



State Trust Lands Habitat Conservation Plan 2017 Annual Report

.....
For Fiscal Year 2017
.....

Published April 2018

▲ Clearwater River channel in the Clearwater Corridor Natural Resource Conservation Area (NRCA) on the Olympic Peninsula. In FY 2017, the Natural Areas Program protected an additional 3,500 acres across the state. Natural areas protect high-quality native ecosystems including critical habitat for salmon, northern spotted owl, and marbled murrelet.



WASHINGTON STATE DEPT OF
**NATURAL
RESOURCES**

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Prepared by
Washington State Department
of Natural Resources
Forest Resources Division



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Acronyms

dbh	Diameter at breast height
DEIS	Draft environmental impact statement
DFC	Desired future condition
DNR	Washington State Department of Natural Resources
ESA	Endangered Species Act
FRIS	Forest resource inventory system
FY	Fiscal year
GNN	Gradient Nearest Neighbor
HCP	State Trust Lands Habitat Conservation Plan
LPU	Landscape planning unit
LiDAR	Light detection and ranging
LRM	Land Resource Manager
MoRF	Movement, roosting, and foraging
MOU	Memorandum of understanding
NAIP	National Agriculture Imagery Program
NAP	Natural area preserve
NEPA	National Environmental Policy Act
NRCA	Natural resource conservation area
NRF	Nesting, roosting, and foraging
NOAA	National Oceanic and Atmospheric Administration
OESF	Olympic Experimental State Forest
P&T	DNR's forest management planning and tracking database
PhoDAR	Photogrammetric Detection and Ranging
QMD	Quadratic mean diameter
RCW	Revised Code of Washington
RD	Relative density
RDEIS	Revised draft environmental impact statement
REGIS	Road easement geographic information system
RFRS	Riparian Forest Restoration Strategy
RMAP	Road maintenance and abandonment plan
RS-FRIS	Remote-Sensing Forest Resource Inventory System
RVMP	Riparian Validation Monitoring Program
SEPA	(Washington) State Environmental Policy Act
SOMU	(Northern) Spotted owl management unit
UAS	Unmanned aircraft system
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
WAU	Watershed administrative unit
WCC	Washington Conservation Corps
WDFW	Washington Department of Fish and Wildlife

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 US 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, conservation strategy achievements and updates, and other related programs. Unless otherwise noted, information about DNR programs included in this report covers fiscal year (FY) 2017 (July 1, 2016, through June 30, 2017). However, in some cases, significant program activities or milestones that occurred in early FY 2018 are reported, particularly for DNR’s high-priority planning projects that involve collaboration with the Services, such as the Marbled Murrelet Long-Term Conservation Strategy.

Report Organization

In FY 2017, DNR’s Forest Resources Division continued producing comprehensive reviews of program activities for the HCP Annual Report. This year’s comprehensive review highlights DNR’s Recreation Program and is included in the body of the report prior to that program’s annual update.

In an effort to engage a broader audience, the Forest Resources Division developed an [ArcGIS story map](#) this year that contains highlights of the HCP Annual Report in an accessible, interactive format. DNR may develop story maps to accompany future HCP Annual Reports depending on staffing levels and feedback from readers.

Highlights

In FY 2017 and early FY 2018, DNR accomplished several objectives affecting lands managed under the HCP. Highlights include:

- **The Board of Natural Resources selected a preferred alternative for the Marbled Murrelet Long-Term Conservation Strategy.** As described in the [DNR factsheet](#) published in November 2017, preliminary data demonstrates the preferred alternative protects all occupied sites with buffers (approximately 88,000 acres), creates 20 special habitat areas (approximately 50,000 acres), delays harvest of some habitat over the five-decade planning period, and maintains approximately 583,000 acres of land already in conservation status.
- **An additional 3,595 acres was protected in natural area preserves (NAPs) and natural resource conservation areas (NRCAs) statewide.** Approximately 3,332 acres fall within the area covered by the HCP. These protection efforts added to 11 existing natural areas and established one new natural area, the Queets River NRCA in Jefferson County.
- **DNR organized the first annual OESF Science Conference.** The conference, held in Forks, Washington, allowed researchers to share and communicate results of research and monitoring activities taking place in the OESF and their relevance to land management uncertainties faced by DNR and other managers.

Progress toward Conservation Objectives

[Appendix: Background on Conservation Objectives](#)

Northern Spotted Owl Habitat

[Appendix: Habitat Type Definitions](#)

[Appendix: Background on Northern Spotted Owl Habitat Data](#)

DNR’s northern spotted owl (NSO) conservation strategy on the westside consists of two complementary habitat threshold targets:

1. In all westside HCP planning units except the OESF, restore and maintain at least 50 percent of designated nesting, roosting, and foraging (NRF) and dispersal management areas at the spotted owl management unit (SOMU) scale as habitat.
2. In the OESF, restore and maintain at least 40 percent of each landscape planning unit (LPU, also generically referred to as SOMU) as NSO habitat with at least 20 percent of each LPU as old forest habitat.

Below are updates to westside habitat percentages by HCP planning unit. The “Percent Habitat” data in the figures below show information as it existed on Dec. 13, 2017, when it was extracted from DNR’s SOMU spatial layer overlaid with the NSO habitat spatial layer.

Columbia and North Puget HCP Planning Units

Figure 1 shows percent habitat for each SOMU in the Columbia HCP Planning Unit. Within this unit, the Upper Washougal dispersal SOMU is above habitat threshold at approximately 55 percent. This is a decrease in percent habitat of approximately 1 percent compared to last year due to 210 acres harvested in suitable habitat through the Stebbins timber sale.

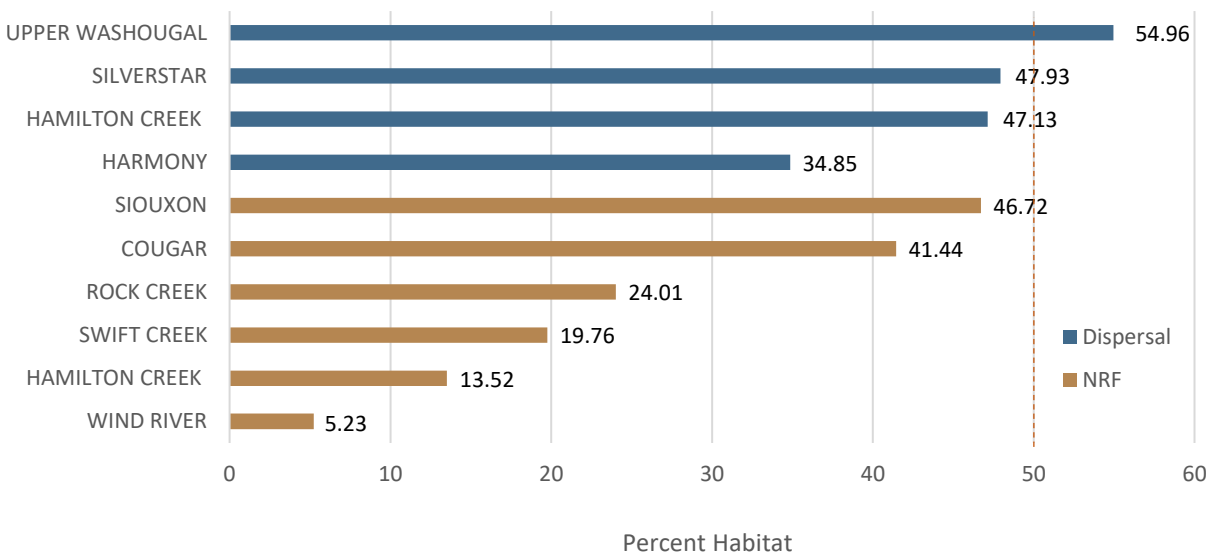


Figure 1: Habitat Percentages by SOMU in the Columbia HCP Planning Unit as of 12/13/2017. The dashed line represents the habitat target.

Figure 2 shows percent habitat for each SOMU in the North Puget HCP Planning Unit. There were no changes in habitat percentages compared to last year.

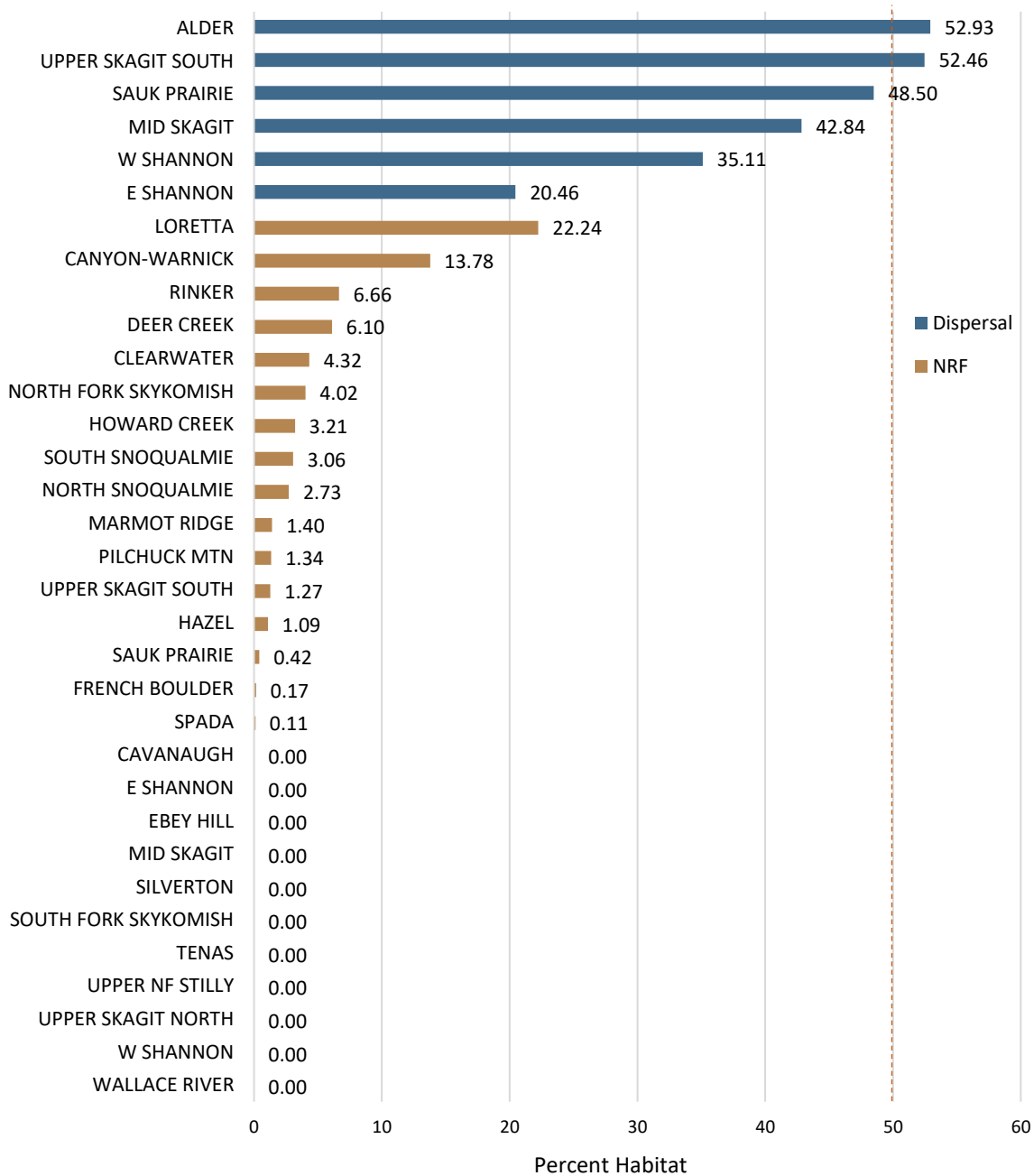


Figure 2: Habitat Percentages by SOMU in the North Puget HCP Planning Unit as of 12/13/2017. The dashed line represents the habitat target.

South Puget HCP Planning Unit

The 2010 *South Puget HCP Planning Unit Forest Land Plan Final EIS* identifies “a forest stand-level [NSO] habitat condition that contains forest stand structural components needed for movement (tree density, cover, and canopy layering), foraging (snags and coarse woody debris), and roosting

(canopy layering)” (p. 32). This movement, roosting, and foraging (MoRF) habitat is a subset habitat class within dispersal management areas in South Puget Planning Unit SOMUs. The South Puget Planning Unit has an overall habitat threshold target of 50 percent for each SOMU. Dispersal management areas have a MoRF threshold target of at least 35 percent with the remaining 15 percent classified as movement habitat. The two NRF management areas within the South Puget HCP Planning Unit share the same habitat targets as other westside NRF management areas.

Figure 3 shows the total NSO habitat percentages in the South Puget Planning Unit SOMUs. There were no changes in percent habitat compared to last year.

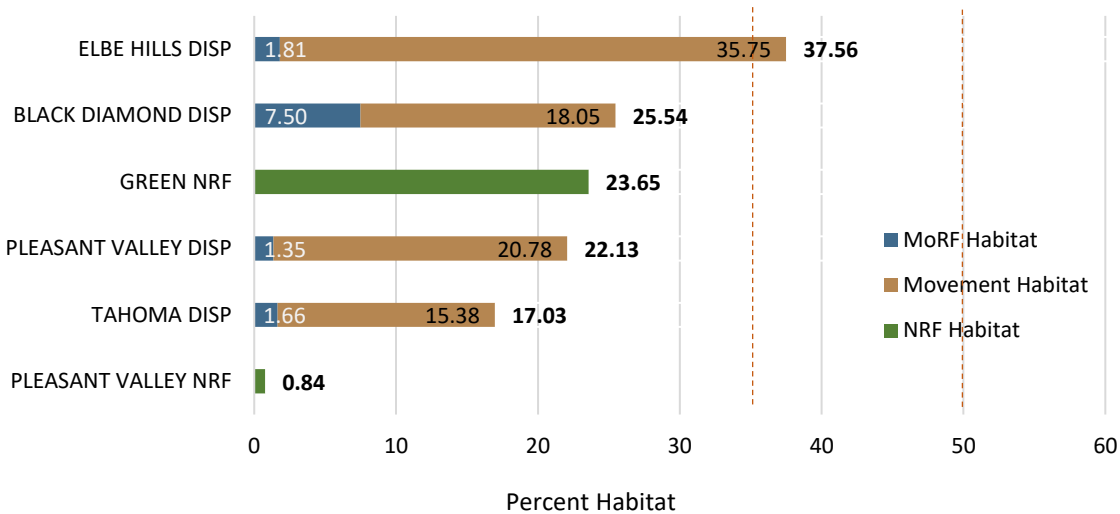


Figure 3: Habitat Percentages by SOMU in the South Puget Planning Unit as of 12/13/2017. Dashed lines represent habitat targets.

Olympic Experimental State Forest HCP Planning Unit

In the OESF HCP Planning Unit, habitat is tracked based on 11 LPUs. DNR does not designate NRF or dispersal areas in the OESF. In each of the 11 LPUs, DNR’s habitat goals are to restore and maintain a minimum of 40 percent NSO habitat, of which at least 20 percent is old forest habitat, and the remaining 20 percent is structural habitat or better. Figure 4 shows current total NSO habitat percentages in OESF Planning Unit LPUs.

In October 2016, DNR adopted the [OESF Forest Land Plan](#) that will guide management of over 270,000 acres of state forest land 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 2009–2109, 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. As a result, percent habitat in all LPUs changed compared to last year’s report. None of the LPUs currently meet both the old forest and structural habitat goals. Two LPUs (Upper Clearwater and Queets) meet the old forest goal and five LPUs (Reade Hill, Clallam River, Dickodochtedar, Upper Sol Duc, and Sekiu) meet the

structural habitat goal. Changes in percent habitat for each LPU are documented in the [Appendix](#).

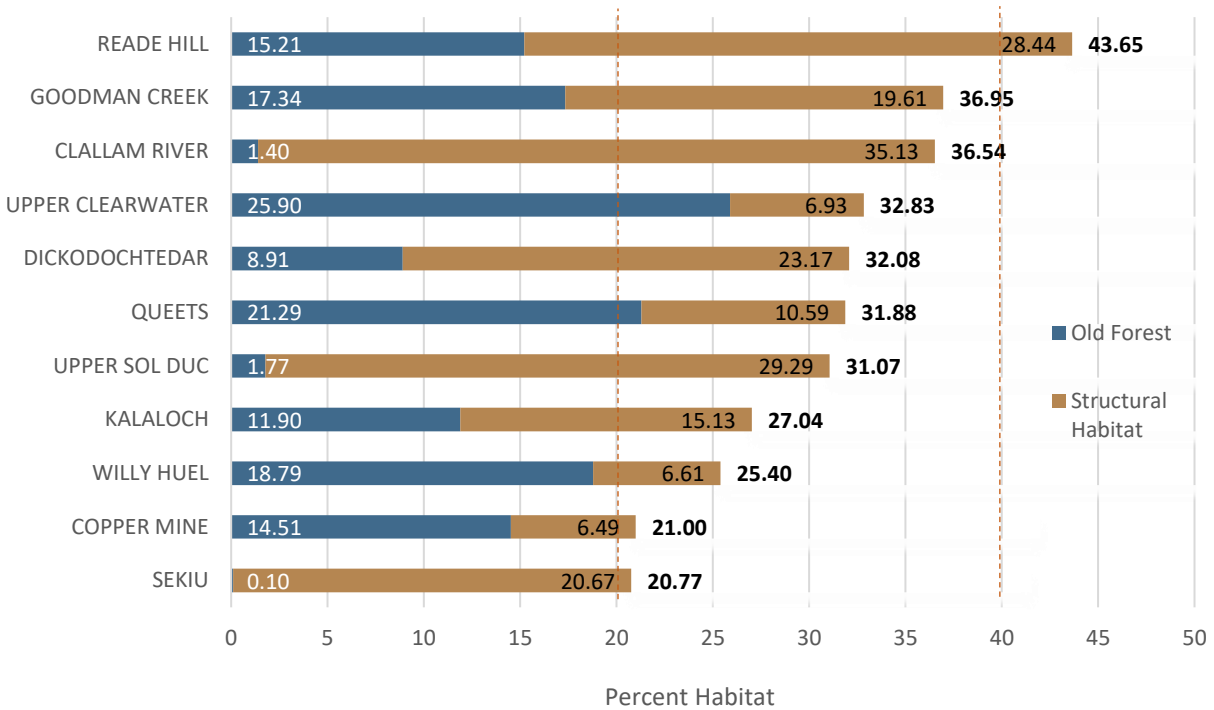


Figure 4: Habitat Percentages by LPU in the OESF HCP Planning Unit as of 12/13/2017. Dashed lines represent habitat targets.

Riparian Forest Habitat Restoration

[Appendix: Background on the Riparian Conservation Strategy](#)

Restoration thinning in riparian management zones (RMZs) is conducted under guidance of the 2006 [Riparian Forest Restoration Strategy \(RFRS\)](#) and is implemented in concert with the timber sales program. Riparian restoration thinnings are designed to provide growing space to encourage older forest stand structures, maintain overstory tree growth, provide large wood to streams, and enhance understory development. DNR tracks timber sales that implement RFRS thinnings to ensure that stand conditions are appropriate for thinning, and to better understand the role of active management in meeting the long-term goals of riparian forest complexity. Table 1 provides the percent of completed timber sales, by region, that have implemented the RFRS since FY 2012.

Table 1: Percent of Westside Timber Sales Implementing RFRS Thinnings, by Region.

	Percent of West-side Timber Sales Implementing RFRS Thinnings ¹					
	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
Northwest	22	33	22	5	25	29
Olympic	0	0	0	25	0	17
Pacific Cascade	11	16	26	27	15	41
South Puget Sound	14	20	24	17	14	26
All westside timber sales						
	13	21	23	19	17	30

¹ These data exclude the OESF HCP Planning Unit, where the RFRS does not apply.

On average, approximately 20 percent of timber sales conducted on the westside since 2012 have implemented some RFRS thinning prescriptions. DNR does not track the number of timber sales that were evaluated for RFRS treatments and rejected due to stand conditions, operational infeasibility, or prohibitive costs associated with additional road building or yarding systems.

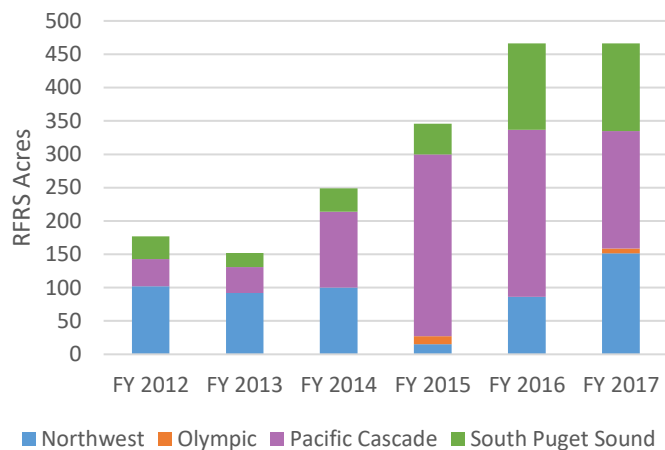


Figure 5: Estimated Acreage Thinned under the RFRS by Region. Data for Olympic Region excludes the OESF where the RFRS does not apply. Due to improved data analysis methods, the acreage reported for FY 2016 has been revised to 466, a decrease in 28 acres from the value reported last year.

Figure 5 shows the estimated acreage thinned, by DNR region, under the RFRS since FY 2012. Approximately 466 acres of riparian restoration thinning were conducted during FY 2017. Since 2012, over 1,800 acres of riparian area have been thinned to accelerate development of complex forest structure.

Wetland Management and the RFRS

Management of forested wetlands and adjacent wetland management zones (WMZs) under the HCP includes short-term measures to maintain minimal acceptable wetland and buffer function (retention of at least 120 ft² basal area per acre of the most wind-firm trees). In practice, wetlands themselves are rarely thinned because there is generally insufficient windfirm conifer basal area to meet the 120 ft² requirement. In addition, thinning may disrupt hydrologic processes, and it tends to increase the risk of windthrow for the remaining trees. In FY 2017, DNR continued to apply an increasingly common approach consistent with the RFRS in which RMZs and WMZs are thinned using the same prescription. Out of 82 sales completed in FY 2017 in the western Washington planning units excluding the OESF, 18 sales (22 percent) included WMZ thinnings.

