NATURAL RESOURCES

Habitat Conservation Plan for State Trust Lands

2007 Implementation Monitoring Report

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Natural Resources
Doug Sutherland - Commissioner of Public Lands

Acknowledgements

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Contributions are by DNR staff unless otherwise indicated.
Copies of this report may be obtained from the Land Management Division, Ecosystem Services Section, 1111 Washington Street, PO Box 47016 Olympia, WA 98504-7016;
http://www.dnr.wa.gov/ResearchScience/Topics/TrustLandsHCP/Pages/implementation_monitoring.aspx

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Introduction

The Washington State Department of Natural Resources (DNR) developed 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 (now known as NOAA Fisheries Service) (collectively, the Services) for the conservation of threatened and endangered species.

The HCP guides DNR management of approximately 1.6 million acres of forested state trust lands within the range of the northern spotted owl throughout western Washington and the upper eastern slopes of the Cascade Mountain Range. To manage habitats more efficiently and effectively, HCP lands were sectioned into nine planning units based primarily on large watersheds. A contractual agreement was established between DNR and the Services to implement and monitor the HCP. Implementation monitoring priorities are identified each year so that conservation strategies are monitored. Three main conservation strategies center on the northern spotted owl, the marbled murrelet, and riparian areas. The 2007 Implementation Monitoring Report focuses on documenting whether the selected HCP conservation strategies were implemented as documented.

In 2007, we looked at two HCP strategies: the Riparian Conservation Strategy for the Olympic Experimental State Forest (OESF) and Uncommon Habitats. These two strategies were selected because they had not been monitored since 2004. In addition to these two strategies, we investigated the consistency with which HCP checklists were included in timber sale jackets. This report is divided into three chapters. Chapter 1 reports our assessment of the presence of HCP checklists in timber sale jackets. Chapter 2 looks at our assessment of the application of the Uncommon Habitats strategy to timber sales in the Northwest, Olympic, and South Puget Sound regions. Chapter 3 details our assessment of the riparian conservation strategy in Olympic Experimental State Forest in the Olympic Region.

Chapter 1. HCP Checklist Review

Each year we review timber sale jackets to determine whether or not a particular HCP strategy was implemented on a timber sale. Checking for the HCP checklist is a quick way to determine whether or not the required HCP strategy documentation was included in the final paperwork. Historically, comprehensive documentation has been one of DNR's biggest challenges in HCP implementation. As systems to implement the HCP develop over time, it is anticipated that documentation will improve.

Methods

We obtained a list of all timber sales that were completed in the 2006 fiscal year. For each jacket we acquired through the DNR Title and Records Office we looked for an HCP checklist. All 2006 timber sale jackets were reviewed. With this relatively easy documentation check we were able to conduct the assessment for every timber sale (100 percent sample).

Results and Discussion

We reviewed 125 DNR timber sale jackets for the presence of HCP checklists. Of these, 88 contained an HCP checklist and 37 did not. The absence of HCP checklists in timber sale jackets does not necessarily mean HCP checklists were not completed during set up of the sale.

In a few cases, HCP checklists were specifically requested from individual regions and the checklists were available. The timber sale jackets we examined were sales that were set up between 2001 and 2005. It was not until 2004 that specific requirements were placed on regions to include the HCP checklist in the final documentation (Heller pers. comm. Feb 2008). This may explain why 30 percent of the jackets did not include HCP checklists in the final documentation. Even if no HCP strategies apply to a sale, an HCP checklist is required in each timber sale jacket. This was the first time we monitored the inclusion of HCP checklists.

In future monitoring, the year that sale jackets were assembled along with HCP checklist presence would be recorded, which would indicate whether or not regions were improving on this documentation issue over time. We would expect that all jackets would include an HCP checklist for sales that were completed after 2004.

Chapter 2. Uncommon Habitats

The protection of uncommon habitats is crucial because these habitats are particularly difficult to restore or recreate once they are destroyed. In addition, they provide habitat for many species of concern (HCP p. IV.151). There are several types of uncommon habitats that require protection and are described in the HCP, including balds, talus, caves, cliffs, oak woodlands, large snags, and large, structurally unique trees. In 2007, we examined timber sales that applied the HCP Uncommon Habitats Strategy in Olympic, Northwest and South Puget Sound Regions; and we evaluated the regions' success in applying conservation efforts. Pacific Cascade region did not have any sales that applied the uncommon habitat strategy.

Methods

We obtained a list of all timber sales that closed in fiscal year 2006. For each jacket that we acquired through the DNR Title and Records Office we selected sales that indicated protection of an uncommon habitat. We looked for all types of uncommon habitats except for large, structurally unique trees. Monitoring large, structurally unique trees requires considerable resources and we typically dedicate a field season to monitor this portion of the strategy (Implementation Monitoring 2004).

Each year strategies are monitored across all of the Westside planning units, which makes monitoring all activities challenging. As a result, a sample of sales is typically selected out of the total number of relevant sales. However, because so few sales implemented the Uncommon Habitats Strategy in 2007, we were able to select a 100 percent sample size for monitoring. In addition, we also monitored for false positives, in other words we looked for uncommon habitats in timber sales where uncommon habitats were not documented. This monitoring was conducted anecdotally; we did not construct a statistically valid sampling design. Instead, each sale we monitored for the riparian strategy we also planned to note any uncommon habitats that appeared to be significant.

For each sale that indicated an Uncommon Habitat in the HCP checklist, we conducted a field visit where we examined habitat protection measures and characteristics specific to the type of habitat. In some cases we checked cliffs or balds for damage. In one instance we assessed an oak woodland to determine whether it was protected and treated as described in the presales notes. Checking uncommon habitats can be both subjective, as in the case of the oak woodland, and less subjective as in the case of examining cliffs. The following describes our methods for implementation monitoring on the cliffs, balds, and oak woodland portions of the Uncommon Habitats Strategy (cliffs, balds, and oak woodlands were the only documented uncommon habitats documented in the sales we selected):

- **Cliffs** – In the office we reviewed documentation to see how the cliff was protected and if a biologist found the cliff to be useful wildlife habitat. We

collected height measurements in the field to determine whether the cliff met HCP requirements for protection. We also searched for any kind of damage (road building or other timber harvest-related activity) to the cliff.

- **Balds** – In the office we reviewed documentation to see how the bald was protected and whether or not it was important for wildlife. In the field we examined each bald to determine if general soil and vegetation characteristics were present per Fleckenstein's recommendations (pers. comm. 2008). We also checked for any signs of damage to the bald.
- **Oak woodland** – In the office we reviewed documentation to see how the oak woodland was protected and also whether or not any kind of silvicultural treatment was applied to the woodland. In the field we searched for oak stumps and/or roads through the habitat as indicators of damage.

Results and Discussion

For a complete description of all Uncommon Habitats we monitored, see Appendix A. Table 2.1 summarizes the types and numbers of uncommon habitats we monitored in three regions. For each Uncommon Habitat we monitored we found no evidence of any kind of damage. All cliffs met the minimum HCP requirements (HCP p.IV.155). In most cases, though the cliffs met HCP requirements, region biologists did not find them to be useful habitat for wildlife. All cliffs were adequately protected by leave trees. The oak woodland in South Puget Sound Region was preserved and we did not find any oak stumps or roads through the habitat. We did not find any sales with undocumented or unprotected uncommon habitats (false positives).

