

Habitat Conservation Plan for Washington State Trust Lands 2008 Implementation Monitoring Report



December 2009



WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

Acknowledgements

Principle Author

Danielle Munzing

Editors

Jane Chavey

Florian Deisenhofer

Allen Estep

Jim Hotvedt

Sabra Hull

Bruce Livingston

Tami Miketa

Jeff Ricklefs

Stephen Slaughter

Special Contributors

The author would like to extend a special thanks to the following people for their contributions to accomplishing our monitoring goals for 2008: Angela Cahill, Geoff Crosby, Florian Deisenhofer, Allen Estep, Sabra Hull, Larry Leach, Alan Mainwaring, Steve Ogden, Dan Ramos, and Noelle Nordstrom. Finally, special thanks to monitoring technician Lance George for his dedication, hard work, and long hours in the field, without him the 2008 field season would not have been possible.

This report is published under the Ecosystems Services section of the Land Management Division, 1111 Washington St SE Olympia, WA 98504. To obtain copies of this report please contact danielle.munzing@dnr.wa.gov.

Habitat Conservation Plan for Washington State Trust Lands 2008 Implementation Monitoring Report

Land Management Division
Ecosystems Services Section

December 2009



WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

Table of Contents

Introduction.....	1
2008 HCP Monitoring Summary	3
Objective	3
Data Collected.....	3
HCP Implementation Monitoring.....	5
Large, Structurally Unique Trees and Snags.....	5
Wetlands	5
Determining Compliance	6
Objectives.....	7
Methods.....	9
Total Trees per Unit	12
Leave Tree Distribution	12
Large, Structurally Unique Trees.....	12
Leave Tree Species Diversity.....	13
Snags.....	13
Wetlands	13
Implementation Monitoring Results	15
Total Trees per Unit	15
Leave Tree Distribution	16
Trends and Conditions Results	18
Large, Structurally Unique Trees.....	18
Leave Tree Species Diversity.....	20
Snags.....	21
Wetlands	22
Discussion	25
Leave Tree Counts.....	25
Large, Structurally Unique Trees.....	27
Species Diversity.....	27
Snags.....	27
Wetlands	28
Appendices.....	29
References	36

Introduction

In 1997, the Washington State Department of Natural Resources (DNR) signed a multi-species Habitat Conservation Plan (HCP) for management of forested state trust lands. Authorized under the Endangered Species Act (ESA), the HCP is a partnership between DNR, the United States Fish and Wildlife Service (USFWS), and National Marine Fisheries Service (NMFS) (collectively, the Services) for the conservation of threatened and endangered species.

The HCP guides DNR management of approximately 1.8 million acres of forested state trust lands within the range of the northern spotted owl throughout western Washington and the eastern slopes of the Cascade Mountain Range. DNR and the Services established a contractual agreement to implement and monitor the HCP where forest activities occur on HCP.

One aspect of monitoring forest activities is implementation monitoring. “Implementation monitoring will document the types, amounts, and locations of forest management activities carried out on DNR-managed lands in each HCP planning unit...” (HCP V.2). The HCP also states that the DNR shall monitor “to determine whether the HCP conservation strategies are implemented as written” (HCP V.1).

Implementation monitoring priorities are identified each year by selecting conservation strategies or portions of strategies to monitor. These priorities are identified in close coordination with the Services.

The 2008 Implementation Monitoring Report focuses on the *Large, Structurally Unique Trees and Snags* (HCP IV.156) portions of the *Uncommon Habitats Strategy* and the *Wetlands* portion of the *Riparian Conservation Strategy* (HCP IV.69). These strategies were selected because they had not been monitored since 2004 and DNR HCP implementation managers were especially interested in how leave trees were being distributed across timber sale units.

2008 HCP Implementation Monitoring Summary

Objective

In 2008, implementation monitoring was conducted on the Habitat Conservation Plan's *Large, Structurally Unique Trees and Snags* portion of the *Uncommon Habitat Conservation Strategy* and the *Wetland* portion of the *Riparian Strategy*. The objectives were to determine compliance on the number of leave trees in a unit, leave-tree distribution, and any net loss of wetlands. Additional objectives looked at conditions and trends for proportion of large-tree retention, species diversity, and snag totals.

Data Collected

Forty-one timber sale units were randomly selected and various attributes of all leave trees and snags contained within were recorded. Attributes included diameter at breast height (dbh), species, and whether the tree was alive or dead, standing or windthrown. In addition, the spatial distribution of leave trees, including all individual trees and the perimeter of clumped trees, was recorded using Global Positioning Systems (GPS) and input into a Geographic Information System (GIS).

Implementation Monitoring Results

Thirty-seven of the 41 units monitored contained at least 100 percent of the required number of leave trees per timber sale unit. All timber sale units except one met distribution requirements; the unit that did not meet the distribution requirement contained a 15-acre area with no leave trees. Survey efforts also documented the presence of two unbuffered and undocumented wetlands.

Trends and Conditions Results

Thirty-three of the 41 units met the HCP large tree objectives. Species diversity was retained in all timber sale units. Snags were deficient in all timber sales (average 0.3 snags per acre).

HCP Implementation Monitoring

Large, Structurally Unique Trees and Snags

Large, structurally unique trees and snags provide important characteristics for wildlife habitat. Trees with large strong limbs, open crowns, large hollow trunks, and broken tops or limbs provide nesting and/or roosting habitat for many bird species and provide important habitat elements for several species including mid-sized carnivores and their prey (GTR RM-254). In addition, trees with these characteristics are typically long lived, wind firm, and can withstand disturbances (HCP IV.156). The two primary conservation objectives stated in the HCP regarding leave trees are: 1) retain large trees with the aforementioned structural characteristics and 2) retain large trees that will potentially develop these characteristics (HCP IV.156). These elements are reiterated in DNR's *Forestry Handbook Procedure* PR 14-006-090 Management of Forest Stand Cohorts, Westside, which provides guidance for the application of HCP requirements for regeneration harvest forest management units (FMUs) on forested trust uplands in the five Westside planning units and the Olympic Experimental State Forest (OESF).

The following summarizes HCP and PR 14-006-090 conservation objectives for live tree and snag retention:

- At least two trees per acre will be retained as large, structurally unique trees, at least one of which belongs to the largest diameter class and at least one of which belongs to the dominant crown class.
- At least three snags will be retained per acre harvested (HCP IV.157) when all safety requirements are met (WAC 296-54). Snags, where available, will be greater than 15 inches dbh and at least 30-feet tall. Preference is given to large snags with cavities. When snags are not available they will be replaced with suitable live trees.
- At least three trees per acre will be from the intermediate to dominant crown class. PR 14-006-090 recommends leave trees will be at least 10 inches dbh and at least 30-feet tall. These trees will be selected first from the largest diameter trees with preference for those with complex structural characteristics such as cavities.
- According to the HCP, the proximity of leave trees is expected to be at least one clump per five acres, except where needed for ecological purposes. PR 14-006-090 provides additional guidance by stating leave trees, in general, will be 400 feet or less from any point in the forest management unit interior, except as needed for ecological objectives.

Wetlands

The wetland strategy is in place to preserve hydrologic function through maintaining the appropriate plant canopy, natural water flow, and ensuring stand regeneration (HCP IV.69). According to the HCP for forested state trust lands, all wetlands ¼ acre or larger shall receive buffer protection (HCP IV.69). The HCP states the DNR “will allow no overall net loss of naturally occurring wetland acreage and function.” (HCP IV.69). No net loss of wetland acreage and function

was the focus of 2008 wetlands portion of implementation monitoring. Rather than analyze whether protections were appropriately applied, monitoring was designed to identify any net loss of naturally occurring wetland acreage and function.

Determining Compliance

In the past, instrument accuracy, along with human error, established compliance thresholds. In the case of leave trees, every tree was counted; as a result, inaccuracies would occur as a result of human error. For example, leave trees may not be identified and counted if they were moved or traded for other trees, blown down, cut down, undocumented, or unmarked. The crew walked each timber sale unit measuring mapped and marked leave trees, during which time they found and counted leave trees that, on occasion, fit one of the aforementioned situations. Because the entire harvest unit was surveyed, the assumption was made that if a leave tree was missed it most likely would be one or more single trees.

