Adverse effects associated with the harvest activities planned on the remaining suitable habitat in the range of coastal marten outside HCAs and RCAs (46%) and will be subject to harvest will be minimized through the implementation of the monitoring program targeting the identification of denning sites using passive monitoring (Chapter 5, *Monitoring and Adaptive Management*), implementation of restrictions around the den site, and through implementation of retention standards outlined in Conservation Action 8. Once denning sites are discovered, Conservation Action 10: *Operational Restrictions to Minimize Effects on Covered Species*, restricts covered activities within 0.25 mile of known coastal marten dens. Confirmed den structures will be retained on the landscape, and tree retention will be incorporated around the den structure during and post timber harvest operations. Conservation Action 10 also provides protection of known martens (e.g., identified by live trapping and tagging, or remote trail cameras) by prohibiting ODF mountain beaver control activities within 2.5 miles of known locations. Upon discovery of a known marten, ODF will, as soon as logistically feasible, make every effort to ensure all authorized agent mountain beaver traps are tripped and not reset. Mountain beaver control activities within 2.5 miles of the den site will cease until September 30 or until a tracked individual has left the area.

6.10.6.3 Monitoring Intent

The monitoring program described in Chapter 5, *Monitoring and Adaptive Management*, includes ODF's commitment to provide technical support and financial assistance to coastal marten research and monitoring efforts in Oregon.

The program will benefit coastal marten populations in Oregon in the following ways.

- Expand current understanding of the distribution and interactions of existing coastal marten populations.
- Protect known breeding coastal marten and their offspring (including protecting occupied den sites, minimizing activities that may disturb the marten using those den sites within 0.25 mile, and prohibiting mountain beaver trapping within 2.5 miles of known den site).
- Improve current understanding of marten response to vegetation management activities.
- Aid in acquiring more accurate estimates of marten densities.
- Examine carnivore populations in and between occupied areas.
- Facilitate future translocation and monitoring of marten in portions of the permit area where they no longer exist.
- Facilitate the cooperation and collaboration among land managers and federal and state wildlife agencies in furthering marten conservation in western Oregon.

ODF will also participate in the Oregon Forest Carnivore Working Group and related USFWS-led Marten Stakeholder Meetings and seek opportunities to collaborate in research and monitoring efforts related to coastal martens to provide information needed by forest managers and conservation biologists to determine effective strategies and techniques for coastal marten conservation.

Also, as described in Chapter 5, *Monitoring and Adaptive Management*, adaptive management will allow for mutually agreed-upon changes to conservation commitments in response to changing conditions or new information, where those changes will avoid or minimize effects and provide a conservation benefit for marten. Adaptive management changes will occur in response to biological information indicating that the conservation commitments are ineffective at meeting the stated goals of the HCP. Examples include if best available scientific data reveal that (1) protection measures for denning female marten may be inadequate to minimize or avoid take; or (2) retention strategies for trees, snags, and downed wood are inadequate or could be improved with modifications or additions (e.g., slash piles). Should USFWS or other ODF cooperators desire to implement adaptive management research to determine the characteristics (location, aspect, size, structure, grouping) of slash piles used for denning by martens, ODF will cooperate in managing its planned timber harvests to leave unburned slash piles for monitoring and controlled research on active management of slash to create habitat elements useful to coastal martens.

6.10.6.4 Effects on Critical Habitat

USFWS has designated critical habitat for coastal marten on approximately 704,000 acres in Oregon (U.S. Fish and Wildlife Service 2024a), of which 1,421 acres (<1%) are in the permit area. Critical habitat has been designated by unit. Of the total coastal marten critical habitat designated in the permit area, 87% (1,241 acres) is in the Klamath Mountains Unit (OR-05) and 13% (180 acres) is in the Coos Bay Unit (OR-03). The Klamath Mountains Unit is composed of nearly 97% federal ownership in southern Oregon and Northern California. All other critical habitat units in Oregon including the Siuslaw (OR-01), Siltcoos (OR-02), and Cape Blanco (OR-04) do not overlap the permit area (Table 6-44). Vegetation in southern Oregon permit area is composed of mixed conifer forest (i.e., dominated by Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), and

Douglas-fir (*Pseudotsuga menziesii*) in mountainous terrain and interspersed with unique plant communities adapted to serpentine soils, including forests of widely spaced pines (*Pinus* spp.) with an understory of grasses and more mesic areas with dense and diverse shrub layer including tan oak (*Notholithocarpus densiflorus*) and huckleberries (*Vaccinium* spp.) (Moriarty et al. 2019).

In general, critical habitat in HCAs is expected to increase in habitat value during the permit term (Section 6.10.6.1, *Management in Habitat Conservation Areas*). Management activities in HCAs will be tailored to that purpose (Section 6.10.6.2, *Management Outside Habitat Conservation Areas*). There may be some short-term effects on critical habitat in locations where management activities occur, but over the permit term any critical habitat inside HCAs will be higher quality than at the start of the permit term. Outside of HCAs, critical habitat may be modified, particularly in locations where critical habitat is designated in suitable habitat. Table 6-44 summarizes the acres of critical habitat inside and outside of HCAs that exist within the coastal marten covered area. A total of 786 acres (55%) of critical habitat are inside HCAs and will likely grow into higher-quality habitat during the permit term. The 45% outside HCAs could be subject to harvest if outside of RCAs.

Table 6-44. Coastal Marten Critical Habitat and Suitable Habitat (acres)

Critical Habitat Unit	Total Suitable ^a
OR-01 – Siuslaw	
Critical habitat in HCAs	--
Critical habitat outside HCAs	--
OR-02 – Siltcoos	
Critical habitat in HCAs	--
Critical habitat outside HCAs	--
OR-03 – Coos Bay	
Critical habitat in HCAs	180
Critical habitat outside HCAs	--
OR-04 – Cape Blanco	
Critical habitat in HCAs	--
Critical habitat outside HCAs	--
OR-05 – Klamath	
Critical habitat in HCAs	606
Critical habitat outside HCAs	635
Total	1421
Critical habitat in HCAs	786
Critical habitat outside HCAs	635

^a This HCP assumes that all of the permit area from the northern boundary of Lane County south to the California border and west of Interstate 5 could provide suitable coastal marten habitat.

HCAs = habitat conservation areas

6.10.7 Net Effects

The coastal marten covered area identified for the purposes of this HCP represents all ODF-managed lands that overlap the historic range of the species. These lands are distributed throughout southwestern Oregon, from the northern boundary of Lane County south to the California border

and west of Interstate 5 and overlap the Central Coastal and Southern Coastal extant population areas. All forested habitats within the coastal marten covered area are considered suitable habitat, encompassing approximately 50,000 existing acres (8%) of the permit area. HCAs and RCAs within the marten covered area overlap 54% of the current coastal marten range.

Implementation of the HCP is modeled to result in a net increase in suitable habitat for coastal martens over the permit term, thereby fully offsetting habitat modification that is modeled to occur under the terms and conditions of the HCP. The majority of coastal marten habitat distributed throughout the permit area will develop into higher-quality habitat throughout the permit term through accelerated development of structural habitat, targeting understory production and diversity of soft mast species that support both martens and their prey within the HCAs (Conservation Action 7: Manage Habitat Conservation Areas). Outside of HCAs (Conservation Action 8: Targeted Actions Outside Habitat Conservation Areas and Riparian Conservation Areas) and for any regeneration harvest conducted within HCAs, retainment of decadent legacy features and hardwoods will provide suitable resting and denning resources, in addition to increasing hard mast food supply for marten prey species. Recruitment of large wood in these areas will also provide future shelter sources for martens as they disperse to new, suitable home ranges. Furthermore, known occupied den sites will be protected through operational restrictions detailed in Chapter 4, Section 4.7.10.4, *Coastal Marten Den Locations*, that will minimize disturbance at these sensitive resource sites leading to increased kit survival that supports population recruitment.

ODF-managed lands distributed throughout southwestern Oregon are smaller and more scattered than tracts located elsewhere in the permit area, but these areas can function as “stepping stones” across the fragmented landscape interspersed with private industrial timberlands managed for production commodity and the alternating square mile sections of federal forests managed by BLM, in addition to the larger tracts of nearby Siuslaw and Rogue-Siskiyou National Forests along the Oregon coastline. Improving landscape connectivity within the coastal marten cover area will facilitate successful movement between the larger, higher-quality habitat blocks on federal lands by minimizing long stretches of unsuitable habitat and reducing mortality risk (Johnson et al. 2009; Moriarty et al. 2016).

The amount of habitat conserved and additional habitat to be developed over time across the marten covered area is expected to serve as strongholds for this species as habitat quality and quantity increases overtime; however, the influence on coastal marten population dynamics may be complicated by their small, documented population size (<100 individuals) and limited dispersal distances (U.S. Fish and Wildlife Service 2023). Nonetheless, the combination of the conservation strategy’s avoidance, minimization, and mitigation measures are expected to have a net beneficial effect on coastal marten that supports the persistence of this species through increases in denning and foraging habitat capacity throughout its range within the permit area.

7.1 Introduction

This chapter discusses the rights and responsibilities of the permittee (Oregon Department of Forestry [ODF]), as well as the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries (collectively, referred to as the Services), regarding changed and unforeseen circumstances that may occur over the permit term. The federal Habitat Conservation Assurances (No Surprises) Rule limits the scope of a permittee's requirement to provide additional mitigation under the federal Endangered Species Act (ESA).

7.2 Federal No Surprises

The No Surprises Rule was established on March 25, 1998 (50 Code of Federal Regulations [CFR] 222.307(g)(3)(ii)). It provides assurances to Section 10 permit holders that, in negotiating unforeseen circumstances that arise once a permit is in place, no additional mitigation in the form of money, water, or land or restrictions on land or water will be required without the permittee's consent. The Services may require additional conservation measures where the Western Oregon State Forests Habitat Conservation Plan (HCP) is being properly implemented if they are deemed necessary to respond to unforeseen circumstances. However, if a permittee is properly implementing an HCP for which an incidental take permit (ITP) has been issued by the Services, additional conservation and mitigation measures will not require a commitment of additional land or water, financial compensation, or further restrictions on the use of land, water, or other natural resources, beyond that already specified in the plan, without the consent of the permittee.

ODF requests regulatory assurances (i.e., the No Surprises Rule) for all covered species in the HCP. In accordance with the No Surprises Rule, ODF will be responsible for implementing and funding measures in response to any changed circumstances, as described in this chapter.

ODF understands that assurances under the No Surprises Rule are contingent on full implementation of the HCP and permits. ODF also understands that the Services may suspend or revoke the federal permit, in whole or in part, in accordance with federal regulations (50 CFR 13.27, 13.28, and 222.306 and other applicable laws and regulations) in force at the time of such suspension. Chapter 8, Section 8.10, *Permit Suspension or Revocation*, provides additional details related to this process.

7.3 Changed and Unforeseen Circumstances

7.3.1 Changed Circumstances

Changed circumstances are defined in the federal No Surprises Rule (63 *Federal Register* 8859). With respect to HCPs, Congress recognizes that "circumstances and information may change over time and that the original plan might need to be revised" (H.R. Rep. No. 97-835, 97th Congress).

Changed circumstances are changes that can be reasonably anticipated over the permit term. Section 10 regulations (50 CFR 17.22(b), 17.32(b), and 222.307) specify that the permittee will be responsible for implementing and funding the measures (potentially including mitigation in the form of money, water, or land or restrictions on land or water, beyond that included in the commitments described in the HCP) necessary to respond to these changed circumstances. Section 10 regulations also require an HCP to identify anticipated and possible changed circumstances that could arise during implementation; strategies and protocols for addressing anticipated changes; and appropriate program adjustments, which will be made in response to circumstances. Changed circumstances are defined in 50 CFR 222.102 as changes that affect a species or geographic area covered by a conservation plan. These can reasonably be anticipated by plan developers and the Services and plans can be developed in response (e.g., the listing of a new species or the planned response to a fire or other natural catastrophic event in areas prone to such events).

Section 7.3.3, *Changed Circumstances Addressed by This Habitat Conservation Plan*, describes ODF's approach to the requirements. The criteria set forth within the requirements arose from knowledge of current baseline habitat conditions; occurrences of ESA-listed (or soon-to-be-listed) species; current and historic responses to natural disturbance regimes and disturbance events, including those related to the transportation system and ODF wildfire response; and the spatial configuration of the design for the HCAs across the permit area. As described in Chapter 9, Section 9.2.4, *Remedial Measures for Changed Circumstances*, ODF will maintain sufficient financial reserves to fund any remedial actions that may occur throughout the permit term.

7.3.2 Unforeseen Circumstances

Unforeseen circumstances are defined by federal regulation as “changes in circumstances affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by plan or agreement developers and the Services at the time of the conservation plan's negotiation and development, and that result in a substantial and adverse change in the status of the covered species” (50 CFR 17.3. and 222.102). The procedures to deal with unforeseen circumstances that may arise during implementation of the HCP are described herein.

The procedure will begin with the identification of unforeseen circumstances and can be part of ongoing compliance reporting and coordination with the Services. Either the Services or ODF may initiate the process for declaring and documenting unforeseen circumstances. Once initiated, ODF will provide available information to the Services regarding the circumstances and associated adverse changes to covered species and their habitat in the permit area. If applicable, ODF will identify specific biological goals and objectives of the HCP that are or will be affected by the circumstances.

