



WASHINGTON STATE DEPT OF
**NATURAL
RESOURCES**



▲ Volunteers navigate difficult terrain in the OESF to survey bird habitat as part of a monitoring project funded by the Earthwatch Institute.

State Trust Lands Habitat Conservation Plan Annual Report

.....
For Fiscal Year 2021
.....

Published November 2022

Acknowledgements

Cassie Davis
Brittany Dayley
Warren Devine
Daniel Donato
Elizabeth Eberle
Allen Estep
Kari Fagerness
Joshua Halofsky
William Hoskins
Kaerlek Janislampi
Sherri Land
Thomas Laxson
Alan Mainwaring

Kyle Martens
Heather McPherson
Teodora Minkova
Alex Nagygyor
Kenny Ocker
Krista Pagel
Luis Prado
Jeff Ricklefs
Karen Robertson
Justin Schmal
Heidi Tate
Zak Thomas
David Wilderman

Cover photo by Teodora Minkova. All photos courtesy of Washington State Department of Natural Resources (DNR) staff unless otherwise noted. Section authors and report contributors are staff of the DNR unless otherwise indicated.

For information on how to obtain a copy of this report, contact:

Nicole Jacobsen
HCP and Scientific Consultation Section
Forest Resources Division
Washington State Department of Natural Resources (DNR)
(360) 902-1788
Nicole.Jacobsen@dnr.wa.gov

Table of Contents

Acronyms	4
1.0 Introduction	5
1.1 Highlights	5
2.0 Progress on Conservation Objectives	6
2.1 Conservation Strategy Updates	6
2.2 Northern Spotted Owl Conservation Strategy	6
2.3 Marbled Murrelet Conservation Strategy	10
2.4 Riparian Conservation Strategy	11
2.5 Multispecies Conservation Strategy	12
3.0 Adaptive Management	13
3.1 Implementation Monitoring	13
3.2 Effectiveness Monitoring	13
3.3 Validation Monitoring	16
3.4 Research	17
3.5 OESF Research and Monitoring Program	22
3.6 Publications and Presentations	23
4.0 Forest Inventory	26
5.0 Silvicultural Activity	27
5.1 Timber Harvest	27
5.2 Forest Site Preparation	28
5.3 Forest Regeneration	28
5.4 Vegetation Management	28
5.5 Pre-Commercial Thinning	28
5.6 Salvage	32
6.0 Road Management Activity	33
6.1 Forest Roads Program	33
6.2 Easements	35
7.0 Land Transaction Activity	36
8.0 Natural Areas Program	39
9.0 Non-Timber Management Activity	45
9.1 Special Forest Products	45
9.2 Leases	45
9.3 Valuable Material Sales	46
9.4 Recreation Program	47
10.0 HCP Implementation Documentation	60

Appendix A: Background	A-3
A1.0 State Trust Lands Habitat Conservation Plan	A-3
A1.1 Lands Covered by the HCP	A-4
A1.2 Comprehensive Reviews	A-4
A2.0 Conservation Objectives for ESA-Listed and Other Species	A-5
A2.1 Northern Spotted Owl Conservation Strategy	A-5
A2.2 Marbled Murrelet Conservation Strategy	A-12
A2.3 Riparian Conservation Strategy	A-16
A2.4 Multispecies Conservation Strategy	A-17
A3.0 Adaptive Management, Monitoring, and Research	A-17
A3.1 Adaptive Management and the Conservation Strategies	A-17
A3.2 Implementation, Effectiveness, and Validation Monitoring	A-18
A3.3 OESF Research and Monitoring Program	A-20
A4.0 Silvicultural Activities	A-22
A4.1 Selecting Silvicultural Activities	A-22
A4.2 Tracking Silvicultural Activities	A-23
A4.3 Descriptions of Silvicultural Activities	A-23
A5.0 Non-Timber Management Activities	A-25
A5.1 Road Management Activities	A-25
A5.2 Easements and Permits	A-27
A5.3 Land Transactions	A-27
A5.4 Natural Areas Program	A-28
A5.5 Special Forest Products	A-30
A5.6 Oil and Gas Leases	A-31
A5.7 Mineral Prospecting Leases and Mining Contracts	A-31
A5.8 Grazing Permits and Leases	A-31
A5.9 Communication Site Leases	A-31
A5.10 Special-Use Leases	A-31
A5.11 Valuable Materials Sales	A-32
Appendix B: Glossary	B-1

Acronyms

dbh	Diameter at breast height
DFC	Desired future condition
DNR	Washington State Department of Natural Resources
ESA	Endangered Species Act
FEIS	Final environmental impact statement
FRIS	Forest Resource Inventory System
FY	Fiscal year
GIS	Geographic information system
HCP	State Trust Lands Habitat Conservation Plan
LPU	Landscape planning unit
LiDAR	Light detection and ranging
LRM	Land Resource Manager
LTFC	Long-term forest cover
MM	Marbled murrelet
MMLTCS	Marbled Murrelet Long-term Conservation Strategy
MoRF	Movement, roosting, and foraging
NAP	Natural Area Preserve
NRCA	Natural Resources Conservation Area
NRF	Nesting, roosting, and foraging
NSO	Northern spotted owl
NOAA	National Oceanic and Atmospheric Administration
OESF	Olympic Experimental State Forest
ONRC	(University of Washington) Olympic Natural Resource Center
P&T	Planning and tracking
PCT	Precommercial thinning
PhoDAR	Photogrammetric Detection and Ranging
QMD	Quadratic mean diameter
RCW	Revised Code of Washington
RD	Relative density
REF	Reference
RFRS	Riparian Forest Restoration Strategy
RMAP	Road Maintenance and Abandonment Plan
RMZ	Riparian management zone
RS-FRIS	Remote-Sensing Forest Resource Inventory System
RVMP	Riparian Validation Monitoring Program
SEPA	(Washington) State Environmental Policy Act
SHA	Special habitat area
SFT	State forest transfer
SOMU	(Northern) Spotted owl management unit
TLT	Trust land transfer
UAS	Unmanned aircraft system
USFWS	United States Fish and Wildlife Service
USFS	United States Department of Agriculture Forest Service
UW	University of Washington
WAU	Watershed administrative unit
WDFW	Washington Department of Fish and Wildlife

1.0 Introduction

Appendix: Background on the State Trust Lands Habitat Conservation Plan

Each year, the Washington State Department of Natural Resources (DNR) develops a State Trust Lands Habitat Conservation Plan (HCP) Annual Report based on commitments outlined in the HCP Implementation Agreement. The intended audience is the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) Fisheries (collectively, “the Services”), and other interested parties.

The HCP Annual Report is a summary of management activities completed on DNR lands managed under the HCP, monitoring and research efforts, and conservation strategy progress. Unless otherwise noted, information about DNR programs included in this report covers fiscal year (FY) 2021 (July 1, 2020 – June 30, 2021).

1.1 Highlights

In FY 2021, DNR accomplished several objectives affecting lands managed under the HCP. Highlights include:

- **Continuing work on the Sustainable Harvest Levels for forests both west and east of the Cascade crest.**
- **Continuing accomplishments in planning the Type 3 Watershed Experiment in the Olympic Experimental State Forest.**
- **DNR added 399.7 acres to Natural Area Preserves and Natural Resources Conservation Areas within the area covered by the Habitat Conservation Plan.**

2.0 Progress on Conservation Objectives

Appendix: Background on Conservation Objectives

The HCP established numerous conservation strategies designed to minimize and mitigate the adverse effects of land management activities on the habitats of federally listed species and unlisted species of concern, as well as riparian and uncommon habitats that exist within the land base covered by the HCP. Habitat conservation strategies for northern spotted owl (NSO), marbled murrelet, riparian areas, and other species of concern are outlined in the HCP. Annual reporting on progress toward habitat objectives is outlined in the sections below.

2.1 Conservation Strategy Updates

The HCP conservation strategies are occasionally updated due to research, plan development, changes to laws, and/or adjustments to DNR administrative procedures.

2.1.1 Northern Spotted Owl Habitat Delineation

DNR developed and applied multiple queries to the Forest Resource Inventory System (FRIS) data to identify northern spotted owl habitat types across state-managed forestland. The DNR FRIS has now been replaced by the Remote Sensing Forest Resource Inventory System (RS-FRIS). The FY 2019 HCP Annual Report provides a comprehensive review on this topic. Additionally, during the transition to RS-FRIS, DNR made minor updates to the queries to reflect the attributes measured in RS-FRIS and better match the habitat definitions in the HCP (see [Table A-3](#) in the [Appendix](#)).

The FY 2020 HCP Annual Report began reporting habitat percentages using RS-FRIS data for the North Puget, South Puget, and Columbia HCP planning units. Starting in this FY 2021 HCP Annual Report, habitat percentages reported in the OESF are also based on RS-FRIS data. The timeline for reporting habitat percentages based on RS-FRIS in the HCP Annual Report mirrors the timeline for implementing RS-FRIS within the DNR timber sales program — starting in FY 2020, sales sold in the westside planning units (excluding the OESF) were planned using RS-FRIS data. Sales sold in the OESF began using RS-FRIS data in FY 2021.

2.1.2 Marbled Murrelet Long-Term Conservation Strategy

In FY 2020, the Board of Natural Resources adopted a long-term conservation strategy for the marbled murrelet to replace the interim conservation strategy. The [Marbled Murrelet Section](#) below contains summary information for the long-term conservation strategy. Additional background information on the history and development of this conservation strategy update can be found in the [Appendix](#), the [FY 2019 HCP Annual Report](#) section titled “Marbled Murrelet Conservation Strategy Development,” as well as on the Marbled Murrelet webpage at dnr.wa.gov/mmltcs.

2.2 Northern Spotted Owl Conservation Strategy

Appendix: Habitat Type Definitions

When the HCP was developed, areas were identified on DNR-managed lands that were most important to northern spotted owl conservation. These designated northern spotted owl management areas are managed for certain habitat classes and types that are defined in the HCP (p. IV.11–12) and [WAC 222-16-085](#). More information about habitat classifications and types for each westside northern spotted owl management area can be found in the [Appendix](#).

The DNR northern spotted owl (NSO) conservation strategy west of the Cascades involves maintaining thresholds of habitat in each spotted owl management unit (SOMU). Most designated nesting, roosting, and foraging (NRF) and dispersal SOMUs have a 50 percent overall habitat target. The Olympic Experimental State Forest (OESF) and South Puget HCP Planning Units each have two-tiered habitat threshold targets that are described later in this section.

Five primary factors can affect habitat percentages reported from year to year:

1. Land is acquired or disposed through a land transaction;
2. Stands are inventoried and their boundaries are refined and/or their habitat type is updated due to growth or an enhancement thinning;
3. A regeneration harvest is conducted within habitat in a SOMU that is over the habitat threshold target;
4. Refinements are made to cadastre data across the state; or
5. Candidate stands in the OESF are thinned to meet habitat requirements.

In some years, none of these factors may occur, while in other years, one or more of these factors may increase or decrease habitat percentages in a SOMU. The figures below show NSO habitat percentages, by HCP planning unit, as they existed on July 17, 2022, when the data was extracted from RS-FRIS.

SOMUs below their habitat thresholds have areas of non-habitat designated as “next best” to ensure each SOMU is on a trajectory to meet the habitat target. The sum of habitat and next best equals the SOMU habitat threshold target. SOMUs above their habitat thresholds do not have next best. Candidate stands in the OESF are described fully in the [OESF Forest Land Plan](#).

2.2.1 Columbia and North Puget HCP Planning Units

In the Columbia and North Puget HCP Planning Units, the HCP habitat goal is to restore and maintain at least 50 percent of NRF and dispersal (DISP) SOMUs as habitat. Figure 2-1 shows percent habitat for SOMUs in the Columbia and North Puget HCP Planning Units. Only SOMUs with more than 1 percent habitat are included in the figure.

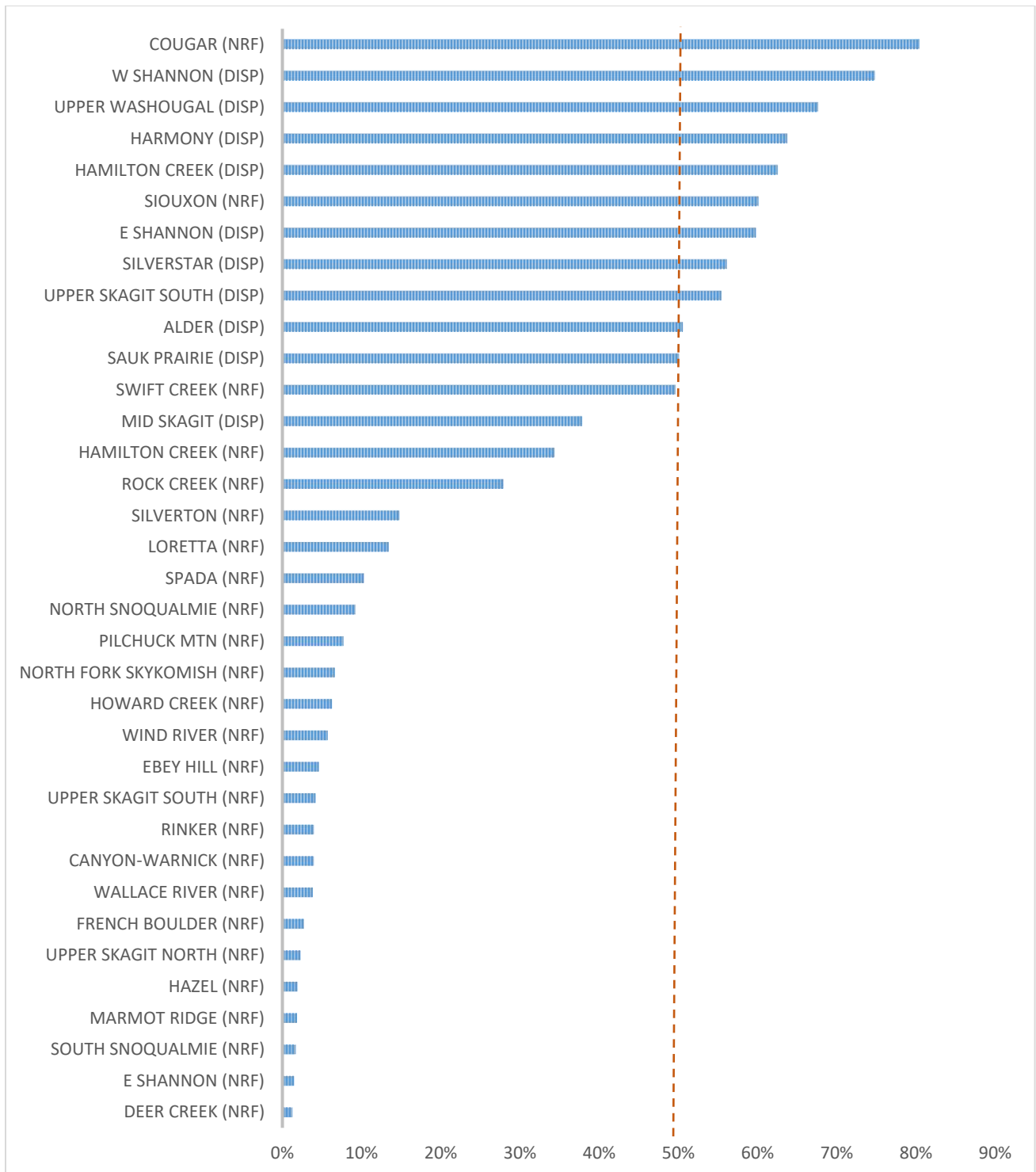


Figure 2-1: Habitat Percentages by SOMU in the Columbia and North Puget HCP Planning Units as of 7/17/2022. The dashed line represents the habitat target. Habitat has been rounded to the nearest percent. The following NRF SOMUs are not included because they have less than 1 percent habitat: Cavanaugh, Clearwater, Mid Skagit, Sauk Prairie, South Fork Skykomish, Tenas, Upper NF Stilly, and W Shannon.

2.2.2 Olympic Experimental State Forest HCP Planning Unit

In the OESF HCP Planning Unit, habitat is tracked based on 11 Landscape Planning Units (also generically referred to as SOMUs). DNR does not designate NRF or dispersal areas in the OESF. In each SOMU, the HCP habitat goal is to restore and maintain a minimum of 40 percent NSO habitat. Of that 40 percent, at least one-half, or 20 percent of the SOMU, must be Old Forest Habitat, and the remaining habitat must be Structural or better. Figure 2-2 shows current total percent NSO habitat in OESF Planning Unit SOMUs.

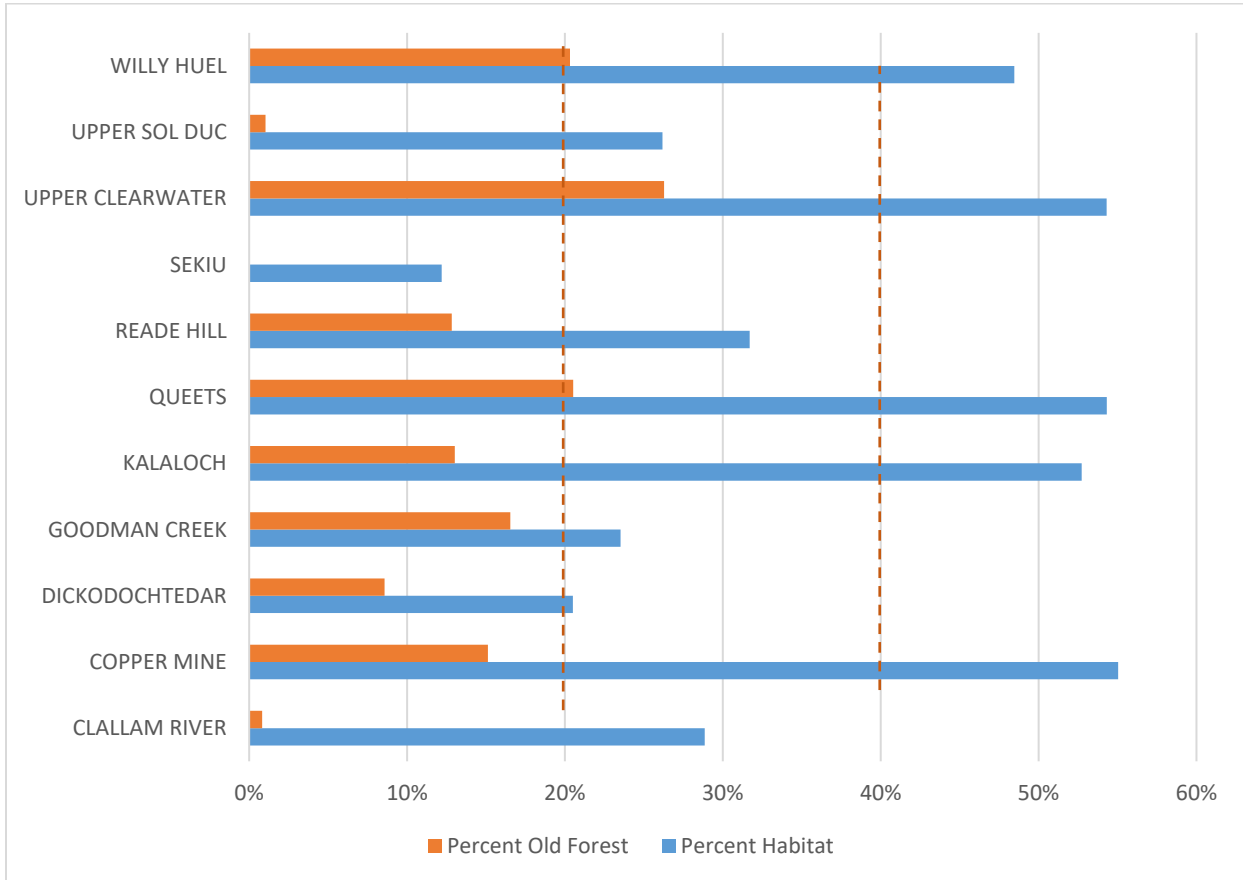


Figure 2-2: Old Forest and Total Habitat Percentages by SOMU in the OESF HCP Planning Unit as of 7/17/2022. Dashed lines represent habitat targets. Habitat has been rounded to the nearest percent. NSO habitat data in the OESF HCP Planning Unit transitioned to RS-FRIS in FY 2021.

2.2.3 South Puget HCP Planning Unit

The South Puget HCP Planning Unit is addressed separately because the requirements for dispersal differ from elsewhere on the westside. The South Puget HCP Planning Unit has an overall habitat threshold target of 50 percent for each SOMU. Dispersal management areas have an additional target that at least 35 percent of each SOMU will be movement, roosting, and foraging (MoRF) habitat or better (MoRF Plus). The remaining habitat must be Movement habitat or better (Movement Plus). MoRF and Movement are two habitat types specific to dispersal management areas in South Puget HCP Planning Unit SOMUs identified in the 2010 *South Puget HCP Planning Unit Forest Land Plan Final EIS*.

The two NRF management areas within the South Puget HCP Planning Unit share the same habitat targets as other westside NRF management areas. As in Figure 2-2, SOMU habitat percentages are not displayed if they are under 1 percent. Because the Green and Pleasant Valley NRF SOMUs are under 1 percent, Figure 2-3 shows only NSO dispersal management area habitat percentages by SOMU in the South Puget HCP Planning Unit.

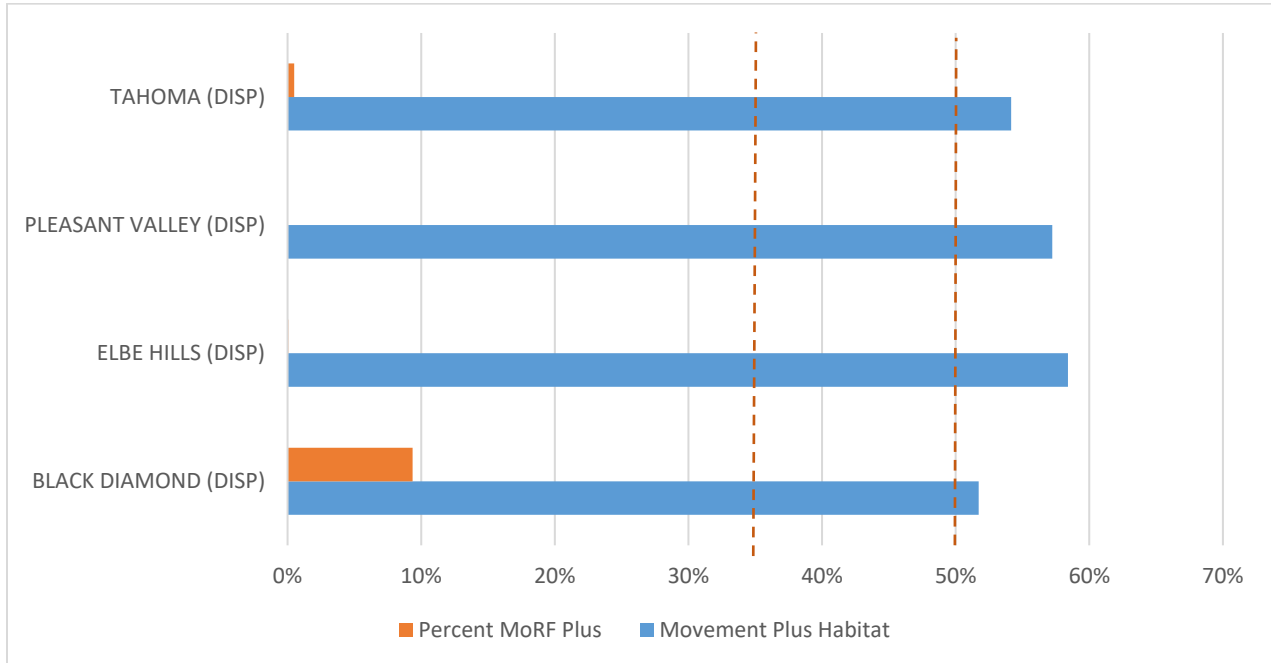


Figure 2-3: MoRF Plus and Total (Movement Plus) Habitat Percentages by SOMU in the South Puget HCP Planning Unit as of 7/17/2022. Dashed lines represent habitat targets. Habitat has been rounded to the nearest percent. Green and Pleasant Valley NRF SOMUs are not included here because they are less than 1 percent habitat.

2.3 Marbled Murrelet Conservation Strategy

Appendix: Background on the Marbled Murrelet Conservation Strategy

The Marbled Murrelet Long-Term Conservation Strategy is an amendment to the 1997 *State Trust Lands Habitat Conservation Plan* (HCP) that replaced the interim marbled murrelet conservation strategy outlined in the HCP (hereafter called MM Amendment; see [Appendix](#) for more background). The MM Amendment was developed in close cooperation with the U.S. Fish and Wildlife Service (USFWS). As part of this process, USFWS issued DNR an amended incidental take permit for the marbled murrelet and other species covered by the amended 1997 HCP.

As previewed in the FY 2019 HCP Annual Report, the Board of Natural Resources (Board) voted to approve the [MM Amendment](#) through [Resolution #1559](#) in December 2019. Following Board approval, DNR began to implement the strategy, including developing administrative procedures, training staff, and developing methods to track and report on implementation.

The FY 2020 HCP Annual Report outlined how habitat will be reported. The habitat reporting and implementation overview has replaced the strategy development information in the Appendix. Due to

the complexity of summarizing a large new dataset, reporting for FY 2021 will be presented in the FY 2022 HCP Annual Report.

2.4 Riparian Conservation Strategy

Appendix: Background on the Riparian Conservation Strategy

Restoration treatments in riparian management zones are conducted under guidance of the [Riparian Forest Restoration Strategy \(RFRS\)](#), the 2006 implementation procedures for the HCP Riparian Conservation Strategy. The RFRS applies to all westside planning units except the OESF and is implemented in concert with the timber sales program. Riparian restoration treatments are designed to provide growing space to encourage more complex stand structure, maintain overstory tree growth, enhance understory development, and provide large wood to streams. DNR tracks timber sales that include RFRS treatments to ensure that stand conditions are appropriate for treatment and to better understand the role of active management in meeting the long-term riparian habitat restoration goals outlined in the HCP.

Figure 2-4 shows the estimated acreage treated under the RFRS by DNR region. Since 2012, roughly 3,500 acres have been treated to accelerate development of complex forest structure. DNR does not track riparian stands that would benefit from restoration but where the RFRS was not applied due to stand conditions or operational infeasibility.

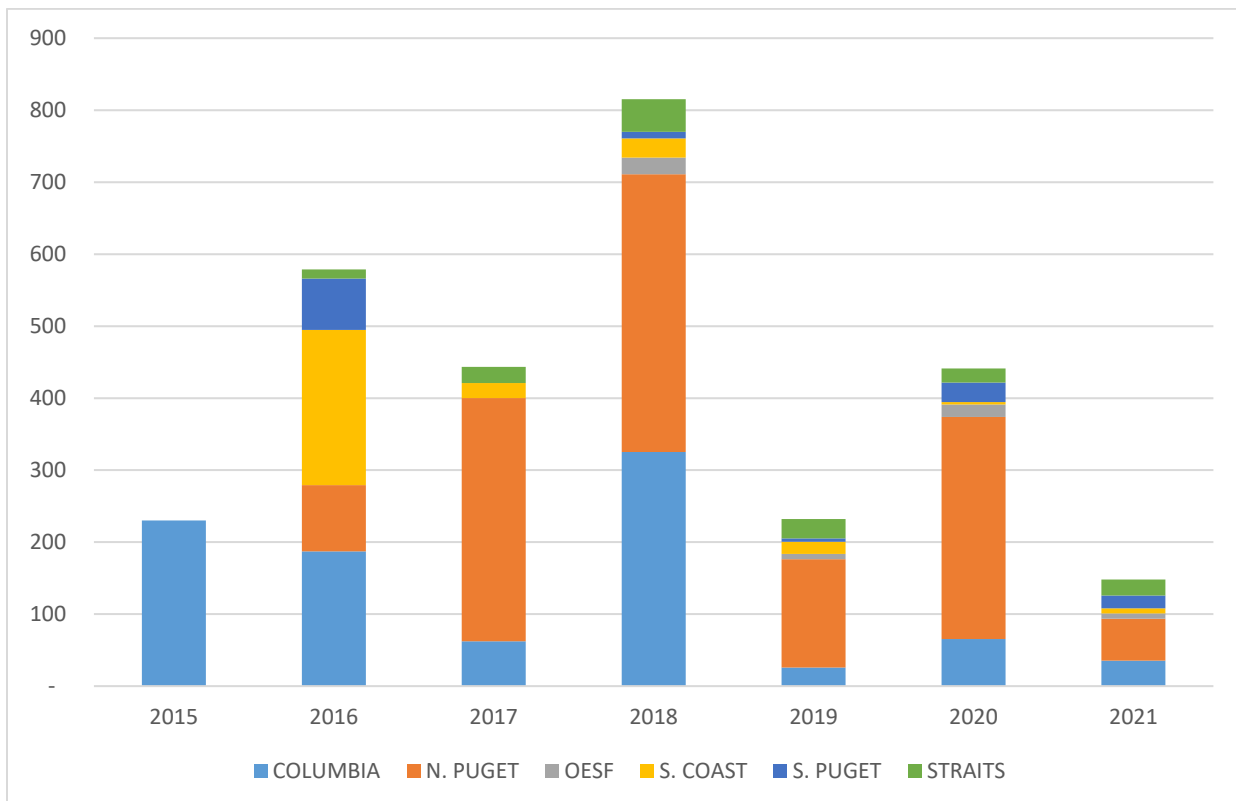


Figure 2-4. Estimated Acreage of RFRS Treatments by Region. Acreage for FY 2021 was derived from LRM and reflects RFRS treatments associated with timber sales sold in FY 2021.