By comparing the HCP-required number of eight leave trees per acre to the number of trees counted on the ground, the percent of leave trees required was calculated (referred to as percent required). In other words, if exactly eight trees per acre were counted the percent required would be one hundred percent. The 'percent required' was used to compare compliance levels of all timber sale units. For total tree count, the minimum level for adequate compliance was set at 95 percent. It is unlikely a harvest unit meeting 95 percent or more of its leave tree requirement would significantly change the ecological affect or the amount of wildlife habitat provided; however, a result meeting less than 95 percent may be reason for concern that DNR is not meeting an acceptable level of leave tree retention.

Compliance was also determined for leave tree distribution. Because the specific locations of all leave trees were recorded using GPS, any harvest unit that had an area greater than five acres with no leave trees was considered non-compliant (unless supporting documentation provided an ecological or operational explanation).

For the wetlands portion of implementation monitoring, a rate of compliance was not calculated because the total number of wetlands present in a timber sale unit was not determined, only the number of wetlands that were not mapped and not buffered were identified and lack of a buffer categorized them as non-compliant. The implementation of the wetlands portion of the HCP *Riparian Conservation Strategy* was considered non-compliant for unbuffered wetlands because wetlands lacking the appropriate protections would be considered a net loss of wetland acreage and function.

Elements such as snags, large leave trees, and species diversity were not examined in terms of specific compliance thresholds. They were examined for conditions and trends across all of the harvest areas that were monitored. This was due to the lack of data available for pre- and post-harvest comparisons. The data used to examine large trees and species diversity was the pre-harvest cruise data, which is a lower intensity sample of trees harvested compared to the 100

percent count of leave tree data. Because of the margin of error and low levels of confidence associated with the cruise data, compliance conclusions were not drawn. Compliance was not determined regarding snags because of snag availability and safety issues involved in leaving snags (HCP IV.157) and also because of the lack of available information on snag densities prior to harvest.

Objectives

Objectives outlined for the 2008 Implementation Monitoring effort were as follows for each timber sale unit:

1. Assess and evaluate each timber sale unit for required leave trees per acre,
2. Evaluate whether leave trees meet HCP requirements and procedural objectives for spatial distribution;
3. Evaluate the proportion of large trees;
4. Assess species diversity of leave trees and evaluate whether diversity post-harvest is similar to pre-harvest;
5. Assess the number of snags retained post-harvest and compare to HCP snag objectives; and
6. Assess net loss of wetlands by identifying those that were neither buffered nor documented.

Implementation Monitoring Methods

Field crews surveyed selected timber sale units in their entirety and collected field data for all leave trees in order to determine whether the leave tree strategy was implemented as written. Leave trees were considered to be any tree in the harvested unit, whether or not it was marked as such. Timber sale maps, documentation, and information from foresters were used as reference in the field to determine the location of leave trees. Leave tree attribute data collected included: diameter at breast height (dbh), species, and whether the tree was live standing, windthrown (this would include any tree that had fallen but not the result of being cut down), or a snag (Figure 1). While not a primary objective of this implementation monitoring effort, windthrow frequency for leave trees was recorded.

There was no intention of examining long-term wind affects; however, there was interest in short-term wind affects. In December 2007, a winter storm brought winds up to 147 miles per hour (Reiter 2008). The storm occurred shortly after harvest of many of the timber sale units. More detailed windthrow results will be discussed in a separate publication.



Figure 1. Field employee collecting leave tree data in the Bob's Big Boy timber sale in Pacific Cascade Region. Photo taken by Danielle Munzing September, 2008.

In most timber sale units, all trees that were within the timber sale boundary tags were counted. Normally any trees outside the boundary tags were considered out of the sale or designated as a riparian management zone. However, leave tree clumps are not uniformly identified and occasionally leave trees are marked with timber sale boundary tags. In those situations, region personnel helped the crew

determine designated leave tree locations. All trees left inside a timber sale unit were counted, whether or not they were marked as a leave tree. During the harvest process, marked leave trees can be traded for different trees if there are safety concerns or operational issues. When trees are traded they are not always marked or may be marked differently than other leave trees (for example, marked with red paint instead of blue).

Data was also collected on leave tree distribution across a timber sale unit. Trimble GPS was used to record individual positions for single leave trees and to delineate the perimeter of leave tree clumps.

Forty-four closed timber sales from fiscal year 2008 were available for monitoring when the 2008 implementation monitoring season was initiated in May 2008. Of these, 23 were selected for monitoring. Initially, one unit from each of the 23 sales was randomly selected. This number was based on what was estimated a 3- to 4- person crew could accomplish over a period of 3 to 5 months. After monitoring several units faster than originally anticipated, the timber sale unit sample size was increased to two units per timber sale, where available. This proved more efficient for both driving time and preparation than selecting single units on more timber sales. While not completely random, the final sample size was 41 timber sale units out of a total 141 possible. Although it is not possible to make statistically valid inferences about the whole population of timber sale units, the data will reveal important information for managers and field staff regarding the units sampled. A map showing the distribution of timber sales selected for monitoring is shown in Figure 2.

Areas Monitored for Implementation of Large, Structurally Unique Trees, Snags, and Wetlands in DNR's Westside Regions

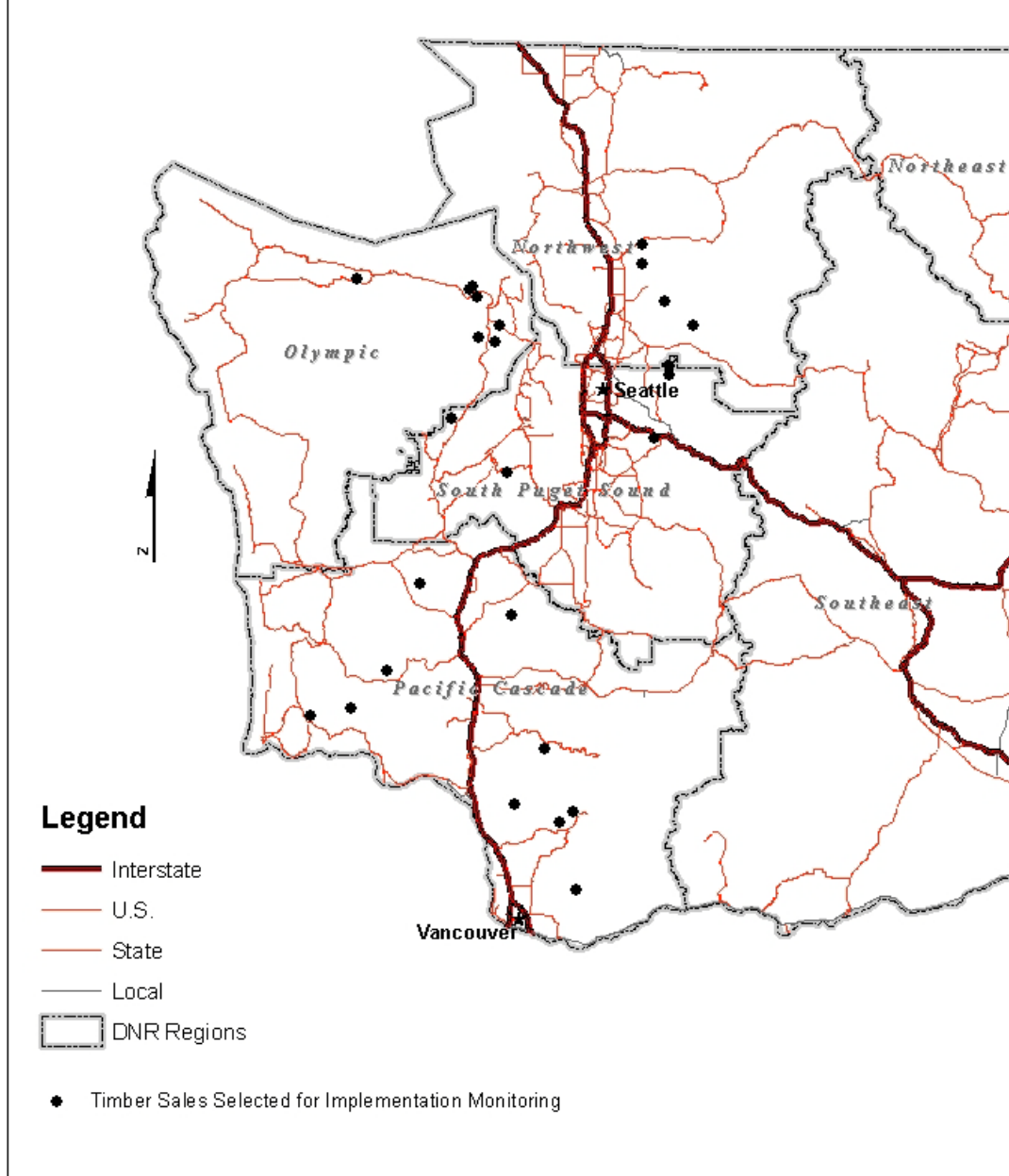


Figure 2. Areas monitored in 2008 for the implementation of Habitat Conservation Plan Strategies protecting large, structurally unique trees, snags and wetlands in Washington Department of Natural Resources Westside Regions.