Pursuant to implementing regulations (e.g., 50 CFR 17.22(b)(5) and 222.307(g)(3)), upon determining that unforeseen circumstances exist, the Services will inform ODF of any additional avoidance, minimization, or mitigation measures that may be warranted, and ODF will work with the Services to determine an appropriate response. Responses may include additional actions; these may be implemented under the direction of ODF. ODF will document and track any unforeseen circumstances—and associated metrics and mitigation—as part of the HCP monitoring and reporting program.

7.3.3 Changed Circumstances Addressed by This Habitat Conservation Plan

Climate change poses the most uncertainty and risk to state forests (Dalton et al. 2017). Warmer, drier summers with more extreme heat events and more extreme precipitation events in winter are expected in western Oregon (Spies et al. 2018). Climate change will most likely be a driver for many of the changed circumstances described in this section, thereby increasing the potential for such events to occur. For example, weather-pattern changes may affect forest productivity as well as health and biodiversity in unforeseen ways. They can also have large but variable effects on species and ecosystems, including increased frequency and severity for droughts, fires, outbreaks of invasive species, or other disturbances. These more frequent and intense disturbances may quickly change habitat conditions for covered species in the plan area.

Climate change resulting from increased concentrations of atmospheric carbon dioxide is expected to result in warmer temperatures and changed precipitation regimes during this century (Intergovernmental Panel on Climate Change 2013; 2023). Climate change is expected to diminish tree health and improve conditions for some highly damaging pathogens (Kliejeunas et al. 2009). The effects of climate change also are generally expected to predispose forests to more frequent and larger wildfires and additional outbreaks of insects and disease, reduce growth and survival, and ultimately change forest structure and composition at the landscape scale. Species' ranges are expected to shift northward and upward in elevation. In addition, the warming of streams and rivers across the northwestern United States over the century will have biological implications for both the quality and quantity of habitats available to species of regional importance, such as salmonids. Ongoing temperature increases will profoundly influence the ecology of salmonids, in particular. Climate change is projected to alter the flow regimes of streams and rivers, with consequences for physical processes and aquatic organisms (Spies et al. 2018). The volume of available habitat is shrinking as summer stream discharges across the region continue a multi-decadal decline that has also been partially linked to environmental variability (Isaak et al. 2012). Warm-water predatory fish, such as bass, will most likely affect the survival and recovery of salmonids.

Because of climate change, and because it is so interconnected to fire, storm, and wind events and invasive species, the thresholds that follow regarding the setting for changed circumstances consider the potential implications of climate change.

7.3.3.1 Listings of New Species and Designations/Revisions to Critical Habitat

Over the course of the permit term (70 years), USFWS or NOAA Fisheries could list a species as threatened or endangered as well as designate critical habitat for species that are not covered under the HCP; the Services could also designate or revise critical habitat for species that are covered under the HCP. ODF will know when a noncovered species associated with habitat in the permit area has been proposed for listing, becomes a candidate for listing, or is emergency listed or when designations or revisions for critical habitat are proposed because these are publicly noticed processes. In addition, currently listed species that are not covered under the HCP may be documented in the permit area; these are likely to be affected by covered activities. During the annual reporting process, ODF will review and consider any pending listing decisions, critical habitat designations, or new information on uncovered listed species that may influence the status of species that occur in the permit area.

ODF does not currently anticipate adverse impacts on or take of any currently listed species not covered by this HCP, as described in Chapter 1, *Introduction*. During the annual reporting process, ODF will review and consider whether any new information suggests that incidental take of any other uncovered listed species is likely.

Changed Circumstance

A changed circumstance will be triggered when ODF receives public notification of an applicable proposed or emergency listing or critical habitat decision or new information suggests that incidental take of any uncovered listed species is likely.

Response

Following public notification, ODF will implement the following measures.

1. **Determine the potential of the species to occur in the permit area.** Once a species is proposed for listing, becomes a candidate for listing, is emergency listed, or an uncovered currently listed species is documented in the permit area, ODF will evaluate and determine the potential distribution of the species on ODF-managed lands and the necessary coordination with the Services.
2. **Coordinate with USFWS and/or NOAA Fisheries and implement agency-provided take avoidance measures.** If ODF or the Services determine that the listed species may be present in the permit area, they will initiate coordination as soon as this is determined. Through technical assistance with the Services, the potential effects of covered activities on the species will be evaluated, including an assessment of the presence of suitable habitat in the permit area. If ODF and the Services determine that the species occur or could occur in the permit area, ODF will identify and implement any necessary measures provided by the Services to avoid unauthorized take of the species. ODF will implement the take avoidance guidelines for the species unless the HCP and associated ITP are amended.
3. **Apply for permit amendment.** Prior to implementing any activities beyond those provided by the Services to avoid take, ODF will apply for a permit amendment or alternative take coverage, as described in Chapter 8, Section 8.9.2, *Permit Amendments*. ODF will not conduct any activities that have the potential to cause take of the currently listed, proposed, candidate, or emergency listed species prior to receiving an amended ITP or take authorization is granted through a separate permitting process.

If new critical habitat is designated or existing critical habitat is revised in the permit area, the permittee and the Services will review the new or revised designation(s) and management under the HCP obligations. The permittee and the Services will first consider whether, or the extent to which, HCP covered activities or avoidance, minimization, or mitigation activities may, individually or cumulatively, adversely modify critical habitat. If implementation of the HCP will result in effects on newly designated or revised critical habitat not otherwise considered under ESA intra-Service Section 7 consultation, the Services may reinitiate consultation. If the Services determine adverse modification to be likely, then the permittee and the Services will discuss reasonable and prudent alternatives to address this outcome. As with other cases of changed circumstances, the Services will not require any conservation and mitigation measures in response (beyond the steps identified above) if the permittee has been properly implementing the HCP.

7.3.3.2 Change in Species Habitat Quality from Fires, Storms, Invasive Species, or Disease

Some natural and human-influenced disturbance events can cause significant changes in terrestrial species habitat quality. Such events that occur in a forested landscape in western Oregon, including the permit area, include fires, storm events (e.g., ice, wind, snow), and occurrences of invasive species and disease. The sections that follow summarize how these disturbance events have affected forests in the permit area historically. The information provides context for the thresholds defined for this HCP and used to determine what would be considered a changed circumstance versus an unforeseen circumstance. Information provided for each disturbance event was not used to develop quantitative thresholds because of the uncertainty and complexity associated with future predictions; it was instead used to present an assortment of the disturbance events likely to affect the habitat conservation areas (HCAs). The proposed responses to these changed circumstances are described after the summary of the disturbance events.

Fire

State forests have a legacy of repeated, large-scale wildfires, most of which occurred prior to ODF management. Wildfires can be natural or human-caused events. Prior to fire-suppression activities, the dominant disturbance in forests was fire, which was key to maintaining wildfire resilience, forest structure, and ecosystem health. Despite the permit area overlapping primarily an area with an infrequent, high-intensity fire regime (i.e., few occurrences of stand-replacing fires), contemporary fire history data indicate more frequent fires of low to moderate intensity and a smaller scale, whether part of underburning or natural starts throughout western Oregon, including the Coast Range, West Cascades, Willamette Valley, and Klamath Mountains.

Over the past century, wildfires have burned hundreds of thousands of acres in western Oregon. In August 1933, a wildfire burned approximately 240,000 acres of mostly old-growth forest in what would later become the Tillamook State Forest. Fires again burned the Tillamook area in 1939, 1945, and 1951. Some areas burned three or four times. By the end of 1945, 355,000 acres had burned. Over the last 20 years, 1,845 acres have burned in the Southwest District.

From 1960 to 2020, 1,214 fires burned 27,844 acres of ODF-managed land in the permit area. Fires were generally infrequent and small. In September 2020, a series of wildfires known as the Labor Day Fires burned more than 25,000 acres of ODF-managed lands, primarily the result of the Beachie Creek Fire in the Santiam State Forest. Similar to the Tillamook burn, this was a rare, wind-driven event that left a mosaic of burn severity on the landscape. In total, the Labor Day Fires burned approximately 25,069 acres across several ODF districts.

Fire-suppression and forest-management techniques over the past century have very likely altered the fire regime in western Oregon, the area where the permit area occurs, thereby influencing forest resilience, structure, and health. This factor, combined with environmental variability associated with climate change, is expected to affect future wildfires by increasing the risk of more frequent, higher-severity stand-replacing fires in western Oregon (Chapter 2, Section 2.3.1.3, *Climate and Climate Change*, and Figure 2-5).

Storm Events

Storm events (e.g., severe wind and heavy precipitation) can lead to under-productive forest conditions and susceptibility to insects and disease. These stands often require immediate action to restore resilient and productive forest conditions.

Northwest Oregon experiences periodic severe windstorms. The Columbus Day storm on October 12, 1962, blew down an estimated 17 billion board feet of timber in western Oregon and Washington. As is typical of most disturbances, windstorms interact with other events in many ways. After the Columbus Day storm in 1962, Douglas-fir bark beetles (*Dendroctonus pseudotsugae*) killed an additional 2.6 billion board feet of timber by 1965. The Great Northwest Gale occurred over 3 days in December 2007 and was the most impactful storm event to hit western Oregon since the Columbus Day storm. In addition to those named storms, there have been nine other major storm or wind events since the Columbus Day storm in 1962, with events in 1981, 1993, 1995, 1996, 2006, 2007, 2015 (two), and 2016.

The storm events that occurred in 1996 are more common examples of significant storm events in the plan area (Robison et al. 1999). In February 1996, a rain on snow event occurred over several days where a subtropical jet stream delivered a large amount of rainfall and warm air that melted a heavy snowpack, causing substantial flooding and landslides. In that event, the Nehalem River reached peak flow rates not typically observed for more than 100 years. The November 1996 event broke records for 24-hour precipitation amounts, which also contributed to soil instability and slides. Such events may be expected to occur more frequently and with greater severity in the future due to environmental variability (Mahoney et al. 2018).

Invasive Plant Species and Disease

Nonnative species and diseases currently occur in the permit area, including invasive weeds, insects, and pathogens. Scotch broom (*Cytisus scoparius*) and Himalayan blackberry (*Rubus armeniacus*) are prevalent throughout most of the region and Oregon's costliest weeds, costing the state nearly \$80 million annually due to lost timber revenue and direct control measures. Other invasive species, such as laminated root rot, caused by the fungal pathogen *Phellinus weirii*; spruce aphid; and balsam woody adelgid, have caused severe tree mortality in the plan area.

Nonnative species and diseases also exist in areas outside the permit area; these have the potential to spread into the plan area and adversely affect the covered species. Emerald ash borer (*Agrilus planipennis*) has caused extensive damage to ash trees across the United States and was discovered in Washington County (west of Portland) in summer 2022. As it continues to invade Oregon, it will most likely cause local extinction of ash trees within 10 to 20 years, potential changes in stream temperatures, and associated changes in plant and animal communities in riparian areas below 2,000 feet in elevation. The overall impact on state forests will most likely be negligible due to the small amount of ash occurring on these lands. Sudden oak death, caused by the nonnative pathogen *Phytophthora ramorum*, is currently present in Oregon but confined to Curry County. Future spread to other counties would affect forest viability. Similarly, *Phytophthora lateralis* infects Port-Orford-cedar (*Chamaecyparis lawsoniana*), but the range of this tree is confined to southwestern Oregon in Curry and Coos Counties; therefore, spread is not probable. Spongy moth (*Lymantria dispar dispar*) and Flighted Spongy Moth Complex (*Lymantria dispar asiatica*), while not established in Oregon, have the potential to have long-lasting negative impacts on state forests if they become established. The increasing popularity of recreational activities in state forests increases the likelihood of new invasive species being introduced, which, in turn, could affect long-term forest health.

A disease or invasive species that spreads throughout the plan area within the permit term is a foreseeable event. If a disease or nonnative species spreads beyond the thresholds identified below, however, it will be considered an unforeseen circumstance.

Changed Circumstance

Any of the previously described disturbance events will be considered a changed circumstance. ODF will be required to implement the responses provided below if the thresholds related to the functionality of HCAs are reached. These thresholds account for the current and anticipated future functionality of individual HCAs, as well as HCAs at a landscape scale, based on the scope, scale, and frequency of past natural disturbance events and more than account for the average acreage of these disturbance events on ODF-managed lands over the past 60 years. Impacts that exceed these thresholds will be considered unforeseen circumstances.

To determine whether the changed circumstances listed below exist, stands will be considered affected if events have removed or reduced the current function or quality of the habitat types for covered species.

- Up to 75% of the total acreage of any one HCA is affected from any combination of these events in a 1-year period.
- Up to 100% of the total acreage of any one HCA is cumulatively affected from any combination of these events during any portion of the permit term.
- Up to 50% of the total acreage of any two or more HCAs is cumulatively affected from any combination of these events during any portion of the permit term.
- Up to 27,500 acres (10% of total acreage) of the HCAs are collectively affected by any combination of these events in a 1-year period.
- Up to 138,000 acres (50% of total acreage) of the HCAs are collectively cumulatively affected by any combination of these events during any portion of the permit term.

ODF will determine whether any threshold has been met and report this information to the Services immediately following assessment of a disturbance event and through ODF's annual monitoring and reporting process. The Services and ODF, in collaboration, will then make a final determination as to whether the impacts are biologically significant and constitute a changed circumstance.