For FYs 2012-18, acreage was generally reported using data from NaturE and Planning and Tracking (P&T), DNR's financial management and previous forest management tracking software, respectively. Beginning in 2016, data was entered into Land Resource Manager (LRM), DNR's forest management tracking system that replaced P&T. LRM is better equipped to track RFRS treatments.

Data for FY 2021 reflects acres of timber harvest associated with sold or completed timber sales with an LRM landclass code of riparian or wetland. This is consistent with DNR's timber sales program, which reports volume of timber sold (rather than planned volume or volume of timber removed) to evaluate progress towards sustainable harvest targets. Note that although RFRS does not apply in the OESF, timber sales sold with landclass riparian and wetland are still tracked in LRM.

2.5 Multispecies Conservation Strategy

The multispecies conservation strategy involves identification and protection of uncommon habitat types for unlisted species. These habitat types include caves, cliffs, talus slopes, wetlands, balds, mineral springs, snags, oak woodlands, and large structurally unique trees. These uncommon habitats provide nesting, roosting, hiding, and foraging opportunities for many species. No tracking is required for this conservation strategy, and implementation is conducted through the [Implementation Monitoring](#) program. No changes or updates were made to this conservation strategy in FY 2021.

3.0 Adaptive Management

[Appendix: Background on Adaptive Management](#)

In FY 2021, the DNR State Lands Adaptive Management Program continued to develop links between scientific research and management. Several projects were published in technical reports and peer-reviewed journals (see [Publications and Presentations](#) section).

The OESF adaptive management process, which is described in an administrative procedure adopted after the publication of the [OESF Forest Land Plan](#), describes how DNR managers and scientists will identify priority research projects as well as report project findings and their management implications. The focus of the OESF adaptive management in FY 2021 was on the uplands components of the T3 Watershed Experiment (see [Research](#) section). DNR managers and DNR and external researchers worked collaboratively to identify management uncertainties, research questions, and operational-scale treatments. The outcomes of this work are being incorporated in a T3 silviculture study plan (currently under development), which will be submitted for peer review.

3.1 Implementation Monitoring

[Appendix: Background on Implementation Monitoring](#)

State lands managed by DNR are subject to complex forest management strategies necessary to achieve a variety of habitat conservation commitments. The objectives of the Implementation Monitoring Program are to confirm that these strategies are appropriately implemented, identify areas for continuous improvement, and respond to changing conditions and new information. DNR managers and field staff use the implementation monitoring findings to improve practices and reduce inconsistencies on the ground.

Due to the COVID-19 pandemic and staff shortages, fieldwork for Implementation Monitoring projects was unable to be completed for inclusion in this FY 2021 report. New staff have been hired and are currently reviewing previous monitoring reports and prioritizing new areas. Updated information will be included in the FY 2022 HCP Annual Report.

3.2 Effectiveness Monitoring

[Appendix: Background on Effectiveness Monitoring](#)

The HCP requires DNR to conduct effectiveness monitoring to determine whether implementation of the conservation strategies results in anticipated habitat conditions. Effectiveness monitoring is intended to document changes in habitat conditions, including general forest structure, specialized habitat features, and northern spotted owl prey populations following timber harvest and other forest management activities. Over time, the results from this effectiveness monitoring may be used to modify management practices to enable DNR to better manage land in accordance with the conservation objectives described in the HCP. This section includes annual updates on the effectiveness monitoring programs for northern spotted owl (NSO) habitat, aquatic and riparian habitat in the OESF, and riparian silviculture.

3.2.1 Northern Spotted Owl Effectiveness Monitoring Program

The NSO Effectiveness Monitoring Program evaluates changes in habitat, including forest structure and specific habitat features, that result from timber harvest and other management activities carried out under the HCP. The status of the two primary components of this program through FY 2021 is noted below.

Long-term tracking of the effects of variable density thinnings on improving habitat structure in stands designated as NSO habitat

The first component of this program was initiated in 2004-07 across five variable density thinning units in the North Puget (Whitehorse Flat timber sale), South Puget (Big Beaver and Cougarilla timber sales), Columbia (Lyons Share timber sale), and Klickitat (Loop timber sale) HCP planning units. The study design included two or three replications of treated stands and one untreated control stand at each site. All stands were measured prior to and immediately after treatment.

Staff conducted the five- to seven-year re-measurement of all five permanent plots from 2013 to 2015. Data analysis is currently underway to compare various metrics — such as tree density, canopy closure and cover, snags, and down wood — to measurements taken before and immediately after treatment. The final stage of this analysis involves processing historic aerial images to produce PhoDAR-based metrics of canopy cover for the pre- and post-treatment measurements. This will allow for consistent comparison of canopy cover and closure between the pre- and post-treatment measurements, and all subsequent re-measurements.

In future years, DNR intends to identify additional effectiveness monitoring sites in stands classified as “next-best” NSO stands using Remote-Sensing Forest Resource Inventory System (RS-FRIS) data, with the objective of identifying variable density thinning treatments that accelerate stand trajectory from next-best to habitat.

Landscape-scale monitoring of basic habitat indicators across the entire westside HCP land base

The objective of this project is to determine whether broad-scale trends in basic habitat features such as tree height, mean tree size, and canopy layering appear to be meeting HCP goals. To accomplish this, DNR is using multiple datasets to cover all westside lands that have consistent data over time. Preliminary results suggest that on lands managed with conservation objectives in addition to economic objectives, the amount of large/complex forest structure is increasing since the signing of the HCP, a distinct change in trend from the years prior to the HCP. Results for this project will be updated upon release of additional data that use a newer method and include additional years.

In addition to the monitoring activities described above, DNR is also conducting two research projects related to NSO effectiveness monitoring (Mind the Gap, and Westside Individuals, Clumps, and Openings). More information about both projects can be found in the [Research](#) section.

3.2.2 Status and Trends Monitoring of Riparian Habitat in the OESF

The key objectives of the Status and Trends Monitoring Program are to provide empirical data to evaluate progress in meeting the HCP riparian conservation objectives and to reduce uncertainties around the integration of habitat conservation and timber production. The study’s main hypothesis is that implementation of the HCP riparian conservation strategy for the OESF allows natural processes of ecological succession and disturbance to improve habitat conditions across managed watersheds over time. More information is available in the [Status and Trends 2013-2020 report](#).

In FY 2021, DNR and collaborators from the USDA Forest Service (USFS) Pacific Northwest Research Station continued field sampling and data management for nine habitat indicators, including riparian vegetation, stream temperature, stream shade, stream channel morphology, and in-stream wood. Automated stream flow monitoring stations recording continuous flow measurements at 10 different streams were maintained and calibrated. In FY 2021, the Status and Trends project team collaborated on several studies with researchers from the University of Washington, U.S. Department of Agriculture, U.S. Geological Survey, and the University of Connecticut, publishing two peer-reviewed publications (see [Publications](#) section) reporting on how watershed characteristics influence winter stream temperature in a forested landscape, and guidelines for using incomplete datasets in annual stream temperature analyses.

In addition, the Olympic Experimental State Forest (OESF) will be featured in Chapter 12 of a report that the Pacific Northwest Research Station will publish in FY 2022. This report synthesizes studies of the biological responses to stream nutrients from 17 long-term Status and Trends research sites across the U.S. Intended for use by regulatory agencies, the report identifies future research that could be conducted to fill important regulatory knowledge gaps. The OESF chapter summarizes and interprets past and ongoing research on stream quality and nutrients, including nitrogen and phosphorus. It also synthesizes information about the effects of climate change and atmospheric deposition on forest streams. Most importantly, this chapter includes information that is helping to fill one of the highest-priority knowledge gaps of regulatory agencies: the effects of alternative forest management activities on ecological conditions.

3.2.3 Riparian Silviculture Effectiveness Monitoring Program

The objective of the DNR effectiveness monitoring program for riparian silviculture is to determine whether various restoration thinning treatments are resulting in riparian habitat conditions that support salmon recovery efforts and contribute to the conservation of other riparian and aquatic species. Thinning treatments are consistent with the RFRS and are applied in riparian management zones in cooperation with the DNR timber sales program.

The effectiveness monitoring program uses an active study approach in which habitat metrics are measured before and after treatment. Treatments consist of thinning to Curtis relative density 40 (RD40) or 50 (RD50), thinning to RD50 with intentional canopy gaps (RD50 gap), or no thinning (REF). DNR established six monitoring sites between 2003 and 2008 in the OESF, South Puget, and North Puget HCP planning units. To assess changes in riparian habitat conditions, habitat metrics are measured at each monitoring site prior to harvest, after harvest, and periodically thereafter. A sampling history of the monitoring sites is included in Table 3-2.

Table 3-2: Treatment Summary and Sampling History of Riparian Silviculture Effectiveness Monitoring Sites.

Site/Timber Sale Name	Planning Unit	Treatments	Year Measured		
			Pre-treatment	Post-treatment	Latest Re-measurement
H1320	OESF	RD40, RD50, REF	2003	2006	2015
Salmon PC	OESF	RD40 RD50, REF	2004	2008	2013
Cougarilla	South Puget	RD40, RD50, RD50 gap, REF	2006	2008	2016
Big Beaver	South Puget	RD40, RD50, RD50 gap, REF	2006	2008	2016
Sumas Pass	North Puget	RD40, RD50, REF	2008	2013	2017
Pink Flamingo	North Puget	RD40, RD50, REF	2008	2010	2017

Several datasets have been prepared for analysis. These datasets include measurements of various habitat metrics, such as downed wood, and overstory and understory structure and composition. DNR scientists are currently organizing the existing data and exploring options for re-measurement of these sites. The program plans to develop a report and present findings following analysis.

3.3 Validation Monitoring

[Appendix: Background on Validation Monitoring](#)

The riparian validation monitoring program (RVMP) was formed to test the hypothesis that forest management practices implemented under the HCP will restore and maintain habitat capable of supporting viable salmonid populations within the OESF. If negative trends are detected in salmonid conditions (abundance, biomass, species composition, age structure, and number of spawning redds), monitoring will then seek to evaluate cause-and-effect relationships between DNR management activities, riparian habitat, and salmonids. Once underlying mechanisms are understood, DNR may use this information to adapt its management practices.

The RVMP uses an observational study approach to monitor 50 fish-bearing watersheds within the OESF and 10 reference watersheds in the OESF, Olympic National Park, and Olympic National Forest. These 60 watersheds are the same watersheds used in the DNR Status and Trends Monitoring of Riparian and Aquatic Habitat Program. As not all of the 60 watersheds can be sampled within one summer, 20 watersheds are sampled annually (annual panel), while an additional 20 watersheds per year are sampled on a two-year rotation (even and odd years). In addition, a section of the Clearwater River, a Type 1 stream, is snorkel-surveyed to assess DNR management on some of the larger streams of the OESF.

In FY 2021, the lead of the RVMP, fish biologist Kyle Martens, continued to work on the Technical Review Group of the [Quinault Indian Nation Lead Entity](#) and was asked to join the Technical Review Group of the [North Pacific Coast Lead Entity](#). These groups coordinate salmon habitat restoration on the western Olympic Peninsula. As part of the Technical Review Group, the RVMP provides scientific expertise to inform and prioritize potential restoration projects.

The RVMP also completed fieldwork focusing on four primary efforts:

1. Multiple-pass removal of resident and juvenile salmonid abundance sampling in the annual and odd-year panel of watersheds (Figure 3-3);
2. Adult coho redd surveys in the annual panel as a measure of adult abundance;
3. Snorkeling and habitat surveys over a 12-kilometer stretch of the Clearwater River;
4. Salmonid and habitat sampling for the riparian component of the T3 Watershed experiment.

Monitoring has shown that salmonid populations have been relatively high within our annual panel of watersheds, primarily driven by age-0 trout. However, the average juvenile coho salmon density in 2020 was the lowest since sampling began in 2016. The low density of coho should be monitored further to understand if it is the result of yearly variations or a sustained decrease.



Figure 3-3: Juvenile cutthroat trout collected from a stream in the OESF. Photo courtesy of Kyle Martens.

Overall, there have been large yearly and site variations in juvenile salmonid populations, showing the need for continuous (both annual and long-term) sampling to help separate fish responses between these natural variations and habitat responses. As sampling continues and more data becomes available, we are better suited to distinguish differences in management-related habitat changes from natural year-to-year variability in fish abundance and biomass (possibly associated with adult returns or seasonal weather trends). These patterns will be crucial for understanding the effects of DNR management on salmonid populations.

More information on the RVMP can be found in the [2020 RVMP Annual Report](#).

3.4 Research

DNR continually conducts research on its forestlands to better understand how forest management practices affect habitat conditions and forest productivity. This section describes DNR research projects on HCP-covered lands that address the three research priorities defined in the HCP (p. V.6):

- **Priority 1 Research** is “research that is a necessary part of a conservation strategy.”
- **Priority 2 Research** is “research needed to assess or improve conservation strategies or to increase management options and commodity production opportunities.”
- **Priority 3 Research** is “research needed to improve general understanding of the animals, habitats, and ecosystems addressed by the HCP.”

Table 3-3 summarizes DNR research projects on HCP-covered lands and the priorities they address. Some projects address multiple research priorities and monitoring commitments. More information on each project is included below the table.

Table 3-3: DNR’s Research and Monitoring Projects on HCP-Covered Lands.

Project	Priority			Monitoring
	1	2	3	
A Rare Opportunity: Gaining Insights into Current and Future Forest Resilience to Wildfire in the Western Cascade Mountains			X	
Eastside NSO Habitat and Fire Risk Evaluation	X	X		
Experiment in Long-Term Ecosystem Productivity		X	X	
Influence of Repeated Alternative Biodiversity Thinning on Young Stand Development Pathways		X		
Landscape-Scale Effectiveness Monitoring of Western Washington HCP Lands		X		X
T3 Watershed Experiment on the OESF	X	X	X	X
Mind the Gap: Developing Ecologically Based Guidelines for Creating Gaps in Forest Thinnings on the Olympic Peninsula		X		
NSO Effectiveness Monitoring	X	X		X
Riparian Silviculture Effectiveness Monitoring	X	X		X
Riparian Validation Monitoring	X	X	X	X
Status and Trends Monitoring of Riparian and Aquatic Habitat on the OESF	X	X	X	X
Tracking Natural Tree Regeneration in Eastern Washington Forests Following Large Wildfires			X	
Using Passive Acoustic Monitoring to Evaluate Sustainability of Forest Management			X	X
Westside Individuals, Clumps, and Openings		X	X	

A Rare Opportunity: Gaining Insights into Current and Future Forest Resilience to Wildfire in the Western Cascade Mountains: The Norse Peak Fire burned more than 50,000 acres near Mount Rainier National Park in 2017 — one of the largest fires affecting the West Cascades since the early 1900s. This event provides a unique opportunity to enhance knowledge of fire ecology in forest types commonly found on DNR-managed land on the westside, and track how increasing disturbance and a warming climate affect these systems. The objectives of the study are twofold:

1. Examine landscape patterns of burn severity in the Norse Peak Fire and compare them to regional historical fire regimes.
2. Test how post-fire vegetation responds to the interaction of burn severity and past disturbance history (including forest management) under a warming climate.

To date, researchers have established and collected data in 56 2.5-acre permanent plots. Data collected includes tree overstory conditions, post-fire seedling regeneration, and understory response.

Data will be analyzed during the winter and spring of 2022 to address questions pertaining to forest resilience and recovery across different fire severities, pre-fire stand structures, and forest zones. Researchers will also examine above-ground carbon changes due to fire, develop a natural range of variability in complex early-seral conditions, and identify locations where huckleberry (an important species for tribes) is more or less likely to persist and positively respond to wildfire. This research is being conducted in collaboration with the University of Washington and Mount Baker-Snoqualmie National Forest. For more information, contact Joshua Halofsky: Joshua.Halofsky@dnr.wa.gov.

Eastside NSO Habitat and Fire Risk Evaluation: This project is assessing historic, current, and future NSO habitat across all available lands in the eastern Washington Cascades. DNR hopes to answer two fundamental questions:

1. How much late-successional, complex-structure habitat can likely be sustained in these fire-prone landscapes?
2. Where on the landscape is such habitat most likely to develop and persist the longest?

Results from this project will help the agency determine the degree to which the current approach for managing eastside NSO habitat under the HCP is likely to be sustainable for the life of the HCP. This research will also help inform other DNR priorities, such as sustainable harvest calculations and forestland planning efforts. To examine question 1, researchers have analyzed nearly 300,000 acres of DNR's original mapped inventory (circa 1960) to estimate potential NSO habitat abundance in the near past. As a second line of evidence, DNR has also conducted extensive modeling to estimate likely ranges in historical NSO abundance prior to Euro-American settlement. To answer question 2, researchers examined more than 200 known NSO nest site locations using LiDAR to better understand how the amount and configuration of habitat used by nesting owls differ from locations where owls are not known to nest. This analysis was used to derive a NSO structural suitability map.

Concurrently, researchers also developed maps representing current forest zones, and how those forest zones shift under climate change. Once combined, the two maps will identify locations where the structures and types of forest used by NSO are likely to persist through mid-century, areas that are currently habitat but are less likely to persist, and areas that are not currently habitat but are more likely to become habitat in the future. This project is a collaboration between DNR, UW, and USFS. Two manuscripts from this project will be submitted to peer-reviewed journals by spring of 2022. For more information, contact Joshua Halofsky: Joshua.Halofsky@dnr.wa.gov.

Experiment in Long-Term Ecosystem Productivity: Models suggest that intensively harvested conifer plantations experience long-term degradation of productivity due to a slow drain of nutrients, especially nitrogen. This project, a collaborative effort between the University of Washington, the Pacific Northwest Research Station, Oregon State University, Western Washington University, and DNR, tests the influence of stand composition and the level of wood removal on tree and soil productivity, soil structure, and plant species diversity. The cooperative, multiple-decade study has been replicated at four sites in the Pacific Northwest: three national forests in Oregon (Willamette, Siskiyou, and Siuslaw) and the OESF. The OESF permanent plot installation in Sappho was established in 1995 and was re-measured in 2000 and 2016. The field measurements in FY 2021 focused on understory vegetation and tree seedlings. A summary of this project is available on the [OESF webpage](#). For more information, visit the [ONRC webpage](#) or contact Teodora Minkova: Teodora.Minkova@dnr.wa.gov.

Influence of Repeated Alternative Biodiversity Thinning on Young Stand Development

Pathways: This project was initiated in the late 1990s and stemmed from DNR’s interest in testing pre-commercial thinning (PCT) as a way to set young stands on development pathways to increase forest structural complexity and habitat diversity. In 1998, five treatments were replicated at five sites on the OESF. Treatments included one control plus two different densities of PCT with or without the addition of gaps (Figure 3-4). In 2017, the sites were thinned again and additional gaps installed to explore the influence of gap timing on structural complexity. Information gained from this project will inform agency decisions about the value of different treatment options in meeting multiple management objectives under the biodiversity pathways approach. As of 2021, this research is ongoing and a summary of this project is available on the OESF webpage. For more information, contact Warren Devine: Warren.Devine@dnr.wa.gov.



Figure 3-4: Understory vegetation community in a young stand in the OESF. This stand was pre-commercially thinned in 1998, creating gaps created to foster development of structural complexity and habitat diversity. Photo courtesy of Richard Bigley.

Landscape-Scale Effectiveness Monitoring of Western Washington HCP Lands: The goal of this project is to determine how landscape-scale habitat conditions have changed since the implementation of the HCP. More information can be found in the [NSO Effectiveness Monitoring](#) section. For more information, contact Daniel Donato: Daniel.Donato@dnr.wa.gov.

T3 Watershed Experiment (Large-Scale Integrated Management Experiment on the OESF): In FY 2021, DNR and ONRC collaborated with Oregon State University and the USDA Forest Service Pacific Northwest Research Station to develop a study plan for the upland component of the experiment. The draft plan will be submitted for peer review. Four alternative upland silvicultural prescriptions will be compared to DNR standard forest management practices in multiple replicates across the 16 experimental watersheds. All experimental treatments, taking on up to 13 percent of the watershed area, will be implemented through DNR timber sale and silvicultural programs. Pre-treatment monitoring started in several experimental upland units. In addition, the pre-treatment monitoring for the five riparian experimental treatments continued at two stream reaches in each watershed, for a total of 32 riparian monitoring sites. The protocols include sampling of stream habitat characteristics, fish, macroinvertebrates, algae, periphyton, water quality, and riparian vegetation. Legislative funding for partial implementation of the project was secured for FY 2020 and FY 2021. For more information, contact Teodora Minkova: Teodora.Minkova@dnr.wa.gov.

Mind the Gap: Developing Ecologically Based Guidelines for Creating Gaps in Forest

Thinnings on the Olympic Peninsula: The goal of this DNR-funded project is to better match silvicultural gap treatments with the late-successional forests they aim to emulate. This study has three phases:

- Phase I: A retrospective study of 10-year-old silvicultural gaps.
- Phase II: An observational study of natural gap structures in primary (never-managed) old-growth forests, which will establish critical reference information.

- Phase III: A replicated silvicultural experiment to test novel gap treatments (informed by the structures found in primary forests) within a variable density thinning treatment.

DNR is tracking tree recruitment, understory vegetation response, branching/crown responses, decadence (dead wood) creation around gap edges, and post-treatment dynamics of gap contraction and expansion (i.e., blowdown). Results from this study are relevant to providing structural diversity and habitat in managed forests. The project was initiated and peer-reviewed in 2014, with data collection for Phase I completed that summer. Data analysis for Phase II is ongoing, including high-resolution LiDAR processing, gap delineation, field validation, and spatial analyses. Thinning treatments and pre- and post-treatment measurements have been conducted for Phase III. This study is now in a waiting period until the next set of measurements are taken, which are planned for 5-10 year intervals. A summary of this project is available on the [OESF webpage](#). For more information, contact Daniel Donato: Daniel.Donato@dnr.wa.gov.

NSO Effectiveness Monitoring: The NSO Effectiveness Monitoring Program evaluates whether the HCP strategies and associated silvicultural treatments maintain or enhance NRF and dispersal habitat. More details can be found in the [NSO Effectiveness Monitoring](#) section. For more information, contact Daniel Donato: Daniel.Donato@dnr.wa.gov.

Riparian Silviculture Effectiveness Monitoring: Since 2006, DNR has documented site responses to silvicultural treatments designed to meet the management objectives specified in the RFRS. More details about this ongoing research can be found in the [Riparian Silviculture Effectiveness Monitoring](#) section. For more information, contact Daniel Donato: Daniel.Donato@dnr.wa.gov.

Riparian Validation Monitoring: The RVMP determines whether DNR's current forest management practices restore and maintain habitat capable of supporting viable salmonid populations. A summary of this work can be found in the [Validation Monitoring](#) section. For more information, contact Kyle Martens: Kyle.Martens@dnr.wa.gov.

Status and Trends Monitoring of Riparian and Aquatic Habitat on the OESF: This project evaluates changes to riparian and aquatic habitat conditions in managed watersheds of small fish-bearing streams across the OESF. More details on this work can be found in the [Effectiveness Monitoring](#) section. For more information, contact Teodora Minkova: Teodora.Minkova@dnr.wa.gov.

Tracking Natural Tree Regeneration in Eastern Washington Forests Following Large Wildfires: Between 2012 and 2015, more than 2.1 million acres burned in Washington, primarily east of the Cascade crest. Most projections suggest fire activity will increase and catalyze ecosystem change under a warming climate. Limited reforestation funds and the expanding burn acreage means that natural regeneration will determine the capacity of many eastside forests to provide goods, services, and management options over the long term.

DNR is conducting one of the first region-wide studies of post-fire regeneration in eastern Washington, focusing on all large fires on public forestlands that burned during 2012-17. The project objectives are to quantify the rate, density, and composition of tree and non-tree vegetation regeneration as influenced by burn severity and environmental setting, and to evaluate the potential for regeneration failure in warm, dry sites near the lower treeline. The study was initiated in 2016 with the establishment of approximately 60 field plots. Fifty additional plots were established in 2017, and another 80 plots were established in 2018. Plot establishment will continue through 2022, with a plan to monitor plots at 5-10 year intervals. For more information, contact Daniel Donato: Daniel.Donato@dnr.wa.gov.

Using Passive Acoustic Monitoring to Evaluate Sustainability of Forest Management: This project assesses the response of indicator bird species to habitat changes caused by forest management. Results will help DNR compare the effectiveness of current upland habitat



Figure 3-5: Acoustic recording unit is installed as part of the Passive Acoustic Monitoring Study. Photo courtesy of Teodora Minkova.

conservation strategies to alternative approaches. The study is implemented across the 16 watersheds designated for the T3 Watershed Experiment described above. The [study plan](#) was developed and peer reviewed in 2020. The project is partially funded by a grant from the EarthWatch Institute and includes a citizen science component.

In 2021, DNR researchers worked with five teams of volunteers to conduct forest habitat surveys in some of the 2013 monitoring stations, and 55 volunteers contributed more than

1,780 hours of field work. Sound recorders were installed and bird vocalizations were recorded for four days in all 2013 monitoring sites during the birds' breeding season (Figure 3-5). For more information, contact Teodora Minkova at Teodora.Minkova@dnr.wa.gov.

Westside Individuals, Clumps, and Openings: Adapting recently developed methods for restoration thinnings on the eastern slopes of the Cascades, this study aims to characterize patterns of stems in old forest reference stands (focusing on known NSO nest sites and territories) and evaluate the degree to which these patterns can be emulated in variable density thinning treatments. Stems in three pilot early old-growth stands and three thinned second-growth stands in westside planning units have been mapped; other qualified stands are being sought. DNR is conducting this project in partial collaboration with University of Washington. For more information, contact Daniel Donato: Daniel.Donato@dnr.wa.gov.

3.5 OESF Research and Monitoring Program

[Appendix: Background on the Research and Monitoring Program](#)

In FY 2021, the OESF Research and Monitoring Program continued implementing two HCP monitoring projects ([Status and Trends Monitoring of Aquatic and Riparian Habitat](#) and [Riparian Validation Monitoring](#)) and two research projects: the T3 Watershed Experiment, a large-scale integrated management experiment in cooperation with University of Washington's Olympic Natural Resources Center (ONRC) and other research institutions, and Passive Acoustic Monitoring to Evaluate Sustainability of Forest Management. Information about these projects can be found in the [Research](#) section of this report and on the [OESF webpage](#).

Despite the continuing COVID-19 pandemic, DNR researchers and field staff were able to complete all planned work following federal, state, and DNR agency safety protocols.

The fourth annual OESF Science Conference took place virtually in April 2021 and was attended by 90-plus people. A dedicated student poster session featured the OESF projects of undergraduate and graduate students. The stakeholder outreach sessions for the T3 Watershed Experiment in the afternoon focused on collaborative learning with the project scientists and DNR staff.

The OESF Research and Monitoring Program and the ONRC continued to publish the joint biannual electronic newsletter *The Learning Forest* in the spring and fall. All issues are available on the [OESF website](#). The publication is distributed to the internal networks of DNR and UW, and an additional 200-plus email subscribers.

In FY 2021, the program had two external sources of funding to support several research projects on the Olympic Peninsula: a three-year grant from the Earthwatch Institute to conduct passive acoustic monitoring by engaging volunteers to collect field data and a legislative budget proviso for FY 2020 and FY 2021 to coordinate with ONRC on four research projects.

3.6 Publications and Presentations

In addition to conducting research on DNR-managed forestlands, DNR researchers also write and contribute to publications and presentations relevant to forest management in the Pacific Northwest. DNR authors denoted in bold text contributed to the articles and presentations listed below published in calendar year 2021.

3.6.1 Publications

Devine, Warren D., E. Ashley Steel, Alex D. Foster, **Teodora V. Minkova**, and **Kyle D. Martens**. Watershed characteristics influence winter stream temperature in a forested landscape. *Aquatic Sciences* 83(45):1-17. 2021. [<https://link.springer.com/article/10.1007/s00027-021-00802-x>]

- Winter stream temperatures, though infrequently studied, exert important influences on aquatic communities. The influences of four watershed characteristics on winter stream temperature were assessed at the scale of type-3 watersheds in the OESF: stream size, elevation, solar exposure, and presence of glacial materials overlying bedrock.