Marbled Murrelet Conservation Strategy Development

[Appendix: Background on the Marbled Murrelet Conservation Strategy](#)

Long-Term Conservation Strategy

In December 2016, DNR and the USFWS released a [draft environmental impact statement \(DEIS\)](#) on a long-term strategy for marbled murrelet conservation for the six western Washington HCP planning units. Following the release of the DEIS, DNR held four public meetings in January 2017, and the 90-day public comment period concluded on March 9, 2017.

In April 2017, DNR published a [summary of public comments](#) from the four meetings and the comment period. To supplement the DEIS, DNR developed a [financial analysis](#) of the six alternatives described in the DEIS by each trust, county, and sustainable harvest unit. This analysis provided estimates of short- and long-term financial and timber harvest volume impacts for each alternative.

In August 2017, DNR held a Board of Natural Resources (Board) retreat in southwest Washington designed to provide participants with an opportunity to see marbled murrelet habitat in the field and discuss potential environmental and economic impacts of long-term conservation strategies (Figure 6). The retreat was open to the public and included a one-day field tour followed by a one-day work session. The tour was attended by four Board members, 16 members of the public, two county commissioners, and 29 staff from DNR and other agencies. A discussion between all six Board members during the work session culminated in the development of key long-term strategy principles including minimizing and offsetting impacts to murrelets, addressing uncertainty associated with the effectiveness of the long-term conservation strategy over time, and reducing disproportionate financial impacts to trust beneficiaries.



Figure 6: Participants in the Board of Natural Resources Retreat in August 2017. Photo courtesy of Brian Bailey.

The Board selected a preferred alternative in its November 2017 meeting based on those key principles. As described in the [DNR factsheet](#) published in November 2017, preliminary data demonstrates that the preferred alternative protects all occupied sites with buffers (approximately 88,000 acres), creates 20 special habitat areas (approximately 50,000 acres), delays harvest of some habitat over the five-decade planning period, and maintains approximately 583,000 acres of land already in conservation status. The preferred alternative will also contain conservation measures to manage the impacts of forest management activities including harvest, thinning, recreation, road building and maintenance, and other activities that could cause audio-visual disturbance to nesting murrelets.

DNR is working with the USFWS on a joint revised draft environmental impact statement (RDEIS) to describe and analyze the preferred alternative amongst a range of other alternatives. The RDEIS will analyze the potential impacts of the alternatives on elements of the natural and built environment most likely impacted by the proposed action.

The RDEIS will be used to satisfy requirements of both the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA). This RDEIS is also required for the submission of a marbled murrelet long-term conservation strategy HCP amendment to the USFWS. DNR is

working on a draft HCP amendment concurrently with the RDEIS and the anticipated release of both documents is mid-2018.

Public comment periods will follow the releases of the RDEIS and the draft HCP amendment. DNR will use the information received during the public comment process to refine the proposal, if necessary, and then begin work towards a Final Environmental Impact Statement and submission of a final HCP amendment to USFWS. USFWS will subsequently complete a biological opinion, determine sufficiency under the Endangered Species Act, and issue a record of decision under NEPA. The Board of Natural Resources will ultimately decide whether to adopt the long-term strategy.

Interim Conservation Strategy

Negotiations between DNR and the USFWS surrounding the long-term strategy for marbled murrelet conservation began on July 8, 2013. DNR will continue to implement the marbled murrelet interim conservation strategy throughout western Washington until a long-term conservation strategy is completed. DNR continues to discuss implementation of the interim strategy with USFWS.

In keeping with the marbled murrelet interim conservation strategy, stands on DNR-managed lands were classified by a habitat relationship model. These “reclassified habitat” stands were predicted to contain occupied sites, and the reclassified habitat that was predicted to contain 95 percent of the occupied sites had protocol surveys conducted to determine occupancy. Inventory surveys using the [2003 Pacific Seabird Group murrelet survey protocol](#) were completed for DNR state lands in Straits, South Coast, and Columbia HCP planning units and documented to USFWS on December 2, 2003.

Within the areas where surveys were completed, DNR identified 42,362 acres of unoccupied reclassified habitat in which some of the habitat could be harvested. Some surveyed, unoccupied habitat has been released from deferral status as directed in Step 4 of the marbled murrelet interim conservation strategy in the HCP (p. IV.40). As described in Step 4b of the interim conservation strategy, reclassified habitat within the South Coast and Columbia Planning Units in Southwest Washington was recently made available for some harvests because at least 12 months had passed since the initiation of negotiations with USFWS on the marbled murrelet long-term conservation strategy. Southwest Washington is defined as those portions of the Columbia and South Coast planning units west of Interstate 5 and that portion of the South Coast Planning Unit that is located south of Highway 8 and south of Highway 12 between Elma and Aberdeen.

Of the 13,418 acres currently available for harvest under the interim conservation strategy, 2,631 acres, or 20 percent of available acres, have been harvested. Table 2 shows the amount of released, reclassified marbled murrelet habitat in the Straits, South Coast, and Columbia planning units and acres harvested within each watershed administrative unit (WAU).

Table 2: Released Reclassified Marbled Murrelet Habitat.

WAU	Total Acres of Reclassified Habitat ¹	Acres of Released, Reclassified Habitat Available for Harvest	Acres Harvested as of 6/30/2017 ^{2,3}
Straits HCP Planning Unit			
Bell Creek	222	0	0
Big Quil	122	61	1
Chimakum	13	6	0

WAU	Total Acres of Reclassified Habitat ¹	Acres of Released, Reclassified Habitat Available for Harvest	Acres Harvested as of 6/30/2017 ^{2,3}
Cushman	15	8	0
Dabob	22	11	0
Discovery Bay	1,161	581	421
Dungeness Valley	1,410	265	39
Hamma Hamma	184	92	37
Lake Crescent	156	0	0
Lilliwaup	573	287	39
Little Quil	97	49	7
Ludlow	94	47	45
Lyre	636	19	0
Morse Creek	308	8	3
Port Angeles	1,441	154	118
Salt	2,418	745	238
Sequim Bay	1,959	450	253
Siebert McDonald	1,857	607	177
Skokomish, Lower NF	71	36	10
Sutherland-Aldwell	1,925	561	225
Twins	731	347	58
South Coast HCP Planning Unit, East of I-5			
Newaukum, Lower NF	5	3	0
Scatter Creek	167	84	22
Skookumchuck, Lower	91	45	5
South Coast HCP Planning Unit, North of Highways 8 and 12			
Cook-Elk	230	0	0
Copalis River	249	21	0
Hoquiam, EF	8	4	1
Hoquiam, WF-MF	57	0	0
Humptulips, Middle	110	55	66
Humptulips, WF	253	30	1
Joe-Moclips	635	158	33
Stevens Creek	107	54	49
Columbia and South Coast HCP Planning Units within Southwest Washington, West of I-5 and South of Highways 8 and 12⁴			
Abernathy	997	499	36
Bear River	185	0	0
Black River	553	276	1

WAU	Total Acres of Reclassified Habitat ¹	Acres of Released, Reclassified Habitat Available for Harvest	Acres Harvested as of 6/30/2017 ^{2,3}
Cedar Creek	2,565	1,282	167
Chinook	40	0	0
Cloquallum	2	1	0
Curtis	54	27	0
Delezene	4	0	0
Elk Creek	162	81	2
Elk River	40	20	0
Elochoman, Main	955	478	0
Garrard Creek	1,619	809	0
Grays Bay	845	43	0
Headwaters	688	344	0
Johns River	24	12	0
Lincoln Creek	337	169	0
Main Fork	300	0	0
Mill Creek	1,503	751	55
Mox Chehalis	578	289	8
Naselle Headwaters	1,243	194	0
Naselle, Lower	725	69	0
Nemah	1,449	0	0
Palix	670	161	0
Porter Creek	2,442	1,221	266
Rock-Jones	39	19	0
Skamokawa	2,974	319	0
Smith Creek	34	0	0
South Fork	566	28	0
Waddel Creek	885	443	3
Willapa Headwaters	1,731	865	165
Willapa, Lower	94	44	1
Willapa, SF	728	187	78
Wilson Creek	1	0	1
TOTAL	42,362	13,418	2,631

¹ The Skokomish (Straits); Wishkah, Lower (South Coast, North of Highways 8 and 12); Hanaford (South Coast, East of I-5); and Kennedy Creek (Southwest Washington) WAUs have no reclassified habitat, so they are not displayed in this table.

² Data originated in DNR's Planning and Tracking (P&T) system. Subsequent new data or corrections are not reflected here. The P&T data has been overlaid with the Marbled Murrelet Habitat GIS layer queried 12/14/2017 to identify timber sale activities (sold and completed, FYs 2004–2017) in released habitat. Values have been rounded to the nearest acre.

³ Harvested acreage includes blowdown salvage sales as well as traditional harvest treatments.

⁴ Corrections made to DNR's Marbled Murrelet Habitat GIS layer for Southwest Washington allowed DNR to more accurately report acreage of reclassified habitat, released reclassified habitat, and harvested acreage in this year's HCP Annual Report.

Adaptive Management

[Appendix: Background on Adaptive Management](#)

DNR's State Lands Adaptive Management Program continues to focus on better documenting and coordinating research on state lands. In FY 2017, DNR developed an Adaptive Management Research Database designed to provide a central location for current information on all agency research projects that support adaptive management on state lands. This searchable database is accessed through DNR's intranet and contains details on each research project including agency goals and policies addressed by the project, as well as budget, location, deliverables, and personnel. Summaries of projects related to HCP research and monitoring priorities are included in the [Research](#) section of this report.

In FY 2017, the program also formed an Adaptive Management Committee comprised of division and region leadership that will meet annually to hear presentations of significant research findings and discuss potential changes to guidance materials. In March 2017, the committee held its first meeting in which DNR scientists briefed the committee on current and proposed research projects, and the committee identified research priorities for the 2017–2019 biennium.

In the OESF, the adaptive management process was formalized with the adoption of the 2016 [OESF Forest Land Plan](#). The plan describes a step-by-step adaptive management process, and an administrative procedure for adaptive management in the OESF was adopted in FY 2017. In the summer of 2017, DNR presented the OESF framework for adaptive management at the international Symposium on Systems Analysis in Forest Resources. In addition to describing the process adopted by DNR, presenters compared it to adaptive management processes implemented by public and private land managers across the Pacific Northwest in the United States and Canada. More information can be found in the [Publications and Presentations](#) section.

Implementation Monitoring

[Appendix: Background on Implementation Monitoring](#)

Forest lands managed by DNR are subject to complex management strategies that help achieve a variety of habitat conservation objectives. The Implementation Monitoring Program enables the agency to determine whether the strategies were appropriately implemented, identify areas for continuous improvement, and respond to changing conditions and new information. Results from implementation monitoring are used by DNR managers and field staff to improve practices and reduce the frequency of inconsistencies on the ground.

The [2016 Implementation Monitoring Report](#) documented DNR's level of compliance with the uncommon habitats component of the multispecies conservation strategy in the HCP. All timber sale units that closed out between July 1, 2012, and Dec. 31, 2014, that contained balds, caves, cliffs, and/or talus fields were visited (a total of 74 uncommon habitat features in 33 timber sales). Monitoring staff determined that 96 percent of the features were protected in ways that met or exceeded the protection requirements described in the conservation strategy and procedural guidance. These results, along with those documented in previous monitoring reports, suggest that DNR staff are consistently implementing best forest management practices near these rare landscape features. Recommendations from the report include continued training of field staff on feature identification, addressing borderline features that may not meet the definitions specified in the HCP, and best practices for feature mapping and documentation.

In FY 2017, monitoring staff also initiated a pilot project to compare and test different methodologies to remotely monitor legacy tree spacing, which is guided by the large, structurally unique trees component of the multispecies conservation strategy. The remote methods include mapping locations of clumped and dispersed legacy trees using PhoDAR-derived 3D point clouds produced by an unmanned aircraft system (UAS) and National Agriculture Imagery Program (NAIP) imagery (Figure 7), NAIP derived 3D stereo imagery, and LIDAR derived 3D point clouds. Additionally, on-the-ground collection of legacy tree points and polygons is being conducted for comparison with the remote methodologies. In FY 2018, DNR plans to finish remaining fieldwork and begin data analysis.



Figure 7: A DNR Employee Operating an Unmanned Aircraft System with Mt. Saint Helens in the Background.
Photo courtesy of Justin Schmal.

Effectiveness Monitoring

[Appendix: Background on Effectiveness Monitoring](#)

As described in the HCP, DNR is required 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 spotted owl prey populations following timber harvest and other forest management activities. Over time, the results from DNR's effectiveness monitoring may be used to modify management practices to enable DNR to better manage land in accordance with the conservation objectives reflected in the HCP. This section includes annual updates on DNR's effectiveness monitoring programs for spotted owl habitat, riparian silviculture, and aquatic and riparian habitat in the OESF.

Northern Spotted Owl Effectiveness Monitoring Program

The NSO Effectiveness Monitoring Program evaluates changes in habitat, including general forest structure and specific habitat features that result from timber harvest and other management activities carried out under the HCP. In FY 2017, DNR made progress on the two primary components of the program:

1. Long-term tracking of the effects of variable density thinnings (VDTs) on improving habitat structure in stands designated as NSO habitat.

Data analysis and summarization from the 5- to 7-year re-measurement of all five permanent installations is ongoing. Identification of a second set of effectiveness monitoring sites has begun, starting in the North Puget Planning Unit. DNR will monitor the second set of sites under an active approach in which novel or future desired treatments are evaluated within an experimental design in support of adaptive management.

2. Landscape-scale monitoring of basic habitat indicators across the entire west-side 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 meet HCP goals. To accomplish this, DNR is using Gradient Nearest Neighbor (GNN) data, a regional data set produced by the US Forest Service (USFS) that covers all forestland in Pacific Coast states. GNN data map the distribution of vegetative characteristics across the landscape, and despite limitations at the single-pixel or small-stand scale, it is sufficiently accurate for assessments over broad spatial extents. GNN data is available for the period of 1984–2012, affording a look at both pre-HCP and post-HCP trends. Initial results indicate that changes in riparian conditions since HCP implementation can already be observed on state lands. For example, the amount of riparian area in the smallest tree diameter class assessed (less than 11 inches quadratic mean diameter, QMD) has declined between 1984 and 2012 across all westside planning units, while area in the 11–21 inch QMD class has increased. This project has been placed on temporary hold in anticipation of the release of additional GNN data that can provide a more updated assessment.

In addition to the monitoring activities described above, DNR is also conducting two research projects related to NSO effectiveness monitoring. More information about both projects can be found in the [Research](#) section of this report.

- **Mind the Gap:** This project measures the response of habitat features to small-gap creation within thinned stands.
- **Westside Individuals, Clumps, and Openings:** This project compares 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.

In FY 2017, DNR and collaborators from the USFS Pacific Northwest Research Station continued to conduct field work and data management for nine habitat indicators such as riparian vegetation (Figure 8). The project's research and technical team published a compendium of stream and riparian monitoring protocols which are available on [DNR's website](#) and through the Pacific Northwest Research Station [publications portal](#). One protocol describes field procedures for site establishment and nine protocols describe field sampling and data management procedures for stream temperature, channel morphology, stream shade, channel substrate, in-stream large wood, habitat units and channel classification, stream discharge, riparian microclimate, and riparian vegetation. Each protocol includes detailed sampling techniques, field forms, and quality assurance and control procedures, which are essential to ensuring the accuracy and repeatability of measurements for characterizing site conditions and temporal trends over the duration of this long-term project.



Figure 8: DNR Field Technicians Conduct Riparian Vegetation Sampling as Part of the Status and Trends Monitoring of Aquatic and Riparian Habitat in the OESF.
Photo courtesy of Teodora Minkova.

Habitat status results from this project were presented at the 2017 OESF annual science conference; the Cooperative Monitoring, Evaluation, and Research Committee meeting of DNR's Forest Practices Adaptive Management Program; and the University of Washington's [Olympic Natural Resources Center](#) (ONRC) Evening Talks. Project staff also developed an [ArcGIS story map](#) of the project available on DNR's website.

Data collected for Status and Trends monitoring was analyzed in FY 2017 to evaluate the effects of nearly 20 years of passive riparian forest restoration that has occurred under the HCP. Passive restoration is the process by which historic riparian habitat is gradually restored through natural succession and disturbance. Stream habitat across the OESF was compared to reference streams in unmanaged watersheds, and to historic stream conditions in watersheds harvested before the adoption of the HCP. Four common indicators were assessed: stream temperature, riparian forest canopy closure, in-stream wood, and salmonid densities. Results show that stream temperatures have decreased below reference levels, canopy closure has increased beyond the level in reference watersheds, and in-stream wood and age-1 or older salmonids appear to be either stable at reduced levels or declining. These findings suggest that passive restoration is unlikely to increase salmonid populations in the near future; long time-frames are needed for current second-growth riparian forests to develop conditions that allow more light into streams, thereby increasing primary productivity, while also allowing for the continuous recruitment of larger pieces of in-stream wood that create winter habitat for salmonids. A manuscript for this project was recently submitted for publication.

Riparian Silviculture Effectiveness Monitoring Program

The objective of DNR's 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 characteristic of those implemented under the 2006 Riparian Forest Restoration Strategy and are applied in RMZs in cooperation with DNR’s timber sales program.

The monitoring program uses an active monitoring approach in which habitat metrics are measured before and after treatment. The initial set of treatments consists 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.

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

Site/Timber Sale Name	Planning Unit	Treatments	Year Measured		
			Pre-treatment	Post-treatment	Last 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

In FY 2017, the Riparian Silviculture Effectiveness Monitoring Program collected re-measurement data to document understory and vegetation response at the Pink Flamingo and Sumas Pass monitoring sites. Previously, a monitoring site in the North Puget planning unit (North Mountain) had been included in the study. However, significant post-treatment disturbance in the form of blowdown and illegal firewood collection was recently discovered at the site, and as a result it was removed from the pool of monitoring sites. Sumas Pass, a site that had originally been included in the study but was subsequently removed due to blowdown, was re-added following field verification that site conditions were suitable for detecting changes in habitat metrics. The Riparian Silviculture Effectiveness Monitoring Program is currently analyzing re-measurement data and plans to publish measured changes.

Validation Monitoring

Appendix: Background on Validation Monitoring

Launched in FY 2015, the Riparian Validation Monitoring Program (RVMP) is designed 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, percent anadromy, 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 established, DNR may choose to adapt management practices.

The RVMP uses an observational study approach to monitor 50 type-3 watersheds within the OESF and four reference watersheds in the neighboring Olympic National Park. These 54 watersheds are the same watersheds used in DNR’s Status and Trends Monitoring of Riparian and Aquatic Habitat Program. As not all of the 54 watersheds can be sampled within a summer, 20 watersheds are sampled annually (annual panel), while an additional 10 to 15 watersheds per year are sampled on a two- or three-year rotation (rotating panel). In FY 2017, the RVMP finalized a [study plan](#) that describes how DNR will implement validation monitoring in the OESF. The first year of fieldwork was also completed which included three primary efforts:

1. Multiple-pass removal and pool-only juvenile salmonid abundance sampling was conducted in the annual panel of watersheds (Figure 9). A secondary objective of this fieldwork was to compare the efficacy of multiple-pass removal and pool-only sampling methodologies.
2. Exploratory snorkel surveys were conducted in the Clearwater River Watershed to identify sampling sites and methods for sampling larger streams in the OESF.
3. Adult coho redd surveys were conducted in the annual panel to measure the adult abundance in the watersheds.

Sampling results from 2016 indicated wide variations in salmonid species assemblage, densities, biomass, and coho redd abundance throughout the OESF watersheds (Figure 10). Results also indicated that multiple-pass removal was a more effective sampling method compared to pool-only sampling. Using the data collected in 2015 and 2016, several models were developed to estimate salmonid presence and absence in type-3 watersheds across the OESF that contain greater than 50 percent DNR ownership. The most accurate model resulted in an average of 84 percent success in predicting species presence or absence. More information about results can be found in the [RVMP 2016 annual report](#).

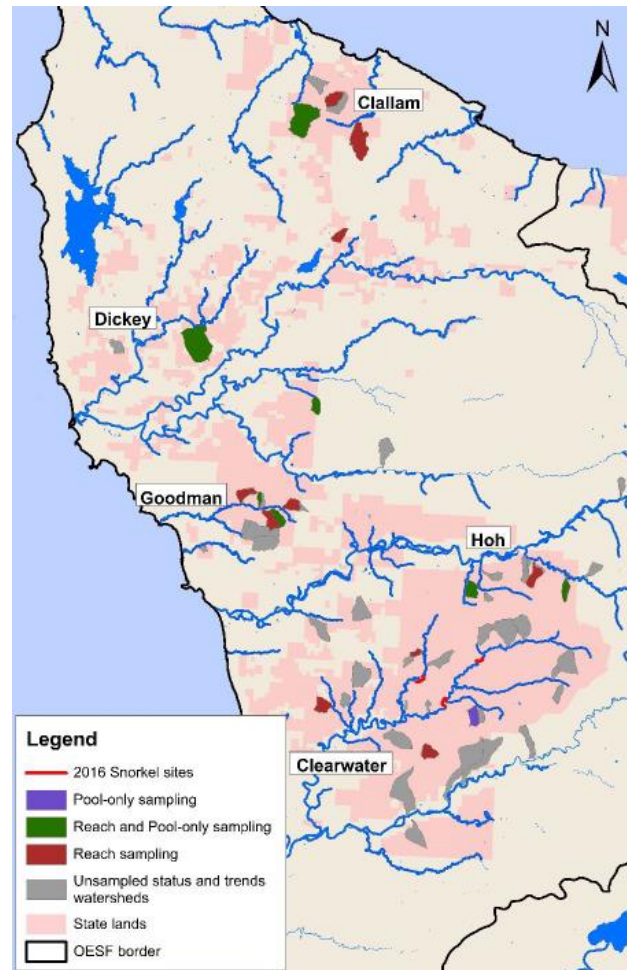


Figure 9: Sites Sampled on the OESF in 2016 as part of the Riparian Validation Monitoring Program. Map courtesy of Kyle Martens.