No changed circumstances are defined for riparian conservation areas (RCAs). Felling of hazard trees or removal of downed trees may be conducted where necessary for public safety or to protect infrastructure. Where RCAs have been affected by wildfire, an assessment will be performed to determine post-fire conditions, including the scale and pace of natural regeneration of riparian areas and impacts on instream habitat, water quality, and soil conditions. Based on findings from the assessment and monitoring results, ODF will attempt to restore riparian areas that would benefit from active restoration to accelerate the regeneration of riparian vegetation and improve natural stream processes within 2 calendar years to allow time to obtain the required seedlings. However, restoration actions in some areas may be precluded by post-fire stand conditions that are deemed unsafe for active restoration. In those instances, passive restoration will be implemented. Sites identified for active restoration will be prioritized, based on the following criteria: post-fire stand conditions, presence of HCP covered species, burn severity, water quality and soil conditions, and the degree of natural regeneration.

Response

Immediately following an assessment of the previously described disturbance events (i.e., fire, storm event, or invasive species or disease outbreak) in the plan area, ODF will determine whether a changed circumstances threshold has been met, notify the Services, and propose and implement remedial measures to address these changed circumstances, using the steps listed here. In addition, through its annual monitoring and reporting processes, ODF will evaluate whether any thresholds were met during the preceding year and provide supporting analysis in the annual report. ODF will also identify and propose a recommended response, if applicable. The Services will review this information and, in coordination with ODF, confirm whether the impacts are biologically significant as well as the appropriate response through the steps described below. These steps are aimed at determining and reducing the extent to which the changed circumstance from natural events could undermine ODF's ability to successfully implement the conservation strategy and the biological goals and objectives (BGOs), as described in Chapter 4, *Conservation Strategy*. These steps will be undertaken in collaboration with the Services to determine whether changed circumstances exist, determine whether the remedial measures proposed by ODF will adequately address them, and identify the need for alternative responses.

1. Quantify habitat impact from the disturbance event for each of the affected covered terrestrial species, based on modeled habitat.
2. Determine whether ODF can modify its fire management practices to adapt to altered fire regimes. This could include the use of underburning or other controlled fire treatments.
3. Determine whether ODF, in consultation with USFWS, is still meeting the stay-ahead provision (as described in Chapter 4, Section 4.7.13, *Conservation Action 13: Stay-Ahead Provision*) and the BGOs for each covered species, despite the habitat impact incurred by the disturbance event, using modeled habitat. Considerations will be given to the range of the species affected by the event. If the stay-ahead provision and the BGOs are still being met for a given covered species, no further response is needed. If the stay-ahead provision is not being met for one or more species, move to Step 4.
4. Examine current implementation plans to assess the potential harvest within the range of the covered species that is not meeting the stay-ahead provision and BGOs and defer or reduce the harvest and apply relevant conservation measures in proximity to the disturbance event where feasible, with the aim of providing temporary refuge for the species. Identify potential harvest activities whose deferment may provide suitable habitat refugia of a similar size to the acres affected by the natural disturbance. Activities identified for deferment will be observed until the stay-ahead provision for all covered species can again be met or until the end of the implementation plan cycle, whichever comes first. If, despite deferments, the stay-ahead provision cannot be met by the end of the implementation plan cycle, the 10-year comprehensive review will identify necessary actions to meet the stay-ahead requirement during the next implementation plan. This may include shifting harvest priorities to locations that will allow the portion of the permit area affected by the natural event to recover for a period of time before harvest resumes.

The options that follow to temporarily defer harvest are listed in order of priority. Habitat will continue to be protected in a mix of HCAs, RCAs, and unharvested stands outside of these conservation areas.

1. Defer harvest in HCAs within the range of the covered species not meeting the stay-ahead provision requirement and not part of an operation currently under contract.
2. Defer harvest outside HCAs but within the same subgeographic area¹ where the disturbance occurred and not part of an operation currently under contract or planned within the current annual operations plan. In the event that areas outside of HCAs are also affected by the disturbance event, the priority item listed below will be used so that areas outside of HCAs can be harvested. RCAs will continue to persist as protected areas outside of HCAs.
3. Defer harvest outside HCAs in a different subgeographic area rather than where the natural disturbance occurred but still within the range of the covered species not meeting the stay-ahead provision requirements and not part of an operation currently under contract or planned in the current annual operations plan. Given the wide geographic, ecotypic, and economic ranges of the subgeographic areas, harvest deferment will be done in consultation with USFWS to align with both the conservation strategy and operational feasibility. RCAs will continue to persist as protected areas outside of HCAs.

7.3.3.3 Changes in Species Habitat Quality from Aquatic Invasive Plants

Nonnative aquatic plant species may currently occur in portions of the plan area as well as outside the plan area. Aquatic invasive plant species like knotweeds (*Polygonum* spp.) can inundate streamside habitat in open areas, displace native vegetation, and increase streambank erosion (Oregon State University 2013).

The spread of aquatic invasive plant species can affect native species. Under the HCP, ODF will be managing the RCAs in the permit area in accordance with BGOs to ensure that riparian and aquatic habitat is maintained (e.g., riparian forests, shading, no harvest) to benefit the covered species. If an invasive aquatic plant were to expand its range within the permit area, to the point it becomes a limiting factor for the habitat quality for covered species, ODF will work with the U.S. Department of Agriculture to identify the measures necessary to eradicate the plant.

Changed Circumstance

- Spread of aquatic invasive plants species within an RCA that affects up to 25% of stream miles within any given independent Hydrologic Unit Code (HUC) 10 population or distinct population segment of the covered fish species within a 3-year time period. Any new invasion that expands beyond 25% within a 3-year time period will be considered unforeseen.

Response

ODF will address changed circumstances using manual, mechanical, and biological treatments to manage new occurrences of invasive plant infestations in the permit area. For unforeseen circumstances, such as an expansion of nonnative fish and disease or parasitic loading that negatively affects covered fish species, ODF will coordinate with the Oregon Department of Fish and Wildlife and the Services on what measures, if any, should be taken. Any response would be consistent with the terms and conditions of the HCP and permits, but ODF would not be required to commit additional funding or resources, beyond those already committed to in the HCP.

¹ The permit area is divided into two subgeographic areas: the North Coast and rest of the permit area, as introduced in Chapter 4, Section 4.7.6.3, *Modifying Habitat Conservation Area Boundaries*.

7.3.3.4 Stream Temperature Changes

Climate change is projected to raise temperatures and alter the flow regimes of streams and rivers in the permit area, which will have consequences for physical processes and aquatic organisms, including covered aquatic species and their habitats. Water temperature plays a critical role for fish and other aquatic organisms in rivers and streams because their biological processes are directly controlled by ambient water temperatures (Neuheimer and Taggart 2007; Buisson et al. 2008; Pörtner and Farrell 2008; Durance and Ormerod 2009). As climate change continues to affect normal weather patterns in the Pacific Northwest, the projected effects manifest largely as a warming of air temperature (Barnett et al. 2008; Intergovernmental Panel on Climate Change 2013; Walsh et al. 2014), changes in seasonal patterns of snow accumulation and stream runoff (Luce et al. 2013; Mote et al. 2005; Stewart et al. 2005), and increasing wildfires (Littell et al. 2016; Westerling et al. 2006). All of these changes affect stream temperature and flow.

Changed Circumstance

Although water temperature varies over time, based on location, time of day, and season, stream temperatures across the Pacific Northwest averaged 58 degrees Fahrenheit (°F) (14.2 degrees Celsius [°C]) from 1993 to 2011 (Isaak et al. 2018). Using the framework provided by the National Hydrography Dataset, recent stream temperature records from 22,700 stream and river sites were used to create the NorWeST database of long-term stream temperature measurements and associated covarying environmental factors (Isaak et al. 2017). Coupling these temperature models with an ensemble of gridded air temperature models enabled authors to provide strong predictions of summertime (August) climate scenarios in western perennial waters in specific regions of Oregon (Isaak et al. 2017).

Based on the NorWeST ensemble projections, water temperatures in perennial streams and rivers in the permit area can be expected to increase, on average, by 2.43°F and 4.18°F (1.35°C and 2.32°C) by the 2040 and 2080 average climate periods,² respectively (Isaak et al. 2017). This amounts to an average increase of 0.43°F (0.24°C) in August perennial stream temperatures each decade, potentially increasing by 3.02°F (1.68°C) by the end of the 70-year permit term.³ These predictions are based on climate models with a +2°F to +7°F (2°C to 4°C) increase in air temperature by the end of the century (2100) in the western United States; they apply only to perennial streams.⁴

At the statewide level, the Seventh Oregon Climate Assessment (Fleishman et al. 2025) projects statewide air temperature increases of +5°F by 2074 and +7.6°F by 2100, with the largest seasonal increases in summer (air temperature is strongly correlated with stream temperature). In addition, annual precipitation is projected to increase by 0.3 inch per decade, but potential evapotranspiration also increases in these models at rates that outpace gains in precipitation (Fleishman et al. 2025). Stream warming projections are smaller than atmospheric warming projections because streams are buffered by groundwater, shading, and hydrology to various degrees (Fuller et al. 2022). Groundwater-fed seeps and springs tend to show low seasonal and

² Relative to the 1993 to 2011 baseline derived from 213,130 miles (343,000 kilometers) of western perennial streams and forecasts available from the NorWeST database for the major river basins in the Lower Columbia, Mid-Coast, North Coast, Rogue, Umpqua, and Willamette river basins (Isaak et al. 2017).

³ Assuming a linear rate of increase. The global climate models used in Isaak et al. (2017) also anticipate accelerated warming trends.

⁴ Based on the Intergovernmental Panel on Climate Change Fourth Assessment Report (2007).

interannual variability compared to surface-runoff streams due to the thermal inertia and time delay of underground flows (Button and Piovia-Scott 2025). However, general forest-wide thermal stress and changes to snow pack dynamics could slow seasonal recharge of aquifers and lead to warming of groundwater under some conditions, particularly when recharge deficits persist across decades or where aquifers are shallow and perched or within fractured colluvium or hillslopes (Cartwright and Johnson 2018).

Based on the summertime climate scenarios derived from the NorWeST model discussed above, summertime perennial stream water temperatures that rise more than 0.43°F (0.24°C) above the natural baseline every 10 years during the permit term would be considered unforeseen. ODF will consult with the Services during each 10-year comprehensive review to re-evaluate modeled climate scenarios and consider modifying the threshold for unforeseen circumstances, based on the best available science.

Response

In response to foreseeable changes in water temperature and flow from environmental variability, ODF will take responsive measures to reduce impacts on water quality and quantity. The measures include, but are not limited to, the following.

- Re-evaluate riparian buffer and management strategies to enhance riparian processes, including aquatic shade, the delivery of large wood, stabilization of streambanks, and floodplain connectivity in locations where stream temperature monitoring results show deficiencies.
- Implement targeted riparian planting strategies that increase tree densities and improve stand health to promote the growth of the riparian area.
- Reconnect streams to floodplains and protect seeps, springs, and wetlands, thereby protecting microrefugia, facilitating flow (including hyporheic), and creating water-related temperature benefits.
- Increase the potential of large wood contributions to streams through management of the buffers within the RCAs to promote shading and large wood in streams. Increased bed load will lead to cooler groundwater temperatures, thereby reducing stream temperatures.
- Implement stream enhancement projects in targeted locations, focusing on increasing suitable habitat conditions for the covered fish species.
- Manage RCAs to increase beaver habitat and presence where possible to create improved habitat conditions for covered fish species.

8.1 Overview

This chapter describes how the Western Oregon State Forests Habitat Conservation Plan (HCP) will be implemented, including the roles and responsibilities of participating state and federal agencies, data tracking and reporting, coordination during implementation, and plan modifications. Internal policies, field manuals, and guidance documents will be developed to provide direction for HCP implementation by all Oregon Department of Forestry (ODF) staff. The ODF Operation Plans for Fiscal Year 2024 forward, including timber sales and projects, have been developed and implemented in compliance with the goals and strategies of this HCP (Chapter 4, *Conservation Strategy*).

8.2 Implementation Roles and Responsibilities

8.2.1 Oregon Department of Forestry

ODF will oversee HCP implementation, including staffing internal positions, hiring consultants, reporting, monitoring, and maintaining all program records. ODF staff includes biologists, foresters, administrators, and other natural resource specialists who will carry out planning, monitoring, adaptive management, and necessary or required coordination with and reporting to the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries (collectively, referred to as the Services). To implement the HCP, ODF will assign HCP implementation responsibilities to staff within the State Forests Division to ensure HCP compliance. ODF will have full decision authority, subject to agreement of the Services, for adaptive management decisions, as well as any changes to the HCP itself and the associated incidental take permits (ITPs) (Section 8.7, *Decision-Making in Implementation*). Chapter 9, *Costs and Funding*, Table 9-1 summarizes assumptions about staff time and time allocation across the HCP program.

8.2.1.1 Habitat Conservation Plan Administrator

ODF will assign HCP implementation responsibilities to the Biological Support Unit Manager within the State Forests Division, who will serve as the HCP Administrator. The HCP Administrator will serve as a point of contact for HCP-related issues between ODF, the Services, and the Oregon Department of Fish and Wildlife (ODFW). The HCP Administrator is expected to report to the Deputy Division Chief, and will also provide support for and oversee the following tasks.