Table 2.1. Summary of the number and types of Uncommon Habitats monitored in each region

	Cliffs	Balds	Oak Woodland
South Puget Sound	1	0	1
Northwest	8	1	0
Olympic	1	0	0

The balds we monitored in Northwest Region are of particular mention because it was difficult to determine whether or not they were actually balds. However, they may be considered low-quality balds. They were large outcroppings of rocks covered in moss and other vegetation. We did not find any plant species indicating a high quality bald; however we did find at least one plant type indicative of a low-quality bald (Fleckenstein, pers. comm. 2008). Technically, these features might not be considered balds because such features typically exist in locations of water stress where either soils are well-drained, or drought conditions exist. For the balds we monitored, very little if any soil existed. Irrespective of whether the features should be considered high- or low-quality balds, they were all adequately protected from harvest activities with leave trees or by being bounded out of the sale. For a complete list of plant species we identified and a detailed description of the balds, see Appendix A.

Chapter 3. Riparian Conservation Strategy in the Olympic Experimental State Forest

The Riparian Conservation Strategy has not been monitored in the Olympic Experimental State Forest (OESF) since 2003, thus in 2007 it was identified as a monitoring priority. We chose to monitor only the riparian buffer portion of the riparian conservation strategy. We determined the most objective way to monitor implementation of riparian buffers in the OESF would be to conduct stream typing surveys and measure buffer widths to determine how buffers were applied on the ground compared to the timber sales documentation.

Due to the experimental nature of the OESF, our approach to determining Riparian Strategy implementation in 2007 was different than our approach in 2006 when we monitored the Riparian Strategy in the five Westside planning units outside the OESF. Unlike the other forested state lands in Western Washington covered by the HCP, the HCP does not prescribe specific buffer widths for streams in the OESF. Rather, the HCP describes types of buffers needed to protect OESF streams. Therefore, rather than conducting monitoring on the implementation of riparian buffers according to HCP rules as we did for the other five Westside planning units, in the OESF we monitored how buffers were implemented compared to the described sale layout documented in the timber sale jacket.

The HCP describes two types of buffers for OESF streams—interior core buffers and exterior buffers. An interior core buffer is "intended to minimize disturbance of unstable channel banks and adjacent hill slopes (*i.e.*, potential areas of mass wasting) in order to protect and aid natural restoration of riparian processes and functions" (HCP p. IV.109). An exterior buffer is intended as a wind buffer and to "maintain channel-floodplain interactions, moderate riparian microclimate, shield the inner core from the physical and ecological disturbances of intensive management on upslope sites, and maintain diverse habitat for riparian dependent and upland biota" (HCP p. IV.112).

Unique to the OESF is the use of experimentation to study the relationships between forest production and riparian protection, whether this means variable width buffers are left on streams or a portion of a riparian buffer is thinned (HCP IV.106). Specific alternatives for determining widths for exterior buffers are currently being developed through DNR's forest land planning process in the OESF.

When the HCP was first implemented, OESF managers typically applied a single multi-purpose buffer to streams (Christiansen and Vaughn pers. comm. 2008). According to Olympic Region management, the timber sales we sampled implemented riparian buffer widths that were based on 150 foot minimum widths for Type 3 streams, measured from the bankfull width mark, or wider, if an unstable slope exceeded 150 horizontal

feet. There was rarely an exterior buffer. Buffers on Type 4 streams were based on slope stability, or 100 feet, whichever was greater. On Type 5 streams, only unstable areas were protected (Christiansen and Vaughn pers. comm. 2008). This is consistent with what we found documented in timber sale jackets for the timber sales we monitored which were completed between the 2003 and 2005 calendar year.

Our goal for 2007 monitoring was to check stream types to see if they matched the rules in place at the time the sales were set up (2001 Forest Practices Rules). Because we conduct HCP implementation monitoring we also checked stream types to see if they matched the rules referred to in the HCP (the 1996 rules Forest Practices Board Emergency Rules, now known as the "Water Typing System for Forested State Trust HCP Lands" referred to as WTS). In addition to investigating stream types we measured riparian buffer widths. We measured riparian buffers to demonstrate whether buffer widths on the ground measured up to the intended average buffer widths documented in the timber sale jacket. We also attempted to gather enough information about riparian buffer widths that we would be able to show managers how buffers were being implemented across all stream types and if there were any significant differences between buffers implemented on individual timber sales.

Methods

Sampling Strategy

There were 12 timber sales distributed across the OESF that fit our sampling criteria; however, one of the sales was dropped due to hazardous conditions caused by blowdown from the 2006 windstorms. Our sample unit was the OESF and our sampling frame included the 11 sales we selected for monitoring (Figure 3.1).

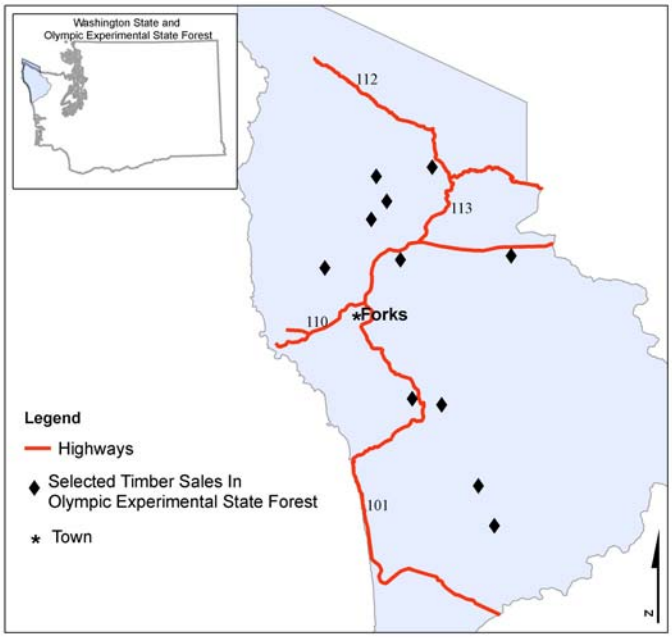

Figure 3.1. Distribution of 11 timber sales selected for 2008 Riparian Strategy implementation monitoring in the Olympic Experimental State Forest

Our criteria for selecting sales were: 1) sales that were completed and closed in the 2006 fiscal year and 2) sales that had riparian areas and therefore applied the riparian conservation strategy. We selected streams from all 11 timber sales; however, due to the high number of stream segments in some of the sales, we selected a sample to monitor. The number of stream segments sampled for each timber sale was determined using Raosoft online sample size calculator (http://www.raosoft.com/samplesize.html). We calculated sample size based on the total number of streams in all timber sales using a 95 percent confidence level. We applied the calculated sample size proportionally to the total number of streams per sale to determine how many streams we would monitor (Table 3.1). We randomly selected streams for each sale. This identified the streams on which we would conduct stream typing. Those stream segments with riparian buffers were selected for riparian buffer evaluation. However, not all stream segments selected for typing had measureable buffers, because riparian buffers cannot be measured when they intersect each other. In addition, many of the Type 5 streams did not have buffers, but instead were protected by leave trees.