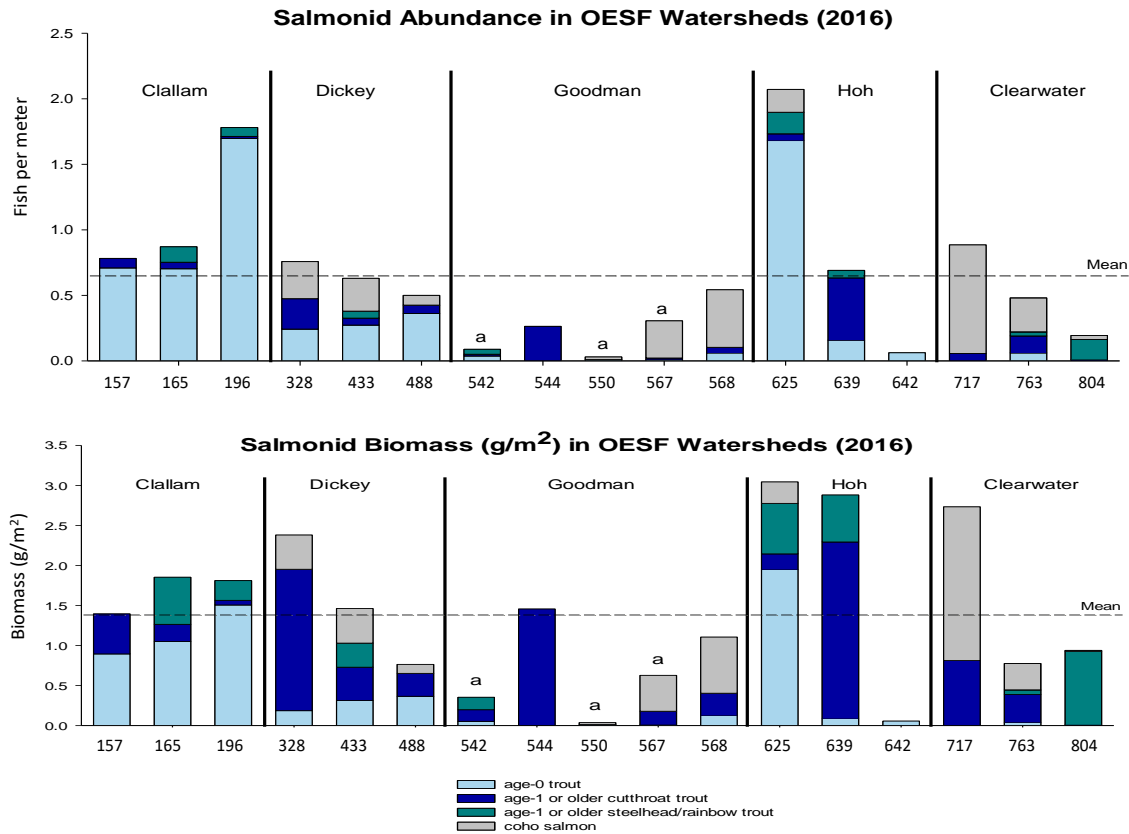


Figure 10: Salmonid Abundance and Biomass Estimates from 17 Watersheds Across Five Basins in the OESF Sampled in 2016. Chart courtesy of Kyle Martens.

Based on the findings from FY 2017, DNR plans to conduct the following activities in FY 2018:

- Sample the annual and rotating panels of watersheds using multiple-pass removal.
- Continue adult redd monitoring in the annual panel as sampled in 2016.
- Conduct a snorkeling effort that includes a channel unit/instream wood habitat survey to collect information on both small and large fish within the mainstem Clearwater River.
- Use the most accurate salmonid presence and absence model to estimate salmonid species assemblages for all type-3 watersheds across the OESF that contain greater than 50 percent DNR ownership.

Research

DNR continually conducts research on its forest lands to better understand how different forest management practices affect habitat conditions and forest productivity. This section describes DNR’s 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 4 summarizes DNR’s 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.

Table 4: DNR’s Research and Monitoring Projects on HCP-Covered Lands.

Project	Priority 1	Priority 2	Priority 3	Monitoring
Eastside NSO Habitat and Fire Risk Evaluation	x	x		
eDNA Research in OESF			x	x
Examining How Changing Climate and Wildfires Could Alter the Forests of Western Washington		x		
Experiment in Long-Term Ecosystem Productivity		x	x	
Historic Range of Variation in Forest Structure in the Washington Cascades	x			
Influence of Repeated Alternative Biodiversity Thinning on Young Stand Development Pathways		x		
Landscape-Scale Effectiveness Monitoring of Western Washington HCP Lands		x		x
Large-Scale Integrated Management Experiment on the OESF	x	x	x	x
Mind the Gap		x		
Northern Flying Squirrel Habitat Enhancement			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	
Westside Individuals, Clumps, and Openings		x	x	

Eastside NSO Habitat and Fire Risk Evaluation: This project will assess historic, current, and future NSO habitat on state 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 forest land planning efforts. DNR has begun analyzing the approximately 12,700 stand polygons that have been digitized and attributed from DNR’s original mapped inventory (circa 1960) to begin to estimate how much potential NSO habitat may have been present (Figure 11). For more information, contact Josh Halofsky: Joshua.Halofsky@dnr.wa.gov.

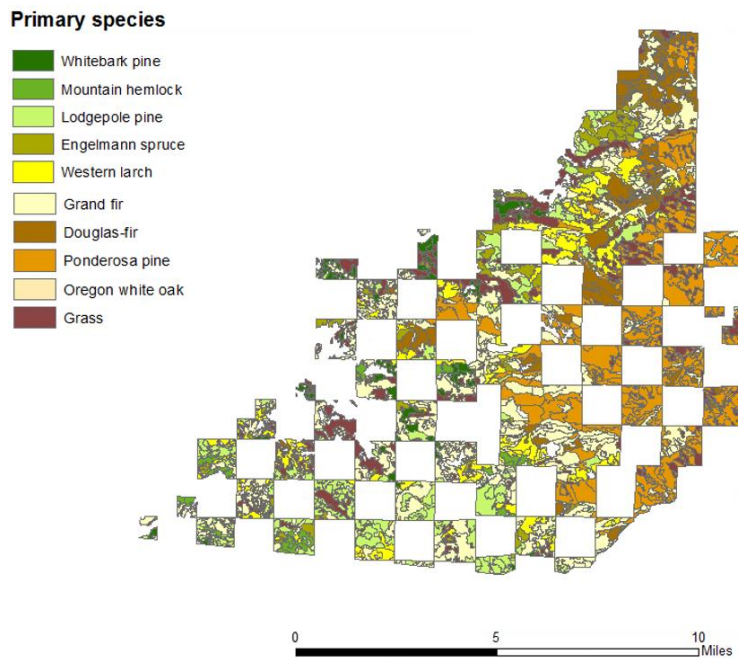


Figure 11: An Example of Historic Stand Polygons and Primary Species in the Ahtanum State Forest circa 1960. Map courtesy of Josh Halofsky and Dan Donato.

eDNA Research in OESF: Many aquatic species that occupy streams of the OESF are found in low densities and are often difficult to detect. In 2016 and 2017, DNR’s Riparian Validation Monitoring program partnered with the USFS Pacific Northwest Research Station to collect water samples for environmental DNA (eDNA) analysis. By filtering water in streams of the OESF, researchers can identify the DNA left behind by the aquatic species that recently occupied or currently occupy each stream (Figure 12). Data from eDNA analyses, along with DNR fish abundance data, may help to develop tools for understanding the presence, abundance, and genetic variability of multiple aquatic species including fish, amphibians, and macroinvertebrates. In addition, results from this work will help DNR better understand the aquatic communities that occupy streams of the OESF. Data from this project are currently being analyzed by the USFS. For more information, contact Kyle Martens: Kyle.Martens@dnr.wa.gov.



Figure 12: A Stream Included in the Riparian Validation Monitoring Project in the OESF and eDNA Sampling Equipment. Photos courtesy of Kyle Martens.

Examining How Changing Climate and Wildfires Could Alter the Forests of Western Washington:

This project examines potential changes in vegetation zones, wildfire, early-seral, and late-successional conditions under different climate and fire suppression assumptions. Results suggest that overall climate-related vegetation changes in western Washington will occur later than changes in other regions such as eastern Washington, in part because wildfire is rarer in the landscape even under a warmer future, and fires will continue to be suppressed across much of the study area. Areas more sensitive to change include high-elevation subalpine forests, forests in the Puget Trough, and forests in the rain shadow of the Olympic Peninsula. This project was completed in 2016 and two manuscripts are currently in journal review. For more information, contact Josh 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 Pacific Northwest Research Station, Oregon State University, the University of Washington, Western Washington University, and DNR, will test the influence of stand composition and the level of wood removed on tree and soil productivity, soil structure, and plant species diversity. The cooperative, multiple-decade study has been replicated in four experimental sites in the Pacific Northwest: Three national forests in Oregon (Willamette, Siskiyou, and Siuslaw) and one site in the OESF. The OESF permanent plot installation in Sappho, Washington was established in 1995 and was re-measured in 2000 and 2016. A summary of this project is available on the [OESF webpage](#). For more information, contact Richard Bigley: Richard.Bigley@dnr.wa.gov.

Historic Range of Variation in Forest Structure in the Washington Cascades:

Estimates of historic range of variation for late-successional conditions can be used as a coarse-filter proxy to identify the historic range in abundance of NSO and murrelet habitat under natural disturbance regimes. These historic conditions can then be compared with current conditions to identify differences in late-successional conditions for different forest zones. Using computer models and USFS Forest Inventory and Analysis data, DNR was able to develop estimates of historic and current amounts of early-seral, mid-seral, and late-successional conditions across all forest lands in the North and West Cascades (Figure 13). Results suggest: 1) complex early-seral conditions are rare in this landscape because the natural disturbances that create such conditions are rare, 2) there is currently an over-abundance of mid-seral conditions due to past and current management, and 3) due to large and infrequent wildfire events, historic late-successional conditions may have composed approximately 45–92 percent of the landscape at any given time. This project is complete and DNR

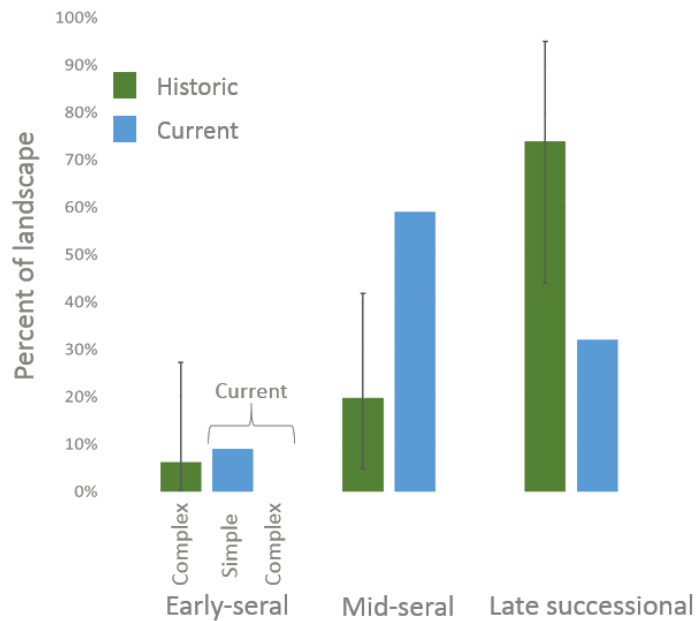


Figure 13: Historic and Current Percentages of Forest Conditions in the North and West Cascades. Error bars represent 90th percentiles. Chart courtesy of Josh Halofsky.

plans to submit a manuscript of the analysis and results in 2018. For more information, contact Josh Halofsky: Joshua.Halofsky@dnr.wa.gov.

Influence of Repeated Alternative Biodiversity Thinning on Young Stand Development Pathways:

In the late 1990s, DNR used pre-commercial thinning (PCT) across the landscape including in riparian and wetland areas and in sites adjacent to high-quality older forest habitat. Managers recognized the ability of PCT to influence stand development trajectory and were interested in exploring a wide variety of alternative approaches to increase future wildlife habitat by increasing forest structural diversity. Setting stands on different development pathways was recognized as important for meeting the management goal of balancing timber and non-timber management on the OESF.

In 1999, DNR initiated an empirical test of alternative biodiversity stand management pathways in young stands. This set of PCT treatments (randomized block design with five treatments and five replicates) is now being subject to a re-thinning with new gap treatments, to explore the influence of gap timing on structural complexity and wildlife habitat. Thinning prescriptions and gap installations were incorporated into the Goodman Demo timber sale which was sold in December 2015. Harvesting was completed in the spring of 2017 and post-treatment measurements were completed in the fall of 2017. 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. A summary of this project is available on the [OESF webpage](#). For more information, contact Richard Bigley: Richard.Bigley@dnr.wa.gov.

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 Dan Donato: Daniel.Donato@dnr.wa.gov.

Large-Scale Integrated Management Experiment on the OESF:

The purpose of this project is to compare three different intensities of integrated management. One strategy includes the level of integrated management as described in the OESF Forest Land Plan. The other two strategies include more and less integration of revenue production and ecological values than described in the plan. In FY 2017, DNR and the ONRC selected 16 experimental watersheds in the Clearwater River landscape of about 1,000 acres each (Figure 14). The three active management approaches and one unmanaged control were randomly assigned and replicated four times across the 16 experimental units.



Figure 14: DNR and UW Olympic Natural Resources Center Staff Review Watersheds Proposed for a Management Experiment in the OESF. Photo courtesy of Teodora Minkova.

The development of a study plan for the project started with a workshop in May 2017 attended by researchers from the University of Washington, USFS Pacific Northwest Research Station, NOAA Fisheries, and DNR. Additional workshops have been planned for FY 2018 and the study plan is expected to be submitted for peer review in the summer of 2018. Researchers are working closely

with the DNR's timber sales program to ensure the proposed treatments can be implemented. Grants and other funding opportunities have been pursued to cover monitoring, analyses, and other project costs. The project proposal was presented at the 2017 OESF annual science conference and various stakeholders' forums, and it was featured in a [UW press release](#) and in [local newspapers](#). For more information, contact Teodora Minkova: Teodora.Minkova@dnr.wa.gov.

Mind the Gap: 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 ten-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) (Figure 15). 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. Unit layout and pre-treatment data have been completed for Phase III, and, with the harvest now completed, post-treatment data collection is underway. A summary of this project is available on the [OESF webpage](#). For more information, contact Dan Donato: Daniel.Donato@dnr.wa.gov.



Figure 15: A Natural Gap Created by Blowdown in a Mature Coastal Forest. Photo courtesy of Dan Donato.

Northern Flying Squirrel Habitat

Enhancement: The objective of this pilot study is to evaluate the effect of various thinning treatments on nesting habitat for northern flying squirrels, the principal prey species for the northern spotted owl. In 2014, DNR installed 16 artificial nest cavities across the Forgotten Top timber sale in the South Puget HCP planning unit (Figure 16). The nest cavities were monitored before and after harvest to determine the presence of flying squirrels, and game cameras were installed to record animal activity. Results indicate that flying squirrels were present pre- and post-harvest, but not during harvest activities.



Figure 16: A Northern Flying Squirrel Artificial Nest Cavity Installed in the South Puget HCP Planning Unit. Photo courtesy of Alan Mainwaring.

Monitoring of nest sites concluded in August 2017 and DNR is currently conducting final data analysis. For more information, contact Alan Mainwaring: Alan.Mainwaring@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 Dan Donato: Daniel.Donato@dnr.wa.gov.

Riparian Silviculture Effectiveness Monitoring: Since 2006, DNR has been documenting 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 Richard Bigley: Richard.Bigley@dnr.wa.gov.

Riparian Validation Monitoring: This work helps determine whether DNR's current forest management practices in the OESF restore and maintain habitat capable of supporting viable salmonid populations within the OESF. 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: During the exceptional wildfire years between 2012 and 2015, over 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 2012–2015. 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. Plot establishment will continue over the next few years, with a plan to monitor plots at 5–10 year intervals. For more information, contact Dan Donato: Daniel.Donato@dnr.wa.gov.

Westside Individuals, Clumps, and Openings: This project aims to develop innovative approaches for using spatial structure analysis to create higher-quality habitat in managed second-growth forests. 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 VDT 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 the University of Washington. For more information, contact Dan Donato: Daniel.Donato@dnr.wa.gov.

OESF Research and Monitoring Program

Appendix: Background on the Research and Monitoring Program

In FY 2017, the OESF Research and Monitoring Program continued implementing two monitoring projects described earlier in this report (*Status and Trends Monitoring of Aquatic and Riparian Habitat* and *Riparian Validation Monitoring*) and planned a large-scale integrated management experiment in cooperation with University of Washington’s ONRC. The program also helped coordinate two research projects implemented by DNR scientists on the OESF (*Mind the Gap* and *Influence of Repeated Alternative Biodiversity Thinning Treatments on Coastal Forests*). Information about these projects can be found in the [Research](#) section of this report and on the [OESF webpage](#).

Following the recommendations for communication and outreach described in the 2016 [OESF Forest Land Plan](#), the OESF Research and Monitoring Program launched a biannual electronic newsletter and annual science conference. The newsletter was developed jointly with the ONRC to share scientific knowledge on sustainable land management on the Olympic Peninsula. The [first issue](#) was published in April 2017 and was distributed to over 140 email subscribers and the internal networks of DNR and UW.

The purpose of the OESF annual 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 first conference took place in Forks on April 20, 2017. Scientists conducting research and monitoring projects in the OESF shared findings on a broad range of topics including aquatic and riparian habitat monitoring, fish monitoring, eDNA methodology, the historic range of natural variation for late-successional forests, understory development in thinned stands, soil risk modelling, and wildlife monitoring using camera traps. Over 80 people attended the conference including local biologists and foresters, land managers, educators, environmental organizations, and members of the public. The conference included a field trip to the newly constructed Reade Hill hiking trail designed to educate the public about different types of forest management (Figure 17).

Two graduate students from The Evergreen State College and University of Washington conducted master’s thesis research in the OESF in FY 2017. DNR staff advised and coordinated students’ work on stream nutrients as part of the Riparian Status and Trends Monitoring Program and the assessment of the understory development for the Long-Term Ecosystem Productivity

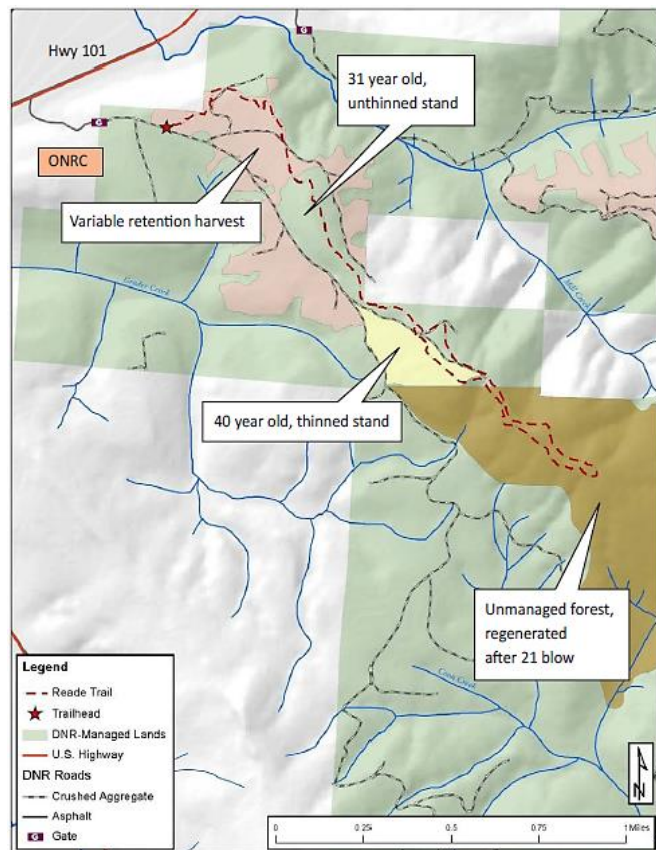


Figure 17: Map of Reade Hill Trail in the OESF. The 2017 OESF annual science conference included a field trip to this newly constructed trail. Map courtesy of Warren Devine.

study. Other educational activities included a seminar for graduate students at the UW School of Environmental and Forest Sciences titled “Sustainability and Adaptive Management” and a presentation on stream habitat status in the OESF as part of the Evening Talks series at the ONRC.

In FY 2017, the OESF Data Manager developed an Adaptive Management Research Database designed to provide a central location for current information on all agency research projects that support adaptive management on DNR state lands. This database contains information on research projects conducted on the OESF and across state lands, and is described in more detail in the [Adaptive Management](#) section of this report.

The OESF Research and Monitoring Program continued to maintain formal and informal research partnerships in FY 2017. In February 2017, an annual meeting was held between DNR, Olympic National Forest, ONRC, and USFS Pacific Northwest Research Station, four parties participating in a memorandum of understanding to advance research, monitoring, and adaptive management in forest ecosystems on the Olympic Peninsula. The meeting focused on collaboration on the planned large-scale integrated management experiment. Program staff also participated in the USFS Experimental Forests and Ranges Network by contributing to a publication synthesizing the science on biological responses to stream nutrients from 17 experimental forests and ranges across the United States. A manuscript of the publication has been submitted for review.

Publications and Presentations

In addition to conducting research on DNR-managed forestlands, DNR state lands researchers also write and contribute to publications and presentations relevant to forest management in the Pacific Northwest. DNR contributed to the articles and presentations listed below published in FY 2017. DNR authors are denoted in bold text.

Bormann, Bernard, Byron Williams, and **Teodora Minkova**. “Learning to Learn: the Best Available Science of Adaptive Management.” In *People, Forests, and Change: Lessons from the Pacific Northwest*. Edited by Beatrice Van Horne and Deanna Olson. Washington DC: Island Press, 2017.

- This book chapter on adaptive management argues for a disciplined, science-based approach to improving forest management; identifies common impediments to effectively implementing adaptive management processes; and reviews its application on federal, state, and private lands. The book is an update of the scientific consensus behind forest management in the temperate moist-coniferous forests of the U.S. Pacific Northwest. Two key concepts are 1) that local communities and the forest can be managed as a unit for mutual benefit; and 2) that forests and communities are much more dynamic than previously thought and demand a more flexible approach to managing them. [Book summary online](#).