- Develop and maintain annual budgets and work plans for HCP implementation. Annual budgets will be incorporated as specific line items into the State Forests Division's fiscal budgeting process and Operations Plans.
- Coordinate communication and decision-making within ODF on HCP implementation and between ODF, the Services, and ODFW, as needed.

- Coordinate compliance and effectiveness monitoring activities.
- Maintain effectiveness and compliance monitoring and survey data reports and archives, including monitoring results.
- Coordinate production of an annual reports and reviews with the Services, along with 5-year mid-point check-ins and 10-year comprehensive reviews (Section 8.5, *Reporting*).
- Coordinate the development of policies needed to communicate HCP expectations and requirements to staff.
- Coordinate updates to existing policies, guidelines, and business practices to align with HCP requirements, as needed.
- Ensure adequate training for ODF staff on HCP implementation, including all compliance requirements.
- Ensure internal HCP-related questions are resolved.
- Coordinate expenditures from the Conservation Fund (Chapter 9, Section 9.4.1.3, *Habitat Conservation Plan Conservation Fund*) and priority of projects.

8.2.1.2 Data Analyst

The State Forests Division Information Management Specialist will serve as the lead Data Analyst for the HCP and will develop a geographic information system (GIS) and other database systems to collect, store, and use spatial data necessary for HCP implementation. Compliance and effectiveness monitoring will be tracked in part through the GIS database system. In addition, the status and trends of covered species habitat across the plan area will be tracked through this system, combined with timber stand inventory data.

8.2.1.3 Staff and Field Biologists

The Staff Wildlife Biologist and Staff Aquatic Biologist, within the State Forests Biological Support Unit, will serve as the lead biologists for the terrestrial and aquatic HCP strategies, respectively. They will provide policy direction and technical assistance for implementing HCP conservation actions in the permit area, help guide key monitoring and adaptive management, and assist in the selection and prioritization of projects that will receive expenditures from the Conservation Fund (Chapter 9, Section 9.4.1.3, *Habitat Conservation Plan Conservation Fund*).

Two field biologists will be primarily responsible for implementing HCP conservation actions as part of ODF's regular planning cycles and providing direct technical assistance to field foresters (e.g., leave-tree selection). These positions are also within the State Forests Biological Support Unit and will work closely with the staff biologists to ensure consistency in application of conservation actions.

8.2.1.4 Other Specialists

Other specialists will collaborate with the positions listed previously to implement the conservation actions. While many specialists will be needed to support HCP implementation, collectively, their time will comprise one full-time position, as shown in Chapter 9, Table 9-1.

The following lists includes some of the other specialist positions and their associated management unit within ODF.

- **State Forests Engineer (Planning Unit).** Consults with field Roads Specialists to minimize road effects in habitat conservation areas (HCAs) and riparian conservation areas (RCAs), consults on best management practices in road design and fish passage structures, and helps prioritize and implement restoration activities related to vacating of roads.
- **State Forests Geotechnical Specialist (Planning Unit).** Evaluates potential landslide initiation areas or other features that may affect RCAs, and buffers features to ensure RCA strategies for potentially unstable slopes function as intended.
- **State Forests Adaptive Management Specialist and Monitoring Specialist (Information Unit).** Plans, coordinates, and implements monitoring and adaptive management activities for the HCP, and suggests improvements to conservation actions to more efficiently and effectively achieve the biological goals and objectives.
- **State Forests Forest Analyst (Information Unit).** Conducts modeling and analysis of habitat suitability, using metrics derived from forest inventory data.

8.2.2 Oregon Board of Forestry

After the National Environmental Policy Act (NEPA) process and federal permit decisions are completed, ODF will begin HCP implementation and the HCP Administrator will provide the Board of Forestry with periodic updates on the status of HCP implementation and progress toward achieving the biological goals and objectives of the HCP.

The Board of Forestry is also responsible for approving Forest Management Plans (FMPs) that guide the operations of ODF. The FMP for the permit area will be aligned with the provisions, standards, and biological goals and outcomes of the HCP and is, therefore, consistent with the HCP. The FMP cannot alter the HCP without an HCP modification as described in Section 8.9, *Modifications to the Habitat Conservation Plan*.

8.2.3 Oregon Land Board and Department of State Lands

As described in Chapter 1, *Introduction*, the HCP permit area includes 25,826 acres of *Common School Forest Lands* that are certified for management by ODF. The Oregon Land Board oversees these lands through the Department of State Lands (DSL). The DSL Real Estate Asset Management Plan directs DSL to manage forestland “in accordance with plans adopted by the Land Board in cooperation with the Board of Forestry.” Approximately 23% of the Common School Forest Lands owned by the Oregon Land Board and managed by ODF (about 5,800 acres) are relatively small, isolated parcels that currently support limited or no timber harvest due to steep slopes, a lack of suitable forest cover, or other constraints. Because of their small size and isolation, these parcels are also often difficult and costly to access, often making harvest financially infeasible. DSL is exploring whether to decouple these small or isolated parcels from the Common School Forest Lands program, a process called *decertification*.

If approved by the Oregon Land Board, decertification would transfer management responsibility of the decertified lands from ODF to DSL while retaining the lands in state ownership. If decertification

occurs, DSL would retain these lands in the HCP and manage these lands consistent with this HCP. Decertified lands designated by the HCP as either RCAs or HCAs would remain in these designations.

8.2.4 U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries

The Services will be responsible for assessing and ensuring that ODF's implementation of the HCP is consistent with the provisions and outcomes that informed the federal agencies' issuance of the ITPs. The Services are likely to perform the following activities in support of HCP implementation.

- Receive and review annual, 5-year, and 10-year reports submitted by ODF.
- Meet annually with ODF, and at other times as requested by ODF or the federal agencies to support successful implementation of the HCP. Determine if ODF is properly implementing the HCP in compliance with the HCP and any additional terms and conditions of each permit, based on the annual report, site visits, and other information provided by ODF or otherwise available to the federal agencies.
- Respond to requests by ODF for HCP modifications, permit amendments (Section 8.9, *Modifications to the Habitat Conservation Plan*), or other changes to the permit area (Section 8.8, *Changes to the Permit Area*).
- Work with ODF to provide input on implementation, including adaptive management responses (Chapter 5, *Monitoring and Adaptive Management*) and when making decisions about management actions inside HCAs, especially when there are tradeoffs among species.
- Work with ODF to address changed and/or unforeseen circumstances and possible remedial measures to address them, as described in Chapter 7, *Assurances*.
- Provide general technical assistance and guidance to ODF regarding interpretation and implementation of the HCP and conservation of the covered species, as requested by ODF or as determined by the federal agencies to be necessary.
- Enforce the provisions of the ITPs, as needed.

8.2.5 Oregon Department of Fish and Wildlife

ODFW may play a role in the implementation of the aquatic monitoring program (Chapter 5, *Monitoring and Adaptive Management*). ODFW may also serve as a technical advisor to ODF during HCP implementation, advising on implementation of conservation actions, the monitoring program, and application of the adaptive management program to inform changes in either the conservation actions or monitoring program. Costs associated with the aquatic monitoring program are summarized in Chapter 9, *Costs and Funding*, Table 9-3.

8.3 Technical Assistance

During HCP implementation, ODF may seek technical assistance from the Services or ODFW to most effectively comply with the HCP and ITPs and implement the conservation strategy. Technical assistance will be most valuable in situations not clearly defined by the HCP or ITPs, where ODF

needs assistance determining how to proceed with a particular action while remaining in compliance. For situations that are not clearly articulated or anticipated in the HCP or ITPs, ODF will work with the Services and ODFW to develop and implement practical solutions and new technologies and methods in a manner that is consistent with the intent of the HCP and ITPs. If it is determined during technical assistance that there needs to be a clarification to the HCP or a modification to the permit, up to and including an amendment, the process described in Section 8.9, *Modifications to the Habitat Conservation Plan*, will be followed.

8.4 Data Tracking

Proper data management, tracking, analysis, and reporting are critical to HCP implementation, including the monitoring and adaptive management program. Data on monitoring methods, results, and analysis must be managed, stored, and made available to staff, decision makers, the Services, and others, as appropriate. ODF will maintain the following data to support HCP implementation.

- The location, extent, and timing of loss and gains of species habitat.
- The location, extent, and timing of all conservation actions.
- The results of all HCP monitoring, including status and trends monitoring, described in Chapter 5, *Monitoring and Adaptive Management*, including changes in species habitat quality and quantity and trends in terrestrial habitat and aquatic inventory elements over time.

The comprehensive data repository for tracking will be operational within 12 months of permit issuance. These reports and other data will be stored and archived electronically and available whenever requested from USFWS and NOAA Fisheries.

8.5 Reporting

Reporting will occur on three timescales during implementation: annual reports, 5-year check-ins, and 10-year comprehensive reviews. The timing of reports serves multiple purposes, including some annual accounting of compliance with the HCP and ITPs and longer term, 5- and 10-year reviews of implementation of conservation actions. The 10-year comprehensive reviews are specifically designed to inform the 10-year implementation planning process, which guides forest management planning for the State Forests Division.

8.5.1 Annual Reporting

ODF will prepare and submit an annual report for the duration of the permit term detailing, among other things, compliance, habitat loss, conservation actions, and monitoring activities and results. The annual reports will summarize the previous state fiscal year's implementation activities (July 1 through June 30). Draft annual reports will be provided to the Services by November 15 of each year.¹ Annual reports will require synthesis of data and reporting on important trends. A due date of

¹ Depending on when ITPs are issued with respect to the reporting period, there might not be meaningful implementation activity to report by the first November 15 delivery date. If ODF and the Services agree that this is the case, delivery of the first draft annual report might be deferred to the following November 15 to include all activities since issuance of the ITPs.

November 15 will allow time for the data to be assembled, analyzed, and presented in a clear and concise format. If ODF requires more time to prepare and submit the draft annual report, ODF may request from the Services a 30-day extension of this deadline. An annual meeting to review the above submitted information, resolve any associated issues, and address any other issues will be held with the Services and ODFW between November 15 and January 31. Within 30 days of the annual meeting and any follow up discussion between ODF and the Services, ODF will finalize the annual report and submit it to the Services. The final annual report will include descriptions of any substantive issues that emerged during the Services' review of the draft and associated resolutions that were developed. In addition to submitting to the Services, final annual reports will be made available to the public and posted on the ODF website.

Annual reporting provides essential information for the Services to track take and compliance with the ITPs. The goals of the annual reports are to demonstrate to the Board of Forestry, the Services, and the public that ODF is implementing its commitments to comply with the ITPs and implement the standards, provisions, and conservation actions identified in the HCP. An important component of this demonstration will be disclosure of any implementation problems that have occurred, and the corrective measures planned or that have been taken to address the problems. The reports will also identify past and expected future changes to the management and monitoring program, adaptive management, and remedial actions needed to address changed circumstances. The annual reports are not expected to report on every item tracked by ODF during implementation,² but will focus on those items identified by the Services as necessary to assess compliance, impacts, effectiveness, and specific provisions of the ITPs and biological opinions. The specific details of which information will be regularly included in the annual reports will be developed through discussion between the Services and ODF and finalized no later than 180 days after issuance of the ITPs. Which details are included in annual reports can be modified throughout the permit term as agreed upon between the Services and ODF.

The typical content of the annual reports is likely to include, but not be limited to the following items.

- A list and description of any activities related to compliance that do not fall within the exceptions identified in Chapter 4, *Conservation Strategy*, and the proposed remediation.
- Amount, location, and type of HCA management activities.
- Amount and general location of modeled habitat for covered terrestrial species lost to covered activities, and amount and general location of modeled terrestrial habitat, including status of Stay-Ahead provision.
- Amount and general location of aquatic covered species habitat and riparian area altered to covered activities in the RCAs.
- A summary of expenditures from the Conservation Fund (Chapter 9, Section 9.4.1.3, *Habitat Conservation Plan Conservation Fund*), including an accounting of the proportion of funds expended on aquatic and terrestrial species conservation actions.

² However, the Services will have full access to all other tracked items will instead be made available through other mechanisms upon request or through access to digital dashboards or their equivalent.

- An explanation of how expenditures from the Conservation Fund (Chapter 9, Section 9.4.1.3, *Habitat Conservation Plan Conservation Fund*) are addressing the limiting factors for covered species and offsetting the impacts of habitat loss that may have occurred from covered activities.
- Acres of timber harvest by type and location.
- Miles of roads surveyed for hydrological connectivity, including miles unconnected, connected, and/or hydrologically disconnected by ODF.
- Miles of roads and trails constructed and vacated, including location within or outside of RCAs and HCAs.
- New roads constructed within 200 feet of streams.
- Current conditions and long-term trends in stream temperature, channel shade, and fine sediment.
- All boat ramps constructed in RCAs.
- HCA management activities slated for the upcoming fiscal year.
- Documentation of any known instances of direct mortality of covered species.
- Locations, methods, species, and life stages of covered species captured during aquatic organism rescue/salvage projects.
- Summary of communication with federal agencies that occurred over the year.
- Description of any changes in HCP implementation resulting from the adaptive management process during the reporting year, as applicable. This description will include the information that triggered the change, rationale for the planned responses, and results of any applicable monitoring actions.
- Summary of surveys conducted through the monitoring program for the reporting year, including a description of surveys conducted, protocols used, and survey results.
- Discussion of possible changes to the monitoring and research program based on interpretation of monitoring results and research findings, if applicable.
- Documentation of any changed circumstances described in Chapter 7, *Assurances*, that were triggered during the reporting year, if applicable. If any such circumstances were triggered, the report will also include any responses implemented (i.e., remedial measures) and resulting monitoring.
- If changed circumstances were triggered in prior years, documented ongoing responses to those past changed circumstances in the current reporting year, and the ongoing results of remedial measures.
- Any administrative changes or amendments proposed or implemented during the reporting year (Section 8.8, *Changes to the Permit Area*).