Total Trees per Unit

To determine whether timber sale units met the eight-tree-per-acre requirement, the total number of leave trees counted at each timber sale unit was compared to the HCP-required eight leave trees per acre. The eight-tree requirement consists of five green trees and three snags, where available. The results are expressed as percent of total trees required after harvest (the total number of leave trees counted divided by the total trees required). Because the Forestry Handbook procedure number PR 14-006-090 recommends tree size for snag recruits to be greater than 10 inches dbh, all trees starting at the 10-inch size class and bigger were included in the total count. The acreage used for the calculation was based on the harvested acreage that included roads and leave tree clumps.

Leave Tree Distribution

Trimble brand GPS was used to mark locations of all single dispersed leave trees and the perimeter of all leave-tree clumps within each harvest unit. GPS data was incorporated in a GIS to assist visualization of the data spatially. To determine if leave tree distribution requirements were met, a visual evaluation was conducted to determine if there appeared to be more than 400 feet between leave trees or leave trees and the unit edge.

Large, Structurally Unique Trees

The HCP requires at least two of the eight leave trees per acre to be: one from the largest diameter class and another from the dominant crown class. This could be interpreted as the two largest trees available (Husch, Beers, and Kershaw 2002). Thus, at least 25 percent of the leave trees should be in the “large” category. Defining the largest tree category depends on what is available in the timber sale unit prior to harvest.

Without measuring leave trees pre- and post-harvest the only way to determine the largest trees available in the timber sale unit prior to harvest is to look at pre-harvest cruise data. Cruise data is a sample of the trees that will be harvested and does not include leave trees. Consequently, cruise and leave-tree data were combined in order to determine whether units contained the appropriate proportions of large leave trees.

In order to reduce the amount of resources required to analyze tree size data for every timber sale unit, analysis was concentrated on timber sale units with a low proportion of “large leave trees.” Timber sale units with low proportions of large leave trees were determined by identifying an approximate large-tree category, which was defined as 24-98 inches. This range was selected based on the HCP references (HCP IV.157) used to identify large trees as the range for bald eagles (24 to 90 inches dbh) because it covers a broad range that includes trees important for pileated woodpeckers and marbled murrelets. The selected range was expanded to include our largest recorded leave tree (98 inch dbh). In reality, trees greater than 24 inches dbh may not define the largest trees on every timber sale unit. The objective was to narrow down which units may have been deficient in meeting the HCP large-tree requirements without analyzing leave-tree sizes in all units.

This method of selecting units to analyze further for tree size is subjective and it assumes that all trees in the “large” category satisfy the HCP large-tree requirement. If timber sale units were not meeting the 25 percent large-tree requirement because 25 percent of their trees were not in the greater-than- 24-inch-dbh category, the timber sale unit would not be considered non-compliant. For timber sale units that appeared to have proportionately low numbers of large leave trees, further exploration into what size trees were available (from cruise data) was required.

Once it was determined which sales had relatively low numbers of leave trees in the 24-98 inch category, the actual number of largest trees available was determined by combining the leave tree and cruise data. From the combined data the eight largest trees available per acre was determined and compared to the proportion of large leave trees retained.

Leave Tree Species Diversity

The HCP states “stand tree species diversity after harvest should be generally representative of the tree species diversity prior to harvest” (HCP IV.157). In addition, the HCP states that Douglas fir, Sitka spruce, and Western red cedar are large sized, long lived, and are generally wind firm (HCP IV.156). In order to determine whether or not the same species diversity was retained pre- and post-harvest, a comparison was made between the leave-tree species and cruised species per acre for both sets of data.

Snags

A significant difference between the number of snags required and the number counted in the field was expected because past monitoring (Implementation Monitoring 2004) has shown that snag numbers tend to be lower than required. Compliance could not be evaluated for snags retained because pre-harvest snag data was not available.

Wetlands

The wetland strategy is in place to maintain hydrologic function through maintenance of the appropriate plant canopy, natural water flow, and ensuring stand regeneration (HCP IV.69). According to DNR’s HCP, all wetlands ¼ acre or larger shall receive buffer protection (HCP IV.69).

In the past, wetland monitoring involved visiting timber sales that indicated the presence of wetlands in the HCP checklist, and examining applied protections to determine whether those protections were compliant with HCP requirements. However, during this monitoring season the crew employed a different approach to wetland monitoring. Rather than selecting a sample of wetlands to monitor, or determine the total number of wetlands available and the rate at which protections were appropriately applied, each harvest unit surveyed for leave trees was also surveyed for unprotected and unmapped wetlands. This allowed implementation

monitoring to determine any net loss of wetlands in harvested units. When an area with characteristics representative of a wetland was located, it was examined in more detail for the following:

1. **Size** — if the wetland appeared to be $\frac{1}{4}$ acre or more, Trimble GPS was used to delineate the perimeter of the wetland and later calculate the area to assess whether it was greater than or equal to $\frac{1}{4}$ acre.
2. **Disturbance** — documented any disturbance to the wetland, such as slash piles, tire tracks, and cut trees.
3. **Hydrology and Soils** — used a checklist of hydrological and soil factors to determine whether or not the crew's observations met the wetland definition under the HCP.

In cases where an unprotected wetland was observed, DNR wetlands expert Sabra Hull conducted a field check to confirm the crew's identification. In cases where the expert confirmed the findings, a memorandum was provided with their observations.

Implementation Monitoring Results

This section addresses results for each objective. They are described in general for all Westside DNR regions and/or each region, and then in more detail by timber sale unit. Specific data for individual timber sale units are in Appendix A.

Total Trees per Unit

Across all Westside regions 1,699 harvested acres were surveyed for implementation of the large, structurally unique tree and snag strategy. To meet HCP leave tree requirements 13,592 trees should have been counted. The crew counted 18,194 leave trees (live standing, windthrown, and snags combined), approximately 10.7 trees per acre, which is 134 percent of the required.

- In Northwest Region the crew counted 3,567 leave trees across 359 acres, at 10 leave trees per acre, 124 percent of the required leave trees were retained.
- In South Puget Sound Region 3,318 leave trees were counted across 226 acres, at 15 trees per acre, 183 percent of the required leave trees were retained.
- In Olympic Region the crew counted 2,269 leave trees across 220 acres, at 10 leave trees per acre, 129 percent of the required leave trees were retained.
- In Pacific Cascade Region 9,040 leave trees were counted across 846 acres, at 11 trees per acre, 134 percent of the required leave trees were retained.

On a timber sale unit basis, the lowest percent of required leave trees was 55 percent. The largest percent of required leave trees in a unit was 334 percent; both occurred in South Puget Sound Region (Figure 3). One sale did not meet the required minimum leave-tree level for compliance of 95 percent. Northwest, Olympic, and Pacific Cascade Regions had no timber sales that met less than 95 percent compliance for the required leave trees. For results of individual harvest units, see Appendix A.