Harvey, B.J., **Donato, D.C.**, and **J.S. Halofsky**. Fighting wildfires in western Washington requires different approaches. *Crosscut*. July 14, 2021. [<https://crosscut.com/opinion/2021/07/fighting-wildfires-western-wa-requires-different-approaches>].

Johnson, Zachary C., Brittany G. Johnson, Martin A. Briggs, Craig D. Snyder, Nathaniel P. Hitt, and **Warren D. Devine**. Heed the data gap: guidelines for using incomplete datasets in annual stream temperature analyses. *Ecological Indicators* 122:107229. 2021. [<https://www.sciencedirect.com/science/article/pii/S1470160X20311687>]

- Incomplete stream temperature datasets may affect interpretation of watershed processes and resilience. Using data from the OESF and other sites, this analysis found that when using a sine-wave modelling approach to analyze annual stream temperature patterns, accurate thermal signal estimates can be made when missing up to seven to nine consecutive weeks of data.

Minkova, T.V., M. Hicks, **K.D. Martens**. Ecoregion 7.1.8 Coast Range: Olympic Experimental State Forest, Washington. Publication in press: Ryan, Douglas F., ed. Biological responses to stream nutrients: a synthesis of science from experimental forests and ranges. Gen. Tech. Rep. [PNW-GTR-981](#). Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 2021.

- The Olympic Experimental State Forest (OESF) is featured in Chapter 12 of a report published by the USDA Forest Service's Pacific Northwest Research Station. This report

synthesizes studies of the biological responses to stream nutrients from 17 long-term research sites across the U.S. Intended to be used by regulatory agencies, the report identifies future research that could be conducted to fill important regulatory knowledge gaps. The OESF chapter summarizes and interprets past and ongoing research on stream quality and nutrients, including nitrogen and phosphorus. It also synthesizes information about the effects of climate change and atmospheric deposition on forest streams. Most importantly, this chapter includes information that is helping to fill one of the highest-priority knowledge gaps of regulatory agencies: the effects of alternative forest management activities on ecological conditions.

Martens, K.D. and Dunham, J. Evaluating coexistence of fish species with coastal cutthroat trout in low order streams of western Oregon and Washington, USA. *Fishes*, 6(1), p.4. 2021. [<https://doi.org/10.3390/fishes6010004>]

Reilly, M.J., Halofsky, J.E., Krawchuck, M.A., **Donato, D.C.**, Hessburg, P.F., Johnston, J.D., Merschel, A.G., Swanson, M.E., **Halofsky, J.S.** and T.A. Spies. Fire Ecology and Management in Pacific Northwest Forests. *In* Greenberg, C.H., and B. Collins (editors), Fire ecology and management: past, present, and future of US forest ecosystems. Springer, New York. 2021. [https://doi.org/10.1007/978-3-030-73267-7_10]

Rocchio, F.J., E. Gage, A.K. Borkenhagen, and D.J. Cooper. 2021. Ecohydrological characteristics of a newly identified coastal raised bog on the western Olympic Peninsula, Washington State, USA. *Ecohydrology*. 14(4). 2021. [<https://onlinelibrary.wiley.com/doi/10.1002/eco.2287>]

3.6.2 Presentations

Buonanduci, M.S., **Donato, D.C.**, **Halofsky, J.S.**, Harvey, B.J. Potential impacts of future fires in western Cascadia: scaling spatial patterns of burn severity. 9th International Fire Ecology and Management Congress, Pensacola, FL (virtual in 2021 due to COVID-19 restrictions). Oral Presentation. 2021.

Devine, Warren, Teodora Minkova, and Kyle Martens. “Status and Trends of OESF Riparian and Aquatic Habitat: 5-year Monitoring Results.” Invited presentation. OESF Science Conference. 2021.

- This presentation discussed findings after five years of monitoring salmonid habitat in type-3 streams in the OESF. Riparian forests were diverse in structure but provided high levels of shade to streams, and summer stream temperatures remained cool. Though in-stream wood was present in sufficient density to provide habitat, most of the largest pieces were in advanced stages of decay.

Halofsky, J.S. *Setting the stage: wildfire and forest health in western Washington.* King County Climate Preparedness Program. July 2021.

Halofsky, J.S. Short-term post-fire dynamics following stand-replacing wildfire in the western Cascades. Sustainable Northwest Westside fire convening. September 2021.

Harvey, B.J., **Donato, D.C.**, **Halofsky, J.S.**, Buonanduci, M.S., Laughlin, M.M., Rangel-Parra, L.K., Morris, J.E. Forest fires in western Cascadia: Drivers, characteristics, and indicators of post-

fire resilience. 9th International Fire Ecology and Management Congress, Pensacola, FL (virtual in 2021 due to COVID-19 restrictions). Oral Presentation. 2021.

Harvey, B.J., Buonanduci, M.S., **Donato, D.C., Halofsky, J.S.** Spatial patterns of burn severity in an archetypal infrequent-severe fire regime: Insights from the Western Cascades. Annual Meeting, Ecological Society of America, Long Beach, CA (virtual in 2021 due to COVID-19 restrictions). Oral Presentation. 2021.

Laughlin, M.M, Rangel-Parra, L.K., Morris, J.E., **Donato, D.C., Halofsky, J.S.,** Harvey, B.J. Disturbance and climate drivers of conifer regeneration following stand-replacing wildfire in western Cascadia, USA. 9th International Fire Ecology and Management Congress, Pensacola, FL (virtual in 2021 due to COVID-19 restrictions). Poster Presentation. 2021.

Martens, K.D. Linking in-stream wood recruitment to adjacent forest development in landscapes driven by stand-replacing disturbances: a conceptual model to inform riparian and stream management. Coast Salmon Partnership. 2021.

- This presentation provided an overview of recently released paper on in-stream wood recruitment.

Martens, K.D., Bormann, B.T., **Minkova, T.V.,** Olson, D.H., Bollens, S.M., Butman, D., Kiffney, P.M., **Alexander, K.,** and Liermann, M. OESF T3 Watershed Experiment: Riparian Study. Invited presentation. OESF Science Conference. 2021.

- This presentation discussed the riparian portion of the T3 watershed experiment.

Martens, K.D., Bormann, B.T., **Minkova, T.V.,** Olson, D.H., Bollens, S.M., Butman, D., Kiffney, P.M., **Alexander, K.,** and Liermann, M. OESF T3 Watershed Experiment: Riparian Study. Invited presentation. T3 Riparian stakeholders meeting. 2021.

- This presentation discussed the riparian portion of the T3 watershed experiment.

Morris, J.E., Laughlin, M.M, Rangel-Parra, L.K., **Donato, D.C., Halofsky, J.S.,** Harvey, B.J. Carbon consequences and reburn potential following forest fires in western Cascadia: influence of stand age and burn severity. 9th International Fire Ecology and Management Congress, Pensacola, FL (virtual in 2021 due to COVID-19 restrictions). Poster Presentation (received 1st place award in student poster contest). 2021.

Rangel-Parra, L.K., Laughlin, M.M, Morris, J.E., **Donato, D.C., Halofsky, J.S.,** Harvey, B.J. Laying the groundwork: Drivers of post-fire early-seral plant community trajectories in western Cascadia. 9th International Fire Ecology and Management Congress, Pensacola, FL (virtual in 2021 due to COVID-19 restrictions). Poster Presentation. 2021.

Rocchio, F.J. Ecology of Crowberry Bog: the only known raised bog in the western, conterminous United States. Invited presentation. Olympic Region Timber, Fish and Wildlife Meeting. 2021.

- This presentation discussed the global and regional conservation significance of Crowberry Bog

Rocchio, F.J. Ecological characteristics of Crowberry Bog, the only known raised bog in the western, conterminous United States. Invited presentation. OESF Science Conference. 2021.

4.0 Forest Inventory

A comprehensive review of the DNR Remote Sensing Forest Resource Inventory System (RS-FRIS) was provided in the [FY 2019 HCP Annual Report](#). As a reminder, RS-FRIS relies largely on remotely sensed data instead of field plots. With the adoption of RS-FRIS, DNR's inventory coverage has expanded considerably, and a new inventory is produced every two years using newly acquired remotely sensed data rather than relying on growth and yield models to grow data forward in time.

RS-FRIS predicts forest conditions using statistical models that relate field measurements to three-dimensional remotely-sensed data ("PhoDAR" and LiDAR point clouds). RS-FRIS includes a combination of raster, vector (polygon), and point data. A suite of approximately 40 rasters report inventory attributes (e.g., volume, dbh, basal area, diameter) at 0.1 acre resolution. Attributes of each polygon (forest inventory unit) were populated using summaries (mean and median) of the underlying RS-FRIS rasters. Point data shows the location of field inventory plots, and includes both tabular data and photographs (where available).

Earlier versions of RS-FRIS reported conditions as of 2013 (RS-FRIS 1.0), 2015 (RS-FRIS 2.0), and 2017 (RS-FRIS 3.0). With each subsequent release, coverage has expanded, and RS-FRIS 4.0, published internally in February 2022, covers approximately 99.9 percent and 98.3 percent of DNR-managed forest lands in western and eastern Washington, respectively.

This update includes expanded coverage and now reports conditions using remotely sensed data collected in 2019 and 2020. This update replaces the previously posted version (RS-FRIS 3.0), which reported conditions as of summer 2017.

Updates for this iteration of RS-FRIS include:

- More recent remotely sensed data. RS-FRIS 4.0 incorporates remotely sensed data collected in 2019 and 2020. Approximately 85 percent of DNR-managed forest lands were flown in 2019; the remaining 15 percent were flown in 2020.
- Expanded coverage.
- Four new layers reporting above-ground biomass and carbon.
- Updated methodology to incorporate data from high-severity and very-high-severity fires in eastern Washington from 2010-20. Inventory attributes for these areas are imputed directly from plot data, instead of predicted from computer models. Origin year is reset to the fire year.

Additional funding provided by the Washington State Legislature through Second Substitute House Bill 1168 has allowed the forest inventory program to expand its field sampling efforts. The inventory program hired three additional field staff and has implemented two large-scale contracts to install field plots at an accelerated rate, with approximately 2,000 additional field plots to be completed by the end of the biennium (June 2023). The expanded effort represents a quadrupling of the rate of field sampling. The additional data will be used for fifth iteration of the inventory (RS-FRIS 5.0).

5.0 Silvicultural Activity

Appendix: Background on Silvicultural Activity

Information and analysis provided in this section are based on activities designated as “complete” in DNR’s forest management activity tracking database, Land Resource Manager (LRM), as of December 21, 2021. LRM is a tabular database that integrates a Geographic Information System (GIS) and allows for the spatial tracking of individual forest management activities on the landscape.

Five major silviculture activity types are discussed in this report: timber harvest, site preparation, forest regeneration, vegetation management, and pre-commercial thinning (PCT). These activities typically occur in this order following final harvest of standing

timber (Table 5-1). Table 5-1 shows completed acres (rounded to the nearest whole acre) of silvicultural activities for FY 2021 and Table 5-2 shows the mean annual acres of each activity for the last five fiscal years by HCP planning unit. FY 2021 data for OESF is shown in Table 5-2. Tables do not include any silviculture activities for which both the completed acreage in FY 2021 and the five-year mean are below 50 acres. (Note that no activities were completed in the Chelan HCP Planning Unit in FY 2021.) Table 5-2 shows post-harvest replanting.



Figure 5-1: Dispersed retention on a variable retention harvest unit in Northwest Region. Photo courtesy of Zak Thomas.

5.1 Timber Harvest

The rights to harvest timber from state trust lands are purchased at regional public auctions held each month. A timber sale contract allows the purchaser to remove timber, typically over a one- to two-year period. Therefore, the number of timber sales sold may stay relatively stable from year to year while timber removals or levels of completed activities may vary based on when purchasers choose to harvest (and thus complete) the sale.

Across all HCP planning units, acres of variable retention harvest (VRH) completed in FY 2021 were 11 percent below the five-year mean, acres of variable density thinning (VDT) were 42 percent below the five-year mean, and acres of commercial thinning were 6 percent above the five-year mean. In the eastside planning units in FY 2021, acres of completed commercial thinning was 400 percent above the five-year mean while acres of variable retention harvest were 47 percent below the mean.

5.2 Forest Site Preparation

Total acreage of forest site preparation completed in FY 2021 was 45 percent higher than the five-year mean. In westside planning units not including the OESF, ground herbicide treatment acres were 48 percent above the mean. In eastside planning units, there were no acres of chemical or mechanical site preparation, but these activities are generally rare in these areas.

5.3 Forest Regeneration

Total acreage of forest regeneration completed in FY 2021 was 10 percent higher than the five-year mean. There was 110 acres of completed natural regeneration in North Puget planning unit, representing less than 1 percent of all reforested acres on lands managed under the HCP. There were no acres of reforestation completed in eastside planning units in FY 2021, reflecting a lack of regeneration and fire salvage harvest operations in these areas in recent years.

5.4 Vegetation Management

Acres of completed vegetation management in FY 2021 were 2 percent below the five-year mean. Ground herbicide and hand cutting treatments in the OESF were 24 and 48 percent above the five-year mean, respectively. In westside planning units not including the OESF, ground herbicide treatments were 74 percent above the five-year mean, while hand-cuttings were 20 percent lower.

5.5 Pre-Commercial Thinning

The total acreage of PCT completed in FY 2021 was 83 percent above the five-year mean. Completed PCT acres in westside planning units not including the OESF was 86 percent higher than the five-year mean while the rate was 104 percent higher than the mean in eastside planning units. New funding sources for silvicultural activities allowed for a greater amount of PCT to be completed in FY 2021.



Figure 5-2. Contractors replant seedlings in the South Puget Sound Planning Unit. Photo courtesy of Zak Thomas.

Table 5-1: Acres of Silviculture Activities Completed in FY 2021 on State Trust Lands Managed under the HCP (OESF FY 2021 is included on Table 5-2).

	FY 2021						
	EAST		WEST				
	Klickitat	Yakima	Columbia	North Puget	South Coast	South Puget	Straits
Timber harvest							
Commercial Thinning	483			468			1,096
Phased Patch Regeneration Cut	107						
Shelterwood Removal Cut							
Uneven-Aged Management	8						5
Variable Density Thinning	104		19	321			
Variable Retention Harvest	51		3,074	2,699	2,614	633	1,057
Total timber harvest	754		3,093	3,489	2,614	633	2,158
Forest site preparation							
Aerial Herbicide			2,641	720	1,301		
Ground Herbicide			816	2,196	2,593	884	2,518
Ground Mechanical							
Total forest site preparation			3,457	2,916	3,895	884	2,518
Forest regeneration							
Hand Planting			3,241	2,958	3,116	1,400	2,271
Natural Regeneration				110			
Total forest regeneration			3,241	3,068	3,116	1,400	2,271
Vegetation management							
Fuels Management							
Ground Herbicide			163	565	776	280	1,604
Hand Cutting			244	2,710	1,020	181	465
Hand Pulling			76				
Total vegetation management			482	3,275	1,796	461	2,068
Pre-commercial thinning							
Total pre-commercial thinning	308	2,330	359	2,071	2,120	1,523	2,852
Grand Total	1,062	2,330	10,633	14,820	13,541	4,902	11,868

Table 5-2: Combined Acres of Silviculture Activities Completed in FY 2021 (grouped into East, West, and OESF) Compared to the Five-year Mean Acres of Silviculture Activities Completed on State Trust Lands Managed under the HCP.

	FY 2021 Totals (Five-year Mean: FY17-21)			
	East	West	OESF	Total
Timber Harvest				
Commercial Thinning	483 (96)	1,564 (1,604)	0 (226)	2,047 (1,928)
Phased Patch Regeneration Cut	107 (21)	0 (0)	0 (0)	107 (21)
Shelterwood Removal Cut	0 (0)	0 (18)	0 (0)	0 (18)
Uneven-Aged Management	7 (300)	4 (42)	0 (0)	12 (342)
Variable Density Thinning	104 (242)	340 (1,095)	1,074 (1,291)	1,518 (2,629)
Variable Retention Harvest	51 (97)	10,077 (11,323)	1,202 (1,289)	11,331 (12,709)
Total timber harvest	753 (757)	11,986 (14,084)	2,277 (2,807)	15,017 (17,649)
Forest site preparation				
Aerial Herbicide	0 (0)	4,662 (3,141)	0 (0)	4,662 (3,141)
Ground Herbicide	0 (0)	9,008 (6,100)	902 (591)	9,910 (6,692)
Ground Mechanical	0 (203)	0 (0)	0 (0)	0 (203)
Total forest site preparation	0 (203)	13,670 (9,241)	902 (591)	14,573 (10,036)
Forest regeneration				
Hand Planting	0 (372)	12,987 (11,036)	953 (1,198)	13,941 (12,607)
Natural Regeneration	0 (98)	110 (34)	5 (3)	115 (135)
Total forest regeneration	0 (470)	13,097 (11,070)	958 (1,201)	14,056 (12,742)
Vegetation management				
Fuels Management	0 (50)	0 (0)	0 (0)	0 (50)
Ground Herbicide	0 (0)	3,387 (1,942)	122 (98)	3,509 (2,041)
Hand Cutting	0 (0)	4,619 (5,757)	663 (448)	5,282 (6,206)
Hand Pulling	0 (0)	76 (755)	0 (0)	76 (755)
Total vegetation management	0 (50)	8,083 (8,456)	785 (547)	8,868 (9,053)
Pre-commercial thinning				
Total pre-commercial thinning	2,638 (1,293)	8,925 (4,792)	823 (691)	12,386 (6,778)
Grand Total	3,392 (2,775)	55,763 (47,644)	5,746 (5,839)	64,902 (56,260)

5.6 Salvage

Table 5-3 compares acres of salvage harvest completed in FY 2021 to the five-year mean by harvest type. Overall, the total acreage of salvage harvest was 18 percent below the five-year mean and was all located in westside HCP planning units not including the OESF. In these areas, there were 186 acres of completed salvage harvest (178 acres were fire salvage), which is 148 percent higher than the five-year mean.

Table 5-3: Acres Salvaged by Harvest Type in FY 2021 Compared to the Five-year Mean (FY17–21).

		FY 2021 (Five-year Mean: FY17–21)			
		East	West	OESF	Total
Harvest type	Commercial Thinning	0 (0)	0 (0.2)	0 (0)	0 (0)
	Uneven-Aged Management	0 (0)	0 (0)	0 (0)	0 (0)
	Variable Density Thinning	0 (0)	0 (71)	0 (0)	0 (71)
	Variable Retention Harvest	0 (67)	186 (75)	0 (12)	0 (154)
	Total	0 (67)	186 (148)	0 (12)	186 (227)

6.0 Road Management Activity

6.1 Forest Roads Program

Appendix: Background on Road Management Activity

The Forest Roads Program continues to improve DNR’s forest road infrastructure across the state. Unlike most activities described in this report, DNR reports road management activities by calendar year instead of fiscal year because of the complexities of collecting data and reporting road-related activities during the height of the construction season. This report contains two calendar years of data to “catch up” to the reporting in the rest of the HCP Annual Report. The information presented here is for calendar years 2020 and 2021.

In 2020, 25 barriers were removed from the fish-barrier worklist on DNR-managed lands, an investment of more than \$540,000. DNR removed or replaced 20 of the barriers, opening an estimated 12.8 miles of fish habitat on DNR-managed lands (Figure 6-1).

In 2021, 25 barriers were removed from the fish-barrier worklist on DNR-managed lands, an investment of more than \$3.67 million. DNR removed or replaced 24 of the barriers, opening an estimated 12 miles of fish habitat. The one remaining fish-passage barriers was removed from the work list because the stream designation was downgraded from “fish” to “non-fish” following protocol survey requirements.

Through land transactions and inspection activities in 2020 and 2021, DNR acquired 27 (8 and 19, respectively) new fish passage barriers that need to be corrected. The Forest Roads Program is committed to remediating new barriers within six years of their identification, and inspecting fish passage culverts every 10 years. In October 2021, DNR completed the removal or corrections of all fish barriers culverts under its Road Maintenance and Abandonment Plans, as required by the Timber, Fish, and Wildlife Agreement and Forest Practices Rules. At the end of calendar year 2021, 21 newly discovered fish barriers remained on DNR-managed lands. DNR has committed to replacing newly discovered fish barriers within six years of identification.

On HCP-covered lands, 40 miles of road were abandoned or decommissioned and 58 miles were constructed in 2020; in 2021, 29 miles were abandoned or decommissioned and 46 miles were constructed. In 2020, there was a net decrease of total road miles on HCP-managed lands from 10,653 to 10,585 due to land transactions, abandonment, decommissioning, and updates to the road inventory; whereas in 2021, there was a net increase from 10,585 to 10,723. Table 6-1 summarizes DNR’s road management activity on both HCP-covered and non-HCP-covered lands in calendar years 2020 and 2021.



Figure 6-1: Fish-barrier removal on an unnamed tributary to Kalaloch Creek. This project replaced a 60-inch corrugated metal pipe (left) with a 16-foot-diameter multi-plate culvert (right). This project opened up a total of 0.7 miles of salmon and trout habitat. Photos courtesy of Jeremy Tryall.

Table 6-1: Road Management Activity Summary for Calendar Year 2020 and 2021. All mileage data has been rounded to the nearest mile.

	Miles										Barriers	
	New Road Constructed		Road Reconstructed		Road Abandoned		Road Decommissioned		Inventoried Road ¹		Fish Barriers Removed	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Chelan	0	0	0	0	0	0	0	1	51	70	0	0
Columbia	11	5	11	6	6	8	0	0	1,270	1,283	0	1
Klickitat	0	0	2	1	0	0	0	1	581	605	0	1
North Puget	17	14	3	2	15	6	1	1	1,494	1,502	4	5
OESF	2	2	1	0	0	0	2	2	1,836	1,832	13	10
South Coast	12	16	6	5	3	1	1	1	1,724	1,759	2	2
South Puget	9	2	2	1	3	4	1	1	1,356	1,361	0	0
Straits	7	5	3	1	2	1	2	1	899	909	0	6
Yakima ²	0	2	0	2	0	0	2	1	1,374	1,401	0	0
TOTAL, HCP-Covered Lands	58	46	18	18	31	20	9	9	10,585	10,753	19	25
Non-HCP-Covered Lands	14	17	3	5	1	0	2	2	3,072	3,100	2	0
Teaway	0	0	0	0	4	0	12	3	351	351	4	0
TOTAL, NON-HCP-Covered Lands	14	17	3	5	5	0	14	5	3,422	3,451	6	0

¹ Inventoried road includes forest roads (according to [WAC 222-160-010](#)) and decommissioned roads. It does not include abandoned or orphaned roads.

² Data for the Yakima HCP Planning Unit does not include roads on land co-managed by DNR and WDFW in the Teaway Community Forest, as this land is not covered by the HCP.

DNR inspects roughly 10 percent of its fish culverts annually. An inspection in 2018 revealed that streambed material had washed out of a fish passage culvert installed in 2013. Additional streambed material was placed in 2020. The culvert is now in “monitor” status and will be checked annually. Pictured below (Figure 6-2) is the pre-repair condition; right shows how DNR crews re-filled the culvert with streambed material. This structure (T29R15W-11) is located on Cedar Creek and is a tributary of the Sol Duc River.



6-2. Culvert maintenance. Photo courtesy of Jeremy Tryall.

6.2 Easements

Appendix: Background on Easements

DNR grants easements across state trust lands to individuals, private organizations, and other public agencies for a variety of purposes, including road and utilities access. DNR also acquires easements across private or public lands to gain access to DNR-managed lands. In addition to granting and acquiring easements, DNR acquires new lands that are subject to existing easement rights.

6.2.1 Road Easement GIS and Spatial NaturE

DNR is digitally mapping all existing and new easements in the Road Easement GIS. Mapping of easements granted to DNR was completed in 2014. Initial mapping of road easements granted over DNR-managed trust lands in all regions was completed at the end of 2016. In FY 2021, DNR continued to make progress on the Spatial NaturE project that maps encumbrances on state lands that are not connected to DNR’s road system, such as utility corridors, communication sites, commercial leases, weather monitoring systems, irrigation infrastructure, water rights, agriculture and grazing leases, railroads, recreation sites, special use permits, and land use restrictions

6.2.2 Road Easements, Road Use Permits, and Utility Easements

Table 6-1 reports easements granted in FY 2021 that created a new footprint (i.e., timber was cut to create open space). Easements granted during the reporting period that created no new footprint because they overlap with existing easements or agricultural leases are not reported.

Table 6-1: Road Easements and Road Use Permits (New Footprint) Granted in FY 2021.

		Columbia	North Puget	OESF	South Coast	Straits	Klickitat	Chelan	Yakima	South Puget	Total
Road easements and road use permits	Miles	0.0	3.0	0.17	0.0	0.0	0.14	0.0	0.04	0.0	3.35
	Acres	0.0	5.3	0.65	0.0	0.0	2.65	0.0	0.1	0.0	8.7

7.0 Land Transaction Activity

Appendix: Background on Land Transaction Activity

Below is a summary of land acquisitions, dispositions, and transfers completed in FY 2021 by HCP planning unit. All newly acquired parcels listed in this section are now covered under the HCP and have been designated as “no role for northern spotted owl habitat,” although this designation may be revised based on the outcome of future field surveys. All disposed parcels were classified as “no role for northern spotted owl habitat” and are no longer covered under the HCP, unless otherwise noted.

Because the narrative portion of this section incorporates acreage data from land surveys conducted during transactions and Table 7-1 incorporates numbers from the DNR GIS layers, the numbers in the narrative may not match exactly the numbers in the table. The acreage data in the narrative is rounded to the nearest whole acre.

7.1 Activity by HCP Planning Unit

7.1.1 *Chelan*

No applicable transactions occurred in Chelan during the fiscal year.

7.1.2 *Columbia*

Acquired: DNR purchased 162 acres of forest land in Clark County. DNR purchased 77 acres of forest land in Cowlitz County.

Disposed: DNR transferred 39 acres of forest land in Cowlitz County.

7.1.3 *Klickitat*

No applicable transactions occurred in Klickitat during the fiscal year.

7.1.4 *North Puget*

Acquired: DNR purchased 23 acres of conservation land for Cypress Island NRCA in Skagit County.

Disposed: DNR transferred 525 acres of forest land in Skagit County.

Trust Land Transfer (TLT)/State Forest Transfer (SFT): In King County, 25 acres was transferred to Middle Fork Snoqualmie NRCA.

7.1.5 *OESF*

Acquired: DNR purchased 85 acres of conservation land for Crowberry Bog NAP in Jefferson County. DNR purchased 12 acres of forest land in Jefferson County.

7.1.6 *South Coast*

No applicable transactions occurred in South Coast during the fiscal year.

7.1.7 South Puget

Acquired: DNR purchased 177 acres of conservation land for Kennedy Creek NRCA in Mason County. DNR purchased 5 acres of conservation land for Woodard Bay NRCA in Thurston County.

Disposed: DNR transferred 27 acres of forest land in King County.

7.1.8 Straits

Acquired: DNR purchased 19 acres of conservation land for Dabob Bay NRCA in Jefferson County. DNR purchased 61 acres of forest land for Dabob Bay NRCA in Jefferson County. DNR purchased 38 acres of forest land in Mason County.

7.1.9 Yakima

No applicable transactions occurred in Yakima during the fiscal year.

Table 7-1: Acquisitions and Disposals Completed in FY 2021 within the HCP Boundary.

		HCP Planning Unit						Totals
		Columbia	North Puget	OESF	South Coast	South Puget	Straits	
		Acquired Lands¹						
Stream miles by stream type	Type 1	-	-	-	-	0.44	-	0.44
	Type 2	-	-	-	-	-	-	0.00
	Type 3	0.27	-	-	-	0.20	0.54	1.00
	Type 4	0.33	0.22	0.05	-	-	0.15	0.74
	Type 5	0.91	-	0.01	-	-	0.45	1.37
	Type 9	0.92	0.02	-	-	0.75	0.22	1.92
	Total miles acquired	2.43	0.24	0.06	-	1.39	1.35	5.47
Acres acquired in rain-on-snow zones⁴		-	-	-	-	-	3.39	3.39
Acres per asset class^{2, 3}	Forested	-	23	85	-	182	19	310
	Conservation	239	-	12	-	0	100	351
Total acres acquired³		239	23	97	-	0	119	660
		Disposed Lands						
Stream miles by stream type	Type 1	-	-	-	-	-	-	-
	Type 2	-	-	-	-	0.28	-	-
	Type 3	-	-	-	-	-	-	-
	Type 4	-	-	-	-	-	-	-
	Type 5	0.33	-	-	-	-	-	-
	Type 9	-	-	-	-	-	-	-
	Total miles disposed	0.33	-	-	-	0.28	-	0.61
Acres disposed in rain-on-snow zones⁴		-	-	-	-	-	-	-
Acres per age class³	Open (0–10 years)	-	77	-	-	-	-	77
	Regeneration (11–20 years)	31	-	-	-	-	-	31
	Pole (21–40 years)	-	-	-	-	-	-	-
	Closed (41–70 years)	6	86	-	-	-	-	92
	Complex (71–100 years)	-	177	-	-	-	-	177
	Complex (101–150 years)	-	13	-	-	-	-	13
	Functional (150+ years)	-	-	-	-	-	-	-
	Non-forested	2	170	-	-	27	-	199
Unknown	-	-	-	-	-	-	-	
Total acres disposed³		37	525	-	-	27	-	-

¹ Data for acquired lands are estimates that have not yet been field-verified.