8.5.2 5-Year Mid-Point Check-Ins

ODF operates on 10-year implementation planning cycles that guide forest management activities at the district level. Halfway through any given implementation planning cycle (i.e., at year 5 of each 10-year implementation cycle) there will be a mid-point check-in focused on effectiveness and progress toward the HCP's biological goals and objectives through implementation. The intent of the mid-point check-in is to assess trends and identify if adaptive management is necessary.

The 5-year mid-point check-ins are likely to include the following content.

- Amount and general location of modeled habitat for covered terrestrial species lost to covered activities and amount and general location of modeled terrestrial habitat, including status of Stay-Ahead provision.
- AQI trends in riparian areas altered by covered activities in RCAs.
- A summary of expenditures from the Conservation Fund (Chapter 9, Section 9.4.1.3, *Habitat Conservation Plan Conservation Fund*), including an accounting of the proportion of funds expended on aquatic and terrestrial species conservation actions.
- An explanation of how expenditures from the Conservation Fund (Chapter 9, Section 9.4.1.3, *Habitat Conservation Plan Conservation Fund*) are addressing the limiting factors for covered species and offsetting the impacts of habitat loss that may have occurred from covered activities.
- Acres of timber harvest with relevant spatial data.

The specific details of which information will be included and addressed through the 5-year mid-point check-ins will be evaluated during annual meetings and other ongoing coordination between ODF and the Services and is likely to change over time. At least 45 days prior to each 5-year mid-point check-in, ODF and the Services will develop the agenda and focus that will guide the upcoming check-in.

8.5.3 10-Year Comprehensive Reviews

ODF will conduct 10-year comprehensive reviews to inform implementation planning and make any adjustments needed to remain in compliance with the HCP and ITPs. These reviews will include information from the annual reports in the intervening 10 years and the summary provided in the 5-year mid-point check-in and will examine whether any program-level or systemic changes need to occur to adjust the level or location of habitat loss, the type of management activities, or the type or location of conservation actions that are being implemented. For example, if different choices need to be made regarding how habitat is managed inside of HCAs or where Conservation Fund (Chapter 9, Section 9.4.1.3, *Habitat Conservation Plan Conservation Fund*) dollars are spent for aquatic enhancement projects, the need for those decisions could emerge during the 10-year review, and changes that result could be codified in implementation plans or other State Forests Division operational policy changes as described in Chapter 5, *Monitoring and Adaptive Management*. Information generated during the 10-year comprehensive review process will be informed by ODF staff along with the Services and ODFW. To the extent practicable, the annual meeting, annual report, and associated discussions between the Services and ODF for the reporting period immediately prior to each planned 10-year comprehensive review should identify these issues and focus what will guide the upcoming review.

8.6 Contract Administration

Several conservation measures, including the execution of timber sales and project work (e.g., road construction), will be implemented wholly or in part by operators contracted to ODF through a formal bidding process. ODF prepares all contracts for timber sales and project work in compliance with applicable HCP requirements and administers them throughout the course of each contract to ensure operators continue to meet those protections and obligations. After ITP issuance by the Services, ODF will modify all future bid specifications and contracts for timber sales to conform to the requirements of the HCP. These future timber sale specifications and contracts will require all timber operators to implement the appropriate avoidance, minimization, and mitigation measures described in Chapter 4, *Conservation Strategy*. Through these mechanisms, ODF maintains oversight and ensures that all required protections are in place, with operators responsible for implementing key aspects of the conservation program.

ODF retains the responsibility for ensuring that all covered activities are carried out in compliance with the HCP. ODF contracts contain provisions to ensure contractors and operators adhere to federal and state law, including this HCP. ODF maintains control over operations by suspending work, charging increased rates for falling or removal of reserved trees, and termination of the contract, if the operator cannot come into compliance. ODF will report operator violations during annual reports, along with any punitive and remedial actions taken. ODF field-verifies timber sales and projects to ensure its compliance with the HCP and any additional terms and conditions of the ITPs.

8.7 Decision-Making in Implementation

As described in this chapter, ODF is responsible for day-to-day implementation of this HCP. ODF will be making almost all decisions related to HCP implementation within the authority provided to them by the Services through the ITPs.³ ODF will coordinate regularly with the Services on HCP implementation to ensure that any issues that arise are addressed quickly and with the input from the Services. In rare instances, ODF may need to deviate from the HCP requirements for practical reasons that cannot be predicted over the 70-year timeframe. In those instances, ODF and the Services will confer to discuss and reach agreement on those deviations.

8.8 Changes to the Permit Area

As described in Chapter 1, *Introduction*, the permit area consists of the lands that ODF operates on at the time of permit issuance. As further described in Chapter 1, Section 1.2.2, *Permit Area*, ODF acquires or disposes of forest parcels in order to consolidate its ownership, increase public use opportunities of state forestland, improve management efficiency, reduce adverse environmental effects, and reduce neighbor conflicts. A plan area has been designated around the permit area to account for and accommodate such future changes in ODF-managed lands through acquisitions and exchanges. Because the permit area will comprise the lands on which ODF is operating, it may change over time, but will never extend outside of the plan area.

³ Some decisions will be the responsibility of the Services, such as whether to approve HCP modifications and permit amendments (Section 8.9, *Modifications to the Habitat Conservation Plan*).

When ODF acquires or disposes of lands in the permit area, ODF will notify the Services describing the location, legal description, and conditions of the land proposed for inclusion or removal from permit coverage, and include the following information.

- Reason for the proposed change.
- Location relative to the existing permit and plan area.
- Characteristics of lands proposed for inclusion and/or removal, including:
 - Forest stand conditions and distribution of forested lands.
 - Amount and/or distribution of critical habitat, roads and road crossings, and stream types and length.
- Whether and how the acquisition or disposal of land meets the criteria in Section 8.9.1, *Habitat Conservation Plan Modifications (Corrective Revisions and Plan Clarifications)*.
- Whether and how the acquisition or disposal of land affects the conservation strategy, including the extent and timing of outcomes.

The Services will use reasonable efforts to notify ODF within 60 days of receiving the above notice, whether the information provided is complete and whether the proposed acquisition or exchange may be processed as an HCP modification or a permit amendment, in accordance with Section 8.9, *Modifications to the Habitat Conservation Plan*. The Services may choose to process the request at the time of notification, or batch similar requests for processing at the end of each calendar year.

ODF will develop and maintain a publicly accessible website that provides up-to-date maps of the permit area and legal descriptions of lands acquired or exchanged after initial permit issuance. Website information will be updated within 30 days of the Services' written acknowledgement of the relevant HCP modification or approval of the permit amendment. All changes to the permit area, regardless of the process used, will be included on ODF's website. The Services will also document changes to the permit area through permit addenda as needed.

8.9 Modifications to the Habitat Conservation Plan

The HCP and associated ITPs may be modified in accordance with the federal Endangered Species Act (ESA), the Services' implementing regulations, and the provisions outlined in this section. HCP or permit modifications are expected to be rare. Modifications to the HCP may be requested by either ODF or the Services. The Services also may amend their permit at any time for just cause, and upon a written finding of necessity, during the permit term in accordance with 50 Code of Federal Regulations (CFR) Section 13.23(b) and the No Surprises assurances described in Chapter 7, *Assurances*. Amendment of the permit may be triggered by some HCP modifications, even when an HCP amendment is not required. HCP modifications are considered either HCP modifications or permit amendments, as described below.

8.9.1 Habitat Conservation Plan Modifications (Corrective Revisions and Plan Clarifications)

Minor HCP modifications may be acknowledged by the Services through an exchange of formal correspondence with the permittee, followed by an addendum or revision to the HCP. Any request to modify the HCP will include a statement of the reason for the proposed modification, an analysis of any environmental effects, including effects on operations under the HCP and on covered species, the conservation strategy, and the permittee's ability to achieve the HCP's biological goals and objectives. Following acknowledgement by the Services, HCP modifications will be made publicly available through updates on a website maintained by the permittee.

HCP modifications may be acknowledged by the Services through an exchange of formal correspondence with ODF, followed by an addendum or revision to the HCP. Any request to modify the HCP will include a statement of the reason for the proposed modification, an analysis of any environmental effects—including effects on operations under the HCP and on covered species, the conservation strategy, and ODF's ability to achieve the HCP's biological goals and objectives—and, where relevant, the information required in Section 8.9, *Modifications to the Habitat Conservation Plan*. Following acknowledgement by the Services, HCP modifications will be made publicly available through updates on ODF's website.

Generally, HCP modifications may be appropriate for minor changes, such as the following.

- Correction of typographical, grammatical, or similar editing errors.
- Clarification of vague or undefined language or phrases.
- Correction of errors in maps or exhibits.
- Slight modifications to avoidance and minimization measures.
- Minor changes to survey, monitoring, or reporting protocols.

HCP modifications may also be appropriate for other changes, including for certain land acquisitions or exchanges, should they occur, or where the effects on covered species, the conservation strategy, and ODF's ability to achieve the HCP's biological goals and objectives are either beneficial or not significantly different than those analyzed for the initial permit issuance. In general, this includes changes that will not increase or change impacts as analyzed in the HCP, environmental impact statement, biological opinions, and permit issuance documents, and changes that will not increase or change the impact of the taking as authorized by the ITPs.

8.9.2 Permit Amendments

Substantial changes beyond those described above would likely require a permit amendment, which will require a review to ensure NEPA and ESA compliance for the amendment, which may include a *Federal Register* notice. Any request to amend the permit will include a statement of the reason for the proposed amendment, an analysis of any environmental effects, including effects on operations under the HCP and on covered species, the conservation strategy, and ODF's ability to achieve the HCP's biological goals and objectives.

Examples of changes that would require a permit amendment include, but are not limited to, the following actions.

- Changes to the permit area that increase or change the level or type of impact on the covered species beyond that authorized.
- Changes that may result in impacts not analyzed in the HCP, environmental impact statement, biological opinions, or permit issuance documents.
- Changes that cause a significant reduction or delay in attainment of expected conservation outcomes.
- Changes in the conservation strategy that no longer offset the impacts of take on one or more covered species.
- ODF's ability to achieve the HCP's biological goals and objectives and, where relevant, the information required by Section 8.9, *Modifications to the Habitat Conservation Plan*.
- The impacts of take on one or more covered species.

8.9.3 Process Determination

In all cases, the Services will decide the level of review needed to satisfy statutory and regulatory requirements and will determine whether the proposed change may be processed as an HCP modification or if a permit amendment is required.

8.10 Permit Suspension or Revocation

The Services have the ability under federal law to suspend or revoke all or a portion of the ITPs if ODF is out of compliance with the HCP or ITPs. USFWS and NOAA Fisheries each have the ability to suspend or revoke all or a portion of the ESA Section 10(a)(1)(B) permit it issues if continuation of covered activities would appreciably reduce the likelihood of the survival and recovery of a covered species in the wild (50 CFR 17.22(b)(8), 17.32(b)(8)), or if ODF does not comply with the conditions of its permits (50 CFR 13.27, 13.28).

If the permit is revoked, ODF will have to fulfill all outstanding mitigation requirements for any take impacts that occurred prior to the revocation, including land management actions and restoration/enhancement actions.

9.1 Introduction

The federal Endangered Species Act (ESA) requires that habitat conservation plans specify, “the funding that will be available to implement” conservation actions that minimize and mitigate impacts on covered species (16 U.S. Code [USC] 1539(a)(2)(A)). The ESA also requires the U.S. Fish and Wildlife Service (USFWS) and the National Atmospheric and Oceanic Administration (NOAA) Fisheries (collectively, referred to as the Services) to find that the applicant will ensure adequate funding is available to implement the Western Oregon State Forests Habitat Conservation Plan (HCP). This chapter outlines the estimated costs to implement the HCP over the proposed 70-year permit term and provides assurances that the Oregon Department of Forestry (ODF) will pay those costs.

9.2 Implementation Costs

As described in Chapter 8, *Implementation*, ODF staff will oversee implementation of the HCP. Staff will include administrators, data analysts, and natural resource specialists who will carry out the conservation strategy, monitoring, adaptive management, and coordination with the Services. The cost to implement the HCP is divided into five categories, summarized in the following subsections.

- Plan Administration and Staffing
- Conservation Strategy
- Monitoring
- Adaptive Management
- Remedial Measures for Changed Circumstances

All estimated costs were provided by ODF staff for the same or similar actions conducted currently. In cases where actual ODF cost data were unavailable (e.g., new HCP costs), costs were estimated based on similar actions conducted by other entities in the state or data from comparable HCPs in other states.

The cost estimates are planning-level estimates only for the purpose of demonstrating assured funding for the HCP. ODF will prepare an annual budget to implement the HCP that may differ from these cost estimates (either more or less). These cost estimates are not required funds ODF must spend, but rather reasonable estimates of total HCP costs over the entire permit term.