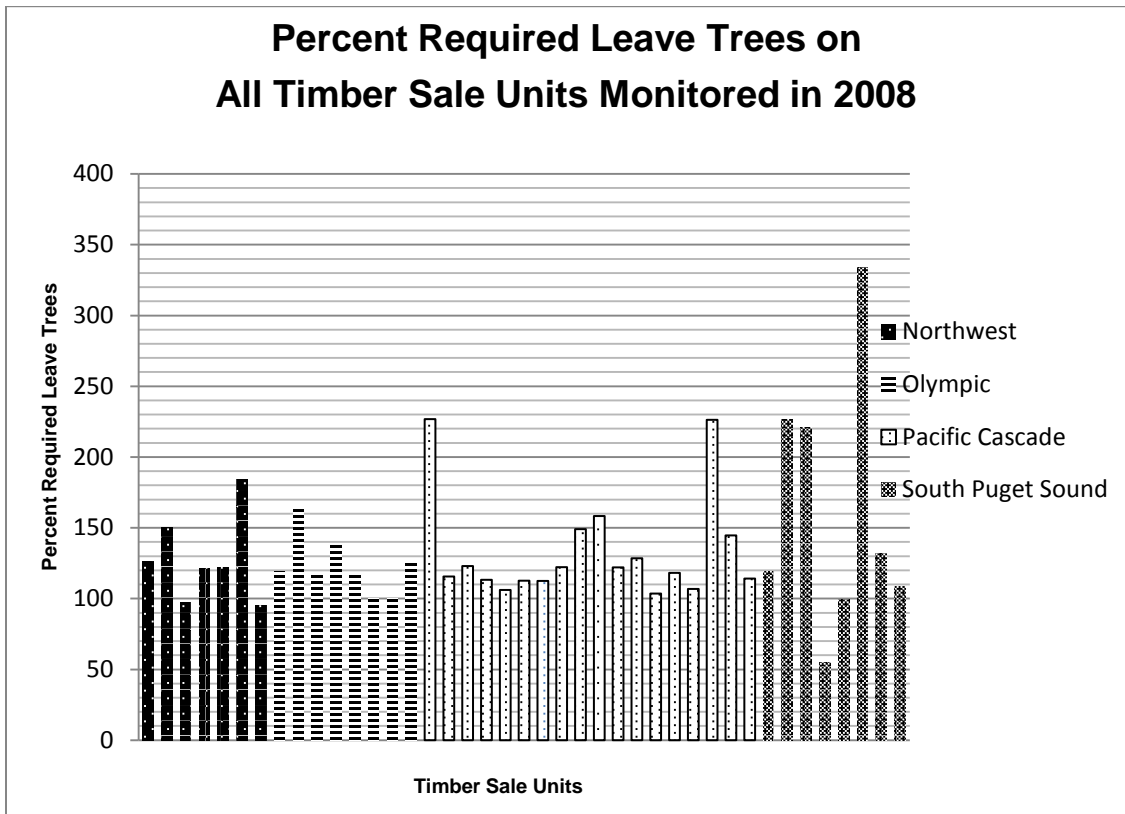


Figure 3. Leave trees per timber sale unit as a percent of the required total. Each bar represents one timber sale unit.

Leave Tree Distribution

Leave tree distribution across timber sale units met HCP and procedural expectations on all timber sales with the exception of one unit (Figure 4) in the Descent timber sale. Documentation was provided by the forester to explain why a portion of the sale did not have leave trees — “Leave Tree Plan: Clumps and scattered trees were left to facilitate the high amount of cable logging.” The forester also noted — “This unit is steep with long yarding distances (3,800 feet) and will 95 percent cable yarding and percent ground based logging.” A typical example of leave tree distribution results is shown in Figure 5.

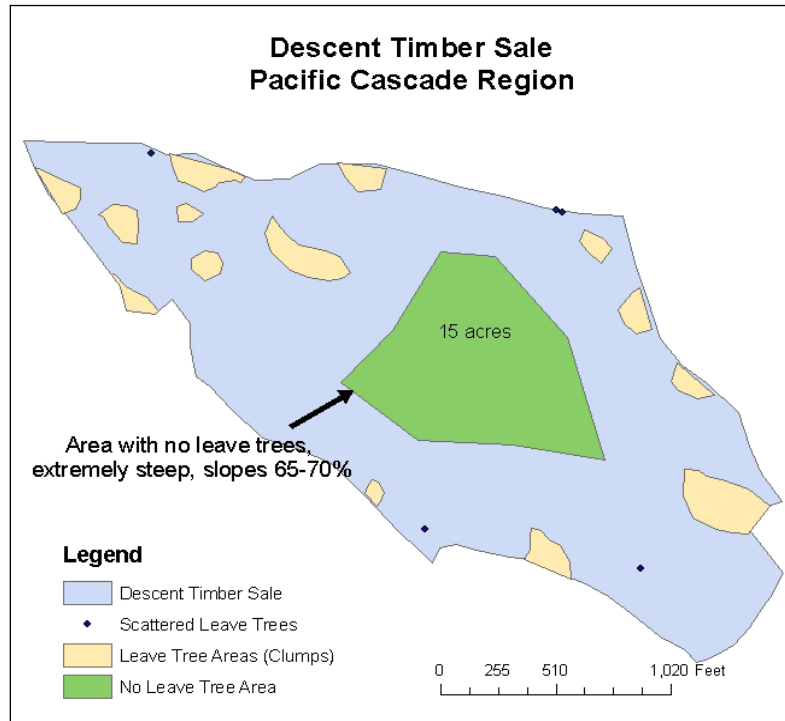


Figure 4. An example of leaf tree distribution showing single dispersed and clumped leaf trees in Unit One of the Descent timber sale.

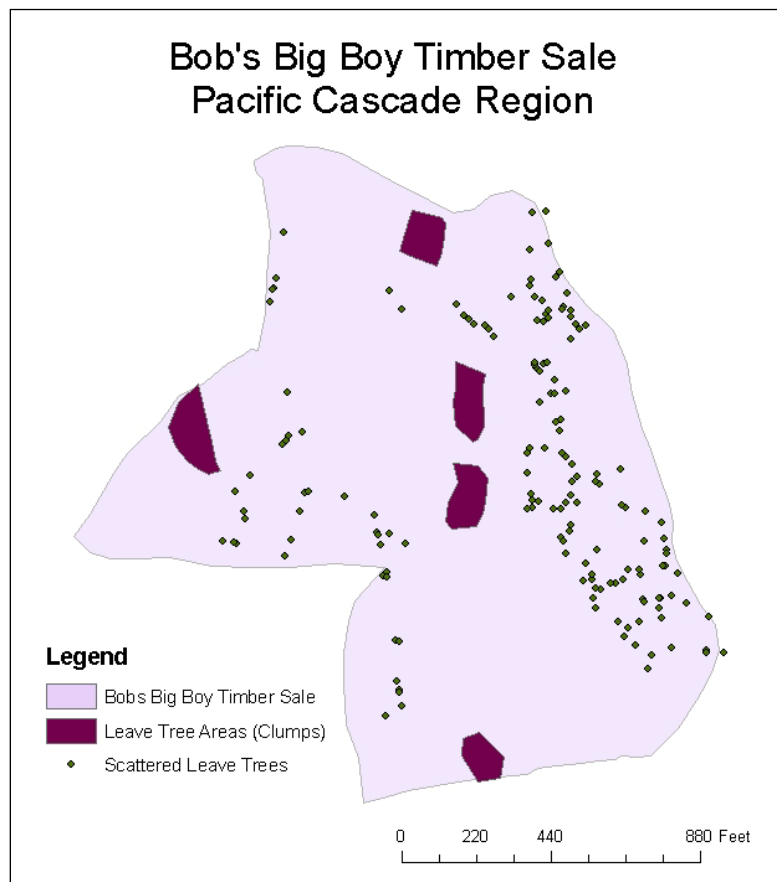


Figure 5. An example of typical distribution of single, dispersed, and clumped leaf trees.

Trends and Conditions Results

Large, Structurally Unique Trees

Across all Westside regions a total of 18,194 leave trees were measured (live standing, windthrown, and snags) between the 10- and 98- inch dbh size class (snags 15- to 98- inches). Size class distribution is shown in Figure 6. An example of a leave tree with unique structural characteristics is shown in Figure 7.