² Asset-class data on acquired lands is obtained from deeds and other information relative to the holdings on the land. Over time, DNR will inventory acquired parcels and replace asset class information with more specific age-class data.

³ Acres rounded to nearest whole number.

⁴ Rain-on-Snow (ROS) data is derived from the DNR corporate GIS layer.

8.0 Natural Areas Program

Appendix: Background on the Natural Areas Program

In FY 2021, the Natural Areas Program protected an additional 399.7 acres in Natural Area Preserves (NAPs) and Natural Resource Conservation Areas (NRCAs), all within the area covered by the HCP. These protection efforts added to seven existing natural areas and established two new natural areas. The most significant of these were:

- **Cypress Island NRCA:** 22.3 acres of intertidal wetland and adjacent forested uplands near Strawberry Bay were acquired, adding to the conservation of this largely undeveloped island. With this acquisition, more than one-half of this intertidal wetland is now protected within the natural area, along with adjacent coniferous forest and seasonal streams. More than 95 percent of Cypress Island is managed by DNR as NAP or NRCA, including late-seral forests, freshwater and intertidal wetlands, beaches, and grassland balds.
- **Crowberry Bog NAP:** 85.3 acres were added to this recently established Natural Area Preserve. This purchase included an additional bog area and surrounding forest, and completed acquisition of all land within the approved boundary. The bog system on this preserve is globally significant, as it is the first documented raised plateau bog in the western United States and the southernmost in western North America. The central portion of this bog is elevated up to 9 feet above the outer portions due to thousands of years of peat accumulation. The site also supports a population of the rare June's copper butterfly.



Figure 8-1: Intertidal wetland on a newly acquired property at Cypress Island NRCA. Photo courtesy of Greg Victor Halberg.

In addition to land acquisitions, the Natural Areas Program continued to actively manage and enhance habitat on natural areas in FY 2021 to benefit federally listed species such as Wenatchee Mountains checker-mallow (Camas Meadows NAP), Island marble butterfly (Cattle Point NRCA; Figure 8-2), Oregon spotted frog (Trout Lake NAP), and Puget Sound/Hood Canal salmon runs (Dabob Bay NAP/NRCA). Bradshaw's lomatium was recently de-listed, in part due to protections



Figure 8-2: Preparing island marble butterfly habitat for seeding at Cattle Point NRCA. Photo courtesy of David Wilderman.

provided by the Lacamas Prairie NAP/NRCA, which supports a portion of the only Washington state population.

Table 8-1 lists acreage added to Natural Area Preserves located within the HCP boundary. Natural areas in bold text are composed primarily of mature forests and/or late-seral forests.

Table 8-1: Acres Added to Natural Area Preserves within HCP-Covered Lands in FY 2021.

Natural Area	County	Acres Added in FY 2021 ¹	Total Current Acres
Admiralty Inlet NAP	Island	-	79.5
Ashford NRCA	Pierce	-	78.4
Bald Hill NAP	Thurston	-	313.7
Blanchard Core NRCA	Skagit	-	661.5
Bone River NAP	Pacific	-	2799.7
Camas Meadows NAP	Chelan	-	2017.8
Carlisle Bog NAP	Grays Harbor	-	310
Cattle Point NRCA	San Juan	-	112.1
Charley Creek NAP	King	-	1966
Chehalis River Surge Plain NAP	Grays Harbor	-	4493.6
Clearwater Bogs NAP	Jefferson	-	504.1
Clearwater Corridor NRCA	Jefferson	-	2323
Columbia Falls NAP	Skamania	-	1233.8
Crowberry Bog NAP	Jefferson	85.3	321.3
Cypress Highlands NAP	Skagit	-	1072.4
Cypress Island NRCA	Skagit	22.3	4157.4
Dabob Bay NAP/NRCA	Jefferson	83.8	3293.6
Dailey Prairie NAP	Whatcom	-	228.8
Devils Lake NRCA	Jefferson	-	80
Elk River NRCA	Grays Harbor	-	5560
Ellsworth Creek NRCA	Pacific	-	557
Goose Island NAP	Grays Harbor	-	12
Granite Lakes NRCA	Skagit	-	603.2
Gunpowder Island NAP	Pacific	-	152
Hamma Hamma Balds NAP	Mason	-	957
Hat Island NRCA	Skagit	-	91.2
Hendrickson Canyon NRCA	Wahkiakum	-	159
Ink Blot NAP	Mason	-	183.6
Kennedy Creek NAP/NRCA	Mason	177.4	1110.6
Kings Lake Bog NAP	King	-	309.2
Kitsap Forest NAP	Kitsap	-	571.9
Klickitat Canyon NRCA	Yakima	-	2335.2
Lacamas Prairie NAP/NRCA	Clallam	-	211.1
Lake Louise NRCA	Whatcom	-	137.7
Lummi Island NRCA	Whatcom	-	671.5
Merrill Lake NRCA	Cowlitz	-	114.2
Middle Fork Snoqualmie NRCA	King	25.9	9224.3

Natural Area	County	Acres Added in FY 2021¹	Total Current Acres
Mima Mounds NAP	Thurston	-	640.5
Monte Cristo NAP	Klickitat	-	1151
Morning Star NRCA	Snohomish	-	37841.9
Mount Si NRCA	King	-	13734.9
Naselle Highlands NRCA	Pacific	-	327.7
Niawiakum River NAP	Pacific	-	1097.8
North Bay NAP	Grays Harbor	-	1214.9
Oak Patch NAP	Mason	-	17.3
Olivine Bridge NAP	Skagit	-	148
Point Doughty NAP	San Juan	-	56.5
Queets River NRCA	Jefferson	-	601
Rattlesnake Mtn Scenic Area	King	-	1875.7
Rocky Prairie NAP	Thurston	-	35
Sand Island NAP	Grays Harbor	-	8
Shipwreck Point NRCA	Clallam	-	471.8
Schumacher Creek NAP	Mason	-	498.8
Skagit Bald Eagle NAP	Skagit	-	1546
Skamokawa Creek NRCA	Wahkiakum	-	503.9
Skookum Inlet NAP	Mason	-	142.6
Snoqualmie Bog NAP	King	-	110.5
South Nemah NRCA	Pacific	-	2439.5
South Nolan NRCA	Jefferson	-	213
Stavis NRCA	Kitsap	-	2996.2
Stevenson Ridge NRCA	Skamania	-	752.3
Table Mountain NRCA	Skamania	-	2836.5
Tahoma Forest NRCA	Lewis	-	230
Teal Slough NRCA	Pacific	-	8.4
Trout Lake NAP	Klickitat	-	2014
Washougal Oaks NAP/NRCA	Clark	-	318.5
West Tiger Mountain NRCA	King	-	3915.5
Whitcomb Flats NAP	Grays Harbor	-	5
White Salmon Oak NRCA	Klickitat	-	551.2
Willapa Divide NAP	Pacific	-	587
Woodard Bay NRCA	Thurston	5	922.5
	Total Acres	399.7	128,820.8

¹Acreege data comes from the database maintained by the Land Transactions Program. This data represents acreage determined through surveys at the time of transaction and may not necessarily match the "GIS acres" of transacted land in the DNR GIS system.

Table 8-2 lists the federally threatened and endangered species found in natural areas covered by the HCP, and Table 8-3 lists other species of concern in these areas.

Table 8-2: Federally Threatened and Endangered Species on Natural Areas Covered by the HCP.

Species	Federal Status	Natural Area
Northern Spotted Owl	Threatened	Camas Meadows NAP, Granite Lakes NRCA, Skagit Bald Eagle NAP, Morning Star NRCA, South Nemah NRCA, Stevenson Ridge NRCA, Table Mountain NRCA, Teal Slough NRCA, Trout Lake NAP
Marbled Murrelet	Threatened	Ashford NRCA, Bone River NAP, Clearwater Bogs NAP, Clearwater Corridor NRCA, Dabob Bay NAP/NRCA, Elk River NRCA, Morning Star NRCA, Naselle Highlands NRCA, Niawiakum River NAP, Queets River NRCA, Skamokawa Creek NRCA, South Nemah NRCA, South Nolan NRCA, Teal Slough NRCA, Willapa Divide NAP
Bull Trout	Threatened	Chehalis River Surge Plain NAP, Carlisle Bog NAP, Olivine Bridge NAP, Skagit Bald Eagle NAP, Morning Star NRCA, Clearwater Corridor NRCA
Chinook Salmon – Puget Sound	Threatened	Dabob Bay NAP/NRCA, Kitsap Forest NAP, Mt. Si NRCA, West Tiger Mountain NRCA, Olivine Bridge NAP, Skagit Bald Eagle NAP, Stavis NRCA
Chinook Salmon – Lower Columbia	Threatened	Klickitat Canyon NRCA
Steelhead – Lower Columbia	Threatened	Klickitat Canyon NRCA, Table Mountain NRCA, Washougal Oaks NAP/NRCA
Steelhead – Puget Sound	Threatened	Dabob Bay NAP/NRCA, Stavis NRCA
Coho Salmon – Lower Columbia/ SW Washington	Threatened	Washougal Oaks NAP/NRCA
Chum Salmon – Hood Canal	Threatened	Dabob Bay NAP/NRCA
Island Marble Butterfly	Endangered	Cattle Point NRCA
Oregon Spotted Frog	Threatened	Trout Lake NAP
Eulachon	Threatened	Dabob Bay NAP/NRCA
Mazama Pocket Gopher	Threatened	Rocky Prairie NAP
Golden Paintbrush	Threatened	Rocky Prairie NAP, Admiralty Inlet NAP
Wenatchee Mountains Checker-Mallow	Endangered	Camas Meadows NAP

Table 8-3: Special Status Species Located in Natural Areas Covered by the HCP.

Species	Natural Area ¹
Federal Species of Concern	
Bald Eagle	Numerous sites
Beller's Ground Beetle	Snoqualmie Bog NAP, Kings Lake Bog NAP
Cascades Frog	Morning Star NRCA
Columbia Torrent Salamander	Ellsworth Creek NRCA
Fringed Myotis	Camas Meadows NAP
Gorge Daisy	Columbia Falls NAP
Harlequin Duck	Morning Star NRCA
Hatch's Click Beetle	Kings Lake Bog NAP
Howell's Daisy	Columbia Falls NAP, Table Mountain NRCA
Larch Mountain Salamander	Table Mountain NRCA, Columbia Falls NAP
June's Copper Butterfly	North Bay NAP, Carlisle Bog NAP, Clearwater Bogs NAP, Crowberry Bog NAP
Northern Goshawk	Clearwater Corridor NRCA, Morning Star NRCA
Northern Red-Legged Frog	Carlisle Bog NAP, North Bay NAP, Table Mountain NRCA, Morning Star NRCA, Ellsworth Creek NRCA, Kings Lake Bog NAP
Olive-Sided Flycatcher	Numerous sites
Oregon Sullivantia	Columbia Falls NAP
Pale Blue-Eyed Grass	Trout Lake NAP
Peregrine Falcon	Table Mountain NRCA, Cypress Highlands NAP, Mount Si NRCA, Elk River NRCA, Hat Island NRCA, Lummi Island NRCA, North Bay NAP
Puget Sound Coho Salmon	Dabob Bay NAP/NRCA
Slender-Billed White-Breasted Nuthatch	Washougal Oaks NAP/NRCA, Lacamas Prairie NAP/NRCA
Suksdorf's Desert-Parsley	White Salmon Oak NRCA
Tailed Frog	Table Mountain NRCA, Morning Star NRCA
Tall Bugbane	Washougal Oaks NAP, Columbia Falls NAP
Valley Silverspot	Mima Mounds NAP
Van Dyke's Salamander	South Nemah NRCA, Ellsworth Creek NRCA
Wenatchee Larkspur	Camas Meadows NAP
White-Top Aster	Rocky Prairie NAP, Mima Mounds NAP
Yuma Myotis	Woodard Bay NRCA
State Listed – No Federal Status	
Olympic Mudminnow (State Sensitive)	Carlisle Bog NAP, Chehalis River Surge Plain NAP, West Tiger Mountain NRCA
Sandhill Crane (State Endangered)	Trout Lake NAP, Klickitat Canyon NRCA
State Candidate – No Federal Status	
Cascade Torrent Salamander	Table Mountain NRCA
Dunn's Salamander	Teal Slough NRCA, South Nemah NRCA
Puget Blue	Rocky Prairie NAP

Species	Natural Area ¹
Sand Verbena Moth	Cattle Point NRCA
Townsend's Big-eared Bat	Blanchard Core NRCA
Western Toad	Dabob Bay NAP/NRCA, Morning Star NRCA, Oak Patch NAP, Stavis NRCA
White-headed Woodpecker	Camas Meadows NAP

¹ Location information was determined by consulting the Washington Natural Heritage database and the following WDFW databases: Animal Occurrences, Northern Spotted Owl Site Centers, Priority Habitat, and Streamnet.

9.0 Non-Timber Management Activity

9.1 Special Forest Products

Appendix: Background on Special Forest Products

DNR’s South Puget Sound, Olympic, and Pacific Cascade region offices auction leases and sell permits to gather special forest products in the OESF, South Coast, South Puget, Columbia, and Straits HCP planning units. These leases and permits provide small businesses and individuals access to gather a variety of valuable non-timber forest products, including brush, boughs, beargrass, evergreen huckleberry, moss, salal, and sword fern, though not every lease or permit includes all these products and not all of the area in these leases or permits have actual gathering.

DNR region offices may also offer direct sales of some of the same special forest products. In South Puget Sound and Pacific Cascade regions, direct sales are made for products gathered from areas too small to be offered under a lease. Table 9-1 summarizes DNR’s sales of special forest products on HCP-covered forestlands in FY 2021.

In Olympic Region, permits are sold for multiple designated brush harvest areas. Applicants are able to buy one permit per brush harvest area. The occurrences are lower in FY 2021 because fewer applications were received than in past years. The number and/or size of brush permit areas have not changed; therefore, the acreage is the same as the prior year.

Table 9-1: Sales of Special Forest Products on HCP-Covered Areas in FY 2021.

Region	Permits		Leases		Direct Sales	
	Occurrences	Acres	Occurrences	Acres	Occurrences	Acres
South Puget	96	76,168	23	82,451	2	784
Olympic	54	170,930	0	0	0	0
Pacific Cascade	0	0	0	0	0	0
Total	150	211,319	23	82,451	2	784

9.2 Leases

Appendix: Background on Leases

9.2.1 Grazing Permits and Leases

Most DNR-managed grazing takes place on non-forested state trust lands east of the Cascade crest on lands that are not managed under the HCP. Grazing is selectively allowed on forested state trust lands managed under the HCP in both eastern and western Washington. In eastern Washington, state trust lands are grazed under permits and leases. Table 9-2 summarizes grazing permit and lease information for FY 2021.

9.2.2 Communication Sites Leases

In FY 2021, 81 communication sites were leased within the HCP boundary, totaling approximately 88 acres. There were a total of 292 leases from individual tenants on the 81 communication sites.

Table 9-2: Grazing Permits and Leases on DNR-managed Lands in FY 2021.

HCP Planning Unit	Acres of Grazing Leases	Acres of Permit Range	Acres of Grazing Leases in Forest	Acres of Permit Range in Forest	Acres of Grazing Leases on HCP Lands	Acres of Permit Range on HCP Lands	Acres of Grazing Leases on Forested HCP Lands	Acres of Permit Range on Forested HCP Lands
Chelan	8,226	0	3,466	0	4,303	0	3,453	0
Columbia	40	0	0	0	12	0	0	0
Klickitat	10,805	36,831	9,511	35,554	10,158	36,714	9,404	35,545
N. Puget	39	0	0	0	38	0	0	0
OESF	0	0	0	0	0	0	0	0
S. Coast	177	0	100	0	118	0	100	0
S. Puget	0	0	0	0	0	0	0	0
Straits	0	0	0	0	0	0	0	0
Yakima	138,098	56,497	92,749	47,261	87,686	53,735	65,352	47,255
Sub-Total	157,387	93,328	104,224	82,816	102,316	90,449	78,410	82,801
Non-HCP	406,497	221,343	101,468	171,575	1	0	0	0
Total Acres	563,884	314,671	205,692	254,391	102,317	90,449	78,410	82,801

9.3 Valuable Material Sales

Appendix: Background on Valuable Material Sales

In FY 2021, DNR had six active sand, gravel, and rock contracts within the HCP boundary, totaling approximately 580 acres. Table 9-3 summarizes those contracts. These contracts were approved by the Board of Natural Resources and awarded through a public auction process.

Table 9-3: Sand, Gravel, and Rock Contracts Active in FY 2021.

Lease Name	Commodity	HCP Planning Unit	Acres
Jordan Road	Sand, gravel	North Puget	61
Lewis Gravel Pit - Winthrop	Rock, sand, gavel	Chelan	14
Livingston Quarry	Road rock	Columbia	170
Kilowatt Quarry	Road rock	Klickitat	15
High Rock	Rock, sand, gavel	North Puget	320
Jordan Road	Sand, gravel	North Puget	61
Total Acres			580

In addition to the contracts listed above, DNR occasionally sells valuable material through a direct sale, a one-time agreement for the removal of a small amount of a resource (a maximum of \$25,000 in value) that does not require Board of Natural Resources approval.

9.4 Recreation Program

Appendix: Background on Recreation Program

In calendar years 2020 and 2021, the DNR recreation program continued to work with Washington Conservation Corps (WCC) crews and many volunteer groups to complete numerous projects across the DNR landscape. These projects included building more than 40 miles of new trail, performing maintenance on more than 300 miles of trail, installing eight new bridges, opening a new campground, adding four vault toilets, erecting four new shelters, expanding parking lots, and installing numerous picnic tables, fire rings, new corrals, and loading ramps. In addition, work went toward closing unauthorized trails and access points, and removing garbage. This work helped to enhance the recreational experience, keep people safe and informed, and protect resources from erosion and overuse. Many sites were closed, then eventually re-opened, due to the COVID-19 pandemic, as well as severe fire danger restrictions. Projects are summarized below.

9.4.1 Development

9.4.1.1 Northwest Region

Blanchard State Forest, Skagit County:

- For each of 2020 and 2021, WCC crews and volunteers worked on 15 miles of trail, maintaining culverts, clearing ditches and drain dips, and cleaning bridges to reduce soil erosion and minimize the impact of recreational use.
- WCC and volunteers constructed trail dirt turnpikes to reduce impacts to wetlands and reduce trail braiding and sediment erosion to nearby lakes and streams.
- WCC and WTA volunteers finished work on the final approach to Oyster Dome. Work was conducted to lengthen the trail to re-establish an out-sloped bench cut, removing fall line sections of trail, helping to improve drainage. Workers also repaired sections damaged by trees that fell during the winter.

Harry Osborne State Forest, Skagit County:

- WCC crews and volunteers worked on 10 miles of trail, maintaining culverts, and clearing ditches and drain dips, to reduce soil erosion and minimize the impact of recreational use.
- WCC and volunteers reconstructed sections of Dry Creek, Just an Hour, and Jack Sims trails by hardening trail tread with native soil and gravel surfacing, and installing drainage features, ditches, and cross culverts to reduce impacts to nearby wetlands and streams.
- Rerouted and rehabilitated 1,000 feet of trail from steep, eroded trail tread to more sustainable trail tread to reduce impacts to a nearby stream.

Cattle Point Natural Resources Conservation Area, San Juan County:

- Conducted routine maintenance on approximately 1 mile of trail and one vault toilet.

Cypress Island Natural Resources Conservation Area, San Juan County:

- Conducted routine maintenance on approximately 20 miles of trail, two camping areas, and seven composting toilets.

Griffin Bay Recreation Site, San Juan County:

- Commenced installation of two new toilets that when completed will replace two existing outhouse-style vault toilets. The new toilets are a “urine diversion” style that separates solids from liquids. Liquids evaporate and solids desiccate to a relatively benign state, at a fraction of their original bulk, after which they are periodically removed for disposal. These toilets eliminate the need for periodic septic pumping, reduce maintenance costs, and provide a more sustainable, user-friendly way to manage human waste. Construction will be completed in early 2022.
- Conducted routine maintenance on approximately 1/3 mile of trail, five campsites, and two outhouse-style vault toilets.

Lummi Island Natural Resources Conservation Area, Whatcom County:

- Conducted routine maintenance on camping area and two outhouse-style vault toilets.
- Performed hazard tree removal within the camping area, along trails, and near the toilet structures.

Morning Star Natural Resources Conservation Area, Snohomish County:

- Completed permitting for three new bridge installations at the Cutthroat Lakes camping area. Began excavation of bridge footings and performed survey work to locate exact bridge locations. Assembled bridges at staging area in preparation for flight and placement by helicopter. Flew gravel to bridge sites for footing construction. These bridges will protect water quality at stream crossings along the trail system, and provide for public safety during periods of high flow.
- Completed design, commenced permitting and procured bridges for three water crossings along the Boulder-Greider Mainline Trail. These bridges will protect water quality at stream crossings along the trail system, and provide for public safety during periods of high flow.
- Secured funding and commenced work on campsite relocation and camping area renovation at three camping areas in the Ashland Lakes landscape. This work will include replacement of existing tent pads and fire rings at the Beaver Plant, Upper Ashland, and Lower Ashland camping areas. In addition, two new campsites will be constructed at Upper Ashland and three new sites will be constructed at Lower Ashland in an effort to move public use away from the lakeshore. The work is intended to protect water quality at these lakes by relocating trails and campsites from fragile soils in close proximity to shorelines, to more stable areas further removed from shorelines.
- Secured funding for trail renovation work on the Ashland Lakes trail system. This work will include repairs to existing boardwalk, trail drainage, and tread improvements, and the replacement of insufficient boardwalk in several locations.
- Secured funding for design and procurement of one or more backcountry toilets in the NRCA, location(s) to be determined. These toilets are a “urine diversion” style as described above.

- Secured grant funding for work on the Boulder Lake trail and camping area. This work will include renovations on 3.8 miles of existing trail, improvements in nine campsites, and the installation of a urine diversion toilet in the camping area. This work is intended to establish safe access to Boulder Lake, which has been inaccessible for nearly a decade due to a condemned bridge.
- Secured grant funding for work on the Gothic Basin trail and camping area. This work will include trail improvements to 1 mile of existing trail, designation of .5 miles of user trail within the Basin itself, designation of six campsites, and installation of a backcountry urine diversion toilet in the camping area. Additionally, several dispersed camping sites and user-built trails will be decommissioned. This work intends to lessen public impact within Gothic Basin while improving water quality and public safety.
- Performed routine maintenance on approximately 15 miles of trail and five camping areas.

Point Doughty Natural Area Preserve, San Juan County:

- Installed two sets of pre-fabricated stairs to facilitate safe public access to trail and camping area. One set of stairs replaced an existing set of stairs that had become unsafe over time. The second set of stairs protects against bank erosion where users had been scrambling up from the beach to access the trail.
- Replaced one picnic table and one fire ring.
- Conducted routine maintenance on approximately 1/3 mile of trail, three campsites, and two outhouse-style vault toilets.

Upright Channel Recreation Site, San Juan County:

- Conducted routine maintenance on approximately 1/3 mile of trail, three picnic sites, and one vault toilet.
- Removed hazard trees in picnic areas.

Reiter Foothills State Forest, Snohomish County:

- DNR and WCC crews finished roughly 1.3 miles of ATV/motorbike trail to access scenic vista sites.
- Excavated, hardened, and placed rock obstacles on roughly 1.5 miles of 4x4 trail.
- Completed roughly 1.5 miles of main trail, and roughly .75 miles of 4x4 trail that connect the ATV/motorcycle trails and the 4x4 trail network to the future permanent trailhead.
- Conducted multiple trail inspections along roughly 30 miles of ORV trails and 3 miles of non-motorized trail to identify trail repairs and prevent sediment delivery to streams.
- Inspected two trail bridges for safety and water quality maintenance needs.
- Removed down trees across sections of trail throughout the forest.
- Blocked several miles of illegal and undesignated trails closed to ORV use, predominately in the Index Aquifer Recharge Area.

Cascade District, Snohomish County:

- With the help from the WCC, DNR installed and maintained signage on every DNR access gate throughout the entire district, illustrating Discover Pass requirements, Non-Motorized Use Only, Restricted Access, Do Not Block Gate, and No Shooting where applicable.

Walker Valley ORV Area, Skagit County:

- Replaced bridges on the SMC Trail, and the Kim and Monica Trail, and maintained nine others.
- In each of the past two years, 40 miles of trails were inspected and maintained, with staff importing hundreds of yards of crushed rock and concrete to harden trails to prevent erosion.
- Four culverts were installed and an additional 95 were maintained.
- 5.2 miles of trail were hardened, and 3.1 miles of illegal trail were removed.
- Cleaned up the Peter Burns Trailhead, resulting in 17 dump runs.
- Used 236 WCC crew days for trail maintenance projects.

*9.4.1.2 Olympic Region***Foothills ORV and Sadie Creek Multi-Use Trails, Clallam County:**

- Installed 11 and maintained 26 culverts, installed 87 and maintained 403 drain dips to improve drainage and reduce soil erosion.
- Built 4 miles of new trail at Foothills and 1.5 miles of new trail at Sadie Creek. A new parking lot was built at Foothills, and a 12-acre “Trials” bike area was designated at Foothills, where construction has begun.
- Maintained all trails, relocated 0.5 miles and abandoned 0.3 miles of trail.
- New bridge built in 2020.
- Removed 244 hazard trees, snags, and windfall.

Lyre River Campground, Clallam County:

- Replaced 20 feet of decking on ADA boardwalk.
- Placed barrier fences and stones to delineate campground features.
- Added rock to roads and campsites.

Silent Lake, Jefferson County:

- Installed rules signage and physical barriers to dissuade people from driving into and launching boats in Silent Lake.

Striped Peak Trail, Clallam County:

- Maintained existing trail and built 2.0 miles of new non-motorized trail.

Coast Campgrounds:

- Maintained all campgrounds weekly; installed new fire rings and tables at Upper Clearwater; reestablished former Clearwater corridor trail in the Clearwater NAP.

9.4.1.3 Pacific Cascade Region

Events, Clark County

- Numerous volunteer events and work parties, including Pick Up the Burn, mountain bike classes and Cascade Enduro Race, Backcountry Horsemen Picnic and Trail Ride, and an LGBTQ+ Volunteer Vacation event.

Events, Skamania County

- National Public Lands Day and five Zoom Trail Advisory meetings.

Yacolt Burn State Forest, Arrowhead Pit, Clark County:

- Trash No Lands – provided graffiti removal here and other places in the Yacolt.

Yacolt Burn State Forest, Bells Mountain Trail System, Clark County:

- Brushed and performed drainage work on 5 miles of Bells Mountain Trail, and closed numerous unauthorized bypass trails.

Yacolt Burn State Forest, Tarbell Trail System, Clark County:

- Installed one 40-foot bridge at Hidden Falls.
- Drainage and culvert work on approximately 2 miles of trail to reduce erosion.
- Brushed 15 miles on Tarbell Trail/Bells Mountain system.
- Replaced numerous damaged DNR signs.
- Maintained all facilities.
- Built 2.68 miles of new trail on Sword Fern Way, 3.58 miles on Appaloosa Trail, 1.46 miles of Bear Grass Trail, and 1.25 miles of Vista Ridge Trail.

Yacolt Burn State Forest, Jones Creek and Hagen Creek Trail Systems, Clark County:

- Installed new bridge on the Hagen Vista Trail.
- COVID-19 and regular maintenance of facilities – Jones Creek ORV Trailhead.
- New signage on new motorized trails.
- Rerouted and adjusted grades on motorized trails to reduce erosion.
- New 0.7 mile Sidewinder/single-track trail opened spring 2021.
- Removed several dumped trash piles.
- Partnered with Jones Creek Trail Riders Association, WCC, and Larch Corrections Camp to find an alternative bypass of a damaged bridge, saving DNR an estimated \$100,000 in a new bridge without compromising safety or trail rider experience.

Yacolt Burn State Forest, Cold Creek Campground and Day-Use Area, Clark County:

- COVID-19 and regular maintenance of facilities.
- New sign installation at day-use area.
- Repaired gate for power line access road.
- Removed hazard trees.
- Recruited a new camp host.