The implementation costs outlined in this section are expressed in 2024 dollars. These costs are not adjusted for inflation because funding is expected to increase at the same rate as costs are expected to increase. All revenue sources that fund ODF operations, including HCP implementation, are reevaluated each year and adjusted for inflation, as necessary. This is discussed further in Section 9.4, *Implementation Funding*.

9.2.1 Plan Administration and Staffing

Program administration involves ongoing or yearly costs associated with staff time for coordination, agency meetings, activity tracking, and reporting. The HCP Administrator, staffed by ODF, will be responsible for oversight of compliance monitoring and reporting and coordinating issue resolution with the Services. A data analyst will maintain and update a database(s) of spatial data necessary for tracking covered activities and conservation actions. The HCP conservation program will be overseen by the HCP Administrator, Staff Wildlife Biologist, and Staff Aquatic Biologist and will be implemented by two full-time field biologists. Other specialists will be involved in HCP implementation as needed. See Chapter 8, Section 8.2, *Implementation Roles and Responsibilities*, for more details on the roles and duties of these positions and Table 9-1 for a summary of estimated time commitments by each position.

The costs of the unit manager, staff biologists, and other specialists are split between several cost categories to recognize their roles in HCP implementation (Table 9-2). It is expected that the actual staffing needs of the HCP program will vary seasonally and from year to year. For example, staffing costs during the first several years of HCP implementation are expected to be greater than costs at other times because of the need to establish new procedures and data tracking systems and when coordination with state and federal partners may be more extensive. This cost estimate, therefore, represents a long-term average of staffing needs and costs used only for the purposes of the HCP cost estimate. ODF will always provide staff and staff time necessary to properly implement the HCP.

Table 9-1. Habitat Conservation Plan Staffing Assumptions

Labor Category	FTEs	Years Needed	Cost Category
HCP Administrator	0.5	70	Plan Administration (100%)
Data Analyst	0.3	70	Plan Administration (100%)
Staff Wildlife Biologist	0.75	70	Conservation Strategy (67%) Monitoring (33%)
Staff Aquatic Biologist	0.75	70	Conservation Strategy (67%) Monitoring (33%)
Field Biologist	2.5	70	Conservation Strategy (20%) Monitoring (80%)
State Forest Engineer	0.25	70	Monitoring (100%)
Geotechnical Specialist	0.25	70	Conservation Strategy (100%)
Recreation Specialist	0.75	70	Monitoring (100%)
Monitoring Specialist	1.0	70	Monitoring (100%)
Inventory specialist	0.5	70	Monitoring (100%)
Adaptive Management Specialist	0.25	70	Monitoring (100%)
Forest Analyst	0.25	70	Monitoring (100%)
Total	8.05	--	--

FTEs = full-time employees

Table 9-2. Estimated Oregon Department of Forestry Staff Time and Costs During Permit Term (2024 dollars)

Labor Category	FTEs	Monthly Salary + OPE (FY2024)	Average Annual Cost Today	Total Cost Over 70 Years
HCP Administrator	0.5	\$15,327	\$91,962	\$6,437,340
Data Analyst	0.3	\$14,331	\$51,592	\$3,611,440
Staff Wildlife Biologist	0.75	\$13,990	\$125,910	\$8,813,700
Staff Aquatic Biologist	0.75	\$13,990	\$125,910	\$8,813,700
Field Biologist	2.5	\$12,110	\$363,300	\$25,431,000
State Forest Engineer	0.25	\$15,949	\$47,847	\$3,349,290
State Forest Geotechnical Specialist	0.25	\$14,690	\$44,071	\$3,084,953
State Forest Recreation Specialist	0.75	\$12,110	\$108,990	\$8,629,300
Monitoring Specialist	1.0	\$12,110	\$145,320	\$10,172,400
Inventory Specialist	0.5	\$12,110	\$72,660	\$5,086,200
Adaptive Management Specialist	0.25	\$12,110	\$36,330	\$2,543,110
State Forest Analyst	0.25	\$13,990	\$41,970	\$2,937,900
Total	8.05	--	\$1,255,862	\$88,910,333

OPE = Other Payroll Expense; FY = fiscal year; FTEs = full-time employees

9.2.2 Conservation Strategy

As stated in Chapter 4, *Conservation Strategy*, the conservation program implements the biological goals and objectives and fulfills the HCP requirement to avoid, minimize, and mitigate impacts of the taking to the maximum extent practicable.

Costs associated with the conservation strategy include the following conservation measures.

- Conservation Action 1: Establish Riparian Conservation Areas (e.g., treating stands with disease or invasive aquatic plant species; converting stands to higher quality covered species habitat).
- Conservation Action 2: Riparian Equipment Restriction Zones.
- Conservation Action 3: Stream Complexity.
- Conservation Action 4: Remove or Modify Artificial Fish-Passage Barriers.
- Conservation Action 7: Manage Habitat Conservation Areas.
- Conservation Action 9: Strategic Terrestrial Species Actions.

HCP staff will implement the conservation strategy by overseeing each of the conservation measures, including designing and implementing mitigation actions, as well as overseeing implementation of avoidance and minimization measures. ODF staff expected to support the conservation strategy are listed in Table 9-1.

Within each category, the levels of annual funding necessary to implement conservation actions under the Conservation Fund are estimated based on historical patterns of likely future needs (Section 9.4.1.3, *Habitat Conservation Plan Conservation Fund*). These estimates are included to demonstrate that the average annual funding range of \$900,000 to \$1 million will more than adequately cover the costs of implementing conservation actions. The annual estimates shown for

each category are neither a maximum nor a minimum that will be spent each year, but an average. Year-to-year spending on conservation activities will vary based on the type of projects being implemented and their complexity that year. Levels of conservation spending will also be relative to the level of effect on covered species from covered activities. By linking the Conservation Fund to harvest volume, there will inherently be more funding available in years of higher harvest when there are potentially more adverse effects on covered species habitat. Additionally, the full cost of conservation actions may not be borne by the Conservation Fund specifically, but in some instances will be supported as part of the project work associated with specific harvest operations.

9.2.2.1 Aquatic Restoration Activities

Chapter 4, Section 4.7.3, *Conservation Action 3: Stream Complexity*, describes stream enhancement activities that ODF will carry out during the permit term. These activities will primarily include the placement of large wood in stream channels and complex floodplain reconnection projects to introduce materials that will enhance and reestablish the physical and biological processes to stream channels. Typically, these activities will be associated with the harvest program to create efficiencies but will also be planned as standalone projects in cooperation with regional partners.

Over the course of 30 years (1995 to 2024), ODF has completed over 200 stream complexity projects, with an average of eight projects per year. During that timeframe, annual in-kind expenditures and outside contributions from grant sources varied due to operational, economic, and other factors. Under the HCP, the assumption is that the extent and type of restoration activities will be similar to what has been accomplished since 1995. ODF intends to spend, on average, \$325,000 annually from the Conservation Fund on aquatic restoration projects, totaling \$22,750,000 over the permit term.

9.2.2.2 Targeted Fish Barrier Removal or Upgrades

Some fish barrier removals or upgrades will occur as part of routine haul road upgrades associated with planned harvest activities. These are described in Chapter 4, Section 4.7.4, *Conservation Action 4: Remove or Modify Artificial Fish-Passage Barriers*. A subset of barrier removals or upgrades will occur as targeted conservation actions outside of the harvest program. ODF's regional partners may be interested in addressing fish barriers in locations that are not associated with planned harvest activities and, therefore, would not likely be candidates for passage upgrades as part of routine road upgrades or maintenance. In those instances, ODF may use Conservation Fund dollars to address fish-passage issues as part of a standalone stream enhancement project.

Conservation Fund dollars will not be spent on barrier upgrades associated with the timber harvest program unless the funding is being used to enhance an otherwise adequate upgrade to a more ecologically beneficial infrastructure upgrade. For example, if installation of a properly sized culvert would meet state and federal fish-passage requirements and improve fish passage, but a bottomless culvert or bridge would be a better ecological solution for covered species, Conservation Fund dollars could be used to pay for the difference between the adequate culvert and the upgraded solution.

9.2.2.3 Upland Restoration Activities

ODF will be investing in upland restoration activities that will benefit covered species inside of habitat conservation areas (HCAs). These activities will primarily include management activities in

stands that have marginal habitat suitability or are not currently suitable and that are unlikely to develop into better habitat during the permit term. Typically, this occurs when a stand has little potential to develop into suitable or highly suitable habitat within the permit term (e.g., stands infected by Swiss needle cast [*Nothophaeocryptopus gaeumannii*] or hardwood-dominated stands with little to no conifer component).

Where they have sufficient commercial value, these management activities are expected to pay for themselves. In certain situations, Conservation Fund dollars may be spent to supplement or otherwise pay for management of these stands. For instances in which stand initiation costs are prohibitive, the Conservation Fund may be used to pay for reforestation and young stand management activities needed to establish diverse early seral forests that will, over time, grow into covered species habitat. ODF will manage 1,000 acres of stands like this annually (on average) during the permit term, at an average reforestation cost of \$400 per acre, resulting in an annual average reforestation cost of \$400,000 per year. These activities are largely expected to occur during the first 30 years of the permit term. Reforestation in HCAs will cost approximately \$7,360,000 over that period.

9.2.2.4 Contribution to Strategic Terrestrial Species Conservation Action

Chapter 4, Section 4.7.9, *Conservation Action 9: Strategic Terrestrial Species Actions*, outlines ODF's commitment to contributing funds to address strategic conservation actions for terrestrial covered species. At any point during the permit term, priorities for strategies that are most important may change, but the intention is to use the Conservation Fund to address key issues or constraints that limit the effectiveness of the remainder of the conservation strategy described in the HCP. The conservation strategy will result in an increase in habitat for all terrestrial covered species, but if there are other factors that limit the ability of covered species to take advantage of the new habitat (e.g., local extirpation of northern spotted owls or isolated red tree vole populations), this fund could be used to address those limiting factors.

For example, regardless of the amount and type of habitat that is in the permit area, barred owls continue to stress northern spotted owl populations. Annually, \$250,000 of the Conservation Fund would be used to establish or support regional barred owl management projects/programs. ODF could work in concert with regional partners, including the Oregon Department of Fish and Wildlife (ODFW), USFWS, Bureau of Land Management (BLM), and U.S. Forest Service (USFS) to conduct barred owl (*Strix varia*) management activities across private, state, and federal lands. Additionally, at some point in the future, provided barred owl management can be successful, there may be interest in reintroducing northern spotted owls (*Strix occidentalis caurina*) onto Oregon forests or developing a captive breeding program to boost owl numbers in western Oregon, similar to ongoing efforts in British Columbia (Fenger et al. 2007). In the permit area, HCAs would serve as candidate locations for those releases, and ODF could partner with other organizations and agencies to create such a program. Finally, one of the limiting factors for red tree vole (*Arborimus longicaudus*), Oregon slender salamander (*Batrachoseps*), and coastal marten (*Martes caurina humboldtensis*) is a lack of understanding of population stressors and, in some cases, a basic understanding of how species use habitat on state lands and what conservation actions are likely to be most successful. Conservation funds could be used to strategically address research questions needed to more effectively execute the conservation strategy over time for these species.

ODF's contribution to strategic terrestrial species conservation actions will be an average annual contribution of approximately \$1.5 million, with some of this funded by commercial value from

management activities and some from the Conservation Fund. The timing of the expenditure of these dollars will be dependent on the need and opportunities presented by regional partners. Specifically, the \$250,000 specifically allocated for barred owl management may require increased spending in certain years, or multiple efforts over the permit term, to ensure adequate removal to achieve spotted owl conservation objectives. The activities discussed in this chapter are just examples of the type of programs or projects that could be implemented; others will likely be identified during implementation. These activities are not defined in more detail in the HCP because the need and efficacy of them is not known at this time, but ODF will continue to explore these activities in collaboration with the Services, BLM, USFS, and ODFW during HCP implementation.

9.2.3 Monitoring and Adaptive Management

9.2.3.1 Monitoring Actions

The HCP monitoring program is described in Chapter 5, *Monitoring and Adaptive Management*. Monitoring the outcomes of conservation measures is the foundation of the HCP's conservation program and adaptive management approach and can help advance scientific understanding to better achieve the HCP's biological goals and objectives. The monitoring actions will result in the costs shown in Table 9-3. These costs include both staff costs and material costs associated with the monitoring program.

Table 9-3. Estimated Costs of Monitoring Actions Annually and During the Permit Term

Monitoring Action	Estimated Annual Cost	Total for 70-year Permit Term
Aquatic monitoring program ^a	\$404,488 ^a	\$28,134,160
Terrestrial monitoring	\$1,500,000 ^b	\$105,000,000
Road program compliance monitoring	\$48,396	\$3,387,720
Aquatic restoration monitoring	Included in costs estimates for restoration projects	--
Upland restoration monitoring	Included in costs allocated to Conservation Fund	--
Barred owl management effectiveness monitoring	Included in costs for terrestrial monitoring management program	--
Total cost of monitoring program	\$1,952,884	\$136,521,880
Estimated cost of adaptive management (10% of total)	\$195,288	\$13,652,188

^a Includes \$204,488/year of ODF staff time and a contribution to the ODFW Aquatic Inventory Program that includes monitoring for sediment, recruitment of large wood, and aquatic habitat features (e.g., pools).

^b Includes \$242,559/year of ODF staff time and material costs associated with monitoring, including external contracts that may be needed to complete the monitoring program.