Table 3.1. OESF timber sales and the number of stream segments selected for field verification, by stream type

Timber Sale	**Stream Type**				
	1	**2**	**3**	**4**	**5**
Longer Run Thin	0	0	4	0	0
C-3000 Commercial Thin (C.T.)	1	0	2	11	20
Wentworthwhile	0	0	4	2	2
Dickey Mountain Alder	0	0	1	5	14
Section 4 40	0	0	1	0	4
Mustard and Relish	0	0	2	17	24
Capitol Split	1	0	2	0	4
Shuwah Jigsaw	0	0	3	1	6
Hoko Ridge	1	0	5	3	9
G-2000 Strip*	0	0	0	0	1
Kuegel Alder	0	0	0	2	6
Tiedye	0	0	2	0	2
TOTAL = 162	**3**	**0**	**26**	**41**	**92**

*****The G-2000 sale had a Type 9 stream which should have been identified as a Type 1-5 stream; this is discussed in the results section of stream typing.

Stream Typing

The DNR stream typing system has changed since the HCP was signed in 1997. For more information on the changes in stream typing rules, please refer to the Habitat Conservation Plan for State Trust Lands 2006 Implementation Monitoring Report (p. 6 www.dnr.wa.gov in Publications, Reports links). All the sales we examined used the 2001 Forest Practices Rules for implementing stream types; however the Water Typing System for Forested State Trust HCP Lands (WTS) is the only system consistent with the HCP (Livingston, pers. comm.). As a result, we used both the state trust lands HCP water typing and the 2001 Forest Practices Rules in order to:

- Assess stream types using the same rules the streams were typed with at the time the sale was set up (2001 Forest Practices Rules).
- Check stream types using the HCP rules (WTS).

Table 3.2 lists the criteria we used for both sets of rules to determine stream type. We applied some of the criteria in the field (e.g. gradient and stream width). For information on basin size, fish surveys, and seasonality of streams we relied on documentation in the timber sale jacket.

Table 3.2. State Lands Water Typing System and 2001 Forest and Fish Rules used to check stream types in OESF

Water type	Water Typing System for Forested State Trust HCP Lands (WTS)	Water Type	2001 Forest Practices Rules
Type 1	Shorelines of the State	**Type S**	Shorelines of the State
Type 2	>20' ordinary high water mark <4% gradient Fish	**Type F**	>20' stream width <4% gradient Fish
Type 3	≥2' ordinary high water mark <16% gradient or >16% or <20% with >50 acres contributing basin size Fish	**Type F**	≥2' stream bank full width <16% but not greater than 20% gradient >16% or <20% with >50 acres contributing basin size Fish
Type 4	≥2' ordinary high water mark > 20% gradient or >16% or <20% with <50 acres contributing basin size Water may be perennial or seasonal	**Type NP**	Stream segment contains water at all times during normal rainfall year Downstream from perennial source Basin size ≥52 acres (outside Sitka spruce zone) Basin size ≥13 acres (in Sitka spruce zone)
Type 5	<2' ordinary high water mark May not have a well defined channel Water may be perennial or seasonal	**Type Ns**	Seasonal water Stream segment physically connected to a Type 1, 2, 3, or 4 water

Documentation was very important to our stream typing process. For example, depending on the season, streams can be mistyped because they contain water, although water is not present at other times of the year. Although typing streams can be very challenging due to a variety of factors, including seasonal water flow, we report our

stream type results based on summer data collection. Due to these stream-typing inconsistencies, we assumed that streams were typed properly when determining riparian buffer widths.

Riparian Buffer Width Measurements

The purpose of measuring riparian buffer widths in the OESF is to assess how the width of a particular buffer segment meets the width documented in the timber sale jacket. In 2007, we used Trimble Global Positioning System (GPS) units to measure average width of Riparian Management Zones. GPS points were collected approximately every 50 feet along the floodplain; we attempted to capture any changes in floodplain direction. GPS points were also collected approximately every 50 feet along the outer edge of the buffer at trees marked with boundary tags. Although there are potentially different ways to measure where a buffer stops and a regeneration harvest activity begins, we collected GPS position data at a spot between each tagged tree and the nearest stump. Stumps were typically only a few feet from the tagged trees, so this was not a point of notable subjectivity. However, if there was a stump on the line, we selected a location on the buffer side of the stump to collect GPS data. When a tree that was tagged had fallen, we approximated a location between the root wad or hole left by the fallen tree, and the nearest stump. When thinning activities occur in the OESF, the outer edge of the exterior buffer is not marked with boundary tags making it extremely difficult to determine the outer edge of the buffer. In such cases, we only measured the section of buffer that was marked with boundary tags; this will be explained in more detail in the discussion section of Chapter 3 of this report.

In some cases, we could not approach the floodplain due to large rocky cliffs, extremely unstable slopes, or heavy blowdown. In these cases, we measured as much of the buffer as we could access and used that smaller extent as our sample of measured riparian buffer. For example, at one site we were able to GPS the entire outer buffer, but were unable to access one end of the floodplain (Figure 3.2).

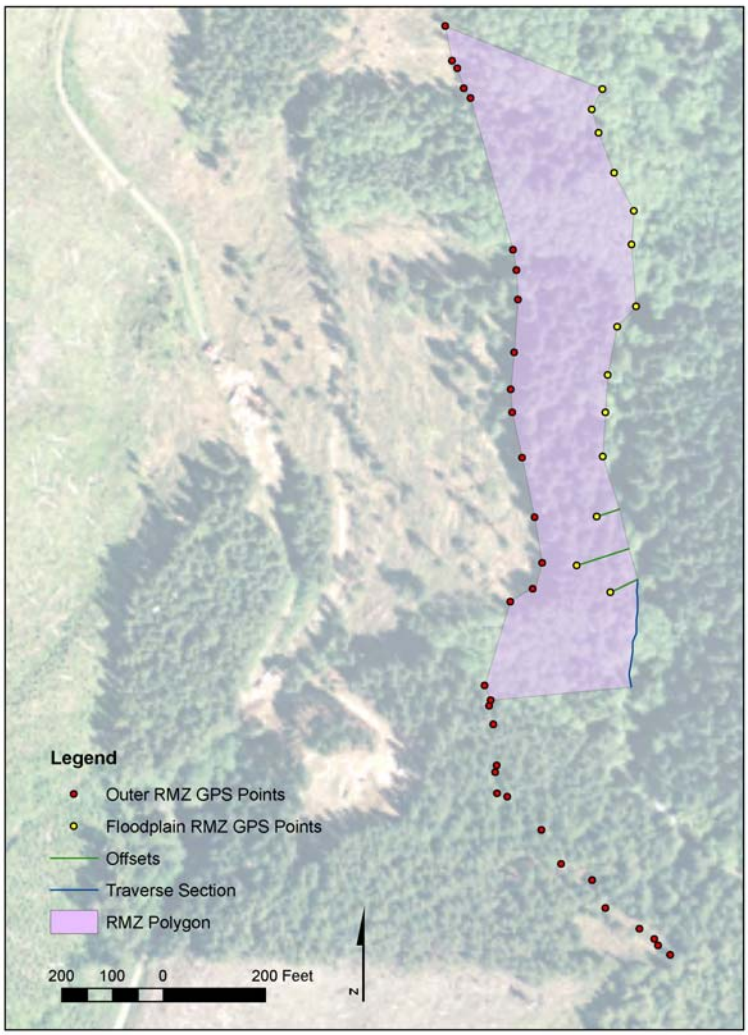

Figure 3.2. Type 3 stream segment where we used the GPS, offset, and traverse methods to measure a riparian buffer. The southern end of this buffer was not measurable due to safety concerns

In 2007, we used two alternative methods (developed in 2006) for recording the location of the 100-year floodplain and/or the outer buffer when GPS was unavailable due to terrain, canopy cover, or time of day. Both alternative methods, known as the "traverse method" and the "offset method" are variations on the GPS method and capture the same information that the GPS method captures.