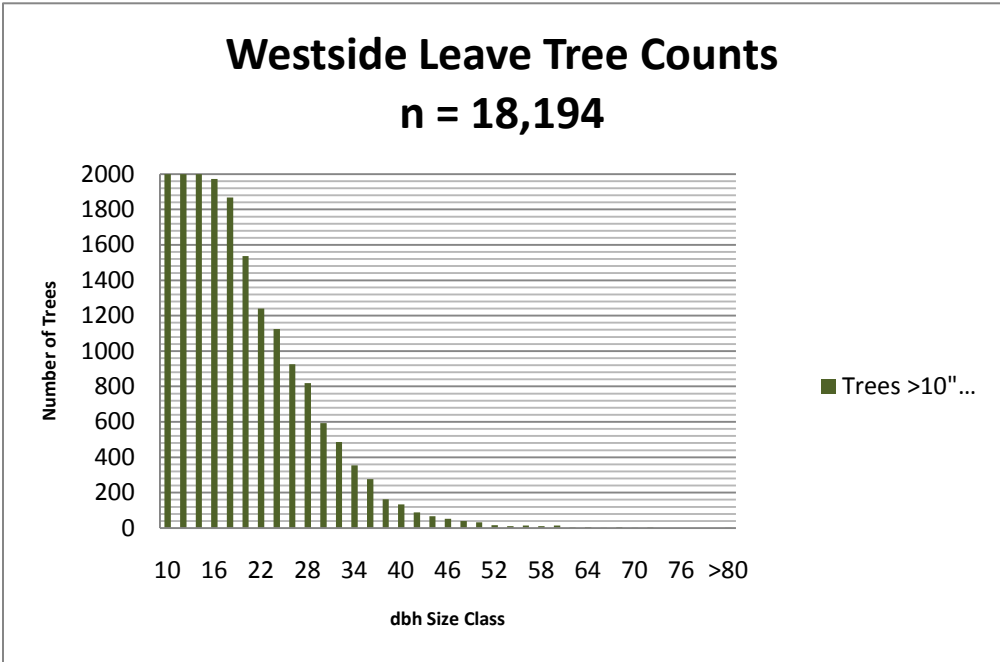


Figure 6. DBH size class distribution of all leave trees, including live standing, windthrow, and snags, across all Westside regions.



Figure 7. An example of a leave tree with unique structural characteristics such as strong limbs and an open crown. This tree is in unit one of the Sea Biscuit timber sale in Pacific Cascade Region. Photo: DNR, Danielle Munzing, October 2008

Analysis of pre-harvest cruise data did not show any timber sale units in which all harvested trees were larger than those retained. Nevertheless, eight timber sale units were identified as having a relatively low number of large trees. Pre-harvest cruise data illustrated the availability of the largest trees sampled in the unit for harvest. This sample data showed large trees were available for leave tree retention (Table 1) in the units that had relatively low numbers of large leave trees in the post-harvest leave tree counts. For example, Off Center Mix unit 2 in Olympic Region, cruise data showed seven trees per acre available from the 28-to 44-inch dbh category. In order to meet HCP large tree objectives, the results should show two trees per acre (25 percent) from the 28-to 44-inch range, instead 0.4 (6 percent) trees per acre were retained.

Table 1. Implementation monitoring of large, structurally unique tree results combined with pre-harvest cruise data demonstrate a comparison between what was retained and what was cut of the largest trees available in a harvest unit.

Region	Timber Sale Unit	Largest Trees Available (inch dbh) ^a	Large Trees Cruised (per acre)	Large Trees Retained (per acre)	Percent Large Trees Retained ^b
Olympic	Off Center Mix 2	28-44	7	0.37	6
Northwest	Passing Lane 2	26-40	10	0.6	8
	Trans Siberia 2	30-98	10	0.81	11
Pacific-Cascade	Outcast 1	26-36	13	1	12
	Outcast 2	28-36	10	1	6
	Special 2	20-34	30	1	8
	6690 Final 2	26-54	7	1	16
South Puget Sound	Tall Ham 1	22-36	12	1	11

^a Largest trees available refers to the largest eight trees per acre determined using a combination of pre-sale cruise and leave tree data.

^b The percent largest trees retained is calculated using the number of leave trees that fell in the largest trees available category and the total number of leave trees counted. The percent of large trees retained should be at least 25 percent (two out of eight trees per acre).

Leave Tree Species Diversity

Across the four Westside regions a variety of species were retained as leave trees, including the following:

- western hemlock (*Tsuga heterophylla*)
- Douglas fir (*Pseudotsuga menziesii*)
- western red cedar (*Thuja plicata*)
- big-leaf maple (*Acer macrophyllum*)
- red alder (*Alnus rubra*)
- Pacific silver fir (*Abies amabilis*)
- black cottonwood (*Populus trichocarpa*)
- Sitka spruce (*Picea sitchensis*)
- Pacific madrone (*Arbutus menziesii*)
- grand fir (*Abies grandis*)
- cherry (*Prunus* species)
- noble fir (*Abies procera*)

The dominant tree species across all sampled harvest units was Douglas fir (50 percent) and a relatively large percentage was western hemlock (26 percent). In addition, there were smaller proportions of western red cedar and red alder (10 percent each). All other species occurred in smaller proportions of 2.5 percent or less. Figure 5 shows the breakdown of these results for each region. Douglas fir was the dominant species in all regions except Northwest region, where the dominant species was western hemlock.

Table 2. 2008 implementation monitoring results for leave tree species in each Westside DNR region. Noble fir was detected in such low numbers (0.02 percent) it is not represented in the percent species by region.

	Northwest Region (% species)	Olympic Region (% species)	Pacific Cascade Region (% species)	South Puget Sound Region (% species)
Douglas Fir	21.8	45.8	64.8	52.2
Western Hemlock	62.9	10.3	18.4	20.3
Red cedar	9.6	21.8	5.1	20.2
Sitka Spruce	0.1	0.2	0.1	0.3
Maple	2.6	5.7	1.1	4.2
Cottonwood	0.4	0	0	0.5
Alder	3.7	18.1	15.5	3.5
Silver Fir	1.4	0	0	0
Grand Fir	0	1.5	0.2	0
Cherry	0	0	0.3	0
Madrone	0	0	0	0.1

Snags

Results from the snag count were fairly uniform across all sampled DNR regions. Out of 18,194 leave trees counted, 4,497 should have been snags. Instead, 349 (2 percent) were snags. The three highest snag densities per acre occurred in Descent harvest unit 2 at the rate of 1.7 snags per acre, Spaceballs harvest unit 3 had 1.1 snags per acre, and 6690 harvest unit 2 at 1.1 per acre. Figure 6 shows the difference between the number of snags counted and the number of HCP required snags.

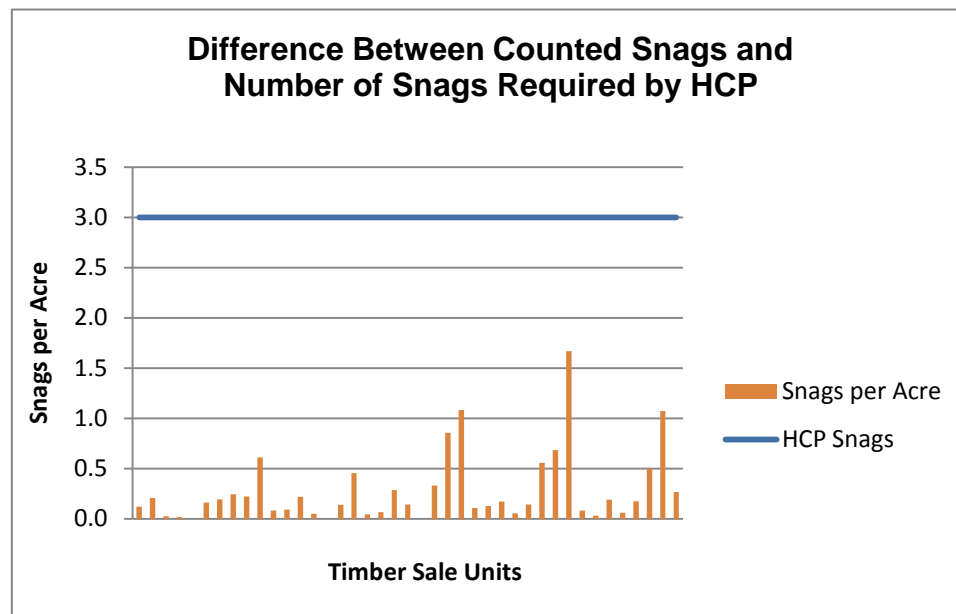


Figure 8. HCP-required snags and snags counted in the field during 2008 HCP implementation monitoring.

Wetlands

Of the 41 timber sale units surveyed, two units in the same sale contained unprotected wetlands. The two wetlands were located in the Hannon Weigh timber sale in South Puget Sound Region. One of the wetlands occurred in the northern portion of unit 2 and was 0.39 acres (Figure 9).