9.2.3.2 Adaptive Management

Chapter 6, *Analysis of Effects and Actions that May Result in Take*, describes the processes for addressing the specific uncertainties associated with the conservation strategy and the adaptive management measures and potential responses associated with those measures. The costs of monitoring actions are shown in Table 9-3. Costs for adaptive management are included as a 10% contingency on all monitoring actions. This funding will be accessed if the monitoring program

demonstrates a need to change conservation actions to better address covered species needs. This would be funded out of the State Forest Operating Fund (Section 9.4.1.2, *Operating Fund Balance*).

9.2.4 Remedial Measures for Changed Circumstances

Chapter 7, *Assurances*, Section 7.3, *Changed and Unforeseen Circumstances*, describes the actions and remedial measures associated with anticipated and possible circumstances that could change during implementation and that may affect the status of the covered species. Remedial measures may also be necessary if foreseeable changes occur that may alter the assumptions or information upon which the HCP is based (see Chapter 7, *Assurances*, for a description of changed circumstances). The cost of remedial measures is calculated as 5% of the cost of the conservation strategy. This cost is included as a contingency in the total cost estimate. This funding will be accessed if changed circumstances do occur and need to be addressed. This would be funded out of the State Forest Operating Fund (Section 9.4.1.2, *Operating Fund Balance*).

9.3 Total Habitat Conservation Plan Program Costs

Table 9-4 summarizes all costs for the HCP program over a 70-year permit term. Details for each cost category can be found in Section 9.2, *Implementation Costs*.

Table 9-4. Total Costs for the Habitat Conservation Plan

Cost Category	Average Annual Cost	Cost Over 70-Year Permit Term
HCP administration	\$132,396	\$9,267,720
Conservation strategy	\$1,231,060 ^a	\$86,174,200
Monitoring	\$1,952,884 ^b	\$136,521,880
Adaptive management	\$195,288 ^c	\$13,652,188
Remedial measures	\$61,553 ^d	\$4,308,710
Total	\$3,573,181	\$249,924,698

^a Costs consist of \$1,000,000/year for the Conservation Fund and \$231,060 per year for staff to oversee and implement the conservation strategy.

^b Costs are outlined in Table 9-3.

^c Costs are estimated to be 10% of monitoring costs over the permit term.

^d Costs are estimated to be 5% of the cost of the conservation strategy over the permit term.

9.4 Implementation Funding

This HCP will be implemented by the State Forests Division of ODF. The State Forests Division is responsible for the management of all state forestlands, including those owned by the Board of Forestry. The State Forests Division of ODF also manages the Common School Forest Lands owned by the Department of State Lands and covered by this HCP (Chapter 1, Section 1.2.1, *Plan Area*, and Section 1.2.2, *Permit Area*).

The State Forests Division of ODF is unique within ODF and other state agencies in that almost 100% of its revenue comes from timber sales on state forestlands. In some years, the State Forests Division obtains small amounts of state General Fund money or other funds for supplemental capital expenditures, such as land acquisition or debt service on past acquisitions. The State Forests

Division also supplements its own funds with matching grants for special projects, such as riparian and stream restoration or forest resiliency treatments.

Despite this unique external funding source, the State Forests Division's budget must still be approved and adopted by the Oregon State Legislature as part of ODF's biennial budget process. Biennial budgets are prepared every 2 years and submitted to the Oregon State Legislature through the Governor's Office for legislative approval. ODF prepares a balanced budget to ensure expected revenue covers anticipated expenses. Biennial budgets provide spending authorization for the State Forests Division to spend money over the 2-year period on Forest Management Plan (FMP) implementation, of which HCP implementation is a part.

On Board of Forestry Lands, current state law¹ mandates that 63.75% of the gross revenue is distributed to the county and local taxing districts where the revenue was generated (e.g., where specific timber sales were harvested). The remaining 36.25% is used by the State Forests Division for state forestland management to implement all aspects of Greatest Permanent Value, which will include almost all HCP implementation.

9.4.1 Revenue to State Forest Division

Timber sales are, by far, the largest revenue source for the State Forests Division and are expected to remain so for the foreseeable future (Table 9-5). More details on timber sale revenue are provided in Section 9.4.1.1, *Timber Sale Revenue*.

Table 9-5. Revenue Sources to the State Forest Division

Revenue Source	Biennial Budget for State Forest Division (2 years) ^a		
	2021–2023 Biennial Actual Revenue	2023–2025 Approved Budget	2025–2027 Approved Budget
State General Fund	\$ 0	\$0	\$0
Federal funds	\$ 1,018,537 (1%)	\$987,406 (1%)	\$1,028,879 (1%)
Recreational fees	\$1,598,621 (2%)	\$1,997,002 (2%)	\$2,683,497 (3%)
Timber sales	\$70,083,006 (97%)	\$99,378,672 (97%)	\$101,656,761 (96%)
Total	\$72,700,164 (100%)	\$102,363,080 (100%)	\$105,369,137 (100%)

^a Source: Oregon Department of Forestry.

The State Forests Division occasionally receives small appropriations from the state General Fund or other funds for one-time capital expenditures, such as land transfers or acquisitions. Federal funds to the State Forests Division are provided in the form of competitive grant awards, including for stream restoration projects. Recreational fee revenues are currently only 1% of the revenue to the State Forests Division but are expected to increase as facilities are upgraded or added and as the population grows. Alternative revenue sources continue to be examined but are currently not considered viable for planning purposes. Therefore, only current revenue sources are considered available to support HCP implementation. Each of these revenue sources is discussed further here.

¹ Oregon Revised Statute 530.110.

9.4.1.1 Timber Sale Revenue

Since 1949, ODF has been harvesting timber and selling timber through timber sale contracts. The Board of Forestry Land base has continued to increase since 1949. The State Forests Division's mission has not changed and continues to provide a full range of economic, environmental, and social benefits. A summary of timber sale revenue to the State Forests Division from 2000 to 2024 is shown in Table 9-6. Revenue generated is largely due to a combination of changes in timber prices and differences in harvest volume. The variations in timber prices from 2000 to 2024 are shown in Table 9-7.

Timber sales are sold annually to the highest bidder. Bids reflect current market conditions. ODF's operating costs are adjusted to ensure a target fund balance. Annual operating costs are adjusted to align with expected revenue whenever possible. For example, in severe market downturns ODF strives to reduce expenditure to minimize deficit spending out of the operational reserve and investment account. The FMP includes levels of implementation that allow for budget fluctuations though all market conditions.

Table 9-6. Timber Sale Revenue to the State Forest Division (2000–2024)

Fiscal Year	Timber Revenue	Fiscal Year	Timber Revenue
2024	\$37,461,345	2012	\$21,409,368
2023	\$34,602,635	2011	\$21,787,543
2022	\$35,480,371	2010	\$24,467,207
2021	\$42,864,244	2009	\$24,217,089
2020	\$38,278,875	2008	\$29,319,099
2019	\$53,819,957	2007	\$33,000,415
2018	\$47,174,928	2006	\$33,761,492
2017	\$34,914,595	2005	\$27,985,988
2016	\$34,748,095	2004	\$27,400,765
2015	\$31,958,423	2003	\$26,314,199
2014	\$27,679,219	2002	\$25,053,874
2013	\$26,976,098	2001	\$24,159,544

Oregon state forests timber management practices focus on the production of high-quality sawlogs. This product is in demand by the lumber manufacturing industry, which is well established in the Pacific Northwest. As with all commodities, prices can fluctuate greatly from year to year but have generally increased over time (Table 9-7).

Table 9-7. Revenue Sources to the State Forest Division (2000–2024)

Fiscal Year	Average Timber Sale Sold Stumpage Price/MBF (BOFL only)
2024	\$588
2023	\$520
2022	\$543
2021	\$476
2020	\$394
2019	\$419

Fiscal Year	Average Timber Sale Sold Stumpage Price/MBF (BOFL only)
2018	\$536
2017	\$397
2016	\$382
2015	\$366
2014	\$391
2013	\$336
2012	\$309
2011	\$315
2010	\$257
2009	\$211
2008	\$250
2007	\$348
2006	\$365
2005	\$361
2004	\$277
2003	\$284
2002	\$306
2001	\$308
2000	\$347

MBF = 1,000 board feet; BOFL = Board of Forestry Lands

9.4.1.2 Operating Fund Balance

ODF maintains an operating fund balance to maintain operations, including HCP implementation, regardless of revenue generated from harvest and market conditions. Figure 9-1 shows the change in ODF's operating fund balance from 2000 to 2024.

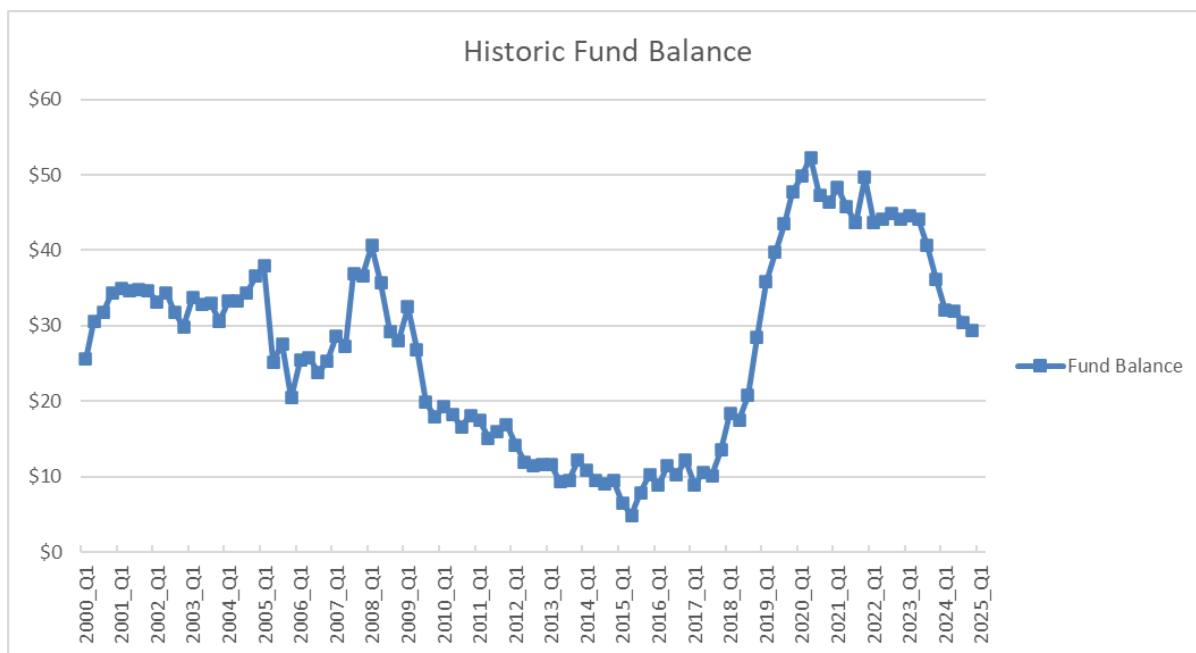


Figure 9-1. State Forest Division Operating Fund Balance (reported as million dollars) from 2000–2024

9.4.1.3 Habitat Conservation Plan Conservation Fund

Several conservation actions will be funded by ODF wholly or in part through the HCP Conservation Fund, which will be established and maintained by a fixed proportion: \$5 per 1,000 board feet (MBF) of all timber sold will be allocated to the fund. Effectively, this serves as a fixed earmark in ODF's budget to complete conservation actions for the HCP. The Conservation Fund will begin accruing from timber sales associated with the first approved Operation Plans following the issuance of the incidental take permits (ITPs). This amount will be adjusted with a rolling 3-year average of timber sale sold stumpage prices but will not drop below \$5 per 1,000 MBF. It will be managed to address both upland terrestrial species activities and riparian and aquatic activities. ODF will report expenditures from the Conservation Fund annually, and the balance of projected needs (upland versus aquatic) will be determined during the 10-year comprehensive reviews for the next 10-year implementation cycle.

This Conservation Fund will be used to ensure implementation of the following conservation actions.

- Conservation Action 3: Stream Complexity.
- Conservation Action 4: Remove or Modify Artificial Fish-Passage Barriers.
- Conservation Action 7: Manage Habitat Conservation Areas.
- Conservation Action 9: Strategic Terrestrial Species Conservation Actions.

Implementation of restoration projects and strategic terrestrial species conservation actions will vary over time. Funding these conservation actions through a dedicated HCP Conservation Fund will help to ensure that these projects can be implemented when their planning, and any necessary site-specific permitting, is complete. This approach also insulates these projects from fluctuations in

timber harvest revenue as a result of stumpage price fluctuations or other ODF decisions regarding the pace of timber sales. Funds will be expended from the Conservation Fund consistent with the requirements of those conservation actions described in Chapter 4, *Conservation Strategy*.

9.4.2 Funding Assurances

As a state governmental agency with budgets approved biennially by the legislature, ODF cannot guarantee the level of future allowable expenditures, which are not yet authorized by the legislature, for the requirements set forth in the HCP over its entire permit term. However, as a commitment of this HCP, ODF will incorporate in its biennial budget a request to the legislature to fund a budget sufficient to fulfill ODF's obligations under this HCP, including all expected costs associated with the administration of the HCP, implementation of the conservation program, monitoring, reporting, adaptive management, changed circumstances, and contingency costs. Each biennial budget request will be adjusted for inflation of capital and operational costs, including salaries and benefits.