Halofsky, Joshua S. and **Daniel C. Donato**. “How can historical fire dynamics inform restoration needs in infrequent stand-replacing regimes?” Invited presentation. Oregon State University Westside Fire Regime Summit. 2017.

- This presentation was part of a two-day meeting examining the state of knowledge of westside fire regimes. The presentation focused on research examining historic and current amounts of early-seral and late-successional conditions in western Washington, how these amounts may vary under different climate futures, and some management options to promote different forest structures given a changing climate.

Halofsky, Joshua S., Daniel C. Donato, and Matthew J. Reilly. “Comparing historic range of variation and current landscape conditions to inform habitat targets in western Washington.” Invited presentation. DNR OESF Annual Science Conference. 2017.

- This project estimated the historic range of late-successional habitat across western Washington as a proxy for northern spotted owl habitat. Results indicate the historic amount of late-successional habitat varied from approximately 44 to 94 percent under a natural fire regime depending on forest type, suggesting that DNR’s northern spotted owl habitat goals documented in the HCP have ecological relevance.

Halofsky, Joshua S., Jessica E. Halofsky, Miles A. Hemstrom, Anita T. Morzillo, Xiaping Zhou, and **Daniel C. Donato.** “Divergent trends in ecosystem services under different climate-management futures in a fire-prone forest landscape.” *Climatic Change* 142 (2017): 83–95.

- This study examines trade-offs in different values (standing timber volume, forest structure, crown fire potential, area burned, and wildlife habitat) under different climate and management assumptions. With high relevance to the eastern slope of the Washington Cascade Mountains, results broadly illustrate all values cannot be sustained at current levels under a warmer and more fiery future. [Available online.](#)

Khadduri, Nabil, Anna Leon, John Browning, and Amy Salamone. “Evaluating Dominus[®] Soil Biofumigant as a Substitute for Methyl Bromide in Pacific Northwest Forest Nurseries.” *Tree Planters’ Notes* 60, no. 2 (2017): 111–120.

- This article presents a two-nursery trial of a promising new pest management approach to address soilborne fungal pathogens and weed propagules in Douglas-fir seedling production. The trial was a collaboration between DNR’s Webster Nursery and Weyerhaeuser’s Mima Nursery. [Available online.](#)

Meigs, Garrett W., Robery C. Morrissey, Radek Bače, Oleh Chaskovskyy, Vojtech Čada, Tiphaine Després, **Daniel C. Donato,** Pavel Janda, Jana Lábusová, Meelis Seedre, Martin Mikolás, Thomas A. Nagel, Jonathan S. Schurman, Michal Synek, Marius Teodosiu, Volodymyr Trotsiuk, Lucie Vítková, and Miroslav Svoboda. “More ways than one: Mixed-severity disturbance regimes foster structural complexity via multiple developmental pathways.” *Forest Ecology & Management* 406 (2017): 410–426.

- Across more than 450 plots in conifer forests with a mixed-severity disturbance regime, researchers related stand-level structural complexity to both the severity and timing (age) of wind and insect-caused disturbances. Results indicate that complex forest structure, including features nominally associated with old-growth, can be associated as much with recent disturbance severity as it is with conventional notions of forest age. [Available online.](#)

Minkova, Teodora and Jennifer Arnold. “A structured framework for adaptive management: Lessons learned from regional cases and applied to the Olympic Experimental State Forest.” Invited presentation. Symposium on Systems Analysis in Forest Resources. 2017.

- This presentation described the adaptive management process adopted by DNR on the OESF and compared it to adaptive management processes implemented by public and private land managers across the Pacific Northwest in the United States and Canada. An abstract of the presentation is [available online](#) (page 23).

Conservation Strategy Updates

The HCP established numerous conservation strategies designed to minimize and mitigate the negative effects of land management activities on the habitats of federally listed species, riparian habitats, unlisted species of concern, and uncommon habitats that exist within the land base covered by the HCP. DNR’s conservation strategies are occasionally updated due to research, plan development, changes to laws, and/or adjustments to DNR’s administrative procedures. DNR did not make any updates to the conservation strategies in FY 2017.

Forest Inventory

Since 2013, DNR’s Forest Inventory Team has been developing the Remote-Sensing Forest Resource Inventory System (RS-FRIS) to replace the previous inventory system based on sample plots. RS-FRIS combines plot measurements taken in the field with data from remote sensing to provide information at a higher spatial resolution and lower cost than a conventional, sample plot forestry inventory. RS-FRIS combines two remote sensing technologies, LiDAR and PhoDAR, to provide a variety of three-dimensional information on stand conditions including the height of dominant trees, total board-foot volume, canopy closure, and relative density.

In FY 2017, DNR’s forest inventory team measured 381 inventory plots on trust lands across the state. At the end of the fiscal year, RS-FRIS covered approximately 99 percent of westside and 83 percent of eastside state trust lands. The forest inventory team is currently investigating how UAS technology could be used to supplement field sampling and remote sensing (Figure 18). For example, it may be more efficient to use a UAS rather than LiDAR to obtain imagery for small stands.



Figure 18: A Photo Point Cloud Derived from Aerial Imagery Taken by an Unmanned Aircraft System. Photo courtesy of Jacob Beard.

In FY 2018, DNR will continue acquiring LiDAR data and conducting plot measurements to further expand coverage of RS-FRIS. RS-FRIS data will be used to support a variety of DNR program areas including research and monitoring, habitat delineation, timber sales, and forest modeling.

Silvicultural Activity

[Appendix: Background on Silvicultural Activity](#)

Information and analysis provided in this section are based on activities designated as “complete” in DNR’s planning and tracking database (P&T) as of December 4, 2017.

Five major silvicultural activity types are discussed in this report: timber harvest, site preparation, forest regeneration, vegetation management, and PCT. These activities usually occur in this chronological sequence for a unit where timber has been harvested (Figure 19). Timber harvests are the primary driving force for other silvicultural activities, as most harvests remove enough trees to require reforestation of the stand. Table 5 shows completed acres of silvicultural activities for FY 2017 as well as the mean annual acres of each activity for the last five fiscal years.



Figure 19: A Ten-Year-Old Plantation Under a Mix of Dispersed and Grouped Leave Trees in Capitol Forest. This unit was harvested in 2005, received ground herbicide site preparation in 2006, and was planted in the winter of 2007. Photo courtesy of Zak Thomas.

Since the early 1990s, information about planned and implemented silvicultural activities on state lands has been stored in DNR's P&T database. This database, which has supplied silvicultural information for all HCP Annual Reports written to date, summarizes acres of activities across all state trust lands managed under the HCP. In the fall of 2017, DNR upgraded its forest management tracking systems from P&T to new software called Land Resource Manager (LRM). DNR staff migrated much of the tabular data and activity tracking workflow from P&T into LRM's more modern interface. LRM also allows DNR to more accurately track the spatial boundaries of silviculture activities using a built-in geographic information system (GIS). Beginning in the FY 2018 HCP Annual Report, silvicultural activity data will be supplied by LRM.

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. Thus, the levels of sold timber sales may stay relatively stable from year to year. However, timber removals or levels of completed activities may vary based on when purchasers choose to harvest (and thus complete) the sale.

Variable retention harvest (VRH) acres in FY 2017 were about 14 percent above the five-year mean, variable density thinning (VDT) acres were 4 percent below the five-year mean, and non-VDT commercial thinning acres were 13 percent above the five-year mean. The number of acres where uneven-aged management occurred on HCP lands was 79 percent lower than the five-year mean with all completed acres occurring in western Washington.

Forest Site Preparation

Forest site preparation acreage in FY 2017 was 14 percent higher than the five-year mean. In westside planning units not including the OESF, aerial herbicide treatments were 34 percent below the five-year mean while ground herbicide treatments were 44 percent above the mean. In the OESF, site preparation was 11 percent higher than the five-year mean.

Forest Regeneration

Forest regeneration acreage in FY 2017 was 20 percent lower than the five-year mean. Hand planting was the technique used on over 99 percent of the regenerated acres.

Vegetation Management

Acres of vegetation management activities in FY 2017 were five percent higher than the five-year mean. Ground herbicide treatments were 35 percent below the five-year mean, while hand-cutting treatments were 12 percent higher than the mean. Hand pulling was 128 percent above the five-year mean due to increased emphasis on treatment of noxious weeds.

Pre-Commercial Thinning

Eighty-four percent of the FY 2017 PCT acres, or 8,361 acres, are located in westside HCP planning units not including the OESF; this acreage is seven percent below the five-year mean. The number of acres treated with PCT in the OESF and eastside planning units was below the five-year mean by 47 and 37 percent respectively.

Table 5: Acres of Completed Silvicultural Activities on State Trust Lands Managed under the HCP from FY 2013–FY 2017.

	FY 2017							FY 2017 Totals				Five-year Mean (FY 13-17) ¹			
	EAST ²		WEST					East	West	OESF	Total	East	West	OESF	Total
	Klickitat	Yakima	Columbia	North Puget	South Coast	South Puget	Straits								
Timber Harvest															
Clearcut	-	-	-	-	-	-	-	-	-	4	4	-	11	1	12
Commercial thinning	-	-	1,359	10	672	317	-	-	2,358	632	2,990	170	1,914	556	2,641
Seed tree removal cut	-	-	-	-	-	-	-	-	-	-	-	51	-	-	51
Selective product logging	-	-	-	-	-	-	-	-	-	-	-	-	40	-	40
Shelterwood intermediate cut	-	-	-	-	-	-	-	-	-	-	-	23	-	-	23
Shelterwood removal cut	-	-	-	-	-	-	-	-	-	-	-	15	-	-	15
Uneven-aged management	-	-	87	4	-	-	19	-	110	-	110	478	42	-	520
Variable density thinning	-	-	15	782	27	5	-	-	829	1,653	2,482	823	849	901	2,573
Variable retention harvest	55	-	2,903	4,264	2,961	314	959	55	11,401	1,235	12,691	262	9,978	875	11,115
Total timber harvest	55	-	4,364	5,060	3,660	636	978	55	14,698	3,524	18,277	1,822	12,835	2,333	16,990
Forest Site Preparation															
Aerial herbicide	-	-	1,380	-	827	-	-	-	2,207	-	2,207	-	3,361	-	3,361
Ground herbicide	-	-	855	1,647	2,025	544	824	-	5,895	595	6,490	-	4,095	535	4,630
Ground mechanical	-	-	-	-	-	-	-	-	-	-	-	132	-	-	132
Pile and burn	-	1,360	100	-	572	-	-	1,360	672	-	2,032	1,034	233	3	1,270
Total forest site preparation	-	1,360	2,335	1,647	3,424	544	824	1,360	8,774	595	10,729	1,166	7,688	539	9,392
Forest Regeneration															
Hand planting	553	-	2,576	2,548	2,069	198	1,258	553	8,649	863	10,065	987	10,320	927	12,235
Natural regeneration	-	-	-	-	-	-	-	-	-	2	2	275	3	0	278
Total forest regeneration	553	-	2,576	2,548	2,069	198	1,258	553	8,649	865	10,067	1,262	10,323	927	12,513
Vegetation Management															
Aerial herbicide	-	-	-	-	-	-	-	-	-	-	-	-	12	-	12
Ground herbicide	-	-	340	590	653	152	519	-	2,254	340	2,594	-	3,742	234	3,976
Hand cutting³	-	-	1,053	3,323	3,705	640	1,278	-	9,999	398	10,397	121	8,922	276	9,319
Hand pulling	-	-	-	-	1,503	251	-	-	1,754	-	1,754	-	769	-	769

	FY 2017							FY 2017 Totals				Five-year Mean (FY 13-17) ¹			
	EAST ²		WEST					East	West	OESF	Total	East	West	OESF	Total
	Klickitat	Yakima	Columbia	North Puget	South Coast	South Puget	Straits								
Seeding grass³	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
Total vegetation management	-	-	1,393	3,913	5,861	1,043	1,797	-	14,007	738	14,745	122	13,445	510	14,077
Pre-Commercial Thinning															
Total pre-commercial thinning	-	1,033	1,056	2,666	2,229	1,643	767	1,033	8,361	534	9,928	1,643	8,943	1,004	11,591
Other															
Biomass piles	-	-	-	-	-	-	2	-	2	-	2	-	243	-	243
Ground fertilization	-	-	-	-	-	-	-	-	-	-	-	-	37	-	37
Shielding or fencing⁴	-	-	140	-	180	-	-	-	320	171	491	-	352	71	424
Grand Total	608	2,393	11,864	15,834	17,423	4,064	5,626	3,001	54,811	6,427	64,239	6,014	53,867	5,385	65,266

¹ The five-year mean covers the time period of July 1, 2012–June 30, 2017. Data is from P&T as of December 4, 2017 and has been rounded to the nearest whole acre.

² There were no completed activities in the Chelan planning unit in FY 17.

³ Seeding grass is rarely implemented as a silvicultural prescription but it may be used for wildfire restoration or for addressing large noxious weed infestations.

⁴ Shielding or fencing are structures placed around seedlings and young trees to protect them from ungulate browse.

Salvage

Salvaged acres are not classified as a discrete harvest type in P&T. Instead, salvage acres are included in the harvest activity type that best fits the silvicultural prescription for the stand being managed. They are then flagged so they can be tracked separately. Table 6 compares the FY 2017 completed salvage acres to the five-year mean annual salvage acres by P&T timber harvest activity type. Overall, the total number of acres of salvage harvest was 83 percent below the five-year mean. The eastside planning units had a 93 percent decline compared to the five-year mean. In the OESF planning unit forty acres were salvaged in FY 2017 compared to the five-year mean of nine acres.

Table 6: Completed Salvage Acres for FY 2017 and Five-year Mean (FY13-17) by Harvest Type.

		FY 2017				Five-year Mean (FY 13-17) ¹			
		East	West	OESF	Total	East	West	OESF	Total
Harvest Type	Clearcut	-	-	4	4	0	3	0.8	4
	Uneven-aged management	-	3	-	3	174	1	0	176
	Variable density thinning	-	2	-	2	389	1	0	390
	Variable retention harvest	55	36	36	127	178	44	8	231
	Total	55	41	40	136	742	49	9	800

¹ The five-year mean covers the time period of July 1, 2012–June 30, 2017. Data is from P&T as of December 4, 2017 and has been rounded to the nearest whole acre.

Road Management Activity

[*Appendix: Background on Road Management Activity*](#)

Forest Roads Program

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. The information presented here is for calendar year 2016 and is rounded to the nearest tenth mile.

During the 2016 legislative session, DNR’s Forest Roads Program did not request any supplemental funding for the remaining 15–17 biennium.

In 2016, 76 barriers were removed from the fish-barrier work list, representing an investment of \$3.31 million dollars. DNR removed or replaced 72 of the barriers, opening an estimated 36 miles of fish habitat on DNR-managed lands (Figure 20). Four other fish-passage barriers were removed from the work list for the following reasons:

- Two stream designations were downgraded from “fish” to “non-fish” following protocol survey requirements.
- One culvert was determined to be passable.
- One alternate habitat improvement project was completed in lieu of the fish barrier removal. Removal of the fish barrier would have opened 15 feet of marginal-quality habitat. The alternate project improved the high-quality pool habitat just below the culvert by providing woody structure in the pool and cover protection (from predation) for juvenile salmon. In a secondary location, woody structure was added to the stream to improve juvenile fish access to a nearby tributary.



Figure 20: Fish-barrier Removal on an Unnamed Tributary to the Chehalis River. This project replaced one 96” culvert in a highly incised channel with a 20’7” wide by 13’2” tall multi-plate pipe arch. Large woody debris was placed in the downstream channel to improve fish habitat. A total of five miles of salmon and trout habitat were opened up as a result of this project. Photos courtesy of Jerry Mizar and Will Hoskins.

Through land transactions and inventory activities in 2016, DNR acquired 27 new fish passage barriers that will need to be corrected. The Forest Roads Program has committed to remediating these “newly-identified barriers” within six years of their identification. At the end of 2016, 85 known fish barriers remained on DNR-managed lands.

On lands managed under the HCP, 74.1 miles of road were abandoned or decommissioned and 75.0 miles were constructed in 2016. There was a net reduction of total road miles on HCP-managed lands from 11,104 to 10,399 due to land transactions, updates to the road inventory, and reconciling the road mileage after an adjustment in the region boundary between Pacific Cascade and South Puget Sound regions in 2014. Table 7 summarizes DNR’s road management activity on both HCP- and non-HCP-covered lands in 2016.

Table 7: Road Management Activity Summary for Calendar Year 2016, including HCP- and Non-HCP-Covered Lands.

	Chelan	Columbia	Klickitat	North Puget	OESF	South Coast	South Puget	Straits	Yakima	Non-HCP lands	Total
Miles of new road constructed	-	16.4	-	29.5	1.6	14.8	0.9	11.4	0.5	12.3	87.3
Miles of road reconstructed	-	8.4	-	49.0	7.8	4.6	2.1	5.7	-	11.2	88.7
Miles of forest road abandoned	-	1.5	1.5	-	3.7	2.4	2.4	2.2	10.6	8.7	32.9
Miles of forest road decommissioned	-	11.5	0.1	26.4	-	0.3	1.8	2.2	7.6	5.2	55.1
Miles of inventoried road	45.9	1,257.3	587.7	1,469.1	1,810.0	1,655.7	1,324.4	857.7	1,390.8	3,430.0	13,828.7
Fish barriers removed	-	3	-	6	37	4	13	6	-	7	76

Easements

Appendix: Background on Easements

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

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 by private individuals, entities, or other agencies 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 2017, DNR began the Spatial Nature project that will map encumbrances on state lands that are not connected to DNR’s road system, such as utility corridors, irrigation infrastructure, railroads, and land use restrictions.

Road Easements, Road Use Permits, and Utility Easements

Table 8 reports easements granted in FY 2017 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 8: Road Easements, Road Use Permits, and Utility Easements (New Footprint) Granted in FY 2017.

		HCP Planning Unit					Total
		North Puget	OESF	South Coast	Yakima	Columbia	
Road easements and road use permits	Miles	7.15	0.54	0.46	-	0.15	8.30
	Acres	36.25	3.72	3.38	-	1.12	44.47
Utility easements	Miles	0.08	-	-	1.67	0.06	1.81
	Acres	0.19	-	-	2.05	0.41	2.65

Land Transaction Activity

Appendix: Background on Land Transaction Activity

Below is a summary of land acquisitions, dispositions, and transfers completed in FY 2017 by HCP planning unit. Planning units not listed had no transaction activity. All newly acquired parcels outside of the OESF listed in this section are 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. One newly acquired parcel in the OESF has been added to the HCP and is being managed for owl habitat. All disposed parcels were classified as “no role for northern spotted owl habitat” and are no longer covered under the HCP.

Because the narrative portion of this section incorporates acreage data from land surveys conducted during transactions and Table 9 incorporates numbers from DNR’s GIS layers, the numbers may not match exactly. The acreage data in the narrative is rounded to the nearest whole acre.

Activity by HCP Planning Unit

Chelan

Acquired: DNR added a one-acre lot to the Camas Meadows Natural Area Preserve (NAP) in Chelan County.

Disposed: None.

Trust Land Transfer/State Forest Transfer (TLT/SFT): None

Columbia

Acquired: None.

Disposed: None.

TLT/SFT: Five parcels totaling 203 acres were transferred out of state forest trust status and added to Stevenson Ridge Natural Resource Conservation Area (NRCA). The property will remain part of the HCP permit lands.

Klickitat

Acquired: None.

Disposed: DNR sold two acres of school trust land to the City of White Salmon. The property serves as the intake site for the City's water supply.

Trust Land Transfer/State Forest Transfer (TLT/SFT): None

North Puget

Acquired: DNR purchased 826 forested acres in Skagit County and 36 acres in King County for the school trust. Middle Fork Snoqualmie NRCA and Mt. Si NRCA in King County acquired 65 acres and 220 acres, respectively, for a total of 1,147 acres added within this planning unit.

Disposed: None.

TLT/SFT: A total of 1,805 acres of school trust land were transferred to the Morning Star NRCA in Snohomish County. The property will remain part of the HCP permit lands.

Olympic Experimental State Forest

Acquired: DNR purchased 601 acres for the Queets River NRCA in Jefferson County. This property has been added to HCP permit lands and is being managed for owl habitat.

Disposed: None.

Trust Land Transfer/State Forest Transfer (TLT/SFT): None

South Coast

Acquired: DNR acquired 160 acres of forestland in Pacific County for the school trust.

Disposed: DNR sold 30 acres of school trust land to the Confederated Tribes of the Chehalis Reservation in Grays Harbor County.

TLT/SFT: Two properties were transferred out of state forest trust status to NRCA status: 63 acres to the Naselle Highlands NRCA in Pacific County, and 178 acres to Skamokawa Creek NRCA in Wahkiakum County, for a total of 241 acres. The properties will be retained as HCP permit lands.

South Puget

Acquired: DNR acquired 23 acres for the school trust in Thurston County. Woodard Bay NRCA in Thurston County and Stavis NRCA in Kitsap County each acquired five acres, for a total of 33 acres within the planning unit.

Disposed: DNR sold two properties: 35 acres to King County and 48 acres to Kitsap County, for a total of 83 acres. Though both have been removed from the HCP permit lands, use by the recipients is restricted to recreation, open space, and wildlife habitat.

TLT/SFT: None.

Straits

Acquired: DNR acquired 185 acres for Dabob Bay NRCA in Jefferson County (Figure 21).

Disposed: None.

TLT/SFT: None.



Figure 21: Recently Acquired Forest and Shoreline added to Dabob Bay NRCA. Photo courtesy of Julie Armbruster.

Table 9: Acquisitions and Disposals Completed in FY 2017 Within the HCP Boundary.