When conducting the traverse method, we started from a GPS location associated with the stream segment (there were no situations when we could not collect some GPS points). We used a laser rangefinder and compass to take distance and bearing measurements where needed to collect data on the entire buffer segment (Figure 3.2).

The offset method entailed using a GPS point as the known location, then measuring a distance and bearing to a specific point using a compass and laser rangefinder; for example, a specific location on the floodplain where GPS was not available, as shown in Figure 3.2.

The offset method was also implemented when buffers were measured on both sides of a stream segment. Offset was used to measure the width of the drainage gradient from one side of the floodplain to the other (Figure 3.3).

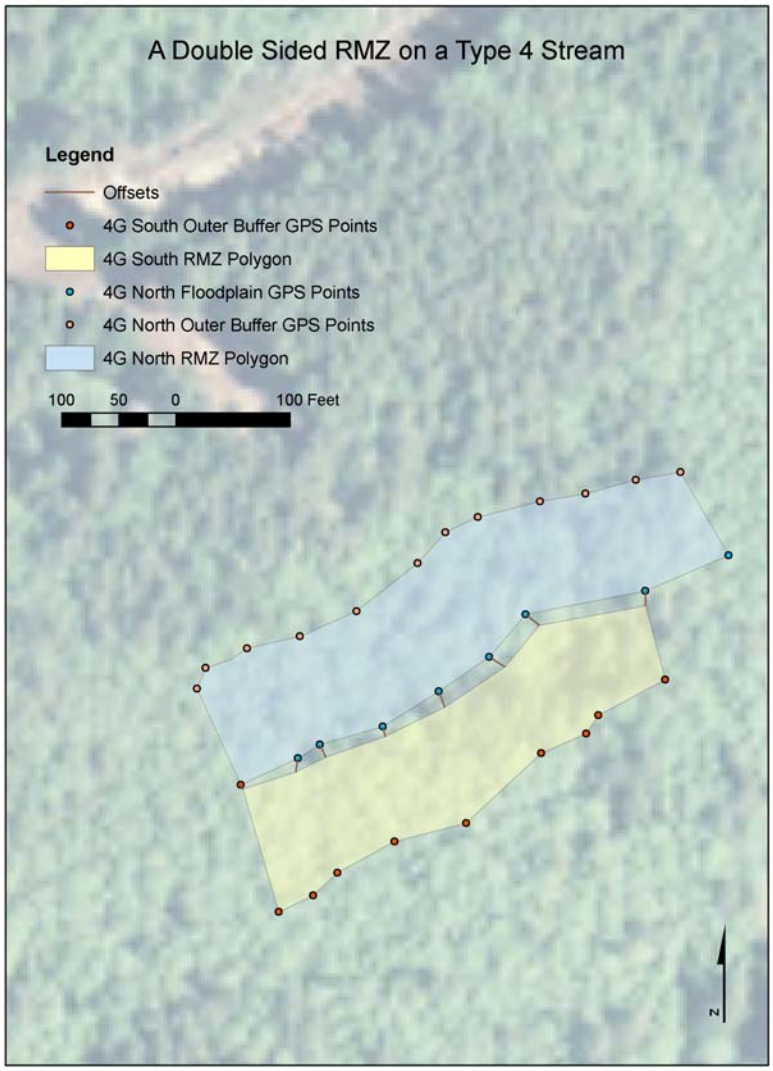

Figure 3.3. Use of the offset method in which GPS points are taken on one side of the floodplain, then a distance and bearing is measured to the opposite side of the floodplain

In the office, collected GPS data were corrected using Pathfinder Office software (a more detailed discussion is in 2006 Implementation Monitoring Report p. 34) and the corrected shape files were added to a Geographic Information System (GIS) project created for each timber sale. Polygons were created for each buffer segment by connecting floodplain GPS points to outer buffer GPS points. An average width was calculated based on the stream segment length and buffer area. Once an average width was calculated, it was compared to the width documented by the forester in the timber sale jacket. The average buffer width calculated from the field data was divided by the documented buffer width to determine what percent of the documented width was applied on the ground. We refer to this calculation as the "percent documented width".

Setting a Threshold for Riparian Buffer Width Implementation

Determining whether buffer widths are implemented correctly is a complex issue. The following points may introduce error in measured buffer width.

1. **The 100-year floodplain.** Frequently, the 100-year floodplain is the same as the ordinary high water mark. However, occasionally the two are not the same and the outer edge of the floodplain can be interpreted to be in different locations, depending on slope and vegetation. It was assumed that our delineated floodplain did not differ greatly from that delineated by the forester. However, we may have introduced some bias, especially when determining the floodplain on wide, flat streams. We may have tended to underestimate the floodplain to err on the side of being conservative, thus overestimating the riparian buffer.
2. **Outer buffer trees.** As discussed in the methods portion of this report, we took GPS locations on the outer buffer trees marked with boundary tags. In some cases there was no tree at the measured outer buffer edge that was tagged. In those cases, foresters may mark the next tree in (towards the stream), leaving the buffer measurement narrower.
3. **Traverse and offset measurements.** The error involved in conducting a traverse was not quantified, but was minimized by taking short measurements (distance was usually dictated by thick brush) and by using the offset method as often as possible. We assumed the offset method error would be less than that of a traverse because each distance and bearing is associated with a GPS point, which would reduce cumulative error.
4. **Riparian buffer extent.** We assumed that each buffer was a single multipurpose buffer that did not differentiate interior core from exterior buffers on the ground (unless documented otherwise in the timber sale jacket). This assumption was based on comments by region management which indicated that riparian buffers were applied using a single minimum width (or wider depending on the extent of unstable slopes).
5. **GPS accuracy.** In order to determine the level of implementation for buffer width, we relied on an acceptable level of error according to the accuracy of the GPS, which was quantified through survey monument analysis and additional information from other studies and publications (Implementation Monitoring Report 2006).

In reporting the results for buffer width measurements, it is important to briefly discuss GPS accuracy and how it relates to determining implementation. In 2006 we monitored buffers according to HCP rules (prescriptive buffer widths); as a result, we set a level of mean buffer width compliance for 2007 at 87 percent of expected width (according to the Riparian Conservation Strategy in the HCP) to account for GPS and human error (Implementation Monitoring Report 2006). Even though we did not conduct monitoring in the OESF in a way that determines HCP compliance, we can still use the 87 percent threshold as a method of determining which buffers are in particular need of re-examination, and more generally, whether buffers are being implemented as documented.