ODF will provide the Services with evidence of its biennial budget requests to the legislature and that the legislature has authorized sufficient funding to implement this HCP for the 2-year period. In addition, HCP commitments will be reflected in the dedication of staff resources through ODF's annual budget, adjusted for inflation, and documented in the HCP annual report. ODF recognizes that failure to annually ensure adequate funding to implement the HCP may be grounds for suspension or partial suspension of the ITPs until adequate funding is restored (Chapter 8, Section 8.10, *Permit Suspension or Revocation*).

ODF is confident that it can successfully fund HCP implementation, despite expected fluctuations in the timber market and consequently timber sale revenue. ODF and the HCP itself have the following safeguards in place to ensure flexibility in HCP implementation and adequacy of funding for HCP implementation.

- Several of the key conservation actions have little or no direct expenditure associated with them because they involve land designations that forgo timber harvest to conserve, enhance, and restore suitable or occupied habitat for the covered species. Chapter 4, Section 4.7.2, *Conservation Action 1: Establish Riparian Conservation Areas*, and Section 4.7.6, *Conservation Action 6: Establish Habitat Conservation Areas*, are two examples.
- Several conservation actions will occur, in part, in conjunction with timber sales because of the operational efficiency that such actions provide. For example, downed wood to supply stream enhancement projects (Chapter 4, Section 4.7.3.1 *Commitment to Stream Enhancement Projects During the Permit Term*) may come from nearby timber harvest activities. Similarly, Chapter 4, Section 4.7.4, *Conservation Action 4: Remove or Modify Artificial Fish-Passage Barriers*, could occur with timber harvest activities to ensure operational and cost efficiencies of using heavy equipment in the field. These conservation actions will, therefore, occur more often (or be more robust) when timber sales increase and would occur less often (or be less robust) when timber sales decrease. Fluctuations in timber sales may or may not be in response to timber markets, as explained in the following bullet.
- Timber sales by ODF do not necessarily track the timber market. In years of depressed timber prices (stumpage price), for example, ODF continues to offer timber sales to maintain a base level of operations, provide critical revenue to local communities, and protect timber jobs that rely on harvest in state forests. However, market conditions may result in some timber not selling or require a reduction in project costs that are tied to conservation actions. In years of

high timber prices, ODF increased revenue to the ODF operating fund that can support an increased level of projects.

- Several conservation measures are designed so that they are insulated against fluctuations in the timber market and in timber harvest revenue. The Conservation Fund will be used when conservation projects are ready to be implemented. Funding for the following project types will come from the Conservation Fund.
 - Stream enhancement projects described in Chapter 4, Section 4.7.3, *Conservation Action 3: Stream Complexity*.
 - Targeted fish-passage barrier removal described in Chapter 4, Section 4.7.4, *Conservation Action 4: Remove or Modify Artificial Fish-Passage Barriers*.
 - Upland restoration projects described in Chapter 4, Section 4.7.7, *Conservation Action 7: Manage Habitat Conservation Areas*.
 - Strategic terrestrial species conservation actions described in Chapter 4, Section 4.7.9, *Conservation Action 9: Strategic Terrestrial Species Actions*.
- It is ODF's policy to maintain at least 6 months to 1 year or more of reserve operating funds for management of state forest lands. The exact amount of operating funds is determined by market conditions and expenses. For the last 20 years, ODF has maintained an operating fund of between \$4.5 million and \$52.3 million, with an average of \$24.6 million. Many of the conservation actions are accomplished, along with the implementation of management activities, at a rate commensurate with management activity levels under variable economic conditions. While extended economic downturns could adversely affect operating funds, ODF will prioritize maintaining compliance with the HCP.
- Within its biennial authorization, ODF can adjust fiscal budgets in response to changing conditions. This HCP will become an essential part of ODF's core business function for management of state forests and, as such, HCP functions will be prioritized during economic downturns or other situations for which budgets may be reduced. The Conservation Fund will continue to be earmarked at the same rate, conservation actions will continue to be implemented, and required monitoring and adaptive management functions will be maintained. If budgets are reduced to the extent that monitoring provisions cannot be maintained as described, ODF will work with the Services to adjust monitoring plans to create efficiencies while still capturing critical information for compliance and effectiveness.

10.1 Introduction

The federal Endangered Species Act (ESA) requires that applicants for incidental take permits (ITPs) specify what alternative actions to the take of federally listed species were considered and why those alternatives were not selected. The *Habitat Conservation Planning and Incidental Take Permit Processing Handbook* (U.S. Fish and Wildlife Service and National Oceanic Atmospheric Administration Fisheries 2016) identifies two alternatives commonly used in habitat conservation plans.

- Any specific alternative that would reduce take below levels anticipated for the proposed project.
- An alternative that would avoid take and, therefore, not require a permit from the U.S. Fish and Wildlife Service (USFWS) or National Oceanic Atmospheric Administration (NOAA) Fisheries.

The preferred and proposed approach is described in previous chapters of this Western Oregon State Forests Habitat Conservation Plan (HCP). This proposed approach represents the Oregon Department of Forestry's (ODF's) best attempt to minimize take of the covered species while allowing ODF to conduct ongoing and planned forest-management activities.

In accordance with the ESA, this chapter discusses alternatives that were considered but not selected and the reasons those alternatives were not selected for inclusion in the HCP. Note that the alternatives described in this chapter are different from the alternatives described in the environmental impact statement (EIS) that accompanies this HCP. The EIS alternatives serve a broader purpose than the alternatives here, which are narrowly focused on eliminating or reducing take of one or more of the covered species. To distinguish the alternatives here from the EIS alternatives, alternatives in the HCP are called *alternatives to take*.

10.2 Description of Alternatives to Take

Three alternatives to take were considered but not selected for analysis in the HCP: no take, reduced covered activities, and reduced covered species. These alternatives to take and the rationale for their elimination are discussed here. ODF considered an increased timber-harvest alternative, but this alternative was found to increase the likely level of take¹ of one or more covered species. In the alternatives, and the HCP itself, take is primarily the result of habitat loss or modification that impairs essential behavioral patterns for fish or wildlife. Because this alternative would not reduce take on any covered species, it is not considered further.

ODF also considered an increased conservation alternative that expanded the amount and extent of HCAs to increase protection for northern spotted owl (*Strix occidentalis caurina*), marbled murrelet

¹ From Section 3(18) of the federal Endangered Species Act: "The term 'take' means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

(*Brachyramphus marmoratus*), and other associated terrestrial covered species such as red tree vole (*Arborimus longicaudus*). The habitat conservation areas (HCAs) in the proposed HCP include 98% of all known occurrences of northern spotted owl and 61% of nesting, roosting, and foraging habitat, along with 99% of all known occurrences of marbled murrelet and 68% of suitable and highly suitable habitat in the permit area. Therefore, larger or more HCAs would have only incremental benefits for those species, reducing take but also reducing available acreage for timber harvest. This increased conservation alternative was rejected because it does not balance the need for species conservation with ODF's mission to harvest timber.

ODF also considered an increased conservation alternative that reduced or eliminated forest-management activities within HCAs. This alternative was also rejected because forest management within HCAs is essential to accelerating the development of additional suitable habitat for the covered species. Furthermore, forest-management actions within HCAs are designed to avoid or minimize take of the covered species within HCAs. Therefore, an alternative that eliminates forest management within HCAs would not reduce take of the covered species.

10.2.1 No Take Alternative

Under the no take alternative, ODF would not engage in forest-management activities that result in the take of any of the covered species, thereby removing the need for ITPs from the Services. This alternative was not selected because ODF must continue to adhere to its mandates and mission to manage forests to the benefit of a variety of organisms, provide economic benefits for citizens, maintain ecosystem services, and provide recreational opportunities for the residents in Oregon. ODF's mission statement is provided below.

To serve the people of Oregon by protecting, managing, and promoting stewardship of Oregon's forests to enhance environmental, economic, and community sustainability.

Although ODF's mission statement is aligned with the need to protect habitat for covered species, it also requires integrated use of the forest for community (e.g., recreation and aesthetic) and economic (e.g., timber harvest) sustainability, which often competes or conflicts with use of the forest to maximize benefits for covered species. In addition, activities that provide long-term benefits to covered species' habitat may have direct, short-term impacts on individual covered species. Chapter 3, *Covered Activities*, identifies the forest-management activities that are necessary for ODF to fulfill its mission statement.

ODF has been managing state forests, using a take-avoidance strategy, since the northern spotted owl was listed in 1990. This strategy requires ODF to conduct both intensive and expensive field surveys prior to every timber sale planned in areas that support federally listed species. If listed species or their suitable habitat is found, timber sales must be redesigned, postponed, or abandoned to avoid taking the species. Although ODF has used this strategy successfully for many years, it is becoming increasingly impractical as the number of listed species increases. Species expected to be listed in the future are also increasingly difficult to survey and detect, making take avoidance even more challenging and costly. Based on all of these factors, managing state forests, using a full take-avoidance strategy to comply with the ESA, is expected to be increasingly difficult, unpredictable, and costly to ODF. ODF believes that this HCP and the take authorization it will provide are essential to ensuring the agency can successfully implement its mission. Therefore, the no take alternative was rejected as impracticable.

10.2.2 Reduced Covered Activities

Under the reduced covered activities alternative, select covered activities would not be included in the HCP. The activities considered for exclusion from the HCP were road construction and recreational infrastructure construction and maintenance. The development of roads and recreational facilities in the HCP supports forest management and public use purposes. Road construction and maintenance requires the removal or modification of habitat (e.g., tree removal, stream crossings). Development and maintenance of recreational infrastructure requires similar activities but at a smaller scale on the landscape. Although the elimination of these select activities could reduce or delay implementation of some remaining covered activities under the HCP, the majority would continue to occur without significant limitations.

Road and recreational infrastructure construction and maintenance have the potential to affect covered species' habitat and individuals in a manner similar to that of timber harvest. Although eliminating road and recreational infrastructure construction and maintenance from the HCP would reduce take of covered species, this alternative was not selected because road and recreational infrastructure construction and maintenance are necessary to the forest-management practices covered under the HCP and implementation ODF's mission. ODF does not expect that, in the future, it will be able to fully avoid take of the covered species from road construction/maintenance or recreational infrastructure construction/maintenance. Also, covering these activities will provide ODF with the necessary flexibility in its operations to optimize its designs and minimize all environmental effects (as opposed to prioritizing take avoidance of listed species). Covering these activities under this HCP will lead to a more comprehensive, large-scale conservation strategy that will provide greater conservation benefit to covered species.

10.2.3 Reduced Habitat Loss from Timber Harvest

This alternative would include a reduction in timber harvest that results in the loss of covered species' habitat. A reduction in timber-harvest activities would reduce incidental take of covered species, at least in locations where species' habitat exists on the landscape. This alternative would result in a net reduction in timber volume and harvest revenue from the forest and, in turn, most likely result in the inability to meet ODF's economic needs. Beyond the economic infeasibility of this alternative, this alternative would also limit the type and amount of habitat management that could be completed in HCAs. This would most likely reduce the long-term habitat value provided under the HCP because, without management of some locations (i.e., even-aged Douglas-fir [*Pseudotsuga menziesii*] plantations in HCAs), habitat quality is expected to be less in the future than it would be if management were to occur. Therefore, although there may be less habitat modification, there would also be less habitat developed over time and economic needs would most likely not be met. Therefore, this alternative was rejected.

10.2.4 Reduced Covered Species

The reduced covered species take alternative would reduce the number of species covered by the HCP to those that are currently listed as threatened or endangered under the ESA. Under this alternative to take, the HCP would not cover species that are not currently protected under the ESA but are expected to become listed during the HCP permit term. Eliminating non-listed species from the HCP would result in the HCP covering 11 species (instead of 15): Oregon Coast coho, Lower Columbia River coho, Upper Willamette River spring Chinook, Upper Willamette River winter

steelhead, Columbia River chum, Southern Oregon/Northern California Coast coho, Lower Columbia River Chinook, eulachon, northern spotted owl, marbled murrelet, and coastal marten. Under this alternative to take, the HCP would not include the following four species: Oregon Coast spring-run Chinook, Southern Oregon Northern California Coast Chinook, red tree vole, and Oregon slender salamander.

The reduced covered species take alternative would result in the same level of take for the 11 species covered by this alternative. However, for those species not covered under this alternative (i.e., the non-listed species), take is likely to increase because take of these species is not prohibited until they become listed. As a result, ODF would not include measures to avoid or minimize effects on these species in the HCP; therefore, take of these species would most likely increase. Once a non-listed species is listed, ODF would have to avoid take of the species or amend this HCP to add it.

This alternative may provide some benefits to ODF in the short term because narrowing the list of covered species would reduce ODF's obligations to implement avoidance, minimization, mitigation, and conservation measures for these non-listed species, thereby reducing costs. However, covering fewer species would result in a biologically inferior program relative to the proposed HCP and may require additional compliance (if species become listed) during the permit term.

The reduced number of covered species take alternative was rejected because it would result in less protection of, and less mitigation for, rare and sensitive species. Also, one or more of these rare and sensitive species might be listed in the future. If this were to happen, ODF would not be authorized for take; any project affecting a newly listed species would be required to go through a separate permit process or take would need to be avoided entirely. In addition, this alternative could result in fewer long-term efficiencies as non-listed species become listed over the permit term.

Chapter 11

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