		HCP Planning Unit ¹									
		Chelan	Columbia	Klickitat	North Puget	OESF	South Coast	South Puget	Straits	Yakima	Totals
Acquired Lands											
Stream miles by stream type²	Type 1	-	-	-	-	-	-	-	-	-	-
	Type 2	-	-	-	0.3	0.5	-	-	-	-	0.8
	Type 3	-	-	-	0.5	1.0	0.8	-	-	-	2.3
	Type 4	-	-	-	3.0	0.4	0.1	-	-	-	3.6
	Type 5	-	-	-	4.8	2.7	0.7	-	1.5	-	9.7
	Type 9	-	-	-	3.2	-	0.9	0.2	-	-	4.3
	Total miles acquired		-	-	-	11.8	4.6	2.6	0.2	1.6	-
Acres acquired in rain-on-snow zones³		-	-	-	702	-	-	-	-	-	702
Acres per asset class³	Forested	-	-	-	857	-	157	24	-	-	1,037
	Conservation	1	-	-	282	585	-	10	185	-	1,063
Total acres acquired		1	-	-	1,138	585	157	34	185	-	2,100
Disposed Lands											
Stream miles by stream type²	Type 1	-	-	0.1	-	-	0.3	-	-	-	0.4
	Type 2	-	-	-	-	-	-	-	-	-	-
	Type 3	-	-	-	-	-	-	-	-	-	-
	Type 4	-	-	-	-	-	-	-	-	-	-
	Type 5	-	-	-	-	-	-	0.1	-	-	0.1

		HCP Planning Unit ¹									
		Chelan	Columbia	Klickitat	North Puget	OESF	South Coast	South Puget	Straits	Yakima	Totals
	Type 9	-	-	-	-	-	-	-	-	-	-
	Total miles disposed	-	-	0.1	-	-	0.3	0.1	-	-	0.5
Acres disposed in rain-on-snow zones⁴		-	-	-	-	-	-	-	-	-	-
Acres per age class	Open (0–10 years)	-	-	-	-	-	-	-	-	-	-
	Regeneration (11–20 years)	-	-	-	-	-	-	-	-	-	-
	Pole (21–40 years)	-	-	-	-	-	-	-	-	-	-
	Closed (41–70 years)	-	-	-	-	-	-	52	-	-	52
	Complex (71–100 years)	-	-	-	-	-	-	-	-	-	-
	Complex (101–150 years)	-	-	-	-	-	-	34	-	-	34
	Functional (150+ years)	-	-	2	-	-	-	-	-	-	2
	Non-forested	-	-	-	-	-	30	-	-	-	30
	Unknown	-	-	-	-	-	-	-	-	-	-
Total acres disposed		-	-	2	-	-	30	86	-	-	119

¹ This data is intended to provide a broad picture of transaction activities for the reporting period. Data for acquired lands are estimates that have not yet been field verified. This information is provided to the Services through the HCP annual reports to provide a general understanding of what stand types and habitat conditions are being transacted. Mileage data is rounded to the nearest tenth mile and acreage data is rounded to the nearest whole acre.

² Stream-type data is reported according to the Forest Practices Hydro Layer (that includes water types 1–5 and 9) which has been used in State Trust Lands HCP annual reports since the first report was published in 1999.

³ 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.

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

Natural Areas Program

[Appendix: Background on the Natural Areas Program](#)

In FY 2017, the Natural Areas Program protected an additional 3,595 acres in Natural Area Preserves (NAPs) and Natural Resource Conservation Areas (NRCAs), 3,332 of which fall within the area covered by the HCP. These protection efforts established one new natural area and added to 11 existing natural areas. The most significant of these included:

- **Queets River NRCA:** DNR acquired 601 acres to establish this new natural area located on the west side of the Olympic Peninsula. This conservation area protects riparian habitat within the Queets River floodplain and adjacent upland forest, supporting federally-listed salmonids and marbled murrelet.

- **Morning Star NRCA:** More than 1,800 acres were added to Morning Star NRCA through the Trust Land Transfer program, including mature forest and remnant old-growth forest stands that support marbled murrelet. These lands also include montane wetlands, ponds, and riparian systems.
- **Stevenson Ridge NRCA:** This site was nearly doubled in size by a 203-acre addition of mature and late-successional forest that provides northern spotted owl nesting habitat.
- **Mt. Si NRCA:** DNR added 220 acres to the Mount Si NRCA, protecting late-successional forests important to marbled murrelets and northern spotted owls, as well as subalpine lake, talus, and cliff habitats (Figure 22).



Figure 22: Blethen Lake and Surrounding Forest on Recently Acquired Land Within Mt. Si NRCA. Photo courtesy of Robert Cugini.

In addition to land acquisitions, the Natural Areas Program continued to actively manage and enhance habitat on natural areas in FY 2017 to benefit federally listed species such as Bradshaw’s Lomatium (Lacamas Prairie NAP/NRCA), Wenatchee Mountains checker-mallow (Camas Meadows NAP), Oregon Spotted Frog (Trout Lake NAP), and Puget Sound/Hood Canal salmon runs (Dabob Bay NAP/NRCA).

Table 10 lists the natural areas that are located in areas managed under the HCP. Natural areas in bold text denote areas composed primarily of mature forests and/or late-seral forests.

Table 10: Acres Added to Natural Areas within HCP-Covered Lands in FY 2017.

Natural Area ¹	County	Acres Added in FY 2017 ²	Total Current Acres
Admiralty Inlet NAP	Island	-	79.5
Ashford NRCA	Pierce	-	78.4
Bald Hill NAP	Thurston	-	313.7
Bone River NAP	Pacific	-	2,720.0
Camas Meadows NAP	Chelan	1.0	2,017.8
Carlisle Bog NAP	Grays Harbor	-	310.0
Cattle Point NRCA	San Juan	-	112.1
Charley Creek NAP	King	-	1,966.0
Chehalis River Surge Plain NAP	Grays Harbor	-	3,024.4
Clearwater Bogs NAP	Jefferson	-	504.1
Clearwater Corridor NRCA	Jefferson	-	2,323.0
Columbia Falls NAP	Skamania	-	1,233.8
Cypress Highlands NAP	Skagit	-	1,072.4
Cypress Island NRCA	Skagit	-	4,135.1
Dabob Bay NAP/NRCA	Jefferson	185.0	2,955.8

Natural Area ¹	County	Acres Added in FY 2017 ²	Total Current Acres
Dailey Prairie NAP	Whatcom	-	228.8
Devils Lake NRCA	Jefferson	-	80.0
Elk River NRCA	Grays Harbor	-	5,560.0
Ellsworth Creek NRCA	Pacific	-	557.0
Goose Island NAP	Grays Harbor	-	12.0
Granite Lakes NRCA	Skagit	-	603.2
Gunpowder Island NAP	Pacific	-	152.0
Hamma Hamma Balds NAP	Mason	-	957.0
Hat Island NRCA	Skagit	-	91.2
Hendrickson Canyon NRCA	Wahkiakum	-	159.0
Ink Blot NAP	Mason	-	183.6
Kennedy Creek NAP	Mason	-	212.9
Kings Lake Bog NAP	King	-	309.2
Kitsap Forest NAP	Kitsap	-	571.9
Klickitat Canyon NRCA	Yakima	-	2,335.2
Lacamas Prairie NAP/NRCA	Clallam	-	201.1
Lake Louise NRCA	Whatcom	-	137.7
Lummi Island NRCA	Whatcom	-	671.5
Merrill Lake NRCA	Cowlitz	-	114.2
Middle Fork Snoqualmie NRCA	King	65.2	9,145.3
Mima Mounds NAP	Thurston	-	640.5
Monte Cristo NAP	Klickitat	-	1,151.0
Morning Star NRCA	Snohomish	1,804.9	37,841.9
Mt. Si NRCA	King	220.0	13,446.0
Naselle Highlands NRCA	Pacific	63.4	108.0
Niawiakum River NAP	Pacific	-	1,097.8
North Bay NAP	Grays Harbor	-	1,214.9
Oak Patch NAP	Mason	-	17.3
Olivine Bridge NAP	Skagit	-	148.0
Point Doughty NAP	San Juan	-	56.5
Queets River NRCA	Jefferson	601.0	601.0
Rattlesnake Mtn Scenic Area	King	-	1,851.4
Rocky Prairie NAP	Thurston	-	35.0
Sand Island NAP	Grays Harbor	-	8.0
Shipwreck Point NRCA	Clallam	-	471.8
Schumacher Creek NAP	Mason	-	493.7
Skagit Bald Eagle NAP	Skagit	-	1,546.0
Skamokawa Creek NRCA	Wahkiakum	177.7	293.6

Natural Area ¹	County	Acres Added in FY 2017 ²	Total Current Acres
Skookum Inlet NAP	Mason	-	142.6
Snoqualmie Bog NAP	King	-	110.5
South Nemah NRCA	Pacific	-	2,439.5
South Nolan NRCA	Jefferson	-	213.0
Stavis NRCA	Kitsap	5.4	2,909.1
Stevenson Ridge NRCA	Skamania	203.4	421.3
Table Mountain NRCA	Skamania	-	2,836.5
Tahoma Forest NRCA	Lewis	-	230.0
Teal Slough NRCA	Pacific	-	8.4
Trout Lake NAP	Klickitat	-	2,014.0
Washougal Oaks NAP/NRCA	Clark	-	264.2
West Tiger Mtn NRCA	King	-	3,907.9
Whitcomb Flats NAP	Grays Harbor	-	5.0
White Salmon Oak NRCA	Klickitat	-	551.2
Willapa Divide NAP	Pacific	-	587.0
Woodard Bay NRCA	Thurston	5.0	901.8
	Total Acres	3,332	123,693

¹Natural areas in bold text denote areas composed primarily of mature forests and/or late-seral forests.

²Acreage data comes from the TransactionsAll 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 as calculated by DNR's GIS system.

Table 11 lists the federally threatened and endangered species found in natural areas located in areas managed under the HCP, and Table 12 lists other species of concern in these areas.

Table 11: 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

Species	Federal Status	Natural Area
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
Oregon Spotted Frog	Threatened	Trout Lake NAP
Eulachon	Threatened	Dabob Bay NAP/NRCA
Mazama Pocket Gopher	Threatened	Rocky Prairie NAP
Bradshaw’s Lomatium	Endangered	Lacamas Prairie NAP/NRCA
Golden Paintbrush	Threatened	Rocky Prairie NAP, Admiralty Inlet NAP
Wenatchee Mts. Checker-Mallow	Endangered	Camas Meadows NAP

Table 12: Special Status Species Located in Natural Areas Covered by the HCP.

Species	Natural Area ¹
Federal Candidate	
Island marble	Cattle Point NRCA
Federal Species of Concern	
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 Mt. NRCA, Columbia Falls NAP
Makah Copper	North Bay NAP, Carlisle Bog NAP, Clearwater Bogs 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, Mt. Si NRCA, Elk River NRCA, Hat Island NRCA, Lummi Island NRCA, North Bay NAP

Species	Natural Area ¹
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	
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
Lewis' Woodpecker	Camas Meadows NAP
Long-horned Leaf Beetle	King's Lake Bog NAP
Olympia Oyster	Dabob Bay NAP/NRCA, Woodard Bay NRCA
Pacific Herring	Dabob Bay NAP/NRCA, Stavis NRCA, Elk River NRCA
Pileated Woodpecker	Table Mountain NRCA, Morning Star NRCA, Kitsap Forest NAP, and others
Puget Blue	Rocky Prairie NAP
Puget Sound Coho Salmon	Dabob Bay NAP/NRCA
Purple Martin	Woodard Bay NRCA, Kennedy Creek NAP
Sand Verbena Moth	Cattle Point NRCA
Western Toad	Dabob Bay NAP/NRCA, Morning Star NRCA, Oak Patch NAP, Stavis NRCA
White-headed Woodpecker	Camas Meadows NAP
Vaux's Swift	Numerous sites
State Sensitive or State Monitor Species	
Bald Eagle	Numerous sites
Cope's Giant Salamander	Ellsworth Creek NRCA, Table Mountain NRCA
Great Blue Heron	Woodard Bay NRCA
Harbor Seal	Dabob Bay NAP/NRCA, Gunpowder Island NAP, North Bay NAP, Sand Island NAP, Woodard Bay NRCA
Olympic Mudminnow	Carlisle Bog NAP, Chehalis River Surge Plain NAP, West Tiger Mountain NRCA
Olympic Torrent Salamander	Merrill Lake NRCA
Oregon Branded Skipper	Mima Mounds NAP
Osprey	Merrill Lake NRCA
Western Bluebird	Rocky Prairie NAP, Mima Mounds NAP

Species	Natural Area ¹
Hoary elfin	Rocky Prairie NAP, Mima Mounds NAP, Bald Hill NAP
Propertius duskywing	Bald Hill NAP
Puget Sound Silverspot	Bald Hill NAP, Mima Mounds NAP, Oak Patch NAP
Reticulate Sculpin	Clearwater Corridor NRCA, Elk River NRCA
Riffle Sculpin	Bone River NAP
Sonora skipper	Bald Hill NAP, Mima Mounds NAP, Rocky Prairie 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.

Non-Timber Management Activity

Special Forest Products

Appendix: Background on Special Forest Products

DNR’s South Puget, 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 Christmas trees, brush, boughs, beargrass, evergreen huckleberry, moss, salal, and sword fern though not every lease or permit includes all these products.

DNR also offers direct sales of some of the same special forest products. In South Puget Region and Pacific Cascade Region, direct sales are made for products gathered from areas too small to be offered under a lease. Direct sales are also made to existing lessees within their lease areas if DNR approves their request to gather products not included in their original lease. Table 13 summarizes DNR’s sales of special forest products on HCP-covered forestlands in FY 2017.

Table 13: Special Forest Product Sales on HCP-Covered Areas in FY 2017.

Region	Permits		Leases		Direct Sales	
	Occurrences	Acres	Occurrences	Acres	Occurrences	Acres
South Puget	239	91,723	23	69,469	4	12,067
Olympic	67	270,133	-	-	-	-
Pacific Cascade	87	220,570	-	-	2	100
Total	393	582,426	23	69,469	6	12,167

Leases

Appendix: Background on Leases

Grazing Permits and Leases

In FY 2017, there were approximately 270 acres of grazing leases on the westside. However, some of this land is not forested and is therefore not managed under the HCP. There were no grazing permits active on the westside in FY 2017.

In Northeast Region, there were approximately 2,754 acres of grazing leases on forested land covered by the HCP in FY 2017. There were no grazing permits active. In Southeast Region as of Dec. 14, 2017, there were 90,051 acres of grazing leases and 74,548 acres of grazing permits on forestlands covered by the HCP.

Communication Sites and Leases

In FY 2017, there were 77 leased communication sites within the HCP boundary, totaling 76.6 acres. There were a total of 299 leases from individual tenants on the 77 communication sites.

Valuable Material Sales

Appendix: Background on Valuable Material Sales

In FY 2017, DNR had six active commercial sand, gravel, and rock contracts within the HCP boundary, totaling approximately 665 acres. Table 14 summarizes those contracts.

Table 14: Sand, Gravel, and Rock Contracts Active in FY 2017.

Lease Name	Commodity	HCP Planning Unit	Acres
Lewis Gravel Pit – Winthrop	Sand, gravel, rock	Chelan	40
Livingston Quarry	Road rock	Columbia	170
Glenwood Pit ¹	Sand, gravel	Klickitat	40
Kilowatt Quarry	Road rock	Klickitat	15
High Rock	Sand, gravel, rock	North Puget	320
Jordan Road	Sand, gravel	North Puget	80
Total Acres:			665

¹ The Glenwood Pit mine has been mined out and is in the process of being reclaimed.

Recreation Program

Appendix: Background on Recreation Program

Comprehensive Review

Appendix: Background on Comprehensive Reviews

Overview

The vision of DNR’s Recreation Program is to provide diverse and high-quality recreational opportunities within DNR landscapes that foster community engagement, promote a strong sense of environmental stewardship, and enrich the quality of life in Washington.

The program’s goals for managing statewide recreation include:

- Promote the safety of the public, DNR employees, and volunteers;
- Support enjoyable recreation that is compatible with land management responsibilities;
- Work in collaboration with volunteers and interested stakeholders to provide engaging recreational opportunities; and
- Manage healthy natural landscapes and working forests that can sustain recreation for current and future generations.

Recreation and public use on DNR-managed lands occurs primarily on state trust lands and are guided by the 2006 Policy for Sustainable Forests, the HCP, and the state Public Lands Act. The Public Lands Act directs DNR to utilize the “multiple use concept” by providing a variety of recreational opportunities for the public where recreational use is compatible with the obligations of trust management.

DNR’s Recreation Program currently manages over 160 facilities across the state including trailheads, campgrounds, picnic areas, and water access sites. Approximately 138 facilities are within the HCP boundary, and some of these sites are located within Natural Areas. Some campgrounds are legacy sites, established originally as fire camps in riparian areas, while other campgrounds are located on uplands outside of riparian corridors. Of the 138 recreation facilities within the HCP boundary, approximately 58 are located adjacent to streams or lakes. The footprints of most of DNR’s recreation facilities range between a couple of acres to several dozen acres, with a few exceeding 100 acres. DNR estimates there are over 1,100 miles of trails for multiple recreational activities across the state.

DNR actively facilitates a variety of recreational activities including hiking; biking; camping; riding or driving off-road vehicles (ORVs); horseback riding; hiking or riding with pack stock such as goats, mules, donkeys, and llamas; rock climbing; fishing; hunting; geocaching; skiing; snowmobiling; snowshoeing; paragliding; hang gliding; picnicking; boating; and other water activities (Figure 23).



Figure 23: A Kayaker Navigates the Middle Fork Snoqualmie River near DNR’s Mine Creek Day Use Area.
Photo courtesy of Carrie McCausland.

Recreation and the HCP

When the HCP was published in 1997, DNR and the Services had determined that the impacts of current recreational activities were *de minimus* relative to the impact of timber management and that the development of future recreation sites must adhere to the riparian conservation strategy (HCP, IV. 199). The HCP also guides DNR to provide recreational opportunities that are consistent with the other conservation strategies outlined in the HCP.

The Recreation Program engages in a variety of activities that support compliance with the HCP and limit or reduce the impacts of recreational activities on northern spotted owl, marbled murrelet, and riparian habitats. Those activities include the following.

- Remove culverts that block fish passage or deliver sediment to streams.
- Install large culverts or bridges that allow fish passage and protect stream bank integrity (Figure 24).
- Remove or reroute both motorized and non-motorized trails away from riparian corridors and out of wetlands.
- Remove or relocate recreation sites in riparian areas.
- Control invasive plant species within designated recreation facilities.
- Locate trails away from wetlands and riparian corridors.
- Design trails to divert water runoff to the forest floor rather than nearby streams.
- Remove or relocate outhouse/restroom facilities in close proximity to riparian areas or within floodplains.
- Install gravel and regrade recreation facilities to better manage water runoff.
- Develop water retention structures to mitigate stormwater runoff.
- Design facilities to limit access to environmentally sensitive areas.
- Provide regular maintenance on facilities and trails to minimize the impacts of high-volume use.
- Develop and install signage to educate the public about appropriate use of state trust lands.



Figure 24: A Recently Installed Bridge in the Tahuya State Forest. Photo courtesy of Sam Lanz.

Implementation of the HCP periodically requires interpretation of its conservation strategies and how they apply to recreation projects. In some cases, strict compliance with the HCP might result in unfavorable outcomes, endanger human lives, 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 and as appropriate, DNR staff seeks guidance from the Services 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. 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 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 15 lists DNR’s HCP implementation documentation for recreation projects since 1997.

Table 15: Summary of DNR’s HCP Implementation Documentation for Recreation Projects since 1997.

Region	Fiscal Year	Type	Associated Project	HCP Strategy	Activity Summary
Southeast	2010	Concurrence	Ahtanum Trailhead Parking Area	NSO	Develop three acres of dispersal habitat into a parking lot. As mitigation, add 15.9 acres of dispersal habitat in a newly-acquired parcel located in the same quarter township.
South Puget	2012	Consultation	Mailbox Peak Trail Construction	MM	Build five miles of new trail, a portion of which passes through suitable marbled murrelet habitat.
South Puget	2013	Consultation	Elbe Hills ORV Campground	NSO	Relocate an ORV campground away from NSO movement habitat.
Northwest	2013	Consultation	Reiter Foothills Recreation Area	NSO	Harvest 11 acres for Reiter Foothills Recreation Area parking lot. Project requires cutting a snag with a pileated woodpecker cavity. The leave tree component will not be implemented in the harvest unit for the 11 acres that will make up the parking lot.
Olympic	2015	Consultation	None	MM	Remove one Sitka spruce tree which is leaning dangerously toward adjacent campground and showing signs of decay and stress.
South Puget	2015	Concurrence	Trail Construction in West Tiger Mountain NRCA	MM	Build 2,500 feet of trail for mountain bikers and hikers through unsurveyed, suitable marbled murrelet habitat within the West Tiger Mountain NRCA.
Northwest	2016	Concurrence	North Mountain Darrington Mountain Bike Trail	MM	Construct a system of single-track mountain bike trails through a block of suitable but low-quality marbled murrelet habitat.
South Puget	2016	Concurrence	East Tiger Inside Passage Trail	MM	Construct 476 feet of non-motorized trail through newly identified, suitable marbled murrelet habitat and 160 feet of non-motorized trail through Criteria 3 habitat.

Recreation Planning

For decades, DNR has coordinated and consulted with the public on land management objectives and strategies, particularly regarding public access and use. In the mid-2000s, the Recreation Program formalized a recreation planning process to ensure that recreation on state land was consistent with DNR’s trust mandate, supported environmental commitments, and provided for continued public access and safe and sustainable recreational opportunities.

On larger blocks of forested state trust lands, the Recreation Program develops integrated, landscape-level plans that have two primary purposes:

- Develop a recreation and public access vision for the landscape by detailing recreation management goals, and
- Present specific objectives and strategies that guide projects and recreation management for 10–15 years.

Table 16 lists recreation plans that have been adopted and those in development.

Table 16: Recreation Plans Adopted and in Development.