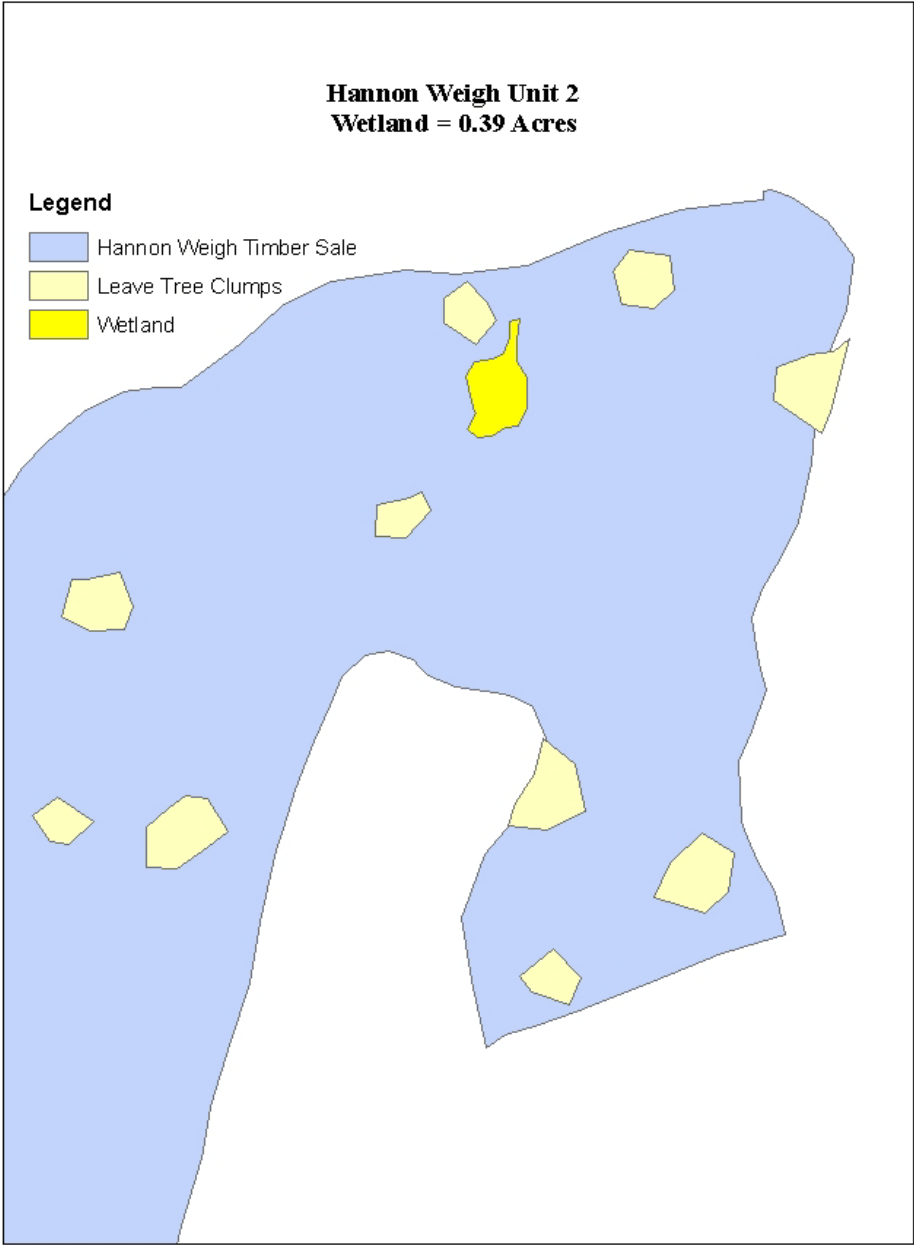


Figure 9. Wetland location mapped in the field using Trimble GPS data and measured with GIS XTools Pro.

The crew's initial assessment of the wetland included observations of appropriate hydrologic conditions, wetland vegetation species, and mucky soils (Figure 10).



Figure 10. Unprotected wetland found during the 2008 implementation monitoring field season. The wetland was in the Hannon Weigh timber sale unit 2, located in DNR's South Puget Sound Region. Photo: Danielle Munzing May, 2008

The second wetland was approximately 0.36 acres (Figure 11).

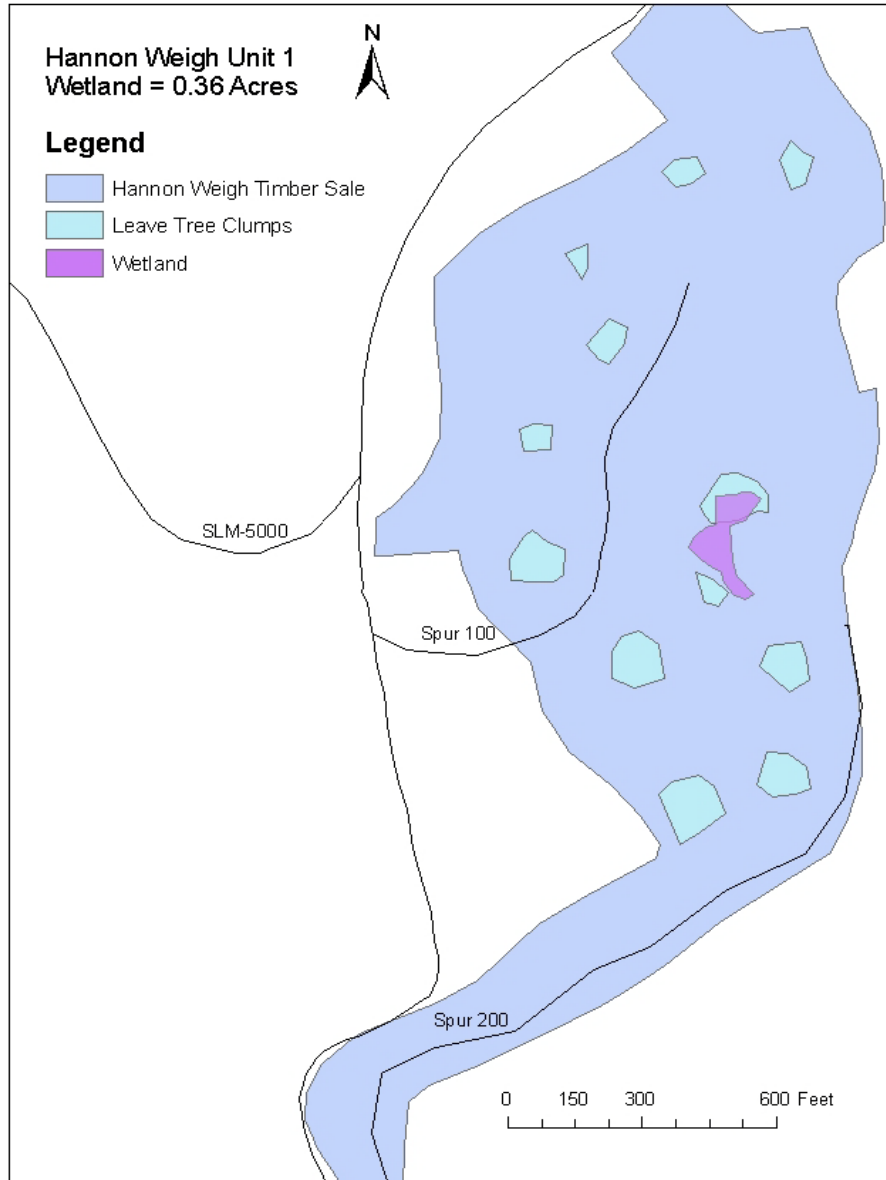


Figure 11. Wetland location mapped in the field using Trimble GPS data and measured with GIS XTools Pro.

Slash piles occurred in both wetlands (Figure 12). Sabra Hull, DNR's wetland consultant wrote a memorandum (Appendix C) of her findings which support the crew's field findings. The South Puget Sound Region biologist, Alan Mainwaring, also contributed his assessment of the wetlands, which is in Appendix D.



Figure 12. Unprotected wetland in the Hannon Weigh timber sale, an example of slash piled on the wetland area. Photo: Danielle Munzing May, 2008

Discussion

Leave Tree Counts

Four timber sale units did not meet the total count for leave tree requirements. Of the four, three of the timber sale units met 95 percent or more of their leave tree requirement. Timber sale units that met at least 95 percent of the required number of leave trees are not likely to significantly change the amount of wildlife habitat provided and probably still meet the ecological need for recruitment trees. Lacrosse Thinning and CC timber sale unit R2 was non-compliant, meeting 55 percent of the required number of leave trees. The unit had single trees scattered throughout and was surrounded by a special management unit area. There was no documentation to explain why the field tally was 53 leave trees compared to the required 96 leave trees.