Implementation monitoring is not intended to determine whether riparian buffers are effective; however, stream buffers are installed with the understanding that a site-specific buffer width will protect riparian function including unstable slopes. For our purposes of monitoring, we need to set a standard at which we can say buffer widths were or were not implemented sufficiently to meet the standard stated in the timber sale jacket established

to protect the riparian zone, even in areas where buffer width guidance is experimental in nature. Therefore, we used the 87 percent threshold as a marker to identify how well buffers were implemented on the sales we monitored. (For an explanation of how we determined the 87 percent threshold, see Implementation Monitoring 2006 p. 34)

Results

Stream Typing

We monitored approximately 162 stream segments for stream type in the OESF, including three Type 1, 26 Type 3, 41 Type 4, and 92 Type 5 stream segments. Most streams matched the appropriate rules for which they were typed (2000 Forest and Fish rules) and most streams matched the 1996 rules except for some Type 5 streams that met the physical criteria for Type 4 streams under the 1996 rules, but were seasonal, thus considered typed correctly under the 2000 Forest and Fish rules. We found six streams that did not match the mapped stream type or did not fit the appropriate rules. For a detailed description of each of the following streams, see Appendix B.

On the C-3000 sale there was a Type 4 stream for which we could not determine type or survey because the stream channel was too ambiguous. This stream may have been typed as a 4 under the 2001 Forest Practices Rules because it contained perennial water. There were three Type 5 stream segments that we surveyed and found matched the physical criteria for Type 4 streams for the 1996 rules. We could not find documentation explaining how the streams met the criteria for Type 5 streams, under the 2000 Forest and Fish rules, i.e. that the streams were seasonal. We found all three streams to contain water the two times we visited them (In June and August).

On the G2000 sale there was a stream labeled as a Type 9. All untyped streams are to be typed in the process of setting up DNR timber sales. Therefore, Type 9 streams should not show up on final timber sale maps; all streams should be labeled as a Type 1-5. We surveyed this stream and determined it was a Type 5.

On the Wentworthwhile sale there was a Type 4 stream and a riparian buffer we could not locate. However, we found an area that more closely resembled a wetland than a stream including an area 50-feet wide with standing water, saturated soils, and an abundance of skunk cabbage. The area did have a buffer which we did not measure.

Riparian Buffer Width Measurements

Twelve OESF sales were completed in the 2006 fiscal year and met our sampling criteria; three of these sales were thinning activities and nine were regeneration harvests. In the sales that had thinned units, we only conducted stream typing, with exception to one sale for which documentation did not differentiate buffer application in thinned units versus regeneration harvest units (this is explained more in the discussion section). One of the thinned sales had so much blowdown we eliminated it. Thus, the total number of sales we monitored for riparian buffer width was 10.

We selected 78 riparian buffer widths on a variety of stream types in the OESF. We found that six of the buffers could not be included in the total for various reasons including:

- One buffer we thought was riparian, but when examined on the ground was a wetland buffer.
- Five were no-equipment zones (four on Type 5 streams and one on a Type 1 stream) and not functioning as riparian buffers.

This leaves a total of 72 riparian buffers measured and included in our results.

- Type 1 stream segments – 2
- Type 2 stream segments – 0
- Type 3 stream segments – 19
- Type 4 stream segments – 26
- Type 5 stream segments – 25

The riparian buffer width distribution results are presented in several ways. First we show the total distribution of buffer widths across the OESF for all stream types. We then illustrate the distribution of riparian buffer widths within timber sales that had at least one buffer that was less than 87 percent of the documented width for all stream types. Next, we analyze data on a finer scale looking at how buffers were implemented on individual stream segments, by stream type. Finally we look at a weighted average for each stream type using total area and total stream length across all timber sales.

Total Distribution

In the OESF, we measured 72 riparian buffer widths. For each buffer we calculated a percent documented width for all stream types. The overall distribution resulted in 21 buffers less than 87 percent of the documented width and 51 greater than or equal to 87 percent (Figure 3.4).

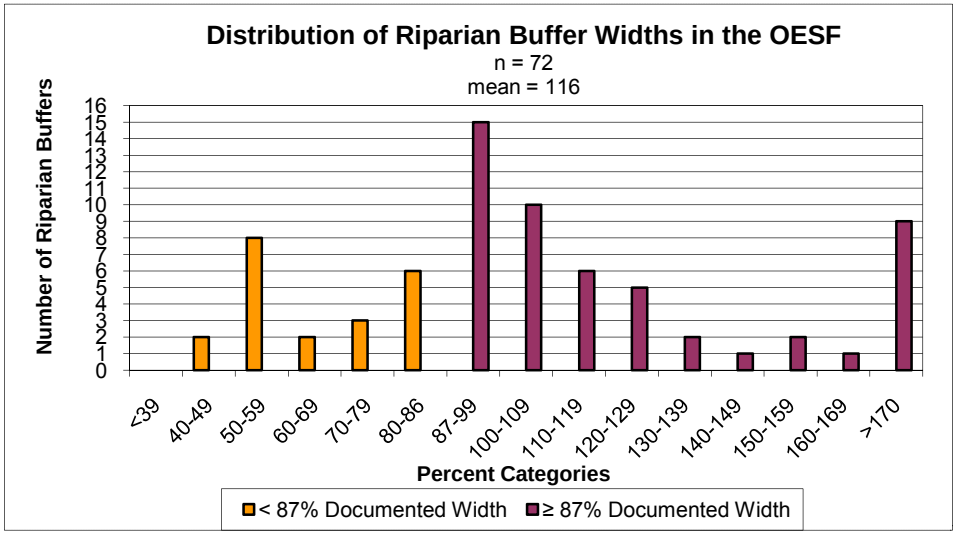

Figure 3.4. Distribution of riparian buffer widths measured in 2007 in the Olympic Experimental State Forest

The 72 buffers we measured were distributed across 10 timber sales. Six of the 10 had no buffers less than 87 percent. For a complete list of sales and each measured buffer width see Appendix C. Four had at least one buffer less than 87 percent of the documented width.

Dickey Mountain Alder had two buffers less than 87 percent of the documented width. Both were Type 4 streams averaging 53 feet (53 percent) and 64 feet (64 percent) in width. While two of the 13 buffers measured on this sale were less than 87 percent of the documented width, 11 were at least 87 percent, and the average documented width for all stream types was 136 percent (Figure 3.5). The three buffers greater than 170 percent of the documented width were all Type 5 streams being protected for unstable slopes.