Adopted Plans		
Plan	Year Adopted	HCP Planning Units
Snoqualmie Corridor Recreation Plan	2015	South Puget
Naneum Ridge to Columbia River Recreation and Access Plan	2015	Yakima
Green Mountain and Tahuya State Forests Recreation Plan	2013	South Puget
Western Yacolt Burn Forest Recreation Plan	2010	Columbia
Reiter Foothills Forest Recreation Plan	2010	North Puget
Ahtanum State Forest Recreation Plan	2010	Yakima
Capitol State Forest Recreation and Public Access Plan	2005	South Puget, South Coast
Plans in Development		
Plan	HCP Planning Units	
Baker to Bellingham recreation planning	North Puget	
Darrington mountain bike trails	North Puget	
Morning Star trails planning	North Puget	

While each recreation planning effort follows the same fundamental process, each plan evolves differently to account for diverse stakeholder input and the unique landscape features. Key steps in the planning process include:

- Consultation with DNR scientists, planners, GIS analysts, and land managers;
- Communication with adjacent landowners and local government;
- Review and consideration of any previous planning efforts;
- Conducting a land suitability assessment;
- Engaging the public (Figure 25);
- Establishing a volunteer stakeholder Recreation Planning Committee; and
- Conducting a SEPA review.



Figure 25: DNR Staff Facilitate a Public Meeting as Part of the Darrington Mountain Bike Trails Planning Effort. Photo courtesy of Eryn Couch.

A land suitability assessment is a broad-scale mapping exercise that identifies areas with long-term limiting factors for recreational use due to ecological factors, geology/soil factors, or other management considerations. Table 17 lists the factors considered in the land suitability assessment for the Snoqualmie Corridor Recreation Plan, which followed a fairly typical land suitability assessment process, but specific factors may vary with each landscape. While HCP requirements help to guide identification of many factors, species covered by the HCP and impacts to habitat are identified as ecological factors. Areas that have been identified as habitat, potential habitat, or riparian or wetland areas are shown on landscape maps as areas with long-term limiting factors for recreation use.

Table 17: Factors Evaluated in the Land Suitability Assessment for the Snoqualmie Corridor Recreation Plan.

Ecological Factors	Geology/Soils Factors	Management Factors
<ul style="list-style-type: none"> ▪ Wetlands and wetland buffers ▪ Fish habitat ▪ Riparian areas and riparian buffers ▪ Talus, cliffs, caves, and balds ▪ Suitable marbled murrelet habitat ▪ Northern spotted owl nest patches ▪ Elk, Columbian black-tailed deer ▪ Mountain goat habitat ▪ High quality and rare plant communities ▪ Sensitive, threatened, or endangered species 	<ul style="list-style-type: none"> ▪ Soils with high erosion potential ▪ Poorly drained soils ▪ Deep-seated landslides ▪ Areas with higher potential for landslides ▪ Slope steepness ▪ Areas with higher potential for soil slumping ▪ Alluvial fans and flats ▪ High elevation soils more than 3,400 feet ▪ 100-year flood plains 	<ul style="list-style-type: none"> ▪ Communication sites ▪ Rock sources ▪ Utility easements ▪ Adjacent lands ▪ Proximity to correctional facilities ▪ Water sources and watersheds ▪ Cultural/archaeological resources

After the attributes are mapped and assigned a recreation suitability value, they are compiled into composite maps containing all attributes on a single map so that planners know which areas have no, low, or moderate levels of suitability for recreational use. An example of a composite map for motorized trails in the Tahuya State Forest is shown in Figure 26. The black and purple areas indicate attributes limiting recreation suitability. These are either areas that should be avoided or areas where great care should be taken when performing on-the-ground assessments for potential projects.

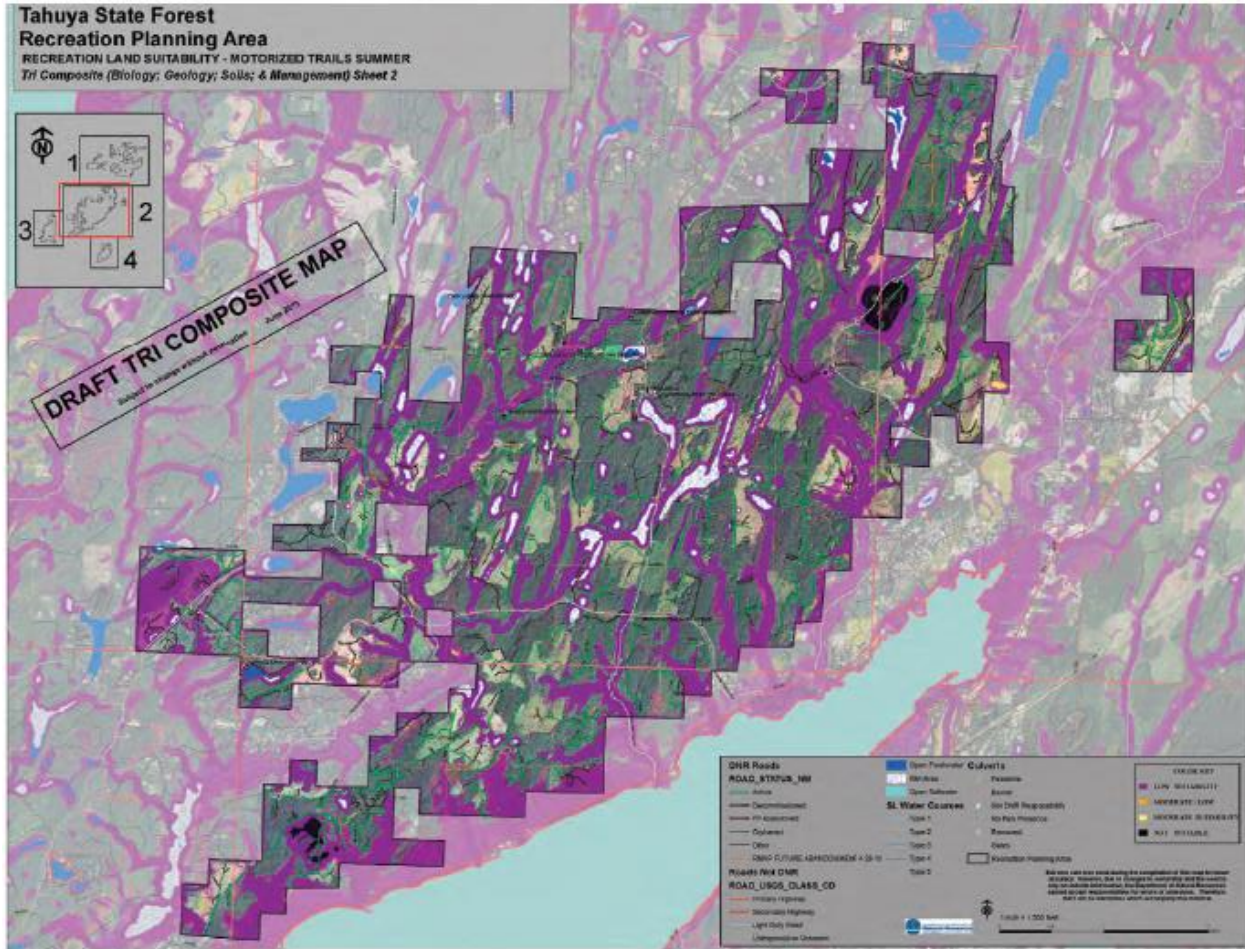


Figure 26: Composite Map Showing Areas of Low (Purple), Moderately Low (Orange), Moderate (Yellow), and No Suitability (Black) for Motorized Trail Development in Tahuya State Forest. Figure courtesy of Cyndi Comfort.

After a recreation plan is adopted, DNR begins work on implementation. Depending on the location and type of project, recreation staff may collaborate with other programs such as natural areas or timber sales to develop site-specific plans for individual projects. The Services and DNR’s HCP and Scientific Consultation section may be consulted to ensure that proposed projects are consistent with HCP objectives.

Annual Update

In calendar year 2017, DNR’s Recreation Program completed various projects statewide, many of which included trail maintenance to control erosion and reduce runoff to streams. DNR continued to work with numerous volunteer groups and Washington Conservation Corps (WCC) crews to develop new projects and improve existing recreation sites for public use. Highlights of this past year’s work are summarized below.

Development

Northwest Region

Blanchard Forest, Skagit County: DNR completed the construction of a 30-foot fiberglass bridge to reduce erosion of stream banks and sediment delivery to a stream. A WCC crew removed a failing puncheon trail structure over a wetland and re-routed 100 feet of trail around the wetland to reduce impacts. WCC crews and volunteers worked on a combined five miles of trail maintaining culverts, clearing ditches and drain dips, and installing dirt turnpikes to reduce soil erosion and minimize the impact of recreational use. DNR hosted a National Trails Day event in which over 60 participants cleaned up trailheads and the Samish Overlook Day Use site.

Harry Osborne Forest, Skagit County: DNR staff, WCC crews, and volunteers from the Skagit Back Country Horseman reconstructed 2,500 feet of the Firebreak trail to improve trail safety, harden trail tread, reduce soil erosion, and eliminate sediment delivery to a nearby creek. They also closed and decommissioned 500 feet of trail to reduce resource impacts and soil erosion. WCC and volunteers started work on trail reconstruction, trail tread hardening, and installing drainage features on the JR Trail which was impacted by a recent timber harvest. Volunteers organized several garbage clean up days in a rock pit and removed 40 cubic yards of garbage.

North Mountain Bike Trail System, Skagit County: DNR worked with the City of Darrington and the Evergreen Mountain Bike Alliance to plan, design, and begin construction on approximately ten miles of trail within the upper elevation area of the planned non-motorized trail system.

Reiter Foothills Forest, Snohomish County: DNR and WCC crews completed 0.6 miles of new motorcycle trail including the installation of flagging stones at or below the trail level in steeper areas to control erosion. One mile of shared ATV and motorcycle trail was completed, and 0.5 miles of a 4x4 trail was constructed that was primarily covered with large rock to minimize erosion and create a challenging rock crawler route.

Sumas Mountain Mainline Road, Whatcom County: Volunteers coordinated a one-day garbage cleanup that filled a 40 cubic yard dumpster.

Walker Valley ORV Area, Skagit County: The Recreation Program completed a variety of projects in Walker Valley in 2017, many in partnership with volunteers. These projects contribute to a more environmentally sustainable ORV trail system:

- Several thousand feet of trail maintenance was conducted to maintain and install water bars and diversion culverts that prevent sediment delivery to streams.
- A new replacement bridge was constructed on the Kim and Monica ORV trail to improve water quality and protect fish habitat (Figure 27).
- Volunteers collected approximately 2,000 pounds of garbage during the annual Hefty Haul event.
- An area of unauthorized 4x4 trail was blocked off and approximately 500



Figure 27: A WCC Crew Creates a New Bridge on the Kim and Monica ORV Trail in the Walker Valley. Photo courtesy of Jim Cahill.

boulder-sized rocks were installed over 800 feet of authorized adjacent trail to prevent soil loss.

- Public information signs were installed advising motor vehicle drivers not to drive in road ditch lines. The signs explain how damage to road infrastructure can impact water quality.
- Three new information kiosks were installed to post trail maps and user rules, including rules about staying on designated trails and out of wetlands.

Olympic Region

Lyre River Campground, Clallam County: DNR added 120 cubic yards of rock to improve roads, parking areas, and tent pad locations. These improvements to the campground are anticipated to reduce user impacts to nearby undeveloped areas. WCC crews worked for over a week to improve butterfly habitat on Kelly Peak by installing protection barriers, removing weeds, and closing non-designated trails.

Reade Hill Trailhead, Clallam County: DNR opened a new 4.2-mile non-motorized trail and trailhead outside of Forks. Plans for future improvements include interpretive signage explaining forest management activities on DNR managed lands.

Sadie Creek Trailhead, Clallam County: DNR finished construction on six new campsites at the Sadie Creek Trailhead including the installation of camping pads, fire pits, and picnic tables. As part of annual trail maintenance, DNR staff, WCC crews, and volunteers maintained 27 culverts, installed three new culverts, maintained 164 drain dips, and built 18 new drain dips. These efforts reduce sediment runoff from trails.

Olympic Region, All Counties: Volunteers donated approximately 554 hours throughout 2017 to assist on numerous projects. Work included hardening almost 1,600 feet of trail with ballast and surface rock to increase trail tread stability and reduce muddy areas. Volunteers also participated in several clean-up and trash removal events. Forest Watch volunteers spent over 167 hours removing trash at dispersed target-shooting sites. Over one ton of material was removed. Over 40 signs were installed in various locations to deter unauthorized recreational activities in environmentally sensitive areas. Existing kiosk signage was updated at designated trail systems to guide recreational use. Seven dispersed locations where illegal access was damaging trails, roads, and habitat were closed and blockaded.

Pacific Cascade Region

Radar Ridge State Forest, Pacific County: DNR built a new 20-foot bridge at the Snag Lake Campground and installed a new kiosk and 30-foot fiberglass bridge over Western Lake.

Siouxan Block, Clark and Skamania Counties: DNR installed two 15-foot bridges on the North Siouxan Trail.

Yacolt Burn State Forest, Clark County: The Recreation Program updated signage at the Rock Creek and Cold Creek campgrounds and at key trail junctions throughout the forest. Two sections of the Tarbell Trail were rerouted to protect seasonally wet areas and construction began on a new connector trail at the north end of the trail. An old trail connector to the Thrillium Trail was decommissioned after an alternative was created that protected seasonally wet areas and provided a better user experience. Approximately 0.75 miles of the Jones Creek Trail was regraded. Sixty feet of the Three Corner Rock trail was rerouted in order to provide better drainage. On the Hagen Creek motorized trail system, DNR built 3.5 miles of new 4x4 trail, four rock crawl obstacles, and two challenge slopes. Staff worked with volunteers to develop an additional 1.25 miles of 4x4 trail and 1.25 miles of ATV/single-track trail within the system. Bollards were installed on the single-track

trails to limit access to larger vehicles. In partnership with volunteers, DNR hosted the 15th annual “Pick up the Burn” garbage clean-up event. Three new concrete vault toilets were installed at busy trailheads.

Pacific Cascade Region, All Counties: DNR maintained approximately 18.3 miles of ATV trail, three miles of 4x4 trail, 55 miles of nonmotorized trail, and 16 facilities including campgrounds, trailheads, and day-use areas. DNR staff also conducted a region-wide bridge inventory. Additionally, 40 new fire rings and over 30 new picnic tables were installed at facilities.

South Puget Sound Region

Capitol Forest, Thurston and Grays Harbor Counties: DNR removed two culverts blocking fish passage and installed two fiberglass truss bridges, one of which rerouted a section of trail from a seasonally wet area. Two additional culverts were removed and replaced with I-beam bridges, and a 50-foot wood stringer bridge was replaced on a nonmotorized trail.

Elbe Hills, Pierce County: DNR laid out and started construction on a new connector trail in the equestrian trail system. The trail will create loops on the west side of the system helping to disperse use from the heavily impacted east end. Approximately 0.5 miles of the ADA equestrian trail was resurfaced. Two new parking lots were developed: one to support entry to Elbe Hills for trucks and trailers and one for ORV day use. DNR also hosted several volunteer events including two shooting pit cleanups and seven work parties in the ORV system that involved picking up trash along approximately 24 miles of forest roads and trails.

Middle Fork Snoqualmie NRCA, King County: DNR’s Recreation and Natural Areas programs coordinated to develop the new Granite Creek Trailhead that provides 43 vehicle parking spaces and a self-contained restroom facility. In addition, DNR completed approximately 0.5 miles of additional construction on the three-mile planned Dirty Harry’s Peak Trail reroute and installed a 30-foot trail bridge at the Mine Creek Day Use Site.

Mount Si NRCA, King County: DNR’s Recreation and Natural Areas programs worked together to develop the new Mount Teneriffe Trailhead, providing 118 vehicle parking spaces and a self-contained restroom facility. In addition, 1.4 miles of new trail and a new 80-foot trail bridge were developed to improve low-elevation trail system connections within the Mt. Si NRCA trail network.

Raging River State Forest, King County: Approximately eight miles of new trail was constructed to complete the 15-mile Phase 1 trail system development project set to officially open in the spring of 2018 (Figure 28).

Tahuya and Green Mountain State Forests, Mason and Kitsap County: In 2017, DNR closed and fenced off approximately 50 undesirable trail access points, guiding recreation to more appropriate areas. DNR also added 3.7 miles of 4x4 trail, including specialty features such as rock crawls. Work included removing several temporary culverts that were part of a timber sale and were no longer needed. One



Figure 28: New Trail Construction in the Raging River State Forest. Photo courtesy of Eryn Couch.

mile of geo-web and puncheons were added to raise trail grades to address seasonally wet areas. In addition, nine culverts were installed and two trails were rerouted to protect seasonally wet areas on the Davis Trail in Green Mountain State Forest for a road-to-trail conversion. The new culverts will reduce sediment delivery to seasonal streams. Improvements were also made to the upper parking area at Elfendahl pass including installation of vehicle barriers and new pipe under the parking area to direct water flow to the forest floor.

Tiger Mountain State Forest, King County: DNR completed 1.6 miles of new mountain biking trails, began constructing two miles of additional mountain biking trails in the eastern zone of the forest, and installed a fifty-foot trail bridge. Mountain bike trail design and maintenance is focused on minimizing runoff, sediment delivery, and avoiding wet areas.

Southeast Region

Ahtanum State Forest, Yakima County: DNR completed the relocation of the Tree Phones Campground that included extensive grading and compaction of seven campsites to improve drainage, installation of a culvert, and repair and cleaning of two others culverts. Barrier rock and log debris were placed near and adjacent to the Middle Fork Ahtanum Creek in the southern half of Tree Phones Campground to keep vehicles away from the creek. In Ahtanum Campground and Ahtanum Meadow Campground, campsites were regraded and regraded, and rock barriers were repositioned to protect adjacent streams from vehicle traffic and water runoff. Volunteers held four work parties removing trash from the South Fork, Middle Fork, and North Fork creeks. DNR also partnered with the Mid-Columbia Fisheries Enhancement Group to identify recreation sites with potential to improve stream habitat and water quality in the Ahtanum Watershed. This partnership will result in a cooperative effort to seek grant funding from the Washington State Recreation and Conservation Office.

Naneum Ridge State Forest and Wenas Block, Kittitas County: DNR hosted several volunteer work parties to remove trash along Green Dot roads. Under the Green Dot system, the DNR, WDFW, and private landowners manage roads that provide access for camping, hunting, wildlife viewing, and ATV and off-road vehicle riding, while protecting sensitive habitat from damage caused by motorized vehicles.

Planning and Design

Northwest Region

Baker to Bellingham Recreation Plan, Whatcom County: DNR staff continued work on the Baker to Bellingham recreation planning effort for DNR-managed lands in Whatcom County. DNR staff and the Recreation Advisory Committee met seven times during 2017. Key actions included refining suitability maps to reflect marbled murrelet conservation areas based on the [DEIS](#) and developing concept plans for recreational use.

South Puget Sound Region

Green Mountain State Forest, Kitsap County: DNR began community outreach for concept planning, design, and layout of new trail system connections within Green Mountain State Forest. DNR also began designing a renovated Green Mountain Summit Vista and a new access road trailhead with approximately 25 vehicle parking spaces.

Raging River State Forest, King County: DNR is moving forward with construction of a new Raging River State Forest Trailhead, which will provide approximately 90 vehicle parking spaces to improve access for visitors.

Tiger Mountain State Forest, King County: DNR continued work on the Tiger Summit Trailhead expansion project, which will provide approximately 150 vehicle and trailer parking spaces and improve access to hiking, equestrian, and mountain biking trails.

HCP Implementation Documentation

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 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.

Click [here](#) for documentation of consultations and other discussions from FY 2017.

Appendix A: Background

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

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 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.



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.

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)].

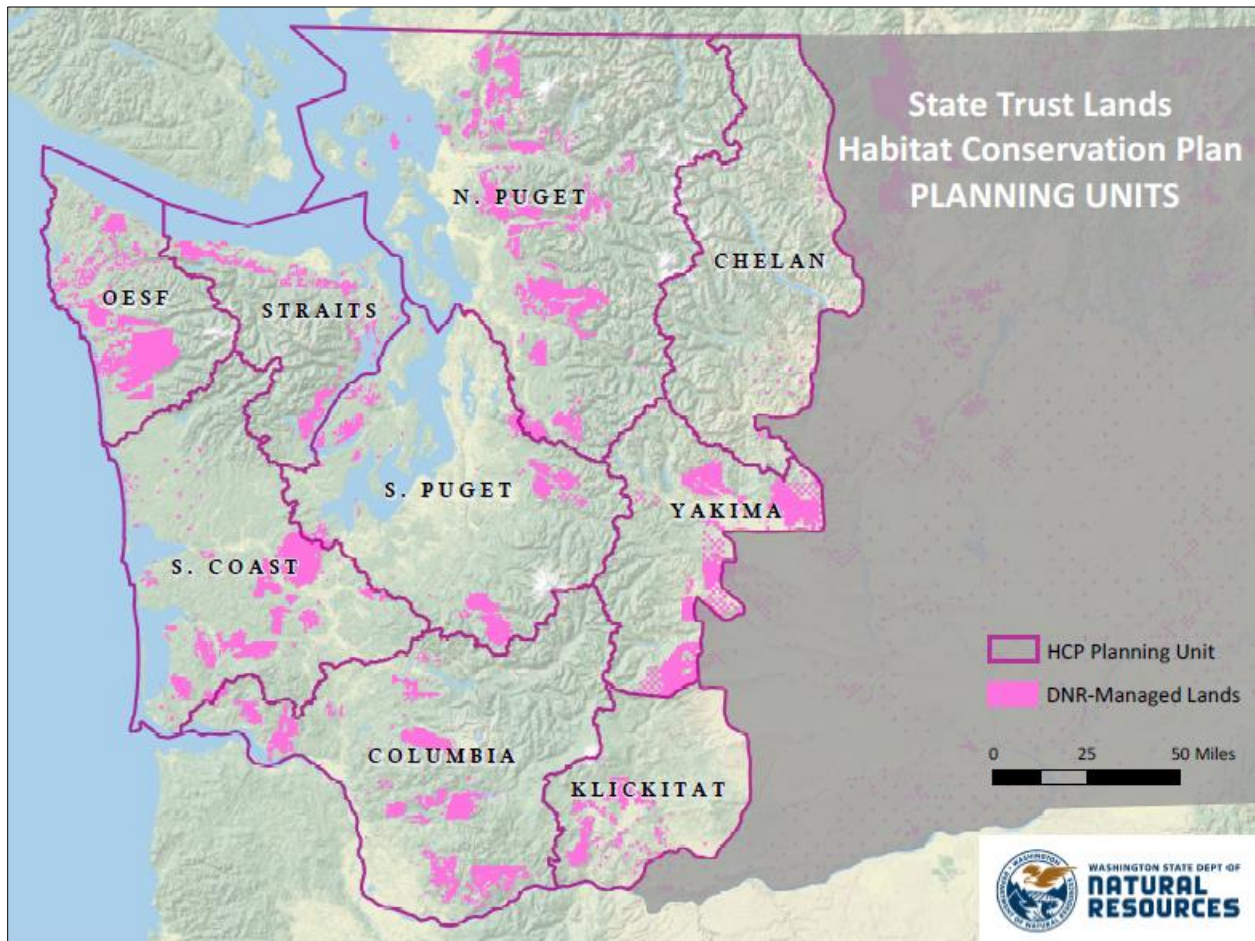
By meeting the terms of the HCP and incidental take permit, DNR fulfills its obligations under the ESA. In this way, the HCP and incidental take permit provide DNR the stability, certainty, and flexibility it needs to meet its fiduciary and ecological responsibilities as a trust lands manager to provide 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.