Results showed that, on average, across western Washington, timber sale units met 134 percent of the required number of leave trees. This is partially explained by implementation monitoring data collection, and analysis procedures. The procedures for implementation monitoring of leave trees had potential to inflate the total leave tree count compared to what was originally intended by the forester responsible for the timber sale. Potential sources for inflated leave tree counts are as follows:

- Every tree remaining after a sale has been harvested is counted because, in some cases, trees are traded during harvest and not necessarily marked or documented (this usually accounts for only a few trees).

- There are situations where a large clump of trees will be left to contribute towards leave trees, and the forester only counts trees that meet the HCP requirement. Uncounted trees are either of low value to the harvester or are difficult to harvest due to the timber sale layout. Because (for monitoring) all trees are counted towards leave trees, the total count for some clumps could be inflated compared to the original intent.
- Unmarked trees may be left by the harvester because they are not of value or it is not efficient for the harvester to remove the trees (however, this may account for only a few trees).
- For some timber sale units, the number of leave trees required was determined based on Procedure 14-006-090 *Legacy and reserve tree levels for regeneration harvest units* (variable retention harvesting) which directs foresters to “retain 7 percent of the trees...”. The percent required leave trees was calculated using eight trees per acre in order to consistently conduct HCP implementation monitoring. Using 7 percent instead of eight trees per acre may have resulted in the number of leave trees to be greater than eight per acre. This was not consistently recorded in timber sale jacket documentation.

Upon further review, documentation helped to explain why certain timber sale units contained relatively high numbers of leave trees. For example, Figure 3 shows that the Stossel Run timber sale unit met 334 percent of the required number of leave trees. Documentation in the timber sale jacket explains: “The retention tree prescription for the stand included 3 leave tree clumps that averaged 10 conifer trees per acre, which is consistent with the Habitat Conservation Plan and forest practices regulations while meeting stand objectives to maintain site productivity and ecological function.” The unit did have three designated leave clumps that totaled four acres. At 10 trees per acre, 400 leave trees would meet the requirement; however, the crew counted 614 trees. The only other documentation that may explain the high number of leave trees was the following: “The three groups of leave trees were also located to protect unique features or sensitive areas such as a cliff and Type 5 stream.” Extra leave trees may have been retained for protection of these sensitive areas.

Another example of a timber sale unit that had high percentage of leave trees and included documentation to explain is unit 2 of the Spaceballs timber sale. Scattered throughout the unit were several small clumps, single leave trees, and one 5-acre leave tree clump. The forester counted 190 trees for retention within the 5-acre clump. The implementation monitoring crew counted 439 trees. Documentation in the timber sale jacket explains the large clump “had many platforms in the canopy, which could be used by many species of wildlife and birds in the future, and also contained some very large, structurally unique western red cedar trees and down woody debris”. In this situation, the forester and biologist counted the required number of trees in the clump, but left more leave trees than required because they felt it provided important wildlife habitat.

Unless implementation monitoring included a count of leave trees pre- and post-harvest, it is not possible to determine the true rate of inflation attributed to monitoring methods compared to what the forester intended.

Large, Structurally Unique Trees

The DNR appears to be leaving, on average, large leave trees. However, for individual timber sale units, nearly a quarter of the units had relatively low numbers of large trees, even when combined with cruise data to show what was available. The eight units were not considered non-compliant because the data we used to draw our conclusions came from two different sources, one was sample data and one was 100-percent count data. However, this is important information for managers and field staff as a reminder of the emphasis the HCP places on the importance of retaining large, structurally unique trees.

Species Diversity

The HCP states “stand tree species diversity after harvest should be generally representative of the tree species diversity prior to harvest” (HCP IV.157). A diversity of species comparison between implementation monitoring results and cruise data revealed that DNR timber sale units are meeting species diversity requirements. While there were some small differences shown in the results, they were not of any significance to the overall diversity, and the trees would not have contributed to large and windfirm trees that are important for wildlife habitat.

Hemlock was the dominant species left in Northwest Region, whereas in all other regions the dominant species was Douglas fir. Cruise data revealed hemlock as the dominant species harvested as well; however, Douglas fir and western redcedar were available and should be emphasized as the preferable leave tree species since they are longer-lived and more windfirm than hemlock.

Snags

Snag numbers were consistently low on all monitored timber sale units. These low numbers may be due to the challenges around safety hazards to logging crews involved in protecting snags. In addition, snags are not available for retention due to historic forest management (Lewis 1998). The HCP states that when snags are not available, live trees should be left towards snag recruitment, specifying that live leave trees will still meet the eight trees per acre requirement whether three trees per acre are left as snags or snag recruits.

Even with the low snag availability the overall snag numbers were not expected to be as low as they were. Implementation monitoring efforts have found consistency with low snag densities across all Westside regions. While three timber sale units had one or more snags per acre, there were no timber sale units that met the snag requirement. This result is consistent with snag results from previous implementation monitoring efforts (2004 Implementation Monitoring Report), thus the results appear to be a trend, not only across the Westside, but also over time. These results may change over time as new forest management strategies take effect; however, managers should consider making snag conservation a priority, including incentives for post-harvest snag creation.

Wetlands

Two unprotected wetlands were found and addressed directly by the region involved. A suggestion to managers would be to emphasize contacting a wetlands expert when uncertainty in wetland identification arises and for field staff to carefully assess potential wetlands. The HCP states the DNR “will allow no overall net loss of naturally occurring wetland acreage and function.” (HCP IV.69).

Appendices

Appendix A. Leave Tree and Snag Results for Individual Timber Sale Units

Region	Timber Sale Name	Timber Sale Unit Number	Timber Sale Unit Area	Number of Trees Counted (>10" dbh)	Number of Trees Required ¹	Percent Required Leave Trees	Trees Counted per Acre	Number of Snags per Acre
Northwest	English Breakfast	1	74	748	594	126	10.1	0.1
	Passing Lane	1	44	530	352	151	12.0	0.2
	Passing Lane	2	42	322	332	97	7.8	0.0
	Shakey	1	60	577	477	121	9.7	0.0
	Shakey	2	51	500	410	122	9.8	0.0
	Trans Siberia	1	31	456	248	184	14.7	0.2
	Trans Siberia	2	57	434	456	95	7.6	0.2
Olympic	Catamount	3	29	277	232	116	9.6	0.1
	Catamount	4	11	145	88	159	13.2	0.5
	Little Quil	1	47	442	376	118	9.4	0.0
	Little Quil	2	45	498	360	138	11.1	0.1
	Off Center Mix	2	7	66	56	118	9.4	0.3
	Off Center Mix	6	7	56	56	117	8.0	0.1
	West Kelly	2	2	16	16	100	8.0	0.0
	West Kelly	3	76	769	608	134	10.1	0.3
Pacific-Cascade	6690 Final	1	7	127	56	212	18.1	0.9
	6690 Final	2	12	111	96	121	9.3	1.1
	Bannockburn	1	75	738	600	128	9.8	0.1
	Bannockburn	2	95	861	760	121	9.1	0.1
	Bob's Big Boy	2	47	399	376	116	8.5	0.2
	Boomer	2	38.5	347	308	113	9.0	0.1
	Boomer	3	14	126	112	177	9.0	0.1
	Deer Lick	3	18	176	144	122	9.8	0.6
	Descent	1	95	1133	760	149	11.9	0.7
	Descent	2	6	76	48	190	12.7	1.7
	Good Seed	1	98	957	784	122	9.8	0.1
Good Seed	2	100	1028	800	129	10.3	0.0	

¹ Number of trees required refers to the 8-trees-per acre discussed in the Habitat Conservation Plan to meet requirements for large, structurally unique trees and snags. Eight is multiplied by the gross timber sale unit acreage.

Appendix A. Continued

Region	Timber Sale Name	Timber Sale Unit Number	Timber Sale Unit Area	Number of Trees Counted (>10" dbh)	Number of Trees Required ¹	Percent Required Leave Trees	Trees Counted per Acre	Number of Snags per Acre
Pacific-Cascade	Outcast	1	63	522	504	104	8.3	0.2
	Outcast	2	33	312	264	118	9.5	0.1
	Sea Biscuit	1	75	641	600	114	8.5	0.2
	Spaceballs	2	58	1050	464	263	18.1	0.5
	Spaceballs	3	14	162	112	169	11.6	1.1
	Special	2	30	274	240	114	9.1	0.3
South Puget Sound	Hannon Weigh	1	37	352	296	119	9.5	0.2
	Hannon Weigh	2	63	1141	504	226	18.1	0.2
	Lacrosse Thinning and CC	R1	18	318	144	221	17.7	0.6
	Lacrosse Thinning and CC	R2	12	53	96	55	4.4	0.1
	Soderman Slope	3	22	175	176	99	8.0	0.1
	Stossel Run	1	23	614	184	404	26.7	0.2
	Tall Ham	1	61	645	488	152	10.6	0.0
	Tall Ham	2	2.3	20	18	109	8.7	0.0

¹ Number of trees required refers to the 8 trees per acre discussed in the Habitat Conservation Plan to meet requirements for large, structurally unique trees and snags. Eight is multiplied by the gross timber sale unit acreage.