Yacolt Burn State Forest, Rock Creek Horse Camp and Day Use Area, Clark County:

- Worked with by Backcountry Horsemen of Washington, Washington Trail Riders Association, and Clark County Horse Council to install three new donated double-stall metal corrals.
- COVID-19 and regular maintenance of facilities, including pumping of vault toilets, hazard tree removal, and installation of new fire rings and picnic tables.
- Recruited two new camp hosts.

Yacolt Burn State Forest, Dougan Creek Campground and Day-Use Area, Skamania County:

- Upgraded numerous campsites with new picnic tables and fire rings.
- Removed bollards, hazard trees, and garbage from the area, and graded and graveled the roads.
- Dougan Falls Day-Use – New map and traffic signs helped mitigate congestion.
- Provided new and replaced damaged signs throughout the area.
- Worked with two full-time camp hosts.

Winston Creek Campground, Lewis County:

- COVID-19 and regular maintenance of facilities.
- Reservation system implemented.
- Upgraded signage.
- Upgraded numerous campsites with new fire rings and picnic tables, and removed hazard trees.

Mitchell Peak, Skamania County:

- Worked with a DNR archaeologist to establish route of new Sugar Loaf Trail.

North Siouxon Block, Skamania County:

- Larch Correction Crews and Northwest Youth Corps provided major trail maintenance.

Yacolt Burn State Forest, Three Corner Rock Trail, Skamania County:

- Scouting for new trail reroute.

Merrill Lake, Cowlitz County:

- COVID-19 and regular maintenance of facilities.
- Improved 1 mile of trail, improved campsites and campground parking area, and replaced road signs.

Butte Creek Day Use Area, Pacific County:

- Maintained approximately .85 miles of non-motorized hiker-only trail.
- Repainted vault toilet to cover graffiti.

Radar Ridge Block, Snag Lake, Pacific County:

- COVID-19 and regular maintenance of facilities.
- Repaired vandalized vault toilet.

Radar Ridge Block, Western Lake Campground, Pacific County:

- COVID-19 and regular maintenance of facilities.

Salmon Creek Block, Tunerville Campground, Pacific County:

- COVID-19 and regular maintenance of facilities.

Bradley Hills ORV Area, Wahkiakum County:

- 1 mile of trail maintenance.
- COVID-19 and regular maintenance of facilities.

*9.4.1.4 South Puget Sound Region***Capitol State Forest, Thurston and Grays Harbor Counties:**

- Volunteers re-routed 1.5 miles of the Crestline Trail to a more enjoyable and sustainable location.
- DNR and volunteers performed drainage maintenance and brushing on approximately 70 miles of trail. An additional 60 miles of trail received light maintenance. Volunteers provided people, equipment, and tools to perform these tasks.
- Recreation and timber sales staff met with trail recreationists in the field to observe the trail renovation completed by a contractor, hired by the timber sale purchaser, following the Delineation timber sale harvest.
- Timber sales staff met with recreationists to help identify leave trees on the Zuke timber sale. Additionally, timber sales and forest land management activities were presented to recreationists at our user group meeting, email list, listserv, and the DNR website. Signs were placed on the trail informing trail enthusiasts of why timber sales were necessary and what steps were taken to protect the environment and the recreation experience.
- In summer 2021, DNR received additional grant funds to continue recreation trail and facility renovation and maintenance.
- The Fall Creek Trailhead expansion project was completed. The larger trailhead will better accommodate equestrian enthusiasts and other recreationists. Other improvements include a day-use shelter (sponsored by the Friends of Capitol Forest) and an unloading ramp for disabled equestrians.
- Septic system installed at the Margaret McKenny Campground host site. The septic system will allow groundwater to return to the earth instead of requiring continued costs to remove waste. An awning was also added to the camp host structure, and four new campsites were installed.
- The New MnM trail is 80 percent completed. This new 3-mile trail will allow for additional front-county trail loops for non-motorized trail users. Work began on a half-mile of new motorized trail. The new trail will eliminate 1 mile of trail adjacent to a county road.

Elbe Hills State Forest, Pierce County:

- **Sahara Creek Campground and Nicholson Horse Trails:** Recreation staff conducted routine maintenance on seven bridges and 40 miles of non-motorized trail. This included brushing, tread and drainage maintenance, and signage. Routine maintenance was also performed on seven day-use areas, six vault toilets, three trailheads, and a campground. A gate was installed at the entrance to the campground, and gravel was spread in campsites and the campground's day-use parking area to prevent cars from creating mud in the soft grass.

- **Elbe ORV Campground and Trails:** Recreation staff conducted routine maintenance on five bridges and 13 miles of ORV trail. This included brushing, tread and drainage maintenance, and signage. Routine maintenance was also completed on two vault toilets, a trailhead, and a campground. Two broken picnic tables were repaired. Approximately 0.1 miles of the Sunrise Trail was fully reinforced with rock for tread protection and erosion prevention. Nearly 0.25 miles of illegal trail was abandoned along Sunrise Trail. Rock was added to the approach of two challenge features on the Mainline and Busywild trails to reduce the erosion of loose soil from ORVs and to improve structural integrity.
- **New Elbe ORV Campground Construction:** Construction on the new 10-site ORV campground was started in 2020. In 2020, 7 acres of previously logged forest was cleared of logging debris. A gravel road and 10 gravel campsites were constructed on the site. A sediment pond was constructed to hold stormwater runoff from the site. Drainage was completed, gravel construction was completed, and the exposed soils were stabilized with planting of 70 Douglas-fir trees and grasses, which have fully rooted and cover all disturbed soils. Two gates were installed to control access to the site. Two vault toilets, three kiosks, signage, and two picnic shelters were installed.
- **Garbage Removal:** Recreation staff and volunteers removed 7,500 pounds of garbage and two abandoned RVs from the Elbe Hills State Forest.

Tahoma State Forest, Lewis County:

- **1 Road Sno-Park and Tahoma Ski Huts:** Recreation staff conducted routine maintenance on 30 miles of winter-use trail, four vault toilets, three ski huts, the Anderson Lake outhouse, and one Sno-Park. Maintenance included brushing, tread and drainage maintenance, and signage.

West Tiger Mountain NRCA, King County:

- DNR's Recreation and Natural Areas programs, in partnership with the City of Issaquah, completed approximately 0.5 miles of trail renovation and re-routes of popular trails accessed from the East Sunset Way Trailhead. Trails were relocated and constructed to more sustainable locations, reducing trail conflicts and improving the user experience for hikers connecting further into the trail system and mountain bikers using the regional Rainier Trail.
- DNR partnered with the Mountains to Sound Greenway Trust to relocate approximately 0.33 miles of the Poo Poo Point Trail to a more sustainable and user-friendly trail alignment. This eliminated segments that contained unsustainably steep and erosive trail grades and that also created several hundred feet of unnecessary elevation gain and loss for hikers on their way to the paragliding destination. Washington Trails Association and Washington Conservation Corps also supported this project with complementary trail maintenance, renovation, and decommissioning work along the Poo Poo Point Trail.

Middle Fork Snoqualmie NRCA, King County:

- Partnering with Mountains to Sound Greenway Trust, completed approximately 1,000 feet of new trail construction and installed a recreational trail boardwalk as part of the ongoing development of the Grouse Basin Loop Trail. When completed, this trail will provide a low-elevation, beginner-friendly hike accessible from the Mailbox Peak Trailhead.

Tiger Mountain State Forest, King County:

- Partnering with the Mountains to Sound Greenway Trust, replaced two trail bridges and reconstructed a half-mile segment of the Forest Loop interpretive trail, adjacent to Tiger Summit Trailhead.
- The same collaboration resulted in the development of a half-mile trail connection near the summit of East Tiger Mountain, to eliminate the prior requirement to travel a forest road for hikers and mountain bikers to access the East Summit viewpoint.
- Completed construction of a 1-mile trail connection, including installation of a new trail bridge, between Iverson Railroad Grade Trail and the Tiger Mountain Trail, primarily for hikers. DNR crews neared completion of a 1.5-mile mountain bike trail connection between Preston Railroad Grade Trail and Iverson Railroad Grade Trail, to complete a missing west trail system link. DNR crews also completed construction of a half-mile length stretch of the NW Timber Trail.
- Partnering with Evergreen Mountain Bike Alliance, completed construction of a 1.5-mile mountain bike descent trail that offers a new loop on the northeast side of the trail system.

Raging River State Forest – Final Phase Trails, King County:

- Partnering with Evergreen Mountain Bike Alliance and WCC, completed construction of 9.5 additional miles of trail, with funding secured for building an additional 20 trail miles to complete trail system development.

Green Mountain State Forest, Kitsap County

- Installed a new vault toilet at Green Mountain Horse Camp to accommodate the increasing number of users.
- Maintained approximately 17 miles of trail, including normal drain and tread maintenance, routine trail corridor brushing, and removal of fallen trees and debris from trail tread surfaces.
- Routine maintenance of existing features and structures, signage and trailhead structures. This work was done with DNR staff, Northwest Youth Corps crews and volunteer labor.
- Closed and blocked access to numerous illegal trail access points to prevent resource damage and eliminate erosion.

Tahuya State Forest, Mason County

- Maintained approximately 88 miles of trail, including normal drain and tread maintenance, routine trail corridor brushing, and removal of fallen trees and debris from trail tread surfaces.
- Routine maintenance of existing features and structures, signage and trailhead structures. This work was done with DNR staff, Northwest Youth Corps crews, and volunteer labor.
- Closed and blocked access to numerous illegal trail access points to prevent resource damage and eliminate erosion.

9.1.4.5 Southeast Region

Ahtanum State Forest, Kittitas and Yakima counties:

- Hosted volunteer work party in July 2021, sponsored by the Yakima Valley Timberwolves.
- Cougar Flats Project in partnership with Mid-Columbia Fisheries: Rehabbed dispersed campsite next to North Fork Ahtanum Creek. Used woody debris to eliminate camping in the RMZ and improve stream-side habitat for bull trout. Improved the parking lot surface with crushed rock and placed barrier rocks to prevent motorized access to the stream. Rehabbed two illegal trails to prevent sediment delivery to the stream.
- Tree Phones Buck Rail Fence Project with Mid-Columbia Fisheries. Erected 400 feet of buck rail fence in the south Tree Phones Campground, between the Middle Fork Ahtanum Creek and the campground, to enhance bull trout habitat by keeping people and vehicles away from and out of the stream.
- Two new interpretive/educational signs on bull trout installed at Tree Phones Campground.
- Regular maintenance of campgrounds, including cleaning out fire pits, removing hazard trees, maintaining vault toilets, and picking up litter occurred throughout the year.
- Blocked several campsites along the Green Dot Road System to keep people out of sensitive meadows and away from riparian areas.
- Volunteers picked up litter along the Green Dot Road System, maintained Green Dot carsonite posts, and picked up litter in dispersed campsites.

Naneum Ridge State Forest, Cookie Cutter Mountain Biking Area, Kittitas County:

- Installed vault toilets at two proposed campground and trailheads.
- Built 2 miles of mountain bike trail construction. These non-motorized trails provide a more safe, sustainable, and enjoyable option than riding on the Green Dot Roads intended for motorized use. The majority of the work has been completed by mountain bike club volunteers, supplemented by WCC crews.

Naneum Ridge State Forest, Kittitas County:

- Built a yurt/shelter in the non-motorized winter recreation area, via a Land Use License with local non-motorized recreation clubs.

Teanaway Community Forest HCP Lands, Indian Camp, Kittitas County:

- Installed barrier rock to keep vehicles away from the Middle Fork Teanaway River to allow riparian habitat to grow and limit sediment delivery to the river.
- Installed new picnic tables and fire rings farther away from the river to lessen the impacts to the river and increase campfire safety.
- New informational and regulatory signage installed at campground kiosk.
- All work parties in 2021 had to be canceled due to either COVID-19, lands closures, fire danger, or inclement weather.

9.4.2 Planning and Design

9.4.2.1 Northwest Region

Blanchard State Forest, Skagit County:

- Planning work has begun to prepare for a WWRP grant to fund the purchase and installation of new toilets. A single-vault toilet will be installed at the Upper Trailhead. Two backcountry urine diversion toilets will be installed at Lily and Lizard Lake campgrounds. Toilets help us meet HCP obligations by reducing waste delivery to bodies of water.
- Planning work will continue to address a steep road to Samish Overlook, incapable of handling excessive public use. Plans are to reroute the road to address safety and erosion concerns.

Olsen Creek, aka Stewart Mountain, Whatcom County:

- Planning work has been done to prepare for a new trailhead and the sanctioning of approximately 20 miles of user-built trail. Trails have been mapped. Talks are ongoing with stakeholders and Whatcom County parks staff.

Stewart Mountain State Trust Lands, Whatcom County:

- Completed land suitability evaluation of an existing user-built non-designated trail system. This involved evaluation of recreation trail system access and design strategies with input from a stakeholder trail system planning advisory committee to complete a concept trail system and access plan ready for the next project proposal phase of SEPA review and permitting.

Maple Creek Water Access, Whatcom County:

- Planning work is ongoing to prepare for the acquisition of land out of trust status for the Maple Creek Water Access site. A well-constructed site will help reduce erosion from existing use as a dispersed recreation water access site. Meetings with stakeholder groups are ongoing.

Galbraith Mountain, Whatcom County:

- Trail management objectives were completed for 2 miles of user-built trail. Sanctioning these trails will ensure they are maintained to DNR standards, reducing the possibility of erosion.

Reiter Foothills State Forest, Snohomish County:

- Acquired permits for a permanent trailhead/parking lot for the motorized area. The project is shovel-ready.

Cattle Point Natural Resources Conservation Area, San Juan County:

- Continued to design new interpretive signage to educate users about the site and our conservation mission there.

Point Doughty Natural Area Preserve, San Juan County:

- Commenced design and permitting to replace two existing outhouse-style vault toilets with urine diversion toilets.

Griffin Bay Recreation Site, San Juan County:

- Completed design and permitting to replace two existing outhouse-style vault toilets.

Lummi Island Natural Resources Conservation Area, Whatcom County:

- Continued investigation of beach access and campground renovation at the boat-in-only camping area in the NRCA. Staff are working deliberately to protect cultural resources and consulting and collaborating with affected Tribe(s).

*.4.2.2 South Puget Sound Region***Capitol State Forest, McLane Creek, Thurston County:**

- Began planning and design of the Forestry Interpretive Trail sign panels. Contracted with a structural engineer to provide advice and engineering, stamped drawings for the new 120-foot bridges to replace old pressure-treated boardwalk along the pond. Conducted geotechnical work to assess project feasibility.
- Continued planning, engineering, and design of long-lasting fiberglass/reinforced plastic truss bridges to replace old pressure-treated boardwalk on the trail.
- Ongoing development of site master plan, started in 2020, to replace all pressure-treated wood boardwalks, renew gravel to comply with ADA accessibility standards and provide longevity of materials for sustainability and reduced maintenance needs, update paving of parking lot to cover added spaces, and update kiosks and signs.

West Tiger Mountain NRCA, King County:

- Continued stakeholder outreach, concepts, and preliminary designs for renovating and expanding a gateway community facility and parking area.
- Explored appropriate amenities and functions to include at the High Point Trailhead and surrounding area.

Tiger Mountain State Forest, King County:

- Further designed and permitted expansion of the east Tiger Mountain trail system, including new and planned trail links, improving hiking and equestrian trail system connections from Tiger Summit Trailhead. In addition, permits were submitted to construct a day-use viewpoint shelter near the east Tiger Mountain Summit. Further progress on the Tiger Summit Trailhead expansion design and obtaining construction permits was also accomplished.

Raging River State Forest – Final Phase Trail System Development, King County:

- Continued Phase 3 and Phase 4 trail system layout, design, and preparing SEPA project proposal and permit documents, which involves 20 additional trail miles. New trails will improve recreational access for mountain bikers, hikers, and equestrian visitors.

Marckworth State Forest, King and Snohomish counties:

- Continued pre-planning and land suitability analysis, while evaluating existing recreational use across the forest, focusing primarily in the Cherry Valley area. Solutions for relocating unsustainable portions of an existing non-designated hiking trail and sustainable parking access to Cherry Creek Falls were explored, evaluated, and concepts further designed.

Green Mountain State Forest, Kitsap County:

- Completed community outreach for trail system concept planning, design, and layout of new trail system connections. In addition, SEPA review was completed for both renovating the Green Mountain Summit Vista and for implementing the trail system concept plan. Portions of these projects will begin the development phase in late 2021.

Mount Si NRCA, King County:

- Completed SEPA project proposal review for developing important trail system connections, renovation of existing trails and trailheads, and decommissioning unsustainable non-designated trails within the eastern zone of the NRCA.

9.4.2.3 Southeast Region

No planning projects, due to COVID-19 restrictions, lands closures, fire danger, or inclement weather.

9.4.2.4 Pacific Cascade Region

Yacolt Burn State Forest, Jones Creek and Hagen Creek trail systems, Clark County:

- Sought county permits for Jones Creek trailhead expansion, submitted initial plans, and completed SEPA and stormwater permits, with stormwater prevention plan in process.

Proposed Sugar Loaf Trail, Clark and Skamania counties:

- Hiked area with a DNR archaeologists for cultural resources survey.

9.4.2.5 Northeast Region

Virginian Ridge State Trust Lands, Okanogan County:

- Completed land suitability evaluation of an existing user-built non-designated trail system. This involved evaluation of recreation trail system access and design strategies, with input from a stakeholder trail system planning advisory committee, to complete a concept trail system and access plan ready for the next project proposal phase of SEPA review and permitting.

10.0 HCP Implementation Documentation

Implementation of DNR’s State Lands HCP often requires interpretation of its conservation strategies and how they apply to HCP-covered management activities. There are times when strict compliance would result in the wrong outcome, endanger human life, or conflict with other HCP objectives. There are also times when an activity unintentionally or inadvertently deviates from an HCP conservation strategy. Under these circumstances, DNR staff may seek guidance to devise appropriate plans of action for complying with HCP objectives and conservation strategies, develop alternative plans of action to avoid conflict with HCP objectives, or rectify the unintended consequences of an activity. Table 10-2 describes activities that have been documented but may not yet have taken place.

HCP consultation represents the cooperative problem-solving that is necessary in the course of HCP implementation. Documentation of these discussions and agreements includes the following:

- **Implementation consultations:** Agreements between DNR’s HCP and Scientific Consultation Section and regions or programs related to operational challenges where assistance and approval for a mitigation plan has been requested.
- **Joint concurrences:** Agreements between DNR and the Federal Services related to strategy modifications and updates.
- **Non-compliances:** Unapproved deviations from HCP conservation strategies and/or objectives.
- **Other:** Informational documented issues and activities associated with HCP strategies, objectives, or implementation.

Table 10-2: Summary of FY 2021 HCP Implementation Documentation.

Region/ Division	Approval Date	Type	Associated Project	HCP Strategy	Activity Summary
Northwest	3/24/2020 ¹	Implementation Consultation	Caddis Timber Sale	Multispecies / Uncommon Habitats	Implementation of the draft cave procedure.
Olympic	10/28/2020	Implementation Consultation	Texas Showdown Timber Sale	Marbled Murrelet	Equipment trail in marbled murrelet occupied site and occupied site buffer adjacent to Texas Showdown timber sale.
Northwest	12/16/2020	Implementation Consultation	Puckwudgie Timber Sale	Multispecies / Uncommon Habitats	Implementation of the draft cave procedure.
Pacific Cascade	12/23/2020	Implementation Consultation	Big Hollow Salvage Sorts Timber Sale	Northern Spotted Owl	Tail holds within northern spotted owl nest core.

Region/ Division	Approval Date	Type	Associated Project	HCP Strategy	Activity Summary
Northwest	2/18/2021	Documentation	Pony Up Timber Sale	Northern Spotted Owl	Windthrow damage in northern spotted owl dispersal habitat created hazard trees, which were removed for safety concerns.
Olympic	4/12/2021	Implementation Consultation	On The Line Timber Sale	Multispecies / Uncommon Habitats	Implementation of the draft cave procedure.
Pacific Cascade	04/15/2021	Implementation Consultation	Cowlitz Valley Currency Timber Sale	Riparian	A portion of the riparian buffer was relocated to prevent trees from falling on a county road.
Northwest	05/7/2021	Implementation Consultation	Bessie Timber Sale	Multispecies / Uncommon Habitats	Implementation of the draft cave procedure.

¹ This FY 2020 memo was not included in last year's report so is included here.

Appendix Contents

Appendix A: Background	A-3
A1.0 State Trust Lands Habitat Conservation Plan	A-3
A1.1 Lands Covered by the HCP	A-4
A1.2 Comprehensive Reviews	A-4
A2.0 Conservation Objectives for ESA-Listed and Other Species	A-5
A2.1 Northern Spotted Owl Conservation Strategy	A-5
A.2.1.1 Northern Spotted Owl Management Areas	A-5
A2.1.2 Northern Spotted Owl Habitat Classes and Types	A-6
A2.1.3 Tracking Northern Spotted Owl Habitat	A-9
A2.1.4 Northern Spotted Owl Conservation in the OESF HCP Planning Unit	A-11
A2.1.5 Northern Spotted Owl Conservation in the Klickitat Planning Unit	A-11
A2.2 Marbled Murrelet Conservation Strategy	A-12
A2.2.1 Habitat Reporting	A-13
A.2.2.2 Implementation	A-15
A2.3 Riparian Conservation Strategy	A-16
A2.3.1 Headwaters Conservation Strategy	A-16
A2.4 Multispecies Conservation Strategy	A-17
A2.4.1 Uncommon Habitat Objectives	A-17
A3.0 Adaptive Management, Monitoring, and Research	A-17
A3.1 Adaptive Management and the Conservation Strategies	A-17
A3.2 Implementation, Effectiveness, and Validation Monitoring	A-18
A3.2.1 Implementation Monitoring	A-18
A3.2.2 Effectiveness Monitoring and Research for HCP Conservation Strategies	A-18
A3.2.3 Validation Monitoring	A-19
A3.3 OESF Research and Monitoring Program	A-19
A3.3.1 Current and Past Research and Monitoring in the OESF	A-21
A3.3.2 Adaptive Management	A-21
A3.3.3 Communication, Outreach, and Education	A-21
A3.3.4 Information Management	A-21
A3.3.5 Research Partnerships	A-22
A4.0 Silvicultural Activities	A-22
A4.1 Selecting Silvicultural Activities	A-22
A4.1.1 Objectives	A-22

Appendix A

A4.1.2	Activities.....	A-23
A4.2	Tracking Silvicultural Activities.....	A-23
A4.3	Descriptions of Silvicultural Activities	A-23
A4.3.1	Timber Harvest.....	A-23
A4.3.2	Forest Site Preparation	A-24
A4.3.3	Forest Regeneration.....	A-24
A4.3.4	Vegetation Management	A-25
A4.3.5	Pre-Commercial Thinning (PCT)	A-25
A4.3.6	Unmanned Aircraft Systems (UAS)	A-25
A5.0	Non-Timber Management Activities.....	A-25
A5.1	Road Management Activities	A-25
A5.2	Easements and Permits.....	A-27
A5.3	Land Transactions	A-27
A5.4	Natural Areas Program.....	A-28
A5.4.1	Habitat for Listed, Candidate, and Sensitive Species.....	A-28
A5.4.2	Native Forests	A-29
A5.4.3	Estuaries.....	A-29
A5.4.4	Rare Species	A-29
A5.4.5	Restoration and Research	A-29
A5.5	Special Forest Products.....	A-29
A5.6	Oil and Gas Leases.....	A-31
A5.7	Mineral Prospecting Leases and Mining Contracts.....	A-31
A5.8	Grazing Permits and Leases	A-31
A5.9	Communication Site Leases	A-31
A5.10	Special-Use Leases	A-31
A5.11	Valuable Materials Sales	A-32
Appendix B:	Glossary.....	B-1

Appendix A: Background

This appendix contains background information about DNR-managed forestlands under the *State Trust Lands Habitat Conservation Plan*.

A1.0 State Trust Lands Habitat Conservation Plan

The *State Trust Lands Habitat Conservation Plan* (HCP) is a long-term land management plan that is authorized under the Endangered Species Act (ESA) and prepared in partnership with the United States Fish and Wildlife Service and NOAA Fisheries (the Services). The HCP describes, in a suite of habitat conservation strategies, how the Washington State Department of Natural Resources (DNR) will restore and enhance habitat for threatened and endangered species – such as the northern spotted owl, marbled murrelet, and salmon – in conjunction with timber harvest and other forest management activities. These strategies range from passive (for example, protecting unique habitats such as cliffs and springs) to active (thinning forests to speed development of habitat). Each strategy is written in the context of an integrated approach to management, in which commercial forest stands are managed to provide both revenue and ecological values such as biodiversity. Through these strategies, DNR offsets the potential harm of forest management activities on individual members of a species by providing for conservation of the species as a whole.

Land managed by DNR under the HCP and covered by the incidental take permit (ITP) are referred to in the HCP, ITP, and implementation agreement variously as “DNR-managed lands in the area covered by the HCP,” “PERMIT LANDS,” the “DNR forest lands,” the “DNR-managed lands,” the “lands within the planning units,” and other similar terms. All such terms, unless otherwise indicated used in the HCP, ITP, or the implementation agreement, refer to those lands identified in Map I.1 of the HCP as “DNR-managed HCP lands,” in addition to those lands that have been added to the HCP planning units through land transactions. (See HCP Appendix B, p. 3, 15.0 for further discussion.)

An HCP is required to obtain an incidental take permit, which allows incidental take of a threatened or endangered species. Incidental take means harming or killing individuals of a listed species “if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity,” such as a timber harvest [16 U.S. Code 1539 (a)(1)(B)].

By meeting the terms of the HCP and incidental take permit, DNR fulfills its obligations under the ESA. In this way, the HCP and incidental take permit provide DNR the stability, certainty, and flexibility needed to meet its fiduciary and ecological responsibilities as a trust lands manager to provide a perpetual source of revenue to trust beneficiaries while simultaneously developing a complex, healthy, resilient forest ecosystem capable of supporting native species. The HCP was signed in January 1997.



The Changing Landscape

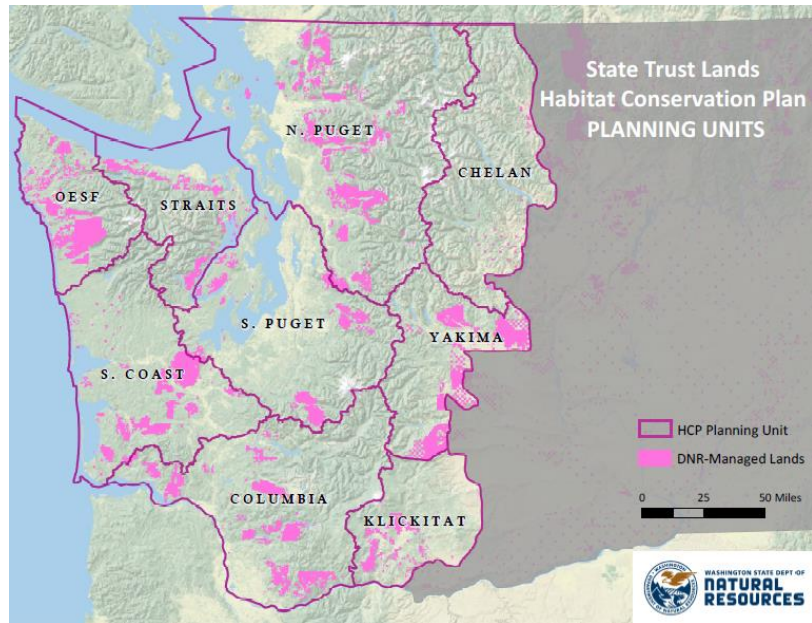
DNR uses harvest methods that promote development of structurally diverse forests. These harvest methods, in combination with the HCP’s northern spotted owl, riparian, and other habitat conservation strategies, promote biodiversity and fundamentally change the landscape from past forest practices.

A1.1 Lands Covered by the HCP

DNR manages approximately 2.4 million acres of forestland statewide. Of this amount, the HCP guides management of approximately 1.9 million acres of forestland within the range of the northern spotted owl (*Strix occidentalis caurina*). In general, these 1.9 million acres are located between the western coast and eastern slopes of the Cascade Range in Washington, from the Canadian border to the Columbia River. To manage these areas more effectively and efficiently, DNR divided this area into nine planning units based primarily on large watersheds (Map A-1).

Implementation of the HCP conservation objectives for the nine planning units is grouped into the three areas: 1) the five westside planning units except the OESF (HCP, p. IV.3), 2) the OESF (HCP, p. IV.86), and 3) the three eastside planning units (HCP, p. IV.19). The five westside planning units are Straits, North Puget, South Puget, South Coast, and Columbia. The three eastside planning units are Yakima, Chelan, and Klickitat.