Lands Covered by the HCP

DNR manages approximately 2.4 million acres of forest land statewide. Of this amount, the HCP guides management of approximately 1.9 million acres of forest land 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).

Map A-1: HCP Planning Units.



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

DNR provides [GIS data for lands covered by the HCP](#). This data has been made available to allow for public analysis and to facilitate comparisons between DNR’s data on HCP lands and relevant GIS layers maintained by the Services.

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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 the comprehensive review by subject over the next few years, 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	Program
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

¹A comprehensive review was not completed for the FY 2015 report due to staffing levels.

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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.

Northern Spotted Owl Conservation Strategy

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).

- **Dispersal management areas:** Areas important for facilitating northern spotted owl dispersal (movement of young owls from nesting sites to new breeding sites).
- **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.

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.

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. For example:

- Within NRF management areas, DNR manages for NRF habitat. NRF habitat is primarily high-quality roosting and foraging habitat with enough interspersed nesting structure to allow the whole area to be utilized by reproducing owls.
- NRF habitat is composed of two habitat classes: high-quality habitat and sub-mature habitat. High-quality habitat includes high-quality nesting, Type A, and Type B habitats.
- The OESF contains two habitat classes: Old Forest and structural habitat. Old Forest includes Old Forest, high-quality nesting, Type A, and Type B habitats. Structural habitat includes both sub-mature and young forest marginal habitat types.

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 provides habitat classifications and types for each westside northern spotted owl management area, and Table A-3 includes the definitions of each habitat type as well as the data queries DNR uses to identify it.

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		High-quality habitat	High-quality nesting Type A Type B
		Sub-mature habitat	Sub-mature
Dispersal	All other westside planning units	Dispersal habitat	High-quality nesting High-quality habitat Type A Type B

Northern Spotted Owl Management Area		Habitat Class		Habitat Type
South Puget HCP Planning Unit only			Sub-mature habitat	Sub-mature
			Dispersal habitat	Young forest marginal Dispersal
	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
				Old Forest Habitat
		Structural habitat		
			High-quality habitat	
		Low quality habitat		

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

Habitat Type	Habitat Definitions (HCP p. IV.11 through 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 \geq 21" diameter class) \geq 31 trees per acre and (Live trees \geq 31" diameter class) \geq 15 trees per acre and
	At least 12 snags per acre larger than 21" dbh	(Snags \geq 21" diameter class and \geq 16' tall) \geq 12 trees per acre and
	A minimum of 70% canopy closure	(Relative density of live trees \geq 4" diameter class) \geq 48 and

Habitat Type	Habitat Definitions (HCP p. IV.11 through 12 and WAC 222-16-085)	Data Query Used to Interpret Habitat Definitions	
	A minimum of 5% ground cover of large woody debris	(Down wood \geq 4" diameter class) \geq 2,400 ft. ³ per acre	
	At least three of the 31 trees \geq 21" dbh have broken tops	Not in query	
Type A	A multi-layered, multispecies canopy dominated by large (\geq 30" dbh) overstory trees (typically 15–75 trees per acre)	(FVS-derived number of canopy layers) \geq 2 and (Primary species \geq 4 diameter class) $>$ 10% and (Primary species \geq 4 dbh) \leq 80% (multispec = yes) and (Live trees \geq 30" diameter class) \geq 15 trees per acre and \leq 75 trees per acre and	
	Greater than 70% canopy closure	(Relative density of live trees \geq 4" diameter class) \geq 48 and	
	More than two large snags per acre, 30" dbh or larger	(Snags \geq 30" diameter class and \geq 16' tall) \geq 2.5 trees per acre and	
	Large accumulations of fallen trees and other woody debris on the ground	(Down wood \geq 4" diameter class) \geq 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	
	Type B	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)	(FVS-derived number of canopy layers) \geq 2 and Primary species $>$ 10% and primary species \leq 80% (multispec = yes) and (Live trees \geq 20" diameter class) \geq 75 trees per acre and \leq 100 trees per acre and
		Greater than 70% canopy closure	(Relative density of live trees \geq 4" diameter class) \geq 48 and
Large (greater than 20" dbh) snags present		(Snags \geq 20" diameter class and \geq 16 ft. tall) \geq 1 tree per acre and	
Accumulations of fallen trees and other woody debris on the ground		(Down wood \geq 4" diameter class) \geq 2,400 ft. ³ per acre	

Habitat Type	Habitat Definitions (HCP p. IV.11 through 12 and WAC 222-16-085)	Data Query Used to Interpret Habitat Definitions
	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 \geq 4" diameter class) \geq 30% of all live trees per acre and
	At least 70% canopy closure	(Relative density of live trees \geq 4" diameter class) \geq 48 and
	Tree density between 115 and 280 trees greater than 4" dbh per acre	(Live trees \geq 4" diameter class) \geq 115 and \leq 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 \geq 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 \geq 15" diameter class and \geq 16 ft. tall) \geq 3 trees/acre and
	At least two canopy layers	(FVS-derived number of canopy layers) \geq 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 \geq 4" diameter class) \geq 30% of all live tree/acres and
	At least 70% canopy closure	(Relative density of live trees \geq 4" diameter class) \geq 48 and
	Tree density of between 115 and 280 trees greater than 4" dbh per acre	(Live trees \geq 4" diameter class) \geq 115 and \leq 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 \geq 20" diameter class and \geq 16 ft. tall) \geq 3 trees per acre and
	Minimum of 5% ground cover of large down woody debris	(Down wood \geq 4" diameter class) \geq 2,400 ft. ³ per acre

Habitat Type	Habitat Definitions (HCP p. IV.11 through 12 and WAC 222-16-085)	Data Query Used to Interpret Habitat Definitions
Young Forest Marginal (Same as Sub-Mature Except for Snag and Down Wood Requirements)	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 \geq 4" diameter class) \geq 30% of all live trees per acre and
	At least 70% canopy closure	(Relative density of live trees \geq 4"diameter class) \geq 48 and
	Tree density between 115 and 280 trees greater than 4" dbh per acre	(Live trees \geq 4" diameter class) \geq 115 and \leq 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 \geq 20" diameter class and \geq 16 ft. tall) \geq 2 trees per acre or (Down wood \geq 4" diameter class) \geq 4,800 ft. ³ per acre
Movement	Canopy closure at least 70%	(Relative density of live trees \geq 4" diameter class) \geq 48 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 \geq 4" diameter class) \geq 30% of all live trees per acre and
	Tree density no more than 280 trees per acre \geq 3; 5" dbh	(Live trees \geq 4" diameter class \leq 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	

Habitat Type	Habitat Definitions (HCP p. IV.11 through 12 and WAC 222-16-085)	Data Query Used to Interpret Habitat Definitions
Dispersal	Canopy cover at least 70%	(Relative density of live trees \geq 4" diameter class) \geq 48 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

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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 (sub-landscapes are used only in the Klickitat Planning unit and were defined through an [amendment to the HCP](#)).

The HCP's northern spotted owl conservation strategy involves maintaining thresholds of habitat in each SOMU.

- Most designated NRF and dispersal SOMUs have a 50 percent overall habitat threshold objective.
- For the OESF and South Puget HCP Planning Units, habitat thresholds are two-tiered or have two threshold objectives. For example, the OESF has a 40 percent overall habitat threshold objective. This threshold is further defined as restoring and maintaining at least 20 percent of each SOMU as Old Forest Habitat with the rest made up of structural or better habitat. In the South Puget HCP Planning Unit, dispersal management areas have an overall 50 percent 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. Refer to Table A-3 for habitat definitions.

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
		15%	Movement plus habitat	Sub-mature
			Young forest marginal	
			Movement	
All Other West-Side Planning Units	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		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.

Northern Spotted Owl Conservation in the OESF HCP Planning Unit

The HCP describes the management approach for the OESF as “unzoned,” in that no special zones are 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](#) that will guide management of over 270,000 acres of forest land 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 2009–2109, 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. As a result, percent habitat in LPUs documented in the FY 2017 HCP Annual Report changed compared to the FY 2016 report. A summary of changes is noted in Table A-5.

Table A-5: Change in Habitat Percentages in the OESF HCP Planning Unit Reported in the FY 2016 and FY 2017 HCP Annual Reports.

Landscape Planning Unit	2016			2017			Net Change		
	Old Forest	Structural Habitat	Percent Habitat	Old Forest	Structural Habitat	Percent Habitat	Old Forest	Structural Habitat	Percent Habitat
Clallam River	0.82	12.43	13.26	1.40	35.13	36.54	0.58	22.70	23.28
Copper Mine	14.58	4.14	18.72	14.51	6.49	21.00	-0.07	2.35	2.28
Dickodochtedar	8.57	15.64	24.21	8.91	23.17	32.08	0.34	7.53	7.87
Goodman Creek	16.81	8.78	25.59	17.34	19.61	36.95	0.53	10.83	11.36
Kalaloch	11.70	9.54	21.24	11.90	15.13	27.04	0.20	5.59	5.80
Queets	21.96	4.46	26.42	21.29	10.59	31.88	-0.67	6.13	5.46
Reade Hill	14.41	16.24	30.65	15.21	28.44	43.65	0.80	12.20	13.00
Sekiu	0.00	4.33	4.33	0.10	20.67	20.77	0.10	16.34	16.44
Upper Clearwater	25.85	3.64	29.50	25.90	6.93	32.83	0.05	3.29	3.33
Upper Sol Duc	1.02	11.78	12.80	1.77	29.29	31.07	0.75	17.51	18.27
Willy Huel	18.79	6.22	25.01	18.79	6.61	25.40	0.00	0.39	0.39

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Northern Spotted Owl Conservation in the Klickitat HCP 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 makes 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.

Northern Spotted Owl Habitat Data

DNR’s tracking and management of northern spotted owl data for westside HCP planning units and the OESF has evolved since the HCP was implemented. This section initially appeared in the *2013 State Trust Lands HCP Annual Report*.

In writing the HCP, DNR identified those lands that were most important to northern spotted owl conservation using age class. These lands were designated as northern spotted owl management areas. Three types of areas were identified in the HCP: nesting, roosting, and foraging (NRF) management areas; dispersal management areas; and the OESF.

The HCP’s northern spotted owl conservation strategy involves maintaining thresholds of habitat in each northern spotted owl management area or OESF landscape unit. Per the HCP, the spatial unit at which DNR would track habitat thresholds differed by HCP planning unit.

The HCP’s northern spotted owl conservation strategy involves maintaining thresholds of habitat in each northern spotted owl management area or OESF landscape unit. Per the HCP, the spatial unit at which DNR would track habitat thresholds differed by HCP planning unit.

- In most westside HCP planning units, DNR would maintain at least 50 percent of designated NRF and dispersal watershed administrative units (WAUs) as habitat.



Northern Spotted Owl.
Photo courtesy of USFWS.

- In the OESF HCP planning unit, DNR would maintain at least 40 percent of each landscape planning unit as habitat. (The OESF is divided into 11 landscape planning units, which are administrative areas designated primarily along watershed boundaries.)

To help DNR implement the northern spotted owl conservation strategy, the department developed an owl habitat spatial data layer using the best data available at that time. DNR used forest resource inventory system (FRIS) data to screen for habitat parameters and identified forest inventory units that were expected to meet HCP northern spotted habitat requirements.

The data layer was used to calculate the percentage of northern spotted owl habitat within each WAU. However, in this calculation DNR evaluated only the minimum habitat type for each NRF and dispersal management area (for example, sub-mature habitat for NRF and dispersal habitat for dispersal management areas). This process essentially missed higher-quality habitat and resulted in an erroneous (lower) habitat percentage for each WAU. This was a major shortcoming of the data layer.

In addition, WAU boundaries were originally based on the 1997 forest practices designation. Since that time, WAU boundaries have shifted based on new or more current hydrographic information. Managing multiple WAU layers for different HCP objectives became problematic (that is, DNR used one WAU layer for northern spotted owl management and another layer to manage hydrologic maturity). Also, the owl habitat data layer was not corrected for any timber sales until 2002, when DNR's Forest Resources Inventory Program implemented a system to model growth and activity updates of the sample inventory.

With the completion of the 2004 sustainable harvest calculation (*Final EIS on Alternatives for Sustainable Forest Management of State Trust Lands in Western Washington and for Determining the Sustainable Harvest Level, July 2004*), the onset of forest land planning, and the implementation of a new northern spotted owl procedure (PR 14-004-120, September 2004), the Forest Resources Inventory Program initiated development of an improved, detailed dataset for northern spotted owl habitat in western Washington. For this northern spotted owl dataset (2004 dataset), DNR used model-grown data that was updated from a 2004 inventory dataset and sample inventory. The 2004 dataset identified all northern spotted owl habitat types in western Washington as determined by a hierarchical assessment. When forest stands met multiple habitat types, DNR assigned them the highest quality habitat type and corresponding habitat code. Any given area had to meet each of multiple parameter thresholds in order to be identified as a specific habitat type (see [habitat types and definitions](#)).

However, before the 2004 dataset could be fully implemented as a core dataset, DNR entered into the 2006 Settlement Agreement (*Washington Environmental Council, et al v. Sutherland, et al (King County Superior court No. 04-2-26461-8SEA, vacated April 7, 2006)*). As a result of this agreement:

- DNR designated a fourth type of owl management area, called an "owl area." Owl areas are those areas which 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 Standard Practice Memorandum SPM 03-07 (*Management of Northern Spotted Owl Circles And The Identification Of Northern Spotted Owl Habitat In Southwest Washington*). Owl areas do not include any areas within NRF or dispersal management areas or the OESF.
- DNR used the 2004 dataset, along with maps and acreage summaries, to re-delineate northern spotted owl habitat in all northern spotted owl management areas in western Washington,

including the new owl areas. The 2004 dataset was renamed the Settlement Agreement habitat layer.

- For the OESF, DNR included non-FRIS identified older forest stands in the Settlement Agreement habitat layer as “Old Forest.” These stands had been identified through a field and map review and approval process.

Around this time, DNR obtained a concurrence letter from USFWS allowing the WAU boundaries used for habitat thresholds to be modified slightly and renamed as spotted owl management units (SOMUs) to distinguish them from WAUs. A spatial layer was created displaying SOMU boundaries. This SOMU layer contained a table showing the percent of habitat for NRF and dispersal management areas using the habitat categories in the Settlement Agreement habitat layer. The SOMU layer also displays habitat percentages in the 11 landscape planning units of the OESF.

Also around this time, DNR compared the method used to evaluate each habitat parameter for the 2004 dataset and for the Settlement Agreement habitat layer. With a few exceptions, it became apparent that most habitat parameters were evaluated in the same way. DNR also recognized the importance of updating and maintaining the Settlement Agreement habitat layer in an accurate and current status.

Between 2007 and 2009, DNR held conversations with the settlement partner representatives to negotiate the best way to update the Settlement Agreement habitat layer and habitat maps outlined in section 1.D.1 of the Settlement Agreement. From those discussions, it was concluded that DNR would update the Settlement Agreement habitat layer (renamed the NSO habitat layer) as needed to respond to information accuracy triggers and would consult with settlement partner representatives and the Services, should updates be required due to habitat-based triggers. Information accuracy triggers are day-to-day operational updates that need to take place in order for the maps to reflect accurate on-the-ground conditions (for example, timber harvest events, new or updated inventory, data clarification, next best designations, land transactions, and resolved settlement agreement items). Habitat-based triggers are those updates involving habitat type changes that require consultation and/or approval from the settlement partners and the Services (for example, re-designation of northern spotted owl management areas and habitat definition adjustments).

Currently, DNR uses the NSO habitat layer to track acres of both habitat and non-habitat within northern spotted owl management areas. Per the agreement, DNR updates this layer regularly to reflect accurate on-the-ground conditions (information accuracy triggers).

Age Class versus Structure

Estimates of current and future northern spotted owl habitat have evolved over time. Initially, the HCP used age-class distribution as a surrogate for habitat, acknowledging that age-class does not necessarily equate to habitat (p. IV.29). Table IV.16 in the “Forest Management Activities” section of the HCP (p. IV.212) provides an estimate of the number of acres of habitat expected to develop on state trust lands managed under the HCP in westside planning units including the OESF at the end of the first decade, based on age class. Table IV.16 from the HCP has been reproduced below.

Table A-6: Estimated amount of habitat on DNR-Managed lands in the area covered by the HCP at the end of the first decade of the HCP.

Type of Habitat	Eastside Planning Units	Westside Planning Units	OESF Planning Unit
Dispersal	34,000	58,000	N/A

NRF¹	25,000	66,000	56,000
Riparian	N/A	23,000	10,000

¹ NRF habitat, not to be confused with NRF management areas; refer to p. IV.88 in the HCP and Hanson et al 1993.

Since the HCP was adopted, DNR has transitioned to northern spotted owl habitat definitions that are based on forest structure (rather than age class) because forest structure is a more effective way to define habitat. For example, it is difficult to predict the development of forest structures such as down wood or snags through age class alone. DNR has also, through planning processes such as development of the South Puget HCP Planning Unit Forest Land Plan, adjusted habitat definitions to better reflect the owls' needs in particular areas. Because of these changes, and because DNR is no longer using age class as a surrogate for habitat, it is not possible to directly compare NSO habitat estimates from 1997 (Table IV.16 in the HCP) to current estimates. The most appropriate and accurate way to capture current acreages is to report habitat within northern spotted owl management areas at a particular point in time. Estimates as of August 28, 2013 are presented in Table A-7.

Table A-7: Estimated Number of Acres of Habitat and Non-Habitat in NSO Management Areas in Westside and OESF HCP Planning Units as of 8/28/2013.

Northern spotted owl (NSO) management area		Habitat class	Habitat type ¹	Habitat acres	Non-habitat acres	Unknown acres ²	Next best acres ³	Total NSO mgmt. area acres	
NRF		NRF habitat	High-quality habitat	High-quality nesting	0	64,582	12,750	69,492	166,132
			Type A	1,122					
			Type B	150					
		Sub-mature habitat	Sub-mature	18,036					
Dispersal	All west-side planning units other than South Puget HCP Planning Unit	Dispersal habitat	High-quality habitat	High-quality nesting	0	18,832	1,674	2,919	125,245
			Type A	74					
			Type B	0					
		Sub-mature habitat	Sub-mature	4,064					
		Dispersal habitat	Young forest marginal	3,751					
		Dispersal	15,892						
	South Puget HCP Planning Unit	Dispersal habitat	Movement, roosting, and foraging (MoRF) plus habitat	High-quality nesting	0	31,410	7,152	19,671	
				Type A	522				
				Type B	107				
			MoRF	2,097					
		Sub-mature	461						

Northern spotted owl (NSO) management area		Habitat class		Habitat type ¹	Habitat acres	Non-habitat acres	Unknown acres ²	Next best acres ³	Total NSO mgmt. area acres
		Movement plus habitat	Young forest marginal	3,075					
			Movement	13,546					
OESF		Old Forest	Old Forest	40,085	199,839		9,513	n/a	271,867
			High-quality nesting	8					
			Type A	541					
			Type B	99					
		Structural habitat	Sub-mature	7,486					
			Young forest marginal	14,297					
Owl area		High-quality habitat	High-quality nesting	0	87,421		5,378	n/a	97,860
			Type A	2					
			Type B	0					
		Low quality habitat	Sub-mature	536					
			Young forest marginal	4,523					

¹ Definitions of northern spotted owl habitat types can be found in the Northern Spotted Owl Conservation Strategy background section.

² Unknown stands are stands containing insufficient FRIS information to query and classify the stand. Any unknown stands greater than 25 years of age must have a FRIS inventory conducted to adequately classify it prior to any harvest activity. Once a new inventory is completed for the stand, it will be updated according to the new/updated inventory trigger and subsequent habitat classification. Stand ages are based upon the current FRIS origin date and are assessed at each layer update.

³ Next best stands are those non-habitat or unknown stands that have been identified as most likely to meet a northern spotted owl habitat classification in the shortest possible time, with or without silvicultural treatment.

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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-fall to the stream when they are alive and large woody debris to the stream channel 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 three-year RFRS implementation period beginning in 2009, thinning in stands 70 years of age or older was addressed on a site-specific basis with the Services. This restriction was lifted in 2012 through a [joint concurrence letter](#) signed by DNR and the Services.

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.

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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.

Following extensive research and input from an independent science team, DNR now has enough information to develop a long-term strategy. Although previously delayed by budgetary and staffing shortfalls, development of the long-term conservation strategy resumed as a top agency priority.

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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.

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.

Adaptive Management and the Conservation Strategies

New scientific developments and information obtained through research and monitoring can identify changes in 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, scientifically based adaptive management process that allows for continual improvement of its implementation. The adaptive management process includes the following tasks:

- Set research priorities
- Manage research projects
- Review results
- Make changes to DNR's forest management practices
- Monitor management activities to help inform needs

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 is focused on activities in the OESF. Unlike the state-wide 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.

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Marbled Murrelet Nest

Marbled murrelets nest on large limbs covered with moss or other natural substances that create a relatively flat platform. Their nests are usually in mature or old conifer forests. Photo courtesy of Tom Bloxton.

Monitoring, Research and Adaptive Management

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 owls, marbled murrelets, and other species addressed by the HCP and how they are affected by land management. 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 DNR's management.