Appendix B. Sabra Hull's Assessment of two Unprotected and Undocumented Wetlands in South Puget Sound Region

Memorandum

June 26, 2008

TO: Danielle Munzing

FROM: Sabra Hull

SUBJECT: Wetlands on the Hannon Weigh sale, Markworth State Forest, South Puget Sound Region.

This memo is to summarize the findings of a field visit to Hannon Weigh sale, on June 25th 2008 where you had identified some possible issues with inappropriate implementation of HCP wetland strategy on 3 different wetlands in two different timber sale units. I concur with your assessment that there may have been some implementation errors in two wetland areas, as described below.

1. Unit 2, northern portion, west of road

We visited a wetland that had been clear-cut harvested. This wetland occupies an obvious topographic depression, and is .39 acres in size as measured this spring. There was evidence of soil disturbance from either yarding through the wetland, or possibly driving through it, and there was a large slash pile in middle. Hydrological conditions yesterday included standing water, with dried algae mats indication a larger area of prolonged inundation. Current vegetation species include skunk cabbage, cattails, water hemlock, small fruited bulrush, impatiens. Fireweed is invading around edges and on hummocks within wetland area, where disturbed soil is exposed. Several large (and some smaller) cottonwood and cedar stumps surround the flooded area. Exposed soil is mucky in surface horizon (~6" thick), subtended by gleyed mineral soil.

It is possible that the open water portion of the wetland is larger now than it was pre- harvest due to loss of trees and subsequent hydrologic changes associated with loss of evapotranspiration function, however it is unlikely that this wetland was less than .25 acres, thus it probably should have been protected with a 100 foot buffer. This previously forested wetland is now flooded, precluding reforestation.

An upland leave tree clump NNW of the wetland consists of mostly smaller diameter conifers. If there had been doubt about the size of the wetland, and whether it warranted a full buffer, the leave tree requirement could have been satisfied by leaving trees clumped in and around the wetland. This would have afforded some protection to hydrologic and habitat functions, and several of these leave trees would have been of larger diameter, and would have more closely adhered to procedure 14-006-090 (cohort management).

2. Unit 2 Leave tree area on western boundary:

We also looked at a small, narrow linear wetland which trends N-S, with skunk cabbage, Sphagnum moss, water parsley and gleyed mineral soils as described above. This wetland area is broken by small isthmuses of upland, and in many areas is overgrown with vine maple and other upland species that are rooted outside of the wetland. This area was appropriately included in a leave tree clump. It probably does not constitute more than a quarter acre in total, and the leave trees appear to provide adequate protection of hydrology.

3. Unit 1, center of sale:

A forested wetland of .36 acres in size (as measured this spring) was half protected by leave tree clump. The eastern side of this wetland was clear-cut, driven through, and had a slash pile in the center. Vegetation in the undisturbed portion includes skunk cabbage in abundance, and water parsley. Sword fern grows on hummocks, elevated above flooded areas. Throughout this wetland there is standing water. Soils are as described above. Also as described above, this entire wetland should have been buffered according to HCP wetland strategy. Significant blow-down within the unmanaged portion has further compromised hydrologic function, and potentially could have been mitigated with a buffer.

Appendix C. South Puget Sound's Assessment of two Unprotected and Undocumented Wetlands in South Puget Sound Region

Hannon Weigh Type B Wetland Field Review
November 5, 2008

Unit 1 (0.36 acre Type B wetland)



Unit 2 (0.39 acre Type B wetland)



Discussions from Site Visit November 5, 2008

Multiple Sale History

Pole sales: Hannon Pole

Unit 1- Harvest date unknown, but thought to be post HCP. The wetland identification was likely missed, however, pole removal would have been permitted in this forested wetland and the associated 100-foot buffer as the removal would not have taken the stand below BA 120.

Unit 2- ~1993 (pre-HCP) and more than likely did not harvest in the hardwood dominated forested wetland.

Regeneration Harvest: Hannon Weigh

Original sale layout occurred in 2002 or 2003 but was postponed due to 50/25 rule. Logged 2006/07; planted with Douglas fir and western red cedar in the spring of 08. Both units had 1 forested wetland larger than ¼ acre but less than 1 acre that was affected by the harvest activity (see Sabra's attached Memo). Each wetland should have been given a 100' buffer and soils protection within 50 feet of wetland edge as per PR 14-004-150, Identifying and Protecting Riparian and Wetland Management Zones in The Westside HCP Planning Units.

Thoughts on how the wetlands were missed

During Sale Layout

Unit 1- We do not know specifically why this forested wetland was not accurately identified in sale layout as the forester who set up the sale is no longer with the agency. We surmised that the forested wetland was judged to be less than ¼ acre and that the marking of clumps on either side of the wetland would provide a measure of protection.

Unit 2- We believe this forested wetland was also evaluated and judged to be less than ¼ acre. Perhaps the wetland characteristics were not as apparent in the forested condition and/or acreage determination was not thorough enough. The wetland was dominated by hardwoods (black cottonwood and red alder) and would not have been a good candidate for a small leaf tree clump due to wind throw. Other small wetlands with conifer were protected with leaf trees in this unit so we have no reason to think this site was not analyzed for similar protection.

During Sale Compliance

The forester that the timber harvest was not involved in the layout/design of the timber sale. It is reasonable to assume the sale layout conformed to HCP policies and procedures. The nature of sale compliance is to inspect areas while road building and harvest is occurring. While it would have been nice to recognize these small forested wetlands as being larger than .25 acres, it would be hard to determine until after the harvest and yarding had occurred. Speaking with the operators about skidding through and piling slash in small wetlands should occur on all harvest operations regardless of wetland size or protection measures.

Mitigation

To Date: Reforested with Douglas-fir and western red cedar

Future: Create separate polygons for each wetland in P&T with 100-foot HCP buffers to provide a mechanism to assure protection next harvest cycle and schedule site specific silvicultural prescriptions. Unit 2 will also need a water type modification for a T5 stream which initiates from the wetland. The Snoqualmie unit also decided to interplant the newly created ZMSAs with western red cedar this coming spring and to schedule competitive vegetation surveys to monitor stand conditions. There is a high likelihood of multiple hardwood removal treatments over the next several years to establish a conifer dominated stand.

Notes

Prevention- A heightened awareness of wetland protection has been developed from analyzing this occurrence and by determining the causal factors. Prevention measures include; attention to detail in reconnaissance, utilization of technology to determine size and bringing in a specialist to identify/quantify when necessary.

Attendees of Site Visit

Alan Mainwaring (biologist), Mark Thibo (State Lands Assistant Manager), Brian Ballard (unit forester), Jason Sharp (Marckworth forester), Tyler Traweek (Tiger Mt. forester) and Brian Williams (Eastside silvicultural forester)

References

- Husch B., Beers T.W., Kershaw J.A. 2003. Forest Mensuration 4th Edition. New Jersey. John Wiley and Sons Inc.
- Lewis J. C. 1998. Creating snags and wildlife trees in commercial forest landscapes. *Western Journal of Applied Forestry* 13:97–101.
- Reiter M. 2008. December 1-4, 2007 Storm Events Summary. Prepared for: Weyerhaeuser Western Timberlands. Weyerhaeuser Company February 8, 2008.
- Ruggiero LF, Zielinski WJ, Aubry KB, Buskirk SW, Lyon LJ. 1994. A conservation assessment framework for forest carnivores. In: Ruggiero LF, Aubry KB, Buskirk SW, Lyon LJ, Zielinski WJ, editors. *The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States*. Fort Collins, CO: USDA Forest Service, General Technical Report GTR-RM-254. Fort Collins, CO. p 1-6.
- Washington State Department of Natural Resources. 1997. Final habitat conservation plan. Author. Olympia, WA.