DNR provides [GIS data for lands covered by the HCP](#) to allow for public analysis and to facilitate comparisons with relevant GIS layers maintained by the Services.



Map A-1: HCP Planning Units

[Back to the HCP Annual Report](#)

A1.2 Comprehensive Reviews

The HCP Implementation Agreement (Section 21.0, p. B.8) requires periodic comprehensive reviews of the HCP, the Incidental Take Permit, and the Implementation Agreement, as well as consultation in good faith between DNR and the Federal Services to identify amendments that might more effectively and economically mitigate incidental take. In 2012, DNR and the Federal Services agreed to conduct annual comprehensive review by subject as funding and staffing allow. Table A-1 provides a summary of the comprehensive reviews completed since 2012.

Table A-1: Comprehensive Reviews Developed for HCP Annual Reports

Link to Report ¹	Subject
FY 2012 Annual Report	Road Management
FY 2013 Annual Report	Silviculture Activities
	Northern Spotted Owl Data
FY 2014 Annual Report	Land Transactions
	Natural Areas

FY 2016 Annual Report	Implementation Monitoring
	Effectiveness Monitoring
FY 2017 Annual Report	Recreation
FY 2018 Annual Report	Riparian Forest Habitat Restoration
FY 2019 Annual Report	Forest Inventory

¹A comprehensive review was not completed for the FY 2015, 2020, or 2021 report due to limited staff capacity.

[Back to the HCP Annual Report](#)

A2.0 Conservation Objectives for ESA-Listed and Other Species

The HCP includes habitat conservation strategies for the northern spotted owl, the marbled murrelet, riparian areas, and other species of concern. These four strategies are individually described in the HCP, but each is linked to and benefits from the other strategies.

A2.1 Northern Spotted Owl Conservation Strategy

A.2.1.1 Northern Spotted Owl Management Areas

DNR is committed to providing habitat to help maintain nesting and foraging areas for northern spotted owls and to facilitate the owl's movement through the landscape. When the HCP was developed, DNR identified DNR-managed lands that were most important to northern spotted owl conservation. These designated northern spotted owl management areas include three subsets:

- **Nesting, roosting, and foraging (NRF) management areas:** Areas likely to provide demographic support and contribute to maintaining species distribution. Demographic support is the contribution of individual, territorial northern spotted owls or clusters of northern spotted owl sites to the stability and viability of the entire population. Maintenance of species distribution supports the continued presence of a northern spotted owl population in as much of its historic range as possible (HCP, p. IV.1). NRF management areas on the westside were identified in the North Puget, South Puget, and Columbia planning units.
- **Dispersal management areas:** Areas important for facilitating northern spotted owl dispersal (movement of young owls from nesting sites to new breeding sites). Dispersal management areas on the westside were identified in the North Puget, South Puget, and Columbia planning units.
- **OESF management area:** DNR-managed lands in the OESF; refer to [Northern Spotted Owl Conservation in the OESF HCP Planning Unit](#) later in this section for more information.



Northern Spotted Owl. Photo courtesy of USFWS.

In 2006, DNR designated another type of northern spotted owl management area called an “owl area.” Owl areas are lands outlined in section I.C.1 of the Settlement Agreement *Washington Environmental Council, et al. v. Sutherland, et al.* (King County Superior Court No. 04-2-26461-

8SEA, vacated April 7, 2006). These areas were a) designated in HCP Implementation Memorandum No. 1 (January 12, 1998), (b) located within Washington Department of Fish and Wildlife (WDFW) Status 1-R (reproductive) owl circles, and (c) located within the four areas identified in DNR’s Standard Practice Memorandum 03-07 (*Management of Northern Spotted Owl Circles and the Identification of Northern Spotted Owl Habitat in Southwest Washington*). Owl areas are intended to sunset when the commitments of the Settlement Agreement are met.

A2.1.2 Northern Spotted Owl Habitat Classes and Types

Each northern spotted owl management area is managed for certain habitat classes, and each habitat class includes specific habitat types. Table A-2 provides habitat classifications and types for each westside northern spotted owl management area

Through HCP research and monitoring commitments, DNR is working to develop a better understanding of what constitutes functional northern spotted owl habitat and to learn which silvicultural techniques create owl habitat.

Table A-2: Habitat Classifications and Types for Each Westside Northern Spotted Owl Management Area.

Northern Spotted Owl Management Area		Habitat Class	Habitat Type	
NRF		NRF habitat	High-quality nesting	
			High-quality habitat	
		Sub-mature habitat	Type A Type B Sub-mature	
Dispersal	All other westside planning units	Dispersal habitat	High-quality nesting	
			High-quality habitat	
		Sub-mature habitat	Type A Type B Sub-mature	
		Dispersal habitat	Young forest marginal Dispersal	
	South Puget HCP Planning Unit only	Dispersal habitat	Movement, roosting, and foraging (MoRF) plus habitat	High-quality nesting Type A Type B MoRF
			Movement plus habitat	Sub-mature Young forest marginal Movement
		OESF	Old forest Habitat	Old forest
				High-quality nesting
Structural habitat	Type A Type B			
	Sub-mature Young forest marginal			
Owl Area	High-quality habitat	High-quality nesting		
		Type A Type B		
		Sub-mature		
	Low quality habitat	Young forest marginal		

As noted in this year’s Conservation Strategy Updates ([Section 2.1.2](#)), northern spotted owl habitat is now calculated using data from the DNR Remotely Sensed Forest Resources Information System (RS-FRIS; see the [FY 2019 HCP Annual Report](#) for background on RS-FRIS).

With the adoption of RS-FRIS, the queries listed in Table A-3 were slightly modified to account for the higher precision of RS-FRIS data and to better match the wording in the HCP (see [Section 2.1.2](#) for specifics). Table A-3 includes the definitions of each habitat type, as well as the queries DNR uses to identify it using RS-FRIS data.

Updated queries are listed below.

- In Type A and Type B habitat, canopy closure has been updated to “>70” (from “≥70”) because the wording of the HCP is “greater than” (not greater than or equal to).
- In Type A and Type B habitat, “Primary species >10% and primary species ≤80% (multispec=yes)” has been updated to “Secondary species is not null.”
- The height requirement for snags has been removed because RS-FRIS does not contain individual tree data.
- “Canopy layers ≥ 2” now comes directly from RS-FRIS data instead of an FVS derivation.

Table A-3: Northern Spotted Owl Habitat Types, Definitions, and Data Queries.

Habitat Type	Habitat Definitions (HCP p. IV.11-12 and WAC 222-16-085)	Data Query Used to Interpret Habitat Definitions
High-Quality Nesting	At least 31 trees per acre are greater than or equal to 21 inches diameter at breast height (dbh) with at least 15 trees, of those 31 trees, per acre greater than or equal to 31" dbh	(Live trees ≥ 21" diameter class) ≥ 31 trees per acre and (Live trees ≥ 31" diameter class) ≥ 15 trees per acre and
	At least 12 snags per acre larger than 21" dbh	(Snags ≥ 21" diameter class) ≥ 12 trees per acre and
	A minimum of 70% canopy closure	Canopy closure ≥ 70 and
	A minimum of 5% ground cover of large woody debris	(Down wood ≥ 4" diameter class) ≥ 2,400 ft. ³ per acre
	At least three of the 31 trees ≥ 21" dbh have broken tops	Not in query
	Type A	A multi-layered, multispecies canopy dominated by large (≥ 30" dbh) overstory trees (typically 15–75 trees per acre)
Greater than 70% canopy closure		Canopy closure > 70 and
More than two large snags per acre, 30" dbh or larger		(Snags ≥ 30" diameter class) ≥ 2.5 trees per acre and
Large accumulations of fallen trees and other woody debris on the ground		(Down wood ≥ 4" diameter class) ≥ 2,400 ft. ³ per acre
A high incidence of large trees with various deformities such as large cavities, broken tops, and dwarf mistletoe infection		Not in query

Appendix A

Habitat Type	Habitat Definitions (HCP p. IV.11-12 and WAC 222-16-085)	Data Query Used to Interpret Habitat Definitions
Type B Type B, cont.	Few canopy layers, multispecies canopy dominated by large (greater than 20" dbh) overstory trees (typically 75–100 trees per acre, but can be fewer if larger trees are present)	Canopy layers ≥ 2 and
		Secondary species is not null and
		(Live trees ≥ 20 " diameter class) ≥ 75 trees per acre and ≤ 100 trees per acre and
	Greater than 70% canopy closure	Canopy closure > 70 and
	Large (greater than 20" dbh) snags present	(Snags ≥ 20 " diameter class) ≥ 1 tree per acre and
	Accumulations of fallen trees and other woody debris on the ground	(Down wood ≥ 4 " diameter class) $\geq 2,400$ ft. ³ per acre
Some large trees with various deformities	Not in query	
MoRF	Forest community dominated by conifers, or in mixed conifer/hardwood forest, community composed of at least 30% conifers (measured as stems per acre dominant, co-dominant, and intermediate trees)	(Live conifers ≥ 4 " diameter class) $\geq 30\%$ of all live trees per acre and
	At least 70% canopy closure	Canopy closure ≥ 70 and
	Tree density between 115 and 280 trees greater than 4" dbh per acre	(Live trees ≥ 4 " diameter class) ≥ 115 and ≤ 280 trees per acre and
	Dominant and co-dominant trees at least 85' tall	(Largest 40 live trees per acre) $\geq 85'$ tall and
	Minimum of 5% ground cover of large down woody debris	(Down wood ≥ 4 " diameter class) $\geq 2,400$ ft. ³ per acre and
	At least three snags or cavity trees per acre that are at least 15" dbh	(Snags ≥ 15 " diameter class) ≥ 3 trees/acre and
	At least two canopy layers	Canopy layers ≥ 2
Sub-Mature	Forest community dominated by conifers, or in mixed conifer/hardwood forest, community composed of at least 30% conifers (measured as stems per acre dominant, co-dominant, and intermediate trees)	(Live conifers ≥ 4 " diameter class) $\geq 30\%$ of all live tree/acres and
	At least 70% canopy closure	Canopy closure ≥ 70 and
	Tree density of between 115 and 280 trees greater than 4" dbh per acre	(Live trees ≥ 4 " diameter class) ≥ 115 and ≤ 280 trees per acre and
	Dominant and co-dominant trees at least 85' tall	(Largest 40 live trees/acre) $\geq 85'$ tall and
	At least three snags or cavity trees per acre that are at least 20"	(Snags ≥ 20 " diameter class) ≥ 3 trees per acre and
	Minimum of 5% ground cover of large down woody debris	(Down wood ≥ 4 " diameter class) $\geq 2,400$ ft. ³ per acre
Young Forest Marginal	Forest community dominated by conifers, or in mixed conifer/hardwood forest, community composed of at	(Live conifers ≥ 4 " diameter class) $\geq 30\%$ of all live trees per acre and

Habitat Type	Habitat Definitions (HCP p. IV.11-12 and WAC 222-16-085)	Data Query Used to Interpret Habitat Definitions
(Same as Sub-Mature Except for Snag and Down Wood Requirements)	least 30% conifers (measured as stems per acre dominant, co-dominant, and intermediate trees)	
	At least 70% canopy closure	Canopy closure ≥ 70 and
	Tree density between 115 and 280 trees greater than 4" dbh per acre	(Live trees ≥ 4 " diameter class) ≥ 115 and ≤ 280 trees per acre and
	Dominant and co-dominant trees at least 85 feet tall	(Largest 40 live trees/acre) $\geq 85'$ tall and
	Snags greater than or equal to 2 per acre (greater than or equal to 20 inches dbh and 16" tall) OR $\geq 10\%$ of the ground covered with 4" diameter or larger wood, with 25–60% shrub cover	(Snags ≥ 20 " diameter class) ≥ 2 trees per acre or (Down wood ≥ 4 " diameter class) $\geq 4,800$ ft. ³ per acre
Movement	Canopy closure at least 70%	Canopy closure ≥ 70 and
	Quadratic mean diameter of 11" dbh for the 100 largest trees per acre in a stand	(Largest 100 live trees per acre) $\geq 11''$ quadratic mean diameter (QMD) and
	Forest community dominated by conifers, or in mixed conifer/hardwood forest, community composed of at least 30% conifers (measured as stems per acre dominant, co-dominant, and intermediate trees)	(Live conifers ≥ 4 " diameter class) $\geq 30\%$ of all live trees per acre and
	Tree density no more than 280 trees per acre ≥ 3 ; 5" dbh	(Live trees ≥ 4 " diameter class ≤ 280 trees per acre and
	Top height of at least 85 feet (top height is the average height of the 40 largest diameter trees per acre)	(Largest 40 live trees per acre) $\geq 85'$ tall
	At least four trees per acre from the largest size class retained for future snag and cavity tree recruitment	Not in query
Dispersal	Canopy cover at least 70%	Canopy closure > 70 and
	Quadratic mean diameter of 11" dbh for 100 largest trees per acre in a stand	(Largest 100 live trees per acre) $\geq 11''$ QMD and
	Top height of at least 85'	(Largest 40 live trees per acre) $\geq 85'$ tall
	At least four trees per acre from the largest size class retained for future snag and cavity tree recruitment	Not in query
Old Forest	Stands classified as the old forest habitat type were identified through implementation of the interim marbled murrelet conservation strategy. As part of the strategy, DNR conducted map and field reviews to delineate remnant patches of older forest to estimate how much potential murrelet habitat was present in the OESF. Although more than 40,000 acres were initially delineated for the purposes of eventually conducting murrelet surveys, the stands also coincided with unknown and suitable NSO habitat. In 2005 and 2006, during the Settlement Agreement negotiations, the Settlement Agreement Partners agreed to include those 40,000+ acres of older forest stands as the old forest habitat type, a fourth habitat type in the old forest habitat class.	

[Back to the HCP Annual Report](#)

A2.1.3 Tracking Northern Spotted Owl Habitat

Within each northern spotted owl management area, DNR tracks habitat using spotted owl management units (SOMUs).

- In most HCP planning units, SOMUs are derived from 1997 watershed administrative units (WAUs) and in some cases modified, in accordance with the HCP, to improve conservation and management capability. For eastside dispersal management areas, SOMUs are derived from ¼ townships.
- In the OESF HCP Planning Unit, SOMUs are derived from landscape planning units, not WAUs. (The OESF is divided into 11 landscape planning units, which are administrative areas designated primarily along watershed boundaries.)
- In the South Puget HCP Planning Unit, SOMUs are based on designated dispersal management landscapes. (Dispersal management landscapes are used only in the South Puget HCP Planning Unit and were defined through forest land planning.)
- For the Klickitat HCP Planning unit, SOMUs are based on sub-landscapes, which were defined through an [amendment to the HCP](#). Sub-landscapes are used only in this unit.

The NSO conservation strategy in the HCP involves maintaining thresholds of habitat in each SOMU. Most designated NRF and dispersal SOMUs have a 50 percent overall habitat threshold.

For the OESF and South Puget HCP Planning Units, habitat thresholds have two objectives. For example, the OESF has a 40 percent overall habitat threshold objective, which is further defined as restoring and maintaining at least 20 percent of each SOMU as old forest habitat with the rest composed of structural or better habitat. In the South Puget HCP Planning Unit, dispersal management areas have a 50 percent overall threshold, 35 percent of which is MoRF-plus habitat, and 15 percent of which is Movement-plus habitat.

Table A-4 describes habitat thresholds for selected HCP planning units.

Table A-4: Habitat Thresholds for HCP Planning Units

HCP Planning Unit	Habitat Threshold		Habitat Classification	Habitat Types
OESF	40% of each SOMU	At least 20%	Old Forest Habitat	Old Forest
				High-quality nesting
		Type A		
		Type B		
	20%	Structural habitat	Sub-mature	
			Young forest marginal	
South Puget	50% of each NRF SOMU	High-quality habitat	High-quality nesting	
			Type A	
		Type B		
		Sub-mature habitat	Sub-mature	
	50% of each dispersal SOMU	At least 35%	MoRF plus habitat	High-quality nesting
				Type A
				Type B
				MoRF
		15%	Movement plus habitat	Sub-mature
				Young forest marginal
			Movement	
	50% of each NRF SOMU		High-quality habitat	High-quality nesting

All Other Westside Planning Units			Type A	
			Type B	
		Sub-mature habitat	Sub-mature	
	50% of each dispersal SOMU	High-quality habitat		High-quality nesting
				Type A
				Type B
		Dispersal habitat		Sub-mature
				Young forest marginal
				Dispersal

In general, harvest activities must not increase the amount of time required to achieve habitat goals beyond what would be expected in an unmanaged stand. To ensure that procedures are being followed and goals are being met, DNR tracks the types and amounts of silvicultural activities in designated NRF and dispersal management areas.

A2.1.4 Northern Spotted Owl Conservation in the OESF HCP Planning Unit

The HCP describes the management approach for the OESF as “unzoned,” in that special zones are not set aside for either ecological values or revenue production. The goal behind this experimental management approach is to learn how to integrate revenue production and ecological values across state trust lands in the OESF.

However, DNR acknowledges that the OESF has fixed geographic features that require special management considerations. Examples include riparian areas, wetlands, potentially unstable slopes, and talus fields. Therefore, DNR currently uses the term “integrated” instead of “unzoned” to describe the management approach for the OESF.

Under this approach, DNR does not designate NRF or dispersal areas. Instead, in each of the OESF’s 11 SOMUs, DNR restores and maintains the following minimum habitat thresholds: 40 percent northern spotted owl habitat, of which at least 20 percent is old forest habitat, and the remaining 20 percent is structural habitat or better. This strategy, which restores northern spotted owl habitat capability, is based on working hypotheses concerning the necessary quality, quantity, and distribution of habitat.

In October 2016, DNR adopted the [OESF Forest Land Plan](#), which guides management of more than 270,000 acres of forestland on the Olympia Peninsula. DNR’s approach to assessing and mapping the current extent of NSO habitat for the OESF Forest Land Plan involved modeling numerous forest attributes from 2009 to 2109, including the presence of snags and down wood, which had been previously included as static features in NSO habitat models. Modeling snags and down wood allowed DNR to more accurately map NSO habitat across the OESF.

[Back to the HCP Annual Report](#)

A2.1.5 Northern Spotted Owl Conservation in the Klickitat Planning Unit

In the Klickitat HCP Planning Unit, many stands are overstocked with tree species that are susceptible to stand-replacing fires, drought, disease, and insect infestations. In addition, some lands originally designated as NRF management areas are not — nor will they ever be — capable of sustaining northern spotted owl habitat. This made the original habitat goal for this unit difficult to achieve.

In April 2004, DNR implemented an amended spotted owl conservation strategy (*HCP Amendment No.1, Administrative Amendment to the Northern Spotted Owl Conservation Strategy for the Klickitat HCP Planning Unit*) to address these issues in the Klickitat HCP Planning Unit. This amended strategy involves designating four sub-landscapes within the planning unit and using field assessments, forest inventory data, and spotted owl demography data to create habitat targets for each sub-landscape.

In addition, DNR renamed dispersal management areas as desired future condition (DFC) management areas. Klickitat DFC management areas have the same habitat commitments as dispersal management areas, but they are managed by vegetation series with the goal of maintaining 50 percent of each vegetation series, by sub-landscape, in a mature DFC (at least 60 years old). Areas incapable of growing and sustaining habitat and those better suited for a different habitat classification have been reclassified.

DNR also adjusted the Klickitat HCP Planning Unit boundaries to exclude approximately 23,000 acres of dispersal management area. These acres, which are located north of Yakama Nation lands, are now part of the Yakima HCP Planning Unit.

[Back to the HCP Annual Report](#)

A2.2 Marbled Murrelet Conservation Strategy

When the HCP was signed in 1997, DNR had insufficient information to create a long-term conservation strategy for the marbled murrelet. Murrelet ecology and habitat use were not well understood at the time, particularly in relation to nesting habitat on DNR-managed lands. To address this, the HCP specified that an interim strategy be implemented while DNR conducted inventories, surveys, and additional research to support development of a long-term strategy.

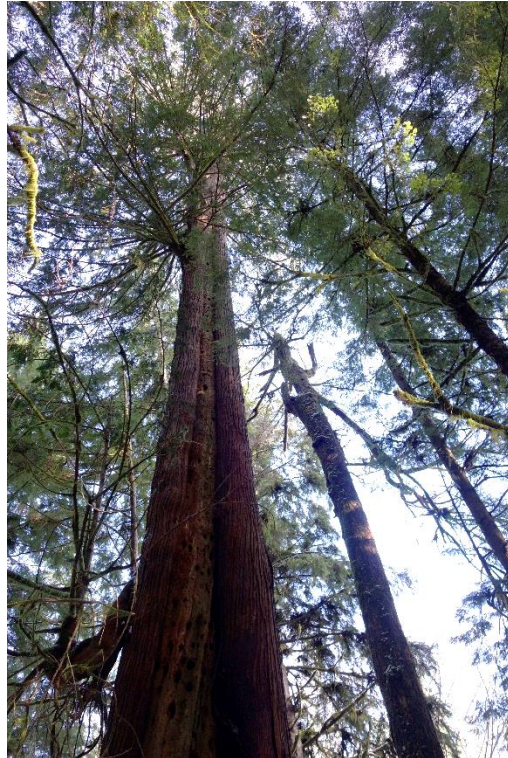
In November 2019, DNR and the USFWS released a [final environmental impact statement](#) (FEIS) on a long-term strategy for marbled murrelet conservation for the six western Washington HCP planning units. Concurrent with the release of the FEIS, DNR published a proposed amendment to the HCP that would replace the interim marbled murrelet conservation strategy with a long-term strategy. At this same time, the USFWS published several documents related to the marbled murrelet long-term conservation strategy:

- [Biological Opinion](#)
- [Record of Decision](#)
- [Findings and Recommendations](#)
- [Incidental Take Permit](#)

Following extensive research, public consultation, input from an independent science team, and several years of consultation with USFWS on the development of alternatives for a long-term conservation strategy, the Board of Natural Resources adopted a long-term strategy in December 2019. Additional information can be found at the [Marbled Murrelet](#) and the [Long-Term Conservation Strategy](#) webpages.

The marbled murrelet long-term conservation strategy (the [MM Amendment](#)) replaces the interim strategy; close-out information for the interim strategy is provided in the FY 2019 HCP Annual Report.

Figure A-5: An Occupied Site in the OESF HCP Planning Unit. Photo courtesy of Heidi Tate.



A2.2.1 Habitat Reporting

As discussed in the MM Amendment (page 19), marbled murrelet “habitat” does not solely include actual nest sites or nest trees and their surrounding forests. Implementation monitoring of the MM Amendment will periodically describe changes in landscape-level habitat conditions. Marbled murrelet reporting will include a summary of the quantity and quality of habitat (P-stage) in occupied sites, occupied site buffers, special habitat areas, and areas of long-term forest cover not included in the previous categories, by HCP planning unit in “gross” and “adjusted” acres (described below). Natural disturbance will be tracked through the reporting of salvage activities, and during the first decade of implementation, DNR will report on “metered” acres (see MM Amendment page 34).

More information is provided below on each of these concepts. For a full description, see the MM Amendment references given in each subsection.

P-Stage

P-Stage is a habitat classification system used in the development of the Marbled Murrelet Long-Term Conservation Strategy. It assigns a numeric value to forest stands based on the probability of their use by marbled murrelets for nesting. As described in the MM Amendment (page 19), P-stage values are used to represent forest stands that express the likelihood of being occupied by murrelets. P-stage is based on a mathematical model of marbled murrelet nesting habitat as it relates to stand development in natural forests. P-stage attempts to generalize and classify levels of habitat quality as they relate to forest stand characteristics. P-stage is constructed and used in a way that incorporates the uncertainty between occupancy and actual nest sites. For the MM Amendment, it groups stands

Appendix A

with varying probabilities of occupancy into six classes: 0.25, 0.36, 0.47, 0.62, 0.89, and 1.0. Refer to MM Amendment Appendix C, Attachment C-3 for a detailed description of the P-stage model.

Adjusted Acres

Adjusted acres refers to a quantity of marbled murrelet habitat (P-stage, in acres) that has been discounted or “adjusted” for factors that can reduce the benefit of that habitat to murrelets (see MM Amendment page 21) – for example, whether the acres are close to a forest edge that can attract predators, whether the acres are near or far from occupied sites, and whether the habitat is subject to disturbance.

Total “gross” or “raw” acres of habitat with P-stage values are estimated using DNR forest inventory. The total raw acres within each P-stage category (0.25, 0.36, 0.47, 0.62, 0.89, and 1.0) are then multiplied by their respective P-stage values, converting them to “adjusted acres,” which incorporates habitat quantity and quality, including edge effects, into one unit of measurement.

Long-term Forest Cover

Long-term forest cover (LTFC) refers to lands on which DNR maintains and grows forest cover for conservation purposes, including habitat conservation for the marbled murrelet, through the life of the HCP. MM Amendment Appendix C, Attachment C-4 provides a focus paper covering LTFC in depth. LTFC includes both murrelet-specific conservation areas and other areas that have multiple conservation objectives. All areas of long-term forest cover outside of occupied sites, occupied site buffers, and special habitat areas are referred to as “other LTFC.” Some elements of other LTFC have been verified in the murrelet GIS layer and do not need to be verified on the ground. These elements will be updated periodically when the marbled murrelet GIS layer is updated, and include:

- Natural Area Preserves and Natural Resources Conservation Areas
- High-quality northern spotted owl habitat, including Old Forest Habitat in the Olympic Experimental State Forest as of November 2018
- Gene pool reserves
- Field-verified old growth
- The following field-verified elements of State Lands (local) Knowledge GIS layer: balds, caves, cliffs, talus slopes, wetlands

Remaining elements of other LTFC need to be verified on the ground. LTFC associated with riparian areas, wetlands, and unstable slopes are examples requiring field inspections to verify boundaries.

Occupied Sites and Buffers

Occupied sites are habitat patches of varying size in which murrelets are assumed to nest, based on field observations. The MM Amendment (page 26), further clarifies that “occupied sites” means those sites that were delineated by the Science Team and described in Section 2.1 of the FEIS and are depicted in MM Amendment Appendix B, Figure B-2. Occupied sites are recorded in the DNR marbled murrelet GIS layer. Based on the Science Team-delineated marbled murrelet occupied sites, there are 59,331 acres within 388 occupied sites.

As outlined in the MM Amendment (page 27), a 328-foot (100-meter) buffer is placed on the outer extent of all occupied sites. This buffer is recorded in the DNR marbled murrelet GIS layer. The MM Amendment establishes 32,777 acres of buffer around the 388 occupied sites.

Special Habitat Areas

Special habitat areas (SHAs) are designed to increase marbled murrelet productivity by reducing edge and fragmentation (see MM Amendment page 28). Special habitat areas that do not contain occupied sites contain high-quality, current and modeled future murrelet habitat, and non-habitat that may function as security forest. As mentioned in the MM Amendment (page 30), security forest protects habitat from deleterious edge effects, including microclimate change, windthrow, predation, and disturbance.

The SHA network comprises 20 areas that together include 46,925 acres, and all but one of the SHAs contain at least one occupied site (see MM Amendment page 29). SHAs range in size from 338 acres to 7,549 acres and average 2,346 acres (see MM Amendment, Appendix A, Table A-6). Occupied sites and current habitat comprise 28,823 acres of the total acres within SHAs, another 5,052 acres is future habitat, and all but 1,014 acres of the remaining acreage is either security forest or future security forest.

Metered Acres

As outlined in the MM Amendment (page 32), DNR will delay (or “meter”) harvest of 5,000 adjusted acres of marbled murrelet habitat that would otherwise be authorized to harvest until the end of the first decade of implementation following the adoption of the MM Amendment (December 3, 2029). Metering was established to maintain habitat capacity while additional habitat develops under the MM Amendment. The specific location and quality of habitat to be metered will be determined at DNR’s discretion as outlined in the MM Amendment (page 32).

A.2.2.2 Implementation

DNR will implement the MM Amendment in two phases. During Phase One, DNR will initially limit some of the flexibility provided in the MM Amendment to allow the development of a detailed implementation procedure and conduct staff training on implementation specifics. Implementing in phases also provides DNR and the trust beneficiaries and stakeholders time to become familiar with the LTCS approach and concepts before moving into full implementation.

Full implementation occurs in Phase Two. Activities that may be allowed in Phase Two with timing restrictions, consultation with USFWS, and/or other requirements are not encouraged during Phase One, without deliberate coordination. Although DNR has more flexibility in Phase Two, activities in occupied sites, occupied site buffers, SHAs, and other LTFC will still be limited.

Management activities are limited in areas being managed for conservation in order to minimize disturbance. Some management activities will result in limited harvest of murrelet habitat (P-stage) and, as outlined above, DNR has a budgeted number of acres allocated to these activities in the MM Amendment over the next 50 years.