The HCP's adaptive management process allows changes to DNR's forest management 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.

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.

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.

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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 VDTs to improve 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.

The first component was initiated in 2004–2007 across five VDTs 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) Planning Units. These five timber sales were designed to maintain or accelerate the development of structural NSO habitat in stands ranging from approximately 50 to 80 years old. The study design includes two or three replications of treated stands and one untreated control stand at each site. All stands were measured prior to treatment and again immediately after treatment. This process will allow DNR to observe how the trajectories of stand development differ between thinned and unthinned stands and evaluate these findings against the habitat definitions described in the HCP (p. IV.22). Consistent with the monitoring objectives in the HCP (p. V.2), DNR's intent is to track habitat conditions in these treatments at approximately five-year intervals over the life of the HCP.

The second component of the NSO Effectiveness Monitoring Program is a landscape-scale assessment of HCP effectiveness for NSO habitat across all westside HCP lands. The objective is to determine whether broad-scale trends in basic habitat features such as tree height, mean tree size, and canopy layering meet HCP goals. To accomplish this, DNR is using Gradient Nearest Neighbor (GNN) data, a regional data set produced by the U. S. Forest Service (USFS) that covers all

forestland in all Pacific Coast states. GNN data map the distribution of vegetative characteristics across the landscape, and despite limitations at the single-pixel or small-stand scale, it is sufficiently accurate for assessments over broad spatial extents. GNN also provides an independent, quantitative dataset back to 1984, affording a look at both pre-HCP and post-HCP trends. Of particular interest is whether SOMUs are showing different trends than other non-DNR-managed lands.

The first related research project is being conducted in the Olympic Experimental State Forest (OESF) with a focus on silvicultural gap treatments. Much of the managed landscape is regrowing after past harvests and is in a relatively uniform stage of competitive exclusion with simple canopy structure. DNR has been creating gaps within VDTs to introduce structural heterogeneity to encourage variable light environments; greater canopy complexity; multiple canopy layers; and specific habitat features such as crown expansion, branch platforms, and deadwood. Recently acquired LiDAR data for the OESF will be used to analyze effects on canopy complexity relative to thinned stands without gaps, unthinned second growth, and older forest habitats.

The second research project aims to develop innovative approaches for using spatial structure analysis to create higher-quality habitat in managed second-growth forests. Current habitat definitions are based on the relatively simple presence or abundance of certain structural features (such as large trees and snags), but they do not capture the fine-scale spatial structure of older forests that function as habitat, such as the arrangement of large and small trees that determines cover, flyways, and prey distribution for forest raptors such as NSOs. 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 VDT treatments. Methodologies to evaluate these patterns will include field stem-mapping as well as analysis of LiDAR data in a series of old forest sites, unthinned second growth, and recently thinned second growth (using other monitored stands described above in the first two components). This project is being conducted in partial collaboration with University of Washington forest scientists. Stem-mapping has begun in monitoring sites, and DNR is currently identifying candidate old forest reference stands.

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. Nine habitat attributes such as 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 to 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.

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.

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Validation Monitoring

The HCP requires that DNR conduct riparian validation monitoring across the conglomeration of state managed lands on the western portion of the Olympic Peninsula known as the Olympic Experimental State Forest (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.

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OESF Research and Monitoring Program

The OESF is unique among HCP planning units in both management and purpose. This working forest is managed under an experimental approach called “integrated management”. Rather than dividing the land base into one area for harvest and another for ecological values, DNR manages the entire land base for both. This is achieved through innovative silviculture, landscape-level planning, intentional learning, effective information management, communication, and application of new knowledge into operations (i.e. adaptive management). The OESF was founded to implement and learn from this experimental approach. New knowledge is applied to continually improve land management practices on state lands 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 long-term vision for the OESF is a productive, resilient, and biologically diverse commercial forest in which both revenue generation for trust beneficiaries and ecological values are maintained through integrated management. The OESF Research and Monitoring Program helps achieve this vision by implementing and coordinating research and monitoring projects; establishing and maintaining research partnerships; managing research and monitoring information; linking management activities and new knowledge through a structured adaptive management process; and fostering communication, outreach, and education.

Past and Current Research and Monitoring in the OESF

Silviculture and fish research has been conducted on state trust lands on the western Olympic Peninsula since the 1970s. After the designation of the OESF in 1992, the research and monitoring activities intensified and broadened to cover forest and wildlife ecology, geology, and riparian management among other topics. The majority of the past research and monitoring activities are listed in the OESF [Research and Monitoring Catalog](#), published by DNR in 2008. More information on [recently completed](#) and [ongoing](#) 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.

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 visibility nationwide.
- A memorandum of understanding between DNR, University of Washington Olympic Natural Resources Center, 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.

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 and stores all scientific and administrative documents on projects implementation. The database is available on DNR's intranet and is linked to DNR's state-wide GIS layer on research areas.

The OESF Research and Monitoring Program is currently supplying environmental data to two online databases:

- Stream temperature data from 50 sites in the OESF and four sites in the Olympic National Park are available at the [NorWeST webpage](#).
- Air temperature and precipitation data from the local NOAA stations and stream discharge data from the local USGS stations are available at the [CLIMDB/HYDRODB webpage](#).

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

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.

Communication, Outreach and Education

Through effective communication, DNR builds public confidence in the sustainability of forest management practices in the OESF 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 [Olympic Natural Resources Center](#)) to share scientific knowledge on sustainable land management on the Olympic Peninsula. The program also organizes an annual science conference 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. Several pages on [DNR’s website](#) contain information about the OESF, ongoing research and monitoring projects, news, and recent publications.

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.

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Silvicultural Activities

Silviculture is the art and science of managing forests to meet objectives. Through silviculture, DNR works with the number, size, species, and spacing of trees in the forest to provide both quality timber for harvest and ecological values including habitat for threatened and endangered species, healthy watersheds, biodiversity, and resiliency to disease and insects.

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 will accomplish them (activities) in a forest management unit over an entire rotation. A forest management unit is an 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.

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 rotation objectives.

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 reassess it to ensure it is on track to meet its objectives.

Tracking Silvicultural Activities

Since the early 1990s, information about planned and implemented silvicultural activities on state lands has been stored in DNR’s P&T database. This database, which has supplied silvicultural information for all HCP Annual Reports written to date, summarizes acres of activities across all state trust lands managed under the HCP. In the fall of 2017, DNR upgraded its forest management tracking systems from P&T to new software called Land Resource Manager (LRM). DNR staff migrated much of the tabular data and activity tracking workflow from P&T into LRM’s more modern interface. LRM also allows DNR to more accurately track the spatial boundaries of silviculture activities using a built-in geographic information system (GIS). Beginning in the FY 2018 HCP Annual Report, silvicultural activity data will be supplied by LRM.

The number of acres of activities DNR reports each year may be different than what actually took place on the ground during that year. These discrepancies are caused by differences in each DNR region’s procedure for recording activities in P&T. (This will also be the case in LRM.) For example, some regions may wait to record individual activities until a sequence of activities is completed. If so, activities completed one year may not be entered into the tracking database until a subsequent year. This is especially true for timber harvests. Most timber sales have multiple units and it is common for individual units to be completed in different fiscal years. Foresters usually do not report a unit as complete in the database until all road abandonment and logging debris cleanup has occurred, which typically happens for an individual sale after all units are harvested. However, when harvesting in a unit is completed in an earlier fiscal year than road abandonment and cleanup, P&T will reflect the earlier year because harvesting is considered more reflective of the overall activity.

Significant increases or decreases in timber harvest volumes will usually be followed by corresponding decreases or increases in the overall 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, 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.

Descriptions of Silvicultural Activities

Timber Harvest

DNR separately tracks and reports on 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 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 ten 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.
- **Temporary retention first cut:** This is a partial-cut timber harvest in which selected overstory trees are left for a portion of the next rotation. The purpose of this harvest method is to retain overstory trees without diminishing establishment of a new stand. These overstory trees can be removed through a temporary retention removal cut, or they can be left through the entire rotation, potentially resulting in a two-aged stand.
- **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



A Variable Density Thinning in the OESF

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 clearcut, in which all or nearly all of the existing stand is removed.
- **Clearcut:** According to Washington forest practices rules, a clearcut is a harvest method in which the entire stand of trees is removed in one timber harvesting operation. In the 1990s, DNR began doing variable retention harvest instead of clearcuts on the majority of its timber sales. However, between the adoption of the HCP in 1997 and fiscal year 2008, variable retention harvests were still reported as clearcuts even though the vast majority of those harvests met the definition of variable retention harvest. From 2009 on, very few acres have been reported as clearcuts.

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.

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.

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.

Pre-Commercial Thinning

During a pre-commercial thinning, DNR removes the less-desirable trees to maintain the growth and stability of the retained trees. Pre-commercial thinnings 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.

Pre-commercial thinning 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. Pre-commercial thinning 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, pre-commercial thinning

improves height-to-diameter ratios, a measure of stem stability, reducing risk of windthrow or stem buckling if partial cutting treatments are applied.

Pre-commercial thinning 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.

Other Silviculture Activities

Other silvicultural activities that DNR conducts less frequently include creating and selling biomass piles, applying fertilizer, and installing shielding and fencing. Piling excess woody material is a common practice during timber harvest to prepare the site for subsequent regeneration activities. In certain circumstances, the excess biomass in these piles is sold and removed from the site.

Fertilization is the practice of applying chemical fertilizer to the base of young or mature trees to induce additional growth that the site's growing conditions would otherwise not allow. Shielding and fencing involves placing plastic tubes or fences around seedlings and young trees in order to protect them from ungulate browse. This practice is most commonly applied to high-value species such as western red cedar that are preferentially browsed by ungulates.

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Non-Timber Management Activities

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, which can potentially harm salmon and other aquatic and riparian-obligate species. Current road-building and maintenance practices create better roads that minimize damage while also allowing DNR to abandon or improve poorly built roads.

In 2001, Washington's state forest practices rules were updated to reflect "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 with the potential for a 5-year extension to 2021, if needed and approved by Forest Practices. DNR completed a full stream-crossing assessment in 2001 and a road assessment for all forested state trust lands in 2006. DNR completed the majority of the RMAP work by the original October 2016 deadline. For the remaining work, DNR applied for and received an RMAP extension on 171 miles of road and 37 fish barriers through 2021.

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, upgrading, 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 on 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).

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Easements and Road Use Permits

DNR generally 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.



DNR Staff Reviewing a Proposed Easement

Photo courtesy of Kaerlek Janislampi.

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 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. Easement mapping under the REGIS and Spatial Nature projects will help to address this issue.

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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 make them whole.

Land transactions can 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.

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 the appropriate spotted owl management role for each parcel as well as any potential roles each parcel may have 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, rather than for income production. These lands may be candidates for the [Trust Land Transfer \(TLT\) Program](#), which applies only to Common School trust lands, or the State Forest Trust (SFT) Land Replacement Program, which applies only to State Forest trust lands. Through the TLT Program, DNR transfers state trust lands to WDFW, the State Parks and Recreation Commission, county governments, city governments, or the Natural Areas Program. The value of the unharvested timber 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 that are 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 unharvested timber 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.

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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 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.

Habitat for Listed, Candidate, and Sensitive Species

Statewide, Washington's natural areas protect over 161,000 acres in 56 NAPs and 37 NRCAs. More than 123,000 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 56 special status species. This total includes 78,300 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*) (determined in 2011 to be 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 Mountain checker-mallow (*Sidalcea oregana* var. *calva*); the only Washington population of Bradshaw's lomatium (*Lomatium bradshawii*); 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



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.

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, and others) identified in the HCP. Examples include butterflies like the Valley silverspot (*Speyeria zerene bremnerii*) and Puget blue (*Icaricia icarioides blackmorei*) that are associated with prairie habitat, 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.

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.

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.

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 had 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 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.

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 near-shore habitats at Stavis, Cypress Island, and Woodard Bay NRCAs by removing bulkheads, fill, and creosote-treated structures.

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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 promotes 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 are selectively granted to prevent habitat degradation.

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Oil and Gas Leases

Oil and gas exploration leases allow a lessee to reserve the right to explore for underground deposits. With a DNR-approved plan of operations and the proper drill permit, the lessee has the sole and exclusive right to explore for, drill, extract, or remove oil and gas. However, any proposed on-the-ground activities must undergo State Environmental Policy Act (SEPA) review and have a plan of operations, which must be approved by DNR.

If the lessee wants to actively drill or thump (measure seismological tremors caused by the dropping of large weights or detonation of explosives), the lessee must obtain an “active” lease, which also includes acquiring a drilling permit. Regulations exist to protect water and air quality, and any exploration holes must be plugged following use. Any new permits are subject to SEPA review. 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.

Prospecting Leases and Mining Contracts

Like oil and gas leases, prospecting and mining leases are exploration agreements that allow a lessee to search for mineral deposits. A lease must be converted to a 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. 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.

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 must be met, such as turnout and removal dates and the number of animals allowed on the range. Leases cover smaller areas than permits, and they include a resource management plan. These leases can allow grazing at any time during the year, as long as guidelines in the plan are followed.

Land transactions, including large-scale exchanges can influence which lands will be managed under the HCP and where grazing will be allowed.

Communication Site Leases

Communication site leases allow private and public entities to build new towers or attach communication equipment to existing towers (for example, cell phone 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.

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.

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Valuable Materials Sales

Rock, sand, and gravel (valuable materials) sales from commercial pits are handled under special sale contracts. Most of DNR’s active commercial pits are not in forested areas. Generally, the few commercial contracts DNR maintains on forested trust lands are small sales from silvicultural pits (pits used primarily for construction of forest roads).

The number of silvicultural pits and inactive commercial pits was not tracked until fiscal year 2003, when DNR initiated an inventory of all such pits. Since the initial inventory, changes—such as abandoning pits or creating new ones—have not been consistently tracked.

Early in the implementation of the HCP, DNR had a substantial number of rock, sand, and gravel sales. Since then, that number has decreased. This primarily is due to two factors: (1) the lengthy contract-development process, including requirements for more valuable or long-term contracts to be reviewed and approved by the Board of Natural Resources; and (2) periodic changes to keep contracts alive regardless of whether or not there were removals. Most rock, sand, and gravel sales are now from private pits, which have fewer time and procedural constraints. Direct sales are one-time agreements that remove only small amounts of a resource (a maximum of \$25,000 in value) and do not require Board of Natural Resources approval. Other (non-direct) sales are active for longer periods and/or have larger maximum removal value limits.

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Recreation Sites

Recreation sites allow public recreation on forested state trust lands as long as it is compatible with state laws and the objectives of the *Policy for Sustainable Forests* and the HCP. Sanctioned recreational activities on state trust lands include hiking, biking, horseback riding, off-road vehicle use, hunting, fishing, gathering, and camping. DNR's vision statement for recreation and public access is to "Manage public and trust lands in a manner that provides quality, safe recreational experiences that are sustainable and consistent with DNR's environmental, financial and social responsibilities." DNR is developing recreation plans for many of the areas it manages. Plans are developed with extensive involvement of local recreation groups and the public, many of whom also volunteer to help maintain recreation sites.

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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.

Activity objective: A measurable and possibly transient condition sought at the conclusion of an activity, such as a certain number of trees left following a timber harvest to serve as habitat and a seed source.

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.

Aerial pesticide: Application of an insecticide or other pesticide from a helicopter or airplane.

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.

Animal repellent: Chemicals or other products applied to discourage animals from damaging seedlings.

B

Biosolids: The nutrient-rich organic materials resulting from the treatment of sewage sludge. When properly treated and processed in a sewage treatment facility, biosolids can be safely applied as fertilizer to maintain productive soil and stimulate tree growth.

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

Broadcast burn: Allowing prescribed fire to burn over a designated area to achieve site preparation or vegetation management objectives.

C

Clearcut: According to Washington forest practices rules, a clearcut is a harvest method in which the entire stand of trees is removed in one timber harvesting operation. In the 1990s, DNR began doing variable retention harvest instead of clearcuts on the majority of its timber sales. However, between the adoption of the State Trust Lands Habitat Conservation Plan in 1997 and fiscal year 2008, variable retention harvests were still being reported as clearcuts even though the majority of those harvests met the definition for variable retention harvest. Since 2009, few acres have been reported as clearcuts.

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.

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.

Demography: The study of populations or communities, including births, deaths, movement, and distribution.

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.

Ecoregion: An area with generally similar ecosystems and types, quality, and quantities of environmental resources. It is designed to provide a spatial framework for research and monitoring of ecosystems and their components.

Effectiveness monitoring: For the State Trust Lands Habitat Conservation Plan, a system used to determine whether or not a management plan and its specific strategies are producing the desired habitat conditions.

Endemic: A species that is a native of, prevalent in, or confined to a specific region.

Equestrian highline: A rope stretched taut between two secure uprights above the animal’s head. The stretched rope has tie loops spaced for securing horses or other stock with lead ropes. Sturdy trees are used as anchors for highlines. When trees are not available, posts set in concrete may serve as uprights.

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 clearcut, seed tree, variable retention harvest, and shelterwood.

F

Fencing: See shielding

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.

First order stream: A stream that does not have any other streams intersecting or feeding into it.

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

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 practice: Any activity conducted on or directly pertaining to forestland and relating to growing, harvesting, or processing timber or forest biomass, including but not limited to road and trail construction, harvesting (final and intermediate), pre-commercial thinning, reforestation, fertilization, prevention and suppression of diseases and insects, tree salvage, and brush control.

Forest Practices: The administrative branch of DNR responsible for regulating forest-practice 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) which 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 hand-held 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: A form of monitoring that determines whether or not a management plan (for example, the State Trust Lands Habitat Conservation Plan) or its components are implemented as written.

Inholding: A parcel of land owned by one party that is entirely surrounded by another ownership. In terms of DNR land transactions, private land surrounded by state-owned property.

L

Landslide hazard zonation: A screening tool in which watershed-scale maps are created that show and describe all areas of potentially unstable slopes in a watershed as well as potential mitigation measures to minimize damage.

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.

Late-rotation thinning (or, older-stand thinning): A partial-cut timber harvest that extends the rotation age of a stand, generally to more than 80 years, or achieves a visual or habitat objective that requires larger trees. Stands eligible for late-rotation thinning are typically 45 to 70 years old and contain a diversity of tree sizes.

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

Marbled murrelet management area: Proposed areas managed to protect occupied sites and develop future marbled murrelet habitat in areas that are not occupied.

Multiple-pass removal: A field sampling method used to estimate fish populations in a stream. This method 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. See also **Pool-only sampling**.

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 resource conservation area: A state-designated area managed to protect an out-standing example of a native ecosystem or natural feature; habitat for endangered, threatened, or sensitive species; or a scenic landscape.

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.

Non-commercial pit: Also called a "silvicultural pit." A rock, sand, or gravel pit primarily used to supply materials for DNR's silviculture-related activities, primarily building forest roads and logging landings.

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.

Overstory: The upper canopy in a multi-canopy stand.

P

Pest management: Treatments or management decisions designed to prevent pest populations from reaching levels that present an unacceptable risk of damage to forest stands.

Phased patch regeneration cut: An even-age timber harvest method using small patch cuts (one to five acres) to progressively harvest and regenerate a single stand over a period of up to 15 years. Several separate patches are simultaneously harvested within a forest management unit. After an adequate green-up period (five to ten years), additional patches are harvested and the process is repeated until the forest management unit is completely harvested.

File and burn: A process where logging slash is placed in piles, generally using mechanized equipment, and the piles are burned under controlled conditions.

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.

Pool-only sampling: A field sampling method used to assess fish populations in a stream. In this method, a backpack electrofisher is used in pool habitat (slow-moving, smooth water areas that are usually deep compared to other parts of the channel) to temporarily disable fish which are then captured, measured, and released. Sampling does not occur in other types of habitat in the stream. See also **Multiple-pass removal**.

Pre-commercial thinning: Removal of less desirable trees to maintain the growth and stability of retained trees. Pre-commercial thinning is 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.

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

Radio telemetry: A tracking system in which wildlife are outfitted with collars that transmit individual signals that can be monitored to track their movement.

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:

3. **Marginal habitat:** Those lands expected to contain a maximum of five 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.
4. **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 DNR document 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 by establishing young trees through natural seeding or planting sites—usually those 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 United States Forest Service biometrician who developed the measure.

Repositioning: A land transaction process in which DNR exchanges, sells, or transfers state trust land, using the proceeds to acquire more suitable property for the affected trust(s). Repositioning occurs on lands that do not fit with management strategies or that are not appropriate for long-term revenue production for the trusts.

Riparian desired future condition: In the Riparian Forest Management 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 ten 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 (selective cutting): 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.

Shielding: Using a physical barrier to prevent animals from entering an area and damaging trees or other resources.

Silvicultural pit: Also called a non-commercial pit. A rock, sand, or gravel pit primarily used for construction of DNR forest roads and timber sale landings. DNR sometimes sells valuable materials (rock, sand, or gravel) from silvicultural pits through a one-time direct sale (a sale with a value of no more than \$25,000). Silvicultural pits are distinct from commercial pits, from which DNR sells rock, sand or gravel through direct sales or longer-term leases.

Silvicultural regime: The specific sequence of activities defined in a silvicultural prescription.

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 delimiting.

Smallwood thinning: A partial-cut timber harvest in young stands (typically less than 40 years of age) that maintains or enhances the stand's growth potential and improves the quality of the remaining trees.

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, often best described as “miscellaneous” 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).

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's normal behavior.

Temporary retention first cut: A partial-cut timber harvest in which selected overstory trees are left for a portion of the next rotation. The purpose of this harvest method is to retain overstory trees without diminishing establishment of a new stand. If these overstory trees are left through the entire rotation, the result may be a two-aged stand.

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).

Type II thinning: A commercial thinning that increases stand stability and diameter growth, protects existing legacy structures, maintains species diversity, and provides large woody and down woody debris to the forest system.

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 data-collection system 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 one 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 (but at least 12” on small end by 20’ long).

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

Vegetation series: A conceptual grouping of related plant associations that have, in the absence of disturbance, the same predicted, dominant conifer species; also known as potential vegetation. In practice, vegetation series represents a way to stratify growing sites by ecological characteristics that determine the bounds of tree species occurrence, growth rates, management potential, and vulnerabilities to climate change and other risk factors.

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.

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