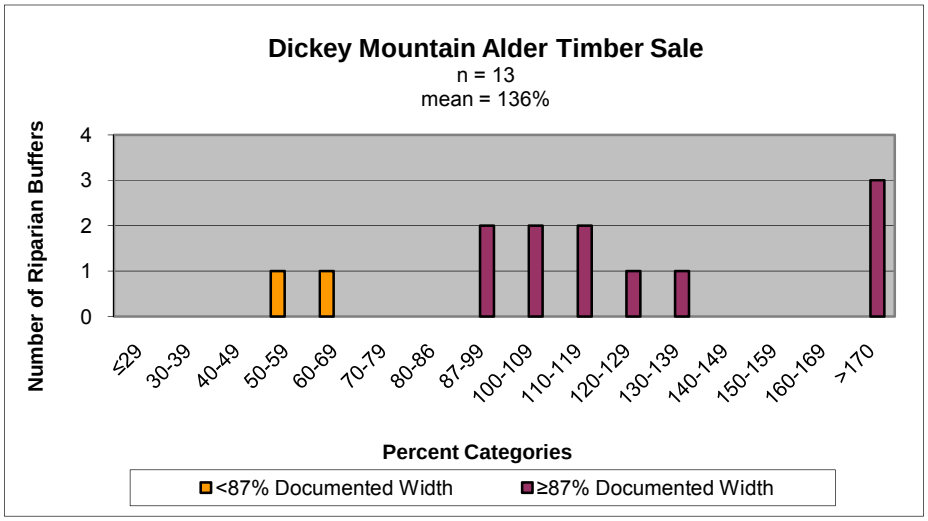

Figure 3.5. Distribution of RMZ widths measured on the Dickey Mountain Alder Timber Sale in the Olympic Experimental State Forest

Wentworthwhile had two buffers less than 87 percent of the required width. Both were Type 3 streams, averaging 121 feet (81 percent) and 126 feet (84 percent). While two of the five buffers we measured on this sale were less than 87 percent of the documented width, three were at least 87 percent (also Type 3 streams) and the average percent documented width for all stream types was 92 percent (Figure 3.6).

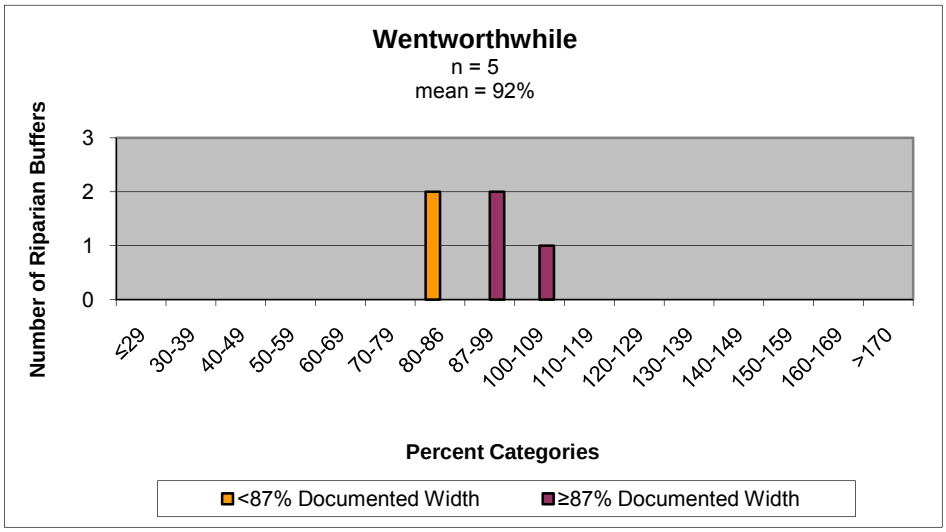

Figure 3.6. Distribution of buffer widths measured on the Wentworthwhile Timber Sale in the Olympic Experimental State Forest

Hoko Ridge had one buffer less than 87 percent of the required width. The buffer was on a Type 4 stream and averaged 47 feet (47 percent). While one of the 15 buffers was less than 87 percent of the documented width, 14 were at least 87 percent, and the average percent documented width for all stream types was 132 percent (Figure 3.7). The two buffers that were greater than 170 percent of the documented width were both Type 5 streams being protected for unstable slopes.

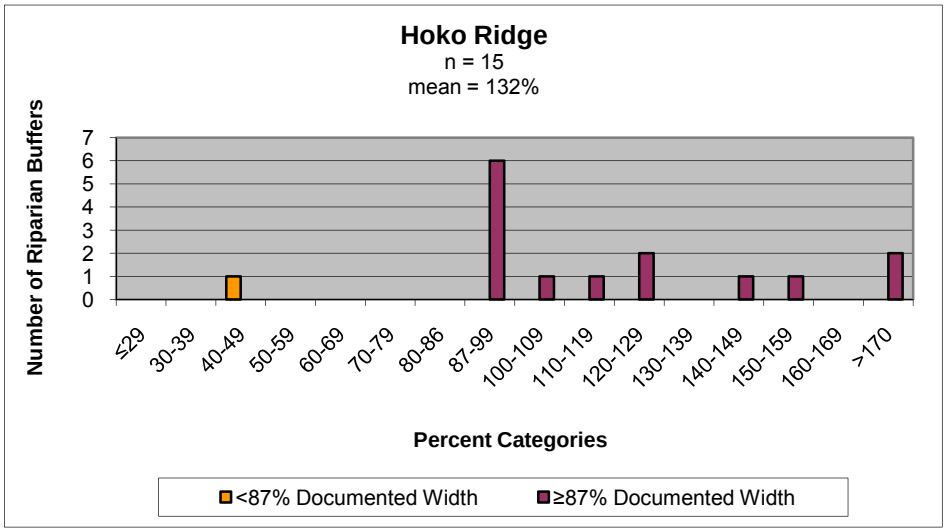

Figure 3.7. Distribution of RMZ widths measured on the Hoko Ridge Timber Sale in the Olympic Experimental State Forest

At Mustard and Relish we measured 15 (out of 25) buffers less than 87% of the documented width. There were three different stream types associated with these 15 buffers including:

- One Type 3 stream segment with a measured average buffer width of 75 feet which was 50 percent of the documented width.
- Ten Type 4 stream segments with measured average buffer widths ranging from 42 to 86 feet (42 percent to 86 percent respectively; for individual widths see Appendix C).
- Four Type 5 streams with documented average buffer widths of 60 feet and measured average buffer widths ranging from 35 feet (58%) to 49 feet (82%).

While 15 of the buffers we measured at Mustard and Relish were less than 87 percent of the documented width, 10 were at least 87 percent and the average percent documented width for all stream types was 105 percent (Figure 3.8). Two of the three buffers that were greater than 170 percent of the documented width were Type 5 streams being protected for unstable slopes and one was a Type 4.

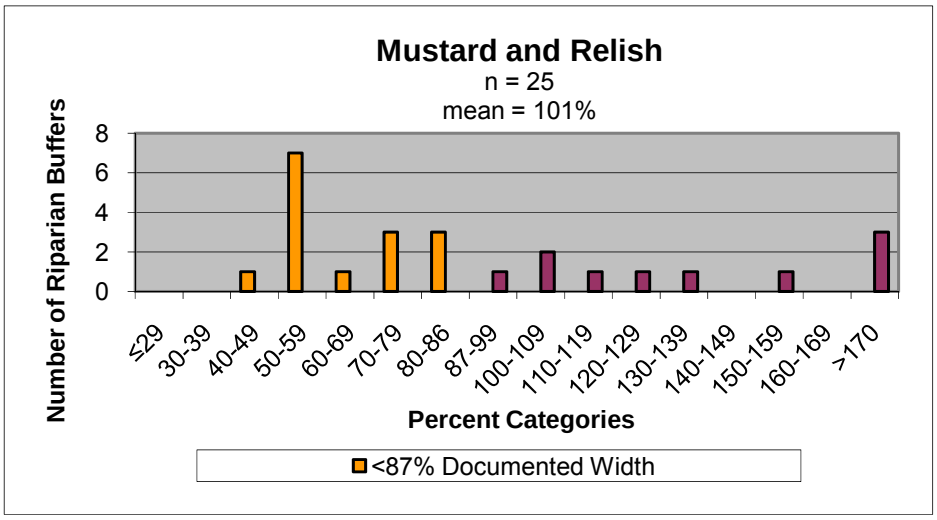

Figure 3.8. Distribution of RMZ widths measured on the Mustard and Relish Timber Sale in the Olympic Experimental State Forest

Riparian Buffer Widths by Stream Type

We analyzed buffers by stream type to see if there was a difference between the average width for Type 3, 4, and 5 streams. We measured two Type 1 buffers, both of which were greater than 87 percent of the documented width.