Table A-4 of the MM Amendment (page A-5) describes the activities allowed and not allowed in the various habitat categories. Allowed activities typically must be performed during limited operating periods if undertaken during the murrelet nesting season, impacts to platform trees must be avoided when possible, and road reconstruction and maintenance must meet Washington State Forest Practices road standards.

[Back to the HCP Annual Report](#)

A2.3 Riparian Conservation Strategy

For the five westside HCP planning units, the HCP riparian conservation strategy was developed with two specific objectives:

- Maintain or restore freshwater habitat for salmonids on state trust lands, and
- Contribute to the conservation of other species that depend on aquatic and riparian habitats, including wetlands (HCP, p. IV.55).

Meeting these objectives means using RMZs and WMZs to provide clean water, shade, and large logs for streams. It also means preventing sediment delivery to streams and wetlands through management standards for road building and for conducting forest management activities on potentially unstable slopes and rain-on-snow areas.

Adopted in 2006, the [Riparian Forest Restoration Strategy \(RFRS\)](#) is part of the HCP riparian conservation strategy. The RFRS, which applies to all westside HCP planning units except the OESF, was developed by a technical review committee consisting of technical staff from DNR, NOAA, USFWS, Northwest Indian Fisheries Commission, and WDFW.

Under the RFRS, DNR designs riparian forest thinnings to restore older forest structure and species composition in areas where historic timber harvest created stands that were even-aged and overstocked. DNR uses canopy gaps and “skips” — areas that are left unmanaged — to help increase structural diversity and accelerate the development of habitat. Candidate stands for RFRS treatments are often missing long-lived conifer species like western red cedar, or are dominated by short-lived species like red alder.

Accelerating the growth of large conifer trees is an important part of the RFRS. Over time, these trees will provide shade and nutrient-rich litter to streams when they are alive and large woody debris when they die and fall over. Large woody debris in the stream channel creates pools and cover, which are important for salmon habitat. Once the riparian forest is on a developmental trajectory to reach an older forest structural condition, further restoration activities are low priority and site-specific. During the initial RFRS implementation period, thinning in stands 70 years of age or older was conducted on a site-specific basis in consultation with the Services. This restriction was lifted in 2012 through a [joint concurrence letter](#) signed by DNR and the Services.

A2.3.1 Headwaters Conservation Strategy

In 2007, DNR collaborated with the Services and the scientific community to develop a draft Headwaters Conservation Strategy to guide forest management along Type 5 streams and complete the HCP riparian conservation strategy. It was determined, however, that the draft strategy would have required a high level of spatial tracking to comply and document, and it would have introduced a prohibitive number of management decisions to complete each timber sale. As a result, a simpler alternative draft headwaters strategy is being developed that will meet the original conservation objectives of the previous version. This alternative strategy incorporates emerging ideas about the importance of non-fish-bearing stream habitat for ecosystem conservation and downstream fish habitat quality.

[Back to the HCP Annual Report](#)

A2.4 Multispecies Conservation Strategy

In addition to providing habitat for ESA-listed species, the conservation objectives developed for the HCP were designed to provide appropriate habitat protection for many native species not currently listed or protected under the ESA. The HCP also specifies habitat protection for numerous Washington state-listed plant and animal species of concern.

A2.4.1 Uncommon Habitat Objectives

The multispecies conservation strategy involves identification and protection of uncommon habitat types for unlisted species. These habitat types include caves, cliffs, talus slopes, wetlands, balds, mineral springs, snags, oak woodlands, and large structurally unique trees. These habitat types provide nesting, roosting, hiding, and foraging opportunities for many species.



[Back to the HCP Annual Report](#)

A3.0 Adaptive Management, Monitoring, and Research

Monitoring and research provide the information necessary to improve the implementation and effectiveness of the conservation strategies in the HCP. Monitoring and research also help DNR document how well different plans and actions are working to achieve the desired outcomes. The information gained can be used to adjust or adapt DNR's management practices as needed.

Since the HCP was adopted in 1997, there have been advances in understanding the ecology of northern spotted owl, marbled murrelet, and other species addressed by the HCP and how land management affects them. However, much remains to be learned, and new systems and techniques continue to be developed and tested. Monitoring and research support the completion of conservation strategies, evaluate their implementation and effectiveness, test promising alternatives to current conservation approaches, and contribute to the ecological foundation of habitat management on DNR-managed lands.

The adaptive management process outlined in the HCP allows changes to DNR forest management techniques and activities when results from the research and monitoring programs or new information from scientific literature indicate that such changes are warranted. For example, adaptive management has resulted in management modifications such as the [Riparian Forest Restoration Strategy](#), the [Administrative Amendment to the Northern Spotted Owl Conservation Strategy for the Klickitat HCP Planning Unit](#), and a [legacy tree procedure for eastern Washington](#) that protects old-growth trees and stands.

[Back to the HCP Annual Report](#)

A3.1 Adaptive Management and the Conservation Strategies

Adaptive management is a way to manage natural resources when knowledge of ecosystem functions or the effects of human actions is incomplete. New scientific developments and information obtained

through research and monitoring can identify changes in DNR management practices that would help address the needs of specific species or improve habitat conditions. For this reason, the HCP includes provisions for a dynamic, science-based adaptive management process that allows for continual improvement of management strategies and practices. The adaptive management process includes the following tasks:

- Set research priorities
- Develop study plans
- Manage research projects
- Review results
- Make changes to DNR's forest management practices if necessary
- Monitor management activities to inform continuous improvement

Currently, adaptive management is implemented through two processes: the State Lands Adaptive Management Program and the OESF adaptive management process. These processes are closely linked, though they differ in scope and level of formalization. The State Lands Adaptive Management Program includes activities throughout DNR managed lands, while the OESF adaptive management process focuses on activities in the OESF. Unlike the statewide program, the OESF process is guided by an administrative procedure, adopted in FY 2017, which describes the steps of the process and the responsible parties. Development of the OESF Forest Land Plan resulted in the separate OESF adaptive management process, as this process is an integral part of the management of the OESF.

[Back to the HCP Annual Report](#)

A3.2 Implementation, Effectiveness, and Validation Monitoring

A science-informed adaptive management program relies primarily on research and monitoring to provide new, relevant information for increasing confidence in current management or developing new management options. A system consisting of three types of monitoring — implementation, effectiveness, and validation — has become a common organizational framework for monitoring programs in forest management.

- **Implementation monitoring** determines whether or not the HCP is being implemented properly on the ground, and is sometimes referred to as compliance monitoring.
- **Effectiveness monitoring** determines whether or not the HCP strategies are producing the desired habitat conditions.
- **Validation monitoring** determines whether or not a certain species responds to the desired habitat conditions as anticipated.

A3.2.1 Implementation Monitoring

The HCP requires DNR to monitor its implementation of the conservation strategies to ensure that the physical outcomes of management activities match DNR's intention as described in the HCP. Conservation strategies are selected for implementation monitoring based on a number of criteria. These criteria may include the level of risk or uncertainty associated with the strategy, the level of management discretion, the cost and timeliness of monitoring results, new information, and input from the Services and DNR managers. Examples of monitoring projects include monitoring large, structurally unique trees left on timber sales following harvest, monitoring for compliance with the

northern spotted owl conservation strategy, and monitoring of management activities in WMZs and RMZs.

[Back to the HCP Annual Report](#)

A3.2.2 Effectiveness Monitoring and Research for HCP Conservation Strategies

Effectiveness monitoring documents changes in habitat conditions, including general forest structure and specialized habitat features that result from timber harvest and other forest management activities. Only habitat areas addressed by the conservation strategies are monitored for effectiveness.

Information from this type of monitoring increases DNR's ability to understand the influence of land management on aquatic and upland habitat conditions, and to effectively implement the conservation strategies to reach the goals of the HCP.

Northern Spotted Owl Conservation Strategy Effectiveness Monitoring

The objective of northern spotted owl research and effectiveness monitoring is to help DNR better understand the habitat needs of the northern spotted owl and how to effectively manage forest stands and landscapes to create and sustain suitable habitat. The effectiveness monitoring program evaluates whether the HCP strategies and associated silvicultural treatments maintain or enhance NRF and dispersal habitat. Effectiveness monitoring also supports the adaptive management goals for the northern spotted owl conservation strategy, such as developing better stand- and landscape-level habitat definitions.

The NSO Effectiveness Monitoring Program currently consists of two primary components:

- Long-term tracking of the effects of variable density thinnings on habitat structure in stands designated as habitat.
- Landscape-scale monitoring of basic habitat indicators across the entire westside HCP land base.

DNR is also conducting two research projects related to NSO effectiveness monitoring:

- Measurement of the response of habitat features to small-gap creation within thinned stands.
- Comparison of the spatial structure of both thinned and unthinned stands designated as habitat to late-successional reference stands known to function as NSO habitat.

Status and Trends Monitoring of Aquatic and Riparian Habitat in the OESF

The key objectives of the Status and Trends Monitoring Program are to provide empirical data to evaluate DNR's progress in meeting the HCP riparian conservation objectives and to reduce uncertainties around the integration of habitat conservation and timber production. The study's main hypothesis is that implementation of the HCP riparian conservation strategy for the OESF allows natural processes of ecological succession and disturbance to improve habitat conditions across managed watersheds over time. Starting in 2012, DNR has monitored stream reaches and adjacent riparian forests in 50 Type 3 watersheds representative of the OESF and four reference sites in the Olympic National Park. In 2018, DNR added six unmanaged or minimally managed watersheds on the western Olympic National Forest to the network of reference sites.

Nine habitat attributes — including stream temperature, shade, and microclimate — are field-sampled at reach level. Watershed-level disturbances such as windthrow, timber sales, and road

management are sampled remotely and through operational records. When integrated with information on management activities in the OESF, the monitoring data from this project will allow DNR to make inferences about the effects of specific forest management operations on habitat, thus helping DNR fulfill its commitments for effectiveness monitoring and implementation of adaptive management under the HCP. The project is conducted and funded by DNR in collaboration with the USFS Pacific Northwest Research Station and the Olympic National Forest.

Riparian Silviculture Effectiveness Monitoring

The objective of effectiveness monitoring for riparian silviculture is to determine whether various restoration thinning treatments are resulting in riparian habitat conditions that support salmon recovery efforts and contribute to the conservation of other riparian and aquatic species. To achieve this, DNR has established several permanent monitoring sites in the OESF, North Puget, and South Puget HCP planning units in which various habitat metrics are measured immediately before and after thinning treatments, and periodically thereafter. Thinning treatments are characteristic of treatments implemented under the 2006 Riparian Forest Restoration Strategy and are intended to facilitate the development of structurally complex riparian forests.

[Back to the HCP Annual Report](#)

A3.2.3 Validation Monitoring

The HCP requires that DNR conduct riparian validation monitoring across the conglomeration of state-managed lands in the OESF. Validation monitoring is defined in the HCP as monitoring “to evaluate cause-and-effect relationships between habitat conditions resulting from implementation of the conservation strategies and the animal populations these strategies are intended to benefit (V.2).” The riparian conservation strategy for the OESF in the HCP was designed to protect or improve habitat for viable salmonid populations. The strategy consists of: (1) interior-core buffers to protect soils on floodplains and unstable stream banks, incised stream valleys, and adjoining unstable slopes; (2) exterior, or wind buffers adjacent to interior buffers, as needed, to protect against blowdown; (3) a comprehensive program of road management, maintenance, and improvement including stabilizing and decommissioning particularly risky roads; and (4) protecting forested wetlands. Riparian validation monitoring will determine if the riparian conservation strategy is maintaining or improving salmonid habitat and expressing stable or positive effects on salmonids as anticipated in the HCP.

[Back to the HCP Annual Report](#)

A3.3 OESF Research and Monitoring Program

The Olympic Experimental State Forest (OESF) is designated with the objective of learning how to integrate revenue production (primarily through timber harvesting) and ecological values (primarily habitat conservation). New scientific knowledge is applied by DNR to continually improve land management practices through a formal process of adaptive management. Knowledge gained is expected to benefit other land managers facing similar challenges of meeting multiple objectives in a working forest.

The OESF Research and Monitoring Program implements and coordinates research and monitoring projects on the OESF; facilitates the adaptive management process at DNR; fosters science communication and outreach; manages research and monitoring information; establishes and maintains research partnerships with universities, colleges, federal agencies and other organizations; collaborates with local land managers, tribes, environmental organizations and regulators on research and monitoring projects; and provides educational opportunities.

A3.3.1 Current and Past Research and Monitoring in the OESF

Information on research in the OESF can be found on the OESF website. These projects are focused on DNR’s needs for revenue generation, environmental protection, and long-term sustainability. The majority of the past research and monitoring activities are listed in the OESF [Research and Monitoring Catalog](#), published by DNR in 2008.

A3.3.2 Adaptive Management

Adaptive management is an HCP commitment. In the [OESF Forest Land Plan](#), it is defined as a formal process for continually improving management practices by learning from the outcomes of operational and experimental activities. Adaptive management in the OESF focuses on integration of revenue production and ecological values, and its theoretical foundation, goal, and scope are described in the OESF Forest Land Plan. DNR follows an administrative procedure for adaptive management in the OESF, which describes the step-by-step process and identifies the parties responsible for implementation.

A3.3.3 Communication, Outreach, and Education

Through effective communication, DNR shares the scientific knowledge developed in the OESF, builds public confidence in the sustainability of forest management practices and the effectiveness of the HCP conservation strategies.

The OESF Research and Monitoring Program publishes a biannual electronic newsletter (“[The Learning Forest](#),” a joint effort with the University of Washington ONRC) to share scientific knowledge on sustainable land management on the Olympic Peninsula. The newsletter is distributed in the spring and fall to about 180 subscribers and to DNR and University of Washington students and staff. Current and past issues are posted on the [OESF](#) and [ONRC](#) websites.

The purpose of the annual OESF Science Conference is to communicate results of research and monitoring activities taking place in the OESF and their relevance to land management uncertainties faced by DNR and other land managers. The conference takes place in Forks at the end of April and is attended by natural resource specialists, land managers, students, scientists, and the public.

Several pages on the [DNR website](#) contain information about the OESF, ongoing research and monitoring projects, news, and recent publications. The program’s informal outreach and communication activities include presentations at scientific and public forums, scientific publications, project reports, booths at college fairs, field trips, and other activities.

Educational opportunities in the OESF include internships for undergraduate and graduate students, field trips for K-12 and college students, and lectures and presentations at colleges and universities. The topics covered in these activities range from specific ecological questions to descriptions of environmental monitoring and adaptive management.

A3.3.4 Information Management

The OESF research tracking database includes metadata on ongoing research and monitoring projects related to natural resource management and ecology conducted by DNR or external parties on the OESF. The database stores all scientific and administrative documents on project implementation, as well as references to project GIS data in DNR’s statewide research areas GIS layer.

Individual project data are available upon request. More information, including contact information, can be found on the [OESF website](#).

A3.3.5 Research Partnerships

DNR maintains two formal agreements related to the OESF:

- A memorandum of understanding with USFS Pacific Northwest Research Station for OESF participation in the Experimental Forest and Range Network (a national network of 80 forests and ranches). It encourages collaboration between OESF and USFS scientists and increases the OESF's visibility nationwide.
- A memorandum of understanding between DNR, University of Washington Olympic Natural Resources Center (ONRC), Olympic National Forest, and the USFS Pacific Northwest Research Station. It advances collaboration between the four parties on research, monitoring, and adaptive management of forest ecosystems on the Olympic Peninsula.

Multiple informal partnerships and collaborations are organized and maintained on a project-by-project basis.

[Back to the HCP Annual Report](#)

A4.0 Silvicultural Activities

Silviculture is the art and science of managing forests to meet objectives. Through silviculture, DNR manages the density and composition of trees in the forest to provide both quality timber for harvest and ecological values such as habitat for threatened and endangered species, healthy watersheds, biodiversity, and resiliency to disease and insects.

A4.1 Selecting Silvicultural Activities

DNR implements an array of silvicultural activities (harvest, regeneration, vegetation management, etc.). Which activities are implemented, when, and how often are determined through the silvicultural prescription.

The silvicultural prescription defines desired outcomes (objectives) and how DNR plans to accomplish them (via silvicultural activities) in a forest management unit over an entire rotation. A forest management unit is a contiguous area that is ecologically similar enough to be managed to meet common objectives, and a rotation is the length of time between stand replacement harvests.

A4.1.1 Objectives

When writing a silvicultural prescription, DNR begins by understanding the unit's contribution to landscape-level objectives set by DNR policies, including the HCP and the *Policy for Sustainable Forests*. Examples of landscape-level objectives include maintaining a certain percentage of the forested landscape as northern spotted owl habitat, or maintaining enough hydrologically mature forest in a watershed to prevent periods of peak flow (periods of high stream flow after storm events).

DNR then applies specific "rotational objectives" to the unit in that context. For example, a unit that contributes to northern spotted owl habitat landscape objectives may have a rotational objective to "attain sub-mature NRF habitat." Rotational objectives are based on the biological capability of the site, including the trees suitable to the site, the site's productive capacity, the presence or absence of competing vegetation, insect and disease issues, and other considerations. Financial and budget constraints also play a role in the selection of rotational objectives.

A4.1.2 Activities

Once DNR defines the rotational objectives and threshold targets, the next step is to determine the sequence of silvicultural activities that are necessary to meet them. The frequency and type of activities DNR selects will depend on the biological capability of the site and the complexity of the prescription. Budget allocations and market conditions also influence the timing and extent of silvicultural activities chosen, and activities may be prioritized based on available resources and relative benefits. Other important considerations include market conditions, ecological constraints, operational constraints (like potentially unstable slopes), new and existing policies and procedures, and new scientific discoveries. As the stand grows, DNR periodically reassesses it to ensure it is on track to meet its objectives.

A4.2 Tracking Silvicultural Activities

DNR tracks planned and completed silvicultural activities using a database called Land Resource Manager (LRM). LRM is a tabular database that contains information about the activities that DNR implements on the landscape. For example, for a timber harvest, DNR uses LRM to track information such as harvest method and land class (riparian vs. upland area), or the density and species composition planted during a regeneration activity. In addition to tracking tabular data, LRM integrates a Geographic Information System (GIS) that allows for the spatial tracking of individual forest management activities on the landscape. The previous system used by DNR (Planning and Tracking, P&T), which supplied data for previous HCP Annual Reports until FY 2018, lacked the functionality to spatially track individual activities.

Year-to-year variation in the volume of timber harvest is common and is typically associated with variation in the level of silvicultural activity. For example, more stand-replacement harvest in one year will typically lead to more site preparation and planting in the next fiscal year, as well as increased levels of other activities in subsequent years. However, because of the possible lag time between when an activity is implemented and when it is recorded in LRM, it may be a year or more before changes in timber harvest volume and other activities are reflected in the number of acres summarized in this report.

A4.3 Descriptions of Silvicultural Activities

A4.3.1 Timber Harvest

DNR tracks each of the following types of harvests:

- **Commercial thinning:** Commercial thinning generates revenue and is performed to meet a wide range of objectives, including improving the growth of the stand, enhancing stand health, reducing tree mortality, or accelerating the development of habitat. Regeneration of a stand is not an objective of thinning.
- **Variable density thinning:** Variable density thinning is a type of commercial thinning that creates a mixture of small openings (gaps), unthinned patches (skips), and varying stand densities to achieve specific objectives, such as



A variable density thinning in the OESF.

accelerating development of a complex stand structure. Variable density thinning may also include treatments to create or encourage development of large down wood and snags.

- **Selective product logging:** This type of harvest removes trees of certain species and sizes that are highly valuable, such as trees that function well as utility poles or logs for cabins.
- **Seed tree intermediate cut:** A seed tree intermediate cut is the first in a series of harvests that is conducted as part of the even-aged seed tree silvicultural harvest system. The purpose of this harvest type is to provide a desirable seed source to establish seedlings. Typically, about 10 overstory trees per acre may be left following this harvest; once the new trees are established, some of these seed trees may be harvested in a seed tree removal cut.
- **Shelterwood intermediate cut:** This harvest is the first in a series of harvests conducted as part of the even-aged shelterwood harvest system. The purpose of this harvest is to provide shelter (typically shade) and possibly a seed source for the seedlings that are regenerating in the stand. Compared to a seed tree intermediate cut, a shelterwood cut typically retains more overstory trees per acre following harvest; retained trees are generally dispersed across the stand. Once the new trees are established, some of these shelter trees may be harvested in a shelterwood removal cut.
- **Seed tree, shelterwood, or temporary retention removal cut:** In these cuts, some overstory trees retained in the earlier harvests are removed.
- **Uneven-aged management:** In uneven-aged management, trees are removed from a multi-aged forest stand while maintaining multiple age classes within that stand. Uneven-aged management is often used on sites with poor soils on which more intensive management is not cost-effective. This type of management may also be used in fire-prone areas to mimic the effects of periodic, lower-intensity fires that do not remove all of the trees.
- **Variable retention harvest:** Variable retention harvest is a type of regeneration, or stand-replacement harvest. With this type of harvest, DNR removes most of the existing forest stand to make room for regeneration of a new stand, while leaving elements of the existing stand, such as down wood, snags, and live leave trees (trees that are not harvested), for incorporation into the new stand. Variable retention harvest is different from a clear-cut, in which all or nearly all of the existing stand is removed.

A4.3.2 Forest Site Preparation

After a stand replacement harvest and before planting the new stand, DNR may remove slash (residue of logging, such as tree limbs) and undesirable plants that would compete with seedlings for nutrients, water, and light. Site preparation may be performed during logging – for example, by pulling up and disposing of brush clumps, or after logging by piling and burning slash, manually cutting undesirable vegetation, applying herbicide to undesirable tree and brush species, or a combination of methods.

A4.3.3 Forest Regeneration

Following a stand-replacing harvest, DNR establishes new stands by planting seedlings or allowing the site to seed naturally from adjacent stands or trees that are retained within the harvested area. DNR typically only tracks natural regeneration as an activity in LRM when the associated timber harvest Forest Practices Application has a natural regeneration plan; natural regeneration occurs following certain timber harvest methods, such as uneven-aged management, but these trees are tracked using stocking surveys over the life of the stand.

A4.3.4 Vegetation Management

After the site has been planted but before the seedlings have become fully established, DNR may remove competing vegetation to give the new seedlings room to grow. Vegetation may be removed by hand, by mechanical means, or through application of herbicide. Vegetation management is done when competing vegetation will have a negative effect on the stand's ability to meet its objectives.

A4.3.5 Pre-Commercial Thinning (PCT)

During a pre-commercial thinning, DNR removes the less-desirable trees to maintain the growth and stability of the retained trees. PCTs are performed before the trees are large enough to be marketable. This type of thinning does not generate revenue, and cut trees are left on site to decompose.

PCT is needed in some stands to reduce high stem densities. When implemented within the optimal timeframe, this prescription increases the chances that stand development will lead to desired future forest conditions. Proper thinning helps maintain individual tree vigor and accelerates diameter growth, resulting in more rapid attainment of size requirements for product or habitat goals. PCT is a particularly important strategy for addressing forest health concerns, because maintaining lower stand densities with good individual tree vigor is important for making stands more resistant to insect attack. In addition, PCT improves height-to-diameter ratios, a measure of stem stability, reducing risk of windthrow or stem-buckling if partial cutting treatments are applied.

PCT does not immediately create habitat for endangered species such as the northern spotted owl or marbled murrelet. However, it can set thinned stands on a developmental trajectory that is more likely to produce future habitat because thinning accelerates the development of large, live trees with stable tree architecture.

A4.3.6 Unmanned Aircraft Systems (UAS)

Throughout the life of a stand, DNR periodically conducts field surveys to assess stand conditions and evaluate the need for future treatment. DNR is beginning to use UAS to supplement or replace young stand surveys as UAS can provide a more cost-effective and safer way to collect data. Footage derived from UAS flights includes information on tree height and density, providing foresters with an additional decision-making tool to refine silviculture prescriptions.

[Back to the HCP Annual Report](#)

A5.0 Non-Timber Management Activities

A5.1 Road Management Activities

Roads that are improperly constructed or maintained can negatively impact habitat in a number of ways. Such roads can increase the rates of slope failure, contribute sediment to streams, and block fish passages, all of which can potentially harm salmon and other aquatic and riparian-obligate species. Current road-building and maintenance practices create better roads that minimize impacts while also allowing DNR to abandon or improve poorly built roads.

In 2001, Washington's state Forest Practices rules were updated to reflect the Forests and Fish legislation passed in 1999. This legislation required all large forest landowners to manage forest roads constructed or used for timber harvest and other forest activities after 1974 under an approved road maintenance and abandonment plan (RMAP) by July 1, 2006. The legislation also stipulated

that all forest roads must be improved and maintained to the standards established in WAC 222-24 by 2016. DNR completed a full stream-crossing assessment in 2001 and a road assessment for all forested state trust lands in 2006. In 2015, RMAP rules were changed to allow forest landowners to apply for an extension of the completion date to October 2021. DNR completed its state uplands RMAP work statewide by the October 2021 completion date.

Under the HCP, DNR made a commitment to develop and institute a process to achieve comprehensive, landscape-based road network management. The major components of this process include the following:

- Minimization of active road density.
- A site-specific assessment of alternatives to new road construction (for example, yarding systems) and the use of such alternatives where practicable and consistent with conservation objectives.
- A baseline inventory of all roads and stream crossings.
- Prioritization of roads for decommissioning, upgrades, and maintenance.
- Identification of fish passage blockages caused by stream crossings, and a prioritization of their retrofitting or removal.

DNR evaluates overall active road density through forest land planning (completed for the South Puget and OESF HCP Planning Units). The department conducts site-specific assessments of alternatives to new road construction at the operational level when planning individual activities, and DNR addresses the last three components of this process through implementation of RMAPs.

As part of meeting HCP annual reporting requirements, DNR tracks and reports the number of road miles constructed (newly built roads), reconstructed (existing roads improved to a timber-haul standard), decommissioned (roads stabilized and made impassable to vehicular traffic), or abandoned (roads stabilized and abandoned to forest practices standards), as well as total active forest road miles and the total number of fish barriers removed.

Unlike other activities, road management activities are reported on a calendar year (rather than fiscal year) basis because the end of the fiscal year is at the start of the busiest time of the construction season. Most road work is subject to a hydraulic “work window” that limits in- or near-stream work to the summer (typically June 15 through September 30).

[Back to the HCP Annual Report](#)

A5.2 Easements and Permits

DNR grants access across its lands, and acquires access to its lands, through easements and road use permits. Easements are long-term (typically permanent) agreements in which property owners grant the rights to cross their land to another individual or entity. Easements are an interest in real property, and most transfer with the land, serving landowner after landowner. DNR also receives easements when it acquires lands.

Road use permits are usually short-term rights that do not convey any interest in property and are revocable by the entity that grants them. Permits are generally non-transferrable.

DNR primarily grants easements and road use permits to other governmental entities for public roads and utilities, and to forest and agricultural landowners for access to valuable materials such as timber or rock. DNR also grants easements and road use permits for many other uses, such as irrigation pipelines and railroads. The department acquires easements and road use permits from private individuals and government agencies to allow staff to access DNR-managed lands.

Unlike other categories of non-timber activities, DNR does not report easements and road use permits on a cumulative basis. Only new easements and permits that create a new “footprint” on state trust lands managed under the HCP are reported for each fiscal year. These include easements for new roads and utilities. DNR does not currently have a system to tally total easement acres, primarily because many easements were granted in the early 1900s and hand-entered on records that are now archived. However, easement mapping under the Road Easement GIS and Spatial NaturE projects is helping to address this issue.

[Back to the HCP Annual Report](#)

A5.3 Land Transactions

DNR’s Land Transactions Program is designed to reposition state trust lands for better long-term management and increased revenue for each of the trusts. Repositioning simply means disposing of properties that do not fit DNR’s management strategies or objectives and acquiring replacement properties that are more suitable. When DNR sells parcels at public auction or transfers (sells) them to other public owners, the department uses the proceeds to acquire replacement lands for the trusts to keep the trust whole.

Land transactions affect the amount of habitat or potential habitat on state trust lands. Transactions may be carried out to consolidate state trust lands in certain areas. Consolidation allows for more cost-effective management and offers opportunities to optimize trust revenue while maintaining habitat and allowing public recreation where appropriate. DNR often consolidates state trust lands by working with owners of adjacent lands to trade their properties for scattered parcels of state trust lands elsewhere.



DNR staff review a proposed easement.

Photo courtesy of Kaerlek Janislampi.

Often, lands that DNR identifies for disposal are better suited to other public benefits, such as parks or habitat for rare, native species. The department may transfer state trust lands out of trust status into protected status as a NAP or NRCA in the Natural Areas Program. DNR may also transfer state trust lands to other government agencies to be used as parks or open space or for public facilities. When this happens, the department compensates the trust at fair market value and acquires replacement properties to maintain trust assets over time. Acquired lands are assessed to determine if they should be included as HCP permit lands (managed subject to the commitments in the HCP). If they qualify, DNR determines whether they should be designated as northern spotted owl NRF or dispersal management areas. DNR also assesses their potential role in other HCP conservation strategies.

Some state trust lands have important social or ecological values. These state trust lands are best managed for protection of these special values and uses, rather than for income production. These lands may be candidates for the [Trust Land Transfer \(TLT\)](#) tool, which applies only to Common School trust lands, or the State Forest Trust Land Replacement Program (SFT), which applies only to State Forest trust lands. Through the TLT program, DNR transfers state trust lands to the Washington Department of Fish and Wildlife, the Washington State Parks and Recreation Commission, county governments, city governments, or DNR's Natural Areas Program. The value of the timber (which is not cut) is given to the Common School Construction Account, which helps fund K–12 schools statewide. The value of the land is used to purchase replacement property for the trust. State trust lands transferred to the Natural Areas Program contribute to the objectives of the HCP. State trust lands transferred to entities outside of DNR are evaluated for their HCP conservation value. If their conservation value is high, the department either does not transfer them, or DNR issues a deed restriction stipulating their continued management under the HCP. Through the SFT program, DNR transfers State Forest trust lands in low-population, timber-dependent counties to NRCAs managed by the Natural Areas Program. To be eligible for the SFT program, the property must be encumbered by harvest restrictions due to species listed under the Endangered Species Act. The value of the timber (which is not cut) from each transferred property goes to the county where the land is located, and the land value is held in a replacement account which is used to buy forestlands for the State Forest trust.

[Back to the HCP Annual Report](#)

A5.4 Natural Areas Program

DNR's [Natural Areas Program](#) protects outstanding examples of the state's extraordinary biodiversity. Lands managed under this program represent the finest natural, undisturbed ecosystems in state ownership and often have features unique to this region. The high-quality condition of these sites, and the broad diversity of ecosystems they represent, make them foundational to maintaining the resilience of Washington's natural heritage in the face of climate change.

The Washington State Legislature established the system of Natural Area Preserves (NAPs) in 1972 to protect the highest quality examples of native ecosystems, rare plant and animal species, and other natural features of state, regional, or national significance. The Washington State Legislature established the system of Natural Resource Conservation Areas (NRCAs) in 1987 to protect areas that are a high priority for conservation because they contain critical wildlife habitat, prime natural features, or examples of native ecological communities. Together, these natural areas include Puget prairies, estuaries, native forests, bogs, ponderosa pine forests, shrub-steppe communities, alpine lakes and meadows, scenic vistas, and significant geological features. These areas provide opportunities for research, education and, where appropriate, low-impact public use. In addition, these areas help meet statewide conservation priorities and DNR's HCP obligations.

A5.4.1 Habitat for Listed, Candidate, and Sensitive Species

Statewide, Washington's natural areas protect over 166,000 acres in 57 NAPs and 39 NRCAs. Over 128,000 of those acres fall within the area managed under the HCP, protecting habitat for 15 species listed as threatened or endangered under the ESA and another 36 special status species. This total includes 83,423.2 acres that DNR has added to the program since the HCP was signed in 1997. An additional 18,100 acres have been added to the program since 1997 in areas not managed under the HCP. Outside of HCP-managed areas, the Canada lynx (*Lynx canadensis*) is found in the Loomis NRCA, the Loomis NRCA and Chopaka Mountain NAP support substantial populations of whitebark pine (*Pinus albicaulis*) (a candidate species for federal listing), and several natural areas provide suitable habitat for grizzly bears (*Ursus arctos horribilis*).

Federally listed species living on natural areas include the largest and healthiest population of golden paintbrush (*Castilleja levisecta*), the largest and most viable population of Wenatchee Mountains checker-mallow (*Sidalcea oregana* var. *calva*), the second-largest population and Washington's highest-quality native habitat for the Oregon spotted frog (*Rana pretiosa*), one occurrence of the Tenino subspecies of the Mazama pocket gopher (*Thomomys mazama*), more than 15 established territories for the northern spotted owl (*Strix occidentalis caurina*), and waters that contain listed runs of Lower Columbia and Puget Sound chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch*), steelhead trout (*Oncorhynchus mykiss*), and bull trout (*Salvelinus confluentus*). Ten of DNR's natural areas contain occupied marbled murrelet (*Brachyramphus marmoratus*) sites. At South Nemah NRCA, more than 30 marbled murrelet occupancies have been recorded, including a confirmed murrelet nest site.

Natural areas also provide habitat for other sensitive species (federal species of concern, state-listed, state candidate) identified in the HCP. Examples include: insects like the Makah copper butterfly (*Lycaena mariposa charlottensis*), Beller's ground beetle (*Agonum belleri*), and Hatch's click beetle (*Eanus hatchi*) that are found only in bog habitats; amphibians like the Larch Mountain salamander (*Plethodon larselli*) that depend on forested talus slopes; birds like the harlequin duck (*Histrionicus histrionicus*) that are associated with mountain streams and rivers; bats that depend on maternal colonies like the colony found at Woodard Bay NRCA; and mammals like the California bighorn sheep (*Ovis canadensis sierrae*) in Loomis NRCA that depend on high-elevation rocky outcrops and alpine communities.

A5.4.2 Native Forests

A number of DNR's natural areas were established because of their high-quality native forest ecosystems. These areas are dominated by mature and/or late-seral forests. Late-seral forests and trees with potential nesting platforms are important to both the northern spotted owl and the marbled murrelet. The native forests on these natural areas also represent some of the highest quality examples of globally imperiled forest ecosystems.



Golden paintbrush at Rocky Prairie NAP.

DNR's natural areas provide habitat for federally listed species such as the golden paintbrush (*Castilleja levisecta*). Photo courtesy of David Wilderman.

A5.4.3 Estuaries

In the Natural Areas Program, there are five high-quality estuaries, including three on Washington’s coast and two on the shores of the Puget Sound. These sites protect rare tidal wetland communities and provide important foraging and cover habitat for anadromous fish during the critical transition from a freshwater to a marine environment. In addition, estuaries help dissipate potentially damaging wave energy before it reaches the land and provide a sink for sediments and wastes derived from both land and sea. Estuaries are some of the most biologically productive systems in the world.

A5.4.4 Rare Species

NAPs and NRCAs protect a broad representation of ecological communities and contribute to the conservation of many species, which is important since DNR’s inventory of the state’s biodiversity is incomplete. For example, Mima Mounds NAP was originally established to protect unusual geologic formations and high-quality prairie habitat. Thirty-five years later, DNR learned that it also has the only known population of the ground-dwelling lichen *Cladonia ciliata* in the United States. Similarly, North Bay and Carlisle Bog NAPs were established to protect high-quality wetlands. DNR later discovered that they both contain populations of the rare June’s copper butterfly (*Lycaena mariposa junia*), formerly known as the Makah copper butterfly (*Lycaena mariposa charlottensis*).



Oregon spotted frog

DNR’s natural areas provide habitat for Oregon spotted frogs (*Rana pretiosa*) and other amphibians. Photo courtesy of W.P. Leonard.

A5.4.5 Restoration and Research

DNR is actively working to restore and enhance habitat for special-status species at a number of NAPs and NRCAs. At Mima Mounds and Rocky Prairie NAPs, for example, DNR is using prescribed fire, invasive species control, and seeding of native grassland plants to restore native prairie habitats that have been heavily fragmented and degraded over most of their range. The Natural Areas Program is restoring and enhancing oak woodland habitat at several sites (Washougal Oaks NAP/NRCA, Bald Hill NAP, Lacamas Prairie NAP, and Oak Patch NAP) by removing competing conifer trees, planting oak seedlings, and replanting native understory species. In addition, DNR is restoring Puget Sound estuary and nearshore habitats at Stavis, Cypress Island, and Woodard Bay NRCAs by removing bulkheads, fill, and creosote-treated structures.

[Back to the HCP Annual Report](#)

A5.5 Special Forest Products

Special forest products are Christmas greens, medicinal plants, western greens (typically used by florists), mushrooms, or other items that can be harvested from forested state trust lands but do not fall into traditional timber or fiber categories. DNR allows commercial and/or recreational harvest of special forest products when doing so will benefit the trusts and will have an insignificant, or *de minimis*, impact on the environment. Permits, leases, and direct sales are selectively granted to prevent habitat degradation.

[Back to the HCP Annual Report](#)

A5.6 Oil and Gas Leases

Oil and gas leases allow a lessee to reserve the right to explore for underground deposits. They also give the lessee the sole and exclusive right to drill, extract, or remove oil and gas. Any proposed on-the-ground activities must undergo State Environmental Policy Act (SEPA) review, and the lessee must have a DNR-approved plan of operations and the proper drill permit. Regulations exist to protect water and air quality, and any exploration holes must be plugged following use. There has been only one active oil and gas lease involving drilling on lands that are now managed under the HCP (in 1996), and the well has since been abandoned and plugged; there have not been any since.

A5.7 Mineral Prospecting Leases and Mining Contracts

Like oil and gas leases, mineral prospecting leases are exploration agreements that allow a lessee to search for mineral deposits. They are allowed for a period of up to seven years and may encompass up to 640 acres. A mineral prospecting lease must be converted to a mining contract before the lessee can begin active mining operations. Before any surface-disturbing work is conducted, the lessee must submit a plan of operations for review and approval and may be subject to SEPA review, depending on the type of exploration activity proposed. In 1996, when the HCP was written, there were no active mining operations (activities that actually extract minerals) on lands managed under the HCP; there have not been any since.

A5.8 Grazing Permits and Leases

Most DNR-managed grazing takes place on non-forested state trust lands east of the Cascade crest on lands that are not managed under the HCP. Grazing is selectively allowed on forested state trust lands managed under the HCP in both eastern and western Washington, though the number of acres permitted in western Washington is minimal.

In eastern Washington, state trust lands are grazed under permits and leases. Permits cover large acreages, and each permit includes a resource management plan with ecosystem standards that the permit holder must meet, such as turnout and removal dates, riparian protections, and the number of animals allowed on the range. Leases cover smaller areas than permits, and they also include resource management plans. These leases can allow grazing at any time during the year, as long as lessees follow the management plans.

A5.9 Communication Site Leases

Communication site leases allow private and public entities to build new towers or attach communication equipment to existing towers (for example, cellphone towers). These sites typically are located on non-forested mountaintops or along second-growth highway corridors and are less than an acre in size. They are accessed by the same road systems used for forest management activities and are subject to the same management practices.

A5.10 Special-Use Leases

Special-use leases are issued for a wide variety of commercial and other uses on state trust lands. Some examples include golf courses, small commercial businesses and buildings, commercial recreation facilities, colleges, takeoff or landing sites for paragliding, governmental or public use facilities, honeybee hive sites, and stockpile sites. Special use leases do not cover major urban commercial uses or aquatic land uses. Often, but not always, these leases are for “interim uses,” and,

as such, they contain language that allows for termination should DNR choose to take advantage of a “higher and better use” of the land.

[Back to the HCP Annual Report](#)

A5.11 Valuable Materials Sales

DNR sells rock, sand, and gravel (valuable materials) through public auctions and direct sales. Contracts awarded through the public auction process are subject to review and approval by the Board of Natural Resources. Occasionally, DNR will conduct a direct sale, a one-time agreement for the removal of a small amount of a resource (a maximum of \$25,000 in value) that does not require Board of Natural Resources approval.

Early in the implementation of the HCP, DNR had a substantial number of rock, sand, and gravel sales. Since then, that number has decreased, primarily due to the lengthy contract-development process and limited staff capacity.

DNR maintains many small rock pits on state land that are primarily used to construct forest roads during timber sales. Companies that purchase DNR timber sales may be permitted to use existing rock pits or develop new ones according to the specifications in the contract.

[Back to the HCP Annual Report](#)

Appendix B: Glossary

This appendix contains a glossary of terms used in this annual report.

A

Abandoned road: A road that is stabilized and removed from use to Washington forest practices standards, including removing water crossings, providing erosion control, and making the road impassible to vehicles.

Adaptive management: A process of periodically reviewing and adjusting management practices based on feedback from internal and external research and monitoring.

Aerial herbicide: Application of herbicides from a helicopter or plane to achieve site preparation or vegetation management objectives.

Age class: A grouping of trees in the same age group used to simplify data that describes age composition for a stand or landscape. Age classes are often divided into decadal groups to portray the distribution of tree ages within a stand, or stand origin dates on a landscape.

B

Blowdown (windthrow): A tree that has been knocked over or had its top blown out by wind.

C

Cadastre: An official register of the ownership, extent, and value of real property in a given area, i.e. property lines.

Commercial thinning: Commercial thinning generates revenue and is performed to meet a wide range of objectives including improving stand growth or health, reducing tree mortality, or accelerating the development of habitat. Regeneration is not an objective of thinning.

Curtis relative density: See relative density.

D

dbh: Diameter at breast height, which is the diameter of a tree measured 4.5 feet above the ground on the uphill side of the tree.

***de minimis*:** A legal term for a level of activity that is too small or insignificant to merit consideration.

Decommissioned road: A road made impassible to vehicles.

Desired future condition: A set of parameters that can be compared to current conditions, showing any management changes needed to achieve specific goals. In the Administrative Amendment to the Northern Spotted Owl Conservation Strategy for the Klickitat Habitat Conservation Plan Planning Unit, DFC habitat represents a sustainable set of stand characteristics (canopy closure level, maximum tree height, etc.) that could realistically be achieved in a 60-year-old stand that has been properly managed.

Direct sale: A one-time agreement that removes only small amounts (a maximum of \$25,000 in value) of a resource such as gravel or trees from state trust lands and is not subject to public auction or advertisement.

Dispersal habitat: Habitat used by northern spotted owls when moving from one area of nesting, roosting, and foraging habitat to another, often to establish new breeding sites.

Dispersal: The movement of an animal from one subpopulation to another or movement from one area to another, often to establish a new nesting area.

E

Easement: Permission given by one person or business to another, allowing one to access their property by crossing through property owned by the other.

Effectiveness monitoring: For the State Trust Lands Habitat Conservation Plan, a system used to determine whether a management plan and its specific strategies are producing the desired habitat conditions.

Even-aged management: A set of final harvest systems defined as a method to “regenerate a stand with a single age-class” (Society of American Foresters). For purposes of managing forested state trust lands, even-aged includes final harvest systems of seed tree, variable retention harvest, and shelterwood.

F

Fertilization: Ground or aerial-based fertilization of forest stands using chemical fertilizers or biosolids to enhance growth.

Final harvest: The harvest that signifies the end of a rotation by harvesting trees within a forest management unit in order to make room for regeneration of a new stand.

Forest land planning: A DNR process — focused at the scale of State Trust Lands Habitat Conservation Plan planning units — to integrate sociocultural, economic, and ecological issues into management strategies for forested state trust lands.

Forest management unit: A forested area with conditions that are ecologically similar enough to allow it to be managed to obtain specific objectives; the unit for which a silvicultural prescription is written.

Forest Practices: The administrative branch of DNR responsible for regulating forest management activities on all state and private forestlands.

G

Grazing lease: A DNR lease agreement covering smaller areas of land (as compared to the larger rangeland of a grazing permit) that includes a resource management plan to protect natural resources. It allows grazing at any time of year as long as the plan’s guidelines are followed.

Grazing permit: A DNR agreement covering large areas that includes a resource management plan containing specific details regarding the number of animals allowed and when the animals may be on the land.

Ground herbicide: Ground-based applications of herbicides used to achieve site preparation or vegetation management objectives. Using ground herbicides allows for application in smaller work areas, thus avoiding spraying areas where herbicides are not desired (i.e., streams, wetlands, and adjacent properties).

Ground mechanical: In forestry, using mechanized equipment to achieve site preparation objectives.

H

Habitat conservation plan: A long-term management plan authorized under the Endangered Species Act to conserve threatened and endangered species across a large landscape while allowing activities to occur under specific conditions.

Hand planting: In forestry, planting seedlings of various species or species mixes.

Hand cutting: In forestry, using handheld equipment to cut stems of existing vegetation to achieve site preparation or vegetation management objectives, such as removing invasive species.

Habitat Conservation Plan permit lands: Lands that are managed subject to the commitments in the State Trust Lands Habitat Conservation Plan.

Headwater stream: A small, first- or second-order stream that forms the beginning of a river. It is often seasonal and forms where saturated ground flow first emerges as a recognizable watercourse.

I

Implementation monitoring: For the State Trust Lands Habitat Conservation Plan, a form of monitoring that determines whether or not a management plan or its components are implemented as written.

Inholding: A parcel of land owned by one party that is entirely surrounded by another ownership.

L

Large, structurally unique tree: A tree that is tall and/or has a large diameter and contains structural elements which are important for habitat such as a hollow trunk, broken top, open crown, or large, strong limbs.

Leave tree: A live tree left on a timber sale after harvest, intended to provide habitat and structure in the developing stand.

LiDAR: Short for “light detection and ranging,” a remote sensing technology that uses lasers to detect distant objects and determine their position, velocity, or other characteristics by analyzing reflections. It has a wide variety of uses, including measuring tree canopy heights, making topographical maps, and mapping floodplains.

M

Multiple-pass removal: A field sampling method used to estimate fish populations in a stream that involves placing nets across a stream at the beginning and end of a reach (typically around 100 meters) to confine fish to that area. A backpack electrofisher is then used to temporarily disable fish, which are then captured, measured, and released. Each reach is sampled multiple times within a day until the desired precision in the population estimate is achieved.

N

Natural Area Preserve: A state-designated area that protects a high-quality, ecologically important natural feature or rare plant and animal species and their habitat. It often contains a unique feature or one that is typical of Washington state or the Pacific Northwest.

Natural regeneration: Allowing naturally produced seedlings to grow after harvest and produce a new forest without human intervention. DNR assesses success by carrying out a thorough regeneration survey of the stand.

Natural Resources Conservation Area: A state-designated area managed to protect an outstanding example of a native ecosystem or natural feature; habitat for endangered, threatened, or sensitive species; or a scenic landscape.

NaturE: The database that keeps track of all contracts and financial data on DNR managed lands.

Nesting, roosting, and foraging habitat: A forested area with the right forest structure, a large enough size, and adequate food to meet the needs of a nesting pair of northern spotted owls.

Next-best stands: Within spotted owl management units that are below the habitat threshold, next-best stands are considered non-habitat, but are predicted to attain the structural characteristics that define northern spotted owl habitat either through passive or active management relatively sooner than other non-habitat stands. Next best stands count towards the target amount of suitable habitat, but are still considered non-habitat. Remaining stands not identified as habitat or next best are available for the full range of silvicultural activities.

No-role lands: A term used by DNR's Land Transactions Program to refer to lands not designated as a nesting, roosting, and foraging, dispersal, or desired future condition management area and thus having no role in northern spotted owl management under the State Trust Lands Habitat Conservation Plan.

O

Oil and gas lease: An agreement that allows the leaseholder to reserve the right to explore for underground oil and/or gas deposits on state trust land. Before active drilling or thumping can occur, the proposal must undergo State Environmental Policy Act review and have a plan of operations approved by DNR.

P

Planning unit: In the State Trust Lands Habitat Conservation Plan, a management unit based on large watersheds. The approximately 1.9 million acres managed under the Habitat Conservation Plan are divided into nine planning units to allow for more efficient planning and management.

Pre-commercial thinning: Removal of less desirable trees to maintain the growth and stability of retained trees. Pre-commercial thinning does not generate revenue and is performed before the trees are large enough to be marketable. Cut trees are left on site to decompose.

Prospecting and mining lease: An exploration agreement that allows the holder to search for mineral deposits on state lands; if the leaseholder wants to begin active mining operations (extraction and removal of valuable materials) that could alter habitat, they must convert the lease to a contract which includes a plan of operations and undergoes State Environmental Policy Act review.

Q

Quadratic mean diameter: The measure of average tree diameter, conventionally used in forestry. The quadratic mean diameter is the diameter of a tree with average stand basal area.

R

Rain-on-snow zone: Generally, an elevation band in which it is common for snow pack to be partially or completely melted during rainstorms several times during the winter.

Reclassified habitat: Two classes of marbled murrelet habitat, identified based on a predictive model:

1. **Marginal habitat:** Those lands expected to contain a maximum of 5 percent of the occupied sites on state trust lands within each State Trust Lands HCP planning unit. These areas were made available for harvest. All known occupied sites were deferred from harvest, and were not included in this habitat designation.
2. **Higher-quality habitat:** In contrast to marginal habitat, those lands expected to contain at least 95 percent of the occupied sites on state trust lands within each HCP planning unit. This habitat is frequently referred to simply as “reclassified habitat.”

Recreation plan: A plan for a forest block or landscape outlining what types of recreation are appropriate in what portions of that block or landscape, as well as what facilities are needed. It includes broad management guidelines and a plan to implement them.

Regeneration: The act of renewing or reestablishing tree cover in a forest through natural seeding or hand planting, typically on sites that were harvested or burned in a wildfire.

Relative density: A mathematically derived parameter that indicates the level of intra-stand competition between trees, and consequently, a theoretical optimal range for thinning. Relative density guidelines for thinning vary by species and sometimes other factors, such as climatic zones. A commonly used version of relative density is formally known as Curtis’ RD after Bob Curtis, a U.S. Forest Service biometrician who developed the measure.

Riparian desired future condition: In the Riparian Forest Restoration Strategy, the riparian desired future condition refers to six measureable target stand conditions that are intended to eventually develop into the Fully Functional stand development stage.

Riparian management zone: A buffer of trees and shrubs applied along a stream to protect the stream and habitat for salmon and other species.

Road abandonment: The permanent closure of forest roads in compliance with DNR guidelines and state forest practices standards. Abandonment work includes placing road barriers to prevent vehicle traffic, removing all culverts and bridges, and vegetating exposed soils to prevent erosion and sediment delivery to surface waters. In some circumstances, the road prism is rehabilitated to resemble the conditions that existed prior to road building. Abandoned roads are exempt from further maintenance.

Road construction: The building of new roads in compliance with DNR policy and state forest practices standards.

Road maintenance and abandonment plan: A plan that covers all forest roads on a landowner's property constructed or used for forest practices after 1974. It is based on a complete inventory that also shows streams and wetlands adjacent to or crossed by roads. The plan lays out a strategy for maintaining existing roads to meet state standards and shows areas of planned or potential road abandonment.

Road reconstruction: A process of bringing existing roads back to drivable conditions in compliance with DNR policy and state forest practices standards.

Rotation: The length of time between when a stand of trees is planted or naturally regenerates and when a final harvest occurs.

S

Salvage cut: A type of timber harvest used to log trees that are dead, dying, or deteriorating due to fire, insect damage, wind, disease, or injuries.

Seed tree intermediate cut: The first timber harvest in a series conducted as part of the even-aged seed tree silvicultural harvest system. The purpose is to provide a desirable seed source to establish seedlings. Typically, about 10 trees per acre may be left following this harvest; once the new trees are established, some of these seed trees may be harvested.

Selective product logging: A timber harvest that removes only specific species from certain size classes which are highly valuable, for example trees that function well as poles or logs for cabins.

Seral: Relating to the stages of an ecological sere.

Sere: The sequential stages in forest succession; the gradual replacement of one community of plants by another.

Shelterwood intermediate cut: The first harvest in a series of harvests conducted as part of the even-age shelterwood harvest system. The purpose of this harvest is to provide shelter (typically shade) and possibly a seed source for the seedlings that are regenerating in the stand. Compared to a seed tree intermediate cut, a shelterwood typically retains more trees per acre following harvest; retained trees are generally dispersed across the stand.

Shelterwood removal cut: The second or final harvest in a series of harvests conducted as part of the even-aged shelterwood harvest system. The purpose is to remove overstory trees that create shade levels that are too high to allow the new understory to thrive.

Silviculture: The art and science of managing or cultivating trees and forests to achieve particular goals and objectives.

Site preparation: Activities performed to increase the probability of successful regeneration in a harvested unit by reducing slash and/or undesirable plants that would compete with seedlings for nutrients, water, and light. Site preparation may be performed concurrently with logging (by, for example, pulling up and disposing of brush clumps or it may be performed through piling and burning logging slash; through broadcast- or under-burning logging slash; by manually cutting undesirable vegetation; by applying herbicide (aerial or ground) to undesirable tree and brush species prior to planting; or by other methods or combinations of methods.

Slash: The residue (for example, tree tops and branches) that is left on the ground after logging or following a storm, fire, girdling, or de-limbing.

Spatial NaturE: The update process to digitize (spatially) current NaturE contracts.

Special forest products: Items that can be harvested from forests but do not fall in traditional timber or fiber categories, such as Christmas trees and boughs, medicinal plants, and floral greens.

Special use lease: A DNR lease for state trust lands that is issued for one of a wide variety of commercial or other uses (for example, golf courses, paragliding landing sites, and public use facilities).

Stand: A group of trees that is similar enough in composition, structure, age, spatial arrangement, or condition to distinguish it from adjacent groups of trees.

Stand development stage: A developmental phase of a forest, defined using a classification system based on the structural conditions and developmental processes occurring within a forest stand.

State Environmental Policy Act: A state law that provides a process for reviewing proposals that require permits or other forms of agency approval. It requires government agencies to consider the potential environmental consequences of their actions and incorporate environmental values into their decision-making processes. It also involves the public and provides the agency decision-maker with supplemental authority to mitigate identified impacts.

State Forest Transfer (State Forest Trust Replacement): A program in which State Forest Trust (formerly known as Forest Board) lands in timber-dependent counties are transferred from trust status to natural resource conservation areas. The state Legislature provides funds to pay for the land and timber on certain properties considered not harvestable due to the presence of federally listed endangered species. The timber value is distributed to the counties as revenue, and the land value is placed in an account for purchasing replacement property for the State Forest Trust.

State trust lands: DNR-managed lands held as a fiduciary trust and managed to benefit specific trust beneficiaries (public K-12 schools and universities, capitol buildings, counties, and local services such as libraries).

Suitable northern spotted owl habitat: Each northern spotted owl management area is managed for certain habitat classes that include specific habitat types. Habitat types include high-quality nesting, Type A or B, movement roosting and foraging, sub-mature, young forest marginal, movement, dispersal, and old forest. Forest stands that meet the definition of habitat types within the specific management area are considered suitable habitat.

T

Take: As used in the Endangered Species Act, refers to harming, hunting, wounding, collecting, capturing, or killing an endangered or threatened species or disturbing habitat in a way that disrupts a species' normal behavior.

Thumping: The exploration for oil or gas deposits by measuring seismological tremors caused by dropping large weights or by detonating explosives.

Trust Land Transfer program: A program in which Common School state trust land is transferred from DNR to another public agency or conservation program. The state Legislature provides the value of the timber (which is not cut) to the Common School Construction account to build K-12 public schools. The value of the land is placed in an account used to purchase replacement property for the school trust. Land can be transferred to the State Parks and Recreation Commission,

Washington Department of Fish and Wildlife, a county or city government, or DNR's Natural Areas Program.

Trust: A legal term for a relationship in which one person, company, or entity (the trustee) holds title to a property and/or manages it for the benefit of another person, company, or entity (the beneficiary).

U

Uneven-aged management: Removal of trees from a multi-aged forest stand while maintaining multiple age classes within that stand. Uneven-aged management is often used on sites with poor soils on which more intensive management is not cost-effective. This type of management also may be used in fire-prone areas to mimic the effects of periodic, lower-intensity fires that do not remove all of the trees.

V

Validation monitoring: For the State Trust Lands Habitat Conservation Plan, a form of monitoring that determines whether or not certain species respond as expected to habitat conditions created by following a management plan and its strategies.

Variable density thinning: Thinning to create a mosaic of different stand densities, with canopy openings generally between 0.25 and 1 acre that capitalizes on landforms and stand features. DNR uses variable density thinning to encourage development of structural diversity in areas where spotted owl habitat is needed or to meet other objectives. Diversity is created by thinning to different residual tree densities, retaining large trees, and, in some cases, adding down woody debris and snags.

Variable retention harvest: An approach to harvesting based on the retention of structural elements or biological legacies (trees, snags, logs, etc.) from the harvested stand for integration into the new stand to achieve various ecological objectives. The following threshold targets apply under the State Trust Lands Habitat Conservation Plan:

- Retention of at least eight trees per acre. Of these:
 - At least two per acre are suitable for wildlife, and are from the largest size class,
 - At least three per acre are snag recruits, and
 - At least three per acre are snags, provided that safety requirements are met; if snags are not available, then three live trees will be retained.
- There are at least two down logs per acre of largest size class (at least 12" on small end by 20' long).

Vegetation management: Using hand-cutting, herbicide, mechanical, or other means to remove competing vegetation in a stand after planting but before seedlings become fully established.

W

Washington Administrative Code: Administrative regulations, or rules, adopted by state agencies to enact legislation and the [Revised Code of Washington \(RCW\)](#).

Windthrow (blowdown): A tree that has been knocked over or had its top blown out by wind.