We measured 19 Type 3 buffers, four of which were less than 87 percent of the documented width and 15 were at least 87 percent (Figure 3.9).

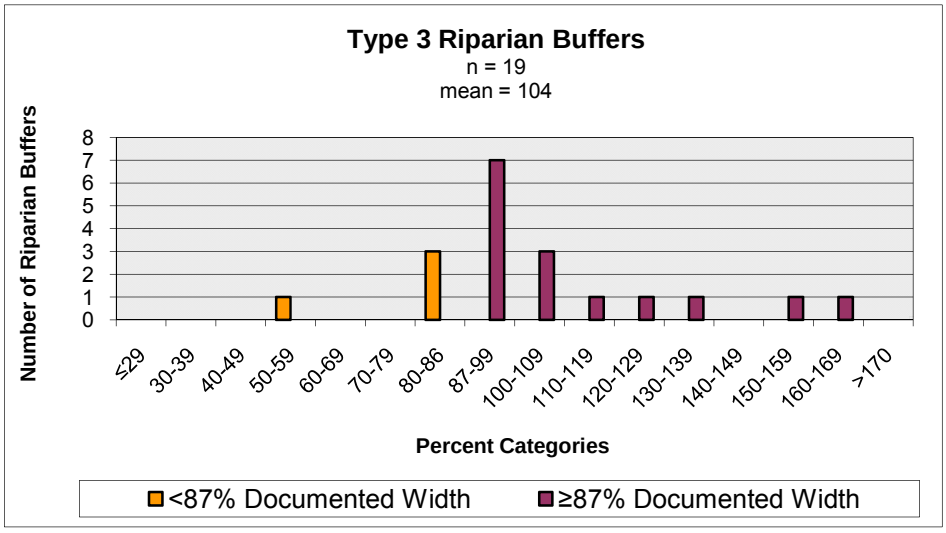

Figure 3.9. Distribution of Type3 stream riparian buffers (by percent documented width) in the OESF

We measured 26 Type 4 buffers, half of which were at least 87 percent (Figure 3.10).

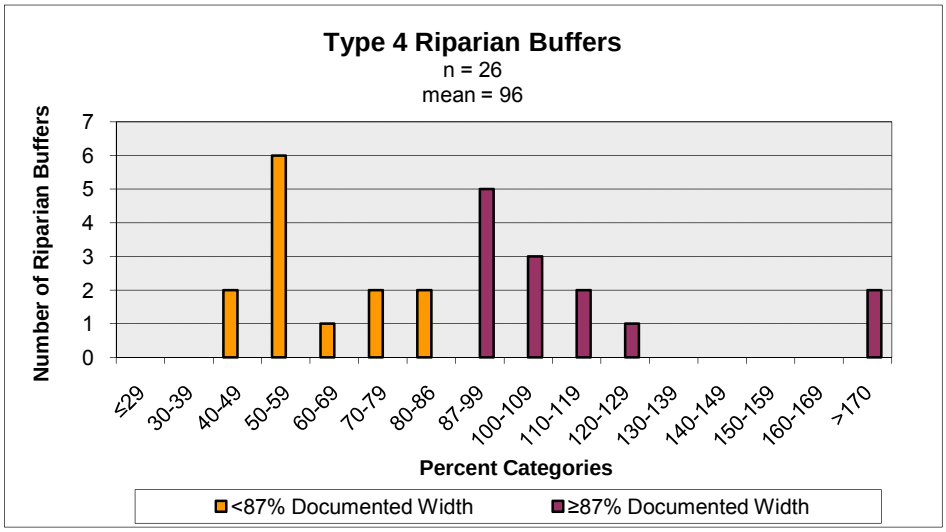

Figure 3.10. Distribution of Type 4 stream segment buffers (by percent documented width) in the OESF

We measured 25 Type 5 buffers, four of which were less than 87 percent of the documented width and 21 of which were at least 87 percent (Figure 3.11).

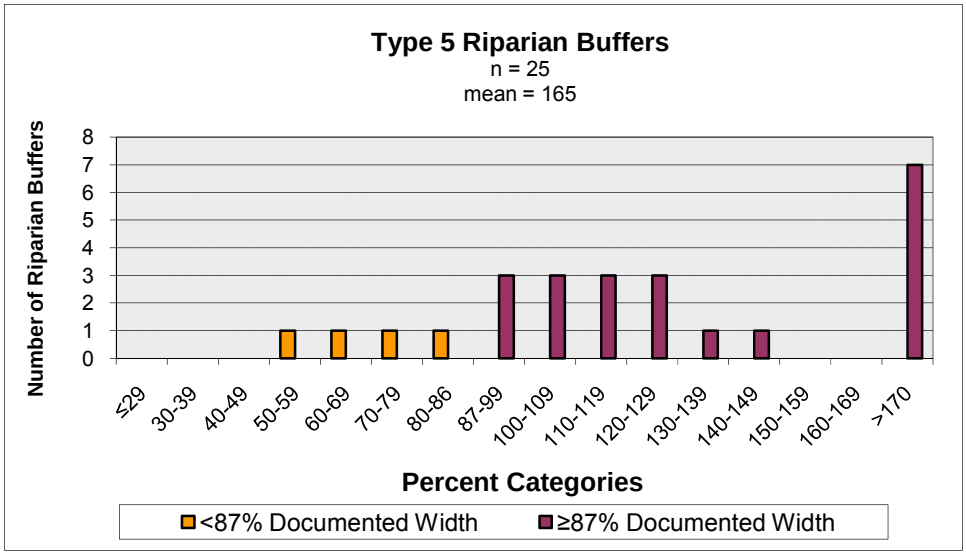

Figure 3.11. Distribution of Type 5 stream segment buffer (by percent documented width) in the OESF

Weighted Average

We calculated a weighted average for each stream type using total buffer area (for all buffer segments) divided by total length of all stream segments (Table 3.3).

Table 3.3. Weighted and arithmetic means for each stream type calculated, using total buffer area and total buffer length

Stream Types with Associated Riparian Buffers	Buffer Area (Feet^2)	Buffer Stream Length (Feet)	Weighted Mean Buffer Width (Feet)	Arithmetic Mean Buffer Width (Feet)
Type 1	673,421	3,525	191	184
Type 3	2,930,598	18,357	160	155
Type 4	903,772	10,186	89	91
Type 5	560,557	11,101	50	60

Larger buffers carry more weight than smaller buffers. If buffer size is relatively equal then the weighted mean is the same as the arithmetic mean. We found that the weighted and arithmetic means for Type 1 buffers was very similar with a difference of seven feet. For Type 3 and Type 4 streams the difference between the weighted and arithmetic mean was five feet or less. For Type 5 streams there was a difference of 10 feet between the weighted and arithmetic mean.

Discussion

Most of the streams we checked matched the rules they were implemented under (2001 Forest Practices Rules). In future riparian strategy monitoring we will be looking at streams that are typed in the field using the Water Typing System for Forested State Trust HCP Lands (WTS) rules, which will eliminate any confusion regarding monitoring for two sets of rules.

Any inconsistencies related to stream typing did not affect buffer width results. Results show that buffers were implemented as documented on almost three quarters of the stream segments we monitored. We found buffers were implemented as documented on nearly two-thirds of the timber sales we monitored and especially on Type 3 streams. There were a number of buffers that met at least170 percent of the documented width. Factors that may contribute to very wide buffers are:

- **Slope break.** Foresters may mark the edge of a buffer where it is practicable to stop harvesting due to topography, effectively increasing the buffer width.
- **Floodplain determination**. In cases where we underestimated the floodplain, the buffer may appear to be wider than it actually was.
- **Unstable slope protection**. In many cases buffers were wider than what was documented in the timber sale jacket to protect unstable slopes, especially on Type 5 buffer segments.

While a majority of the measured buffers were implemented as documented, 29 percent were not. We found problems with buffer implementation, mostly on Type 4 streams; half of the buffers fell below the 87 percent threshold. Ten of the Type 4 riparian buffers were located on the Mustard and Relish sale, which is where we found there were more buffers less than 87 percent (15), than were at least 87 percent (10). Meeting less than 87

percent of the documented width does not directly violate any HCP rules; however it does not meet the anticipated buffer widths documented in timber sale jackets.

The Mustard and Relish sale exemplified circumstances not common to the majority of sales we monitored. A combination of circumstances made this sale more challenging to monitor implementation of riparian buffers. At the time the sale was designed riparian buffers may have been implemented based solely on areas of unstable slopes (Clallam Landscape Plan) and the approach of leaving a minimum average width buffer did not necessarily apply (Vaughn, pers. comm. 2008), which could have resulted in relatively narrow buffers. While this may have been the approach taken on riparian buffers, this was not explicitly documented in the timber sale jacket. In addition to this issue, on this sale there were thinned units and regeneration harvest units. The problem we encountered in differentiating how buffers were applied in the various types of harvests was also a lack of documentation clarifying how riparian buffers were applied differently in thinned units. Region management explained that in thinned units, instead of a single multipurpose buffer being applied to streams, exterior and interior core buffers were applied. Furthermore the exterior portion of the riparian buffer was thinned and only the interior core buffer was marked on the ground with boundary tags. Contrary to that, documentation in the timber sale jacket states that no-cut buffers were applied to all streams. Documentation does not explain that the no-cut buffer is an interior core buffer only. Thus, when monitored, they were measured and analyzed as single multipurpose no-cut buffers. Because documentation in the timber sale jacket did not clarify differences in buffer application between thinned and regeneration harvest units, we included all riparian buffer data from Mustard and Relish in our analysis. There were several buffer segments whose overall documented width may have been affected by being in the thinned units. If the differences in buffer application had been described in the documentation, we would have been able to more accurately interpret the implementation of those buffers.

Overall, the results show that on average OESF buffers are meeting the documented width; however on a finer scale there were a few sales that had buffers that did not meet documented widths. The sale that was least consistent in meeting documented buffer widths was Mustard and Relish. As previously explained, this sale had one main identifiable issue, which was inconsistent and lack of documentation. While most of the expectations for buffers were met on Type 1, 3, and 5 streams, buffers on Type 4 streams had the greatest number of relatively narrow buffer widths.

References

Washington State Department of Natural Resources. 1997. Final habitat conservation plan. Author. Olympia, WA.

Appendix A.

Descriptions of each Uncommon Habitat that 2008 the Ecosystem Services Implementation Monitoring team examined in the field.

UNCOMMON HABITAT DATA SHEET		**NOTES:**
Region		We were able to locate two cliffs along the optional construction road within the timber sale. Doug Hooks, the Deming Unit forester from the Northwest region, accompanied us to this sale. The timber sale jacket indicated that a "leave tree patch encompasses a 25-30 foot cliff within the sale area, that was recognized as "unique habitat" in SEPA B.5.d. This is the only reference to the cliffs that we found in the timber sale jacket, besides the documentation on the HCP checklist. The first cliff we looked at was located in a leave tree area. One leave tree had fallen, leaving a very slight disturbance to the cliff face. The average measured height of this cliff was 36.57 feet. The estimated width of the cliff was 75 feet. The second cliff did not have any retention trees surrounding it. Both cliffs were composed of a metamorphic phyllite rock. We did not see any evidence of damage to the cliff due to the harvest activities. The average measured height of this cliff was 52 feet. The approximate width of this cliff is 150 feet. There was one vine maple left on the top of the cliff. Neither of these cliffs showed evidence of wildlife value. Cliff 1- Measured height using clinometer- 33 feet Measured height using vertical distance option on laser range finder- 38.19 feet and 38.51 feet Average measured height- 36.57 feet Cliff 2- Measured height using clinometer- 53 feet Measured height using vertical distance option on laser range finder- 52.45 feet Average measured height- 52.73 feet Pictures for first cliff #64-65 Pictures for second cliff #66-67
	Northwest	
Timber Sale		
	Going Beyond	
Date		
	10/17/2007	
Your Name	Kosterman, Munzing, Hooks	
Type of Uncommon Habitat	**Cliffs**	
Is the cliff greater than 25 feet tall?	Yes	
Is the cliff below 5,000 feet in elevation?	Yes	
Is there disturbance to cliff face?	No	
Is there retention of trees on cliff benches and the base and top of cliff?	See notes	
Is there any damage to cavities, fissures, or ledges?	No	

UNCOMMON HABITAT DATA SHEET		NOTES:
Region	**Northwest**	This cliff is located near the northeastern corner of the timber sale. It is located in a leave tree area that borders private property to the east. Doug Hooks, a forester from the Northwest region, accompanied us to the timber sale. According to Hooks, this cliff is located along the property line. The area to the east of the cliff is private property and has been harvested. The width of the cliff is approximately 150 feet and the measured height is 54 feet. The lower 15 feet of this cliff is not as exposed as the upper portion. It did not appear as though there was any damage to the cliff as a result of harvest activities. This cliff was indicated on the HCP Checklist. It was also referenced in the timber sale jacket as a "cliff located in the central portion of proposal area not deemed to have significant current wildlife use, however protected through green tree retention" in SEPA B.5.d. Measured height using clinometer- 54 feet Pictures #68-69
Timber Sale	**Hutch Valley**	
Date	10/17/2007	
Your Name	Kosterman, Munzing, Hooks	
Type of Uncommon Habitat	**Cliffs**	
Is the cliff greater than 25 feet tall?	Yes	
Is the cliff below 5,000 feet in elevation?	Yes	
Is there disturbance to the cliff face?	No	
Is there retention of trees on cliff benches and the base and top of cliff?	Yes	
Is there any damage to cavities, fissures, or ledges?	No	

UNCOMMON HABITAT DATA SHEET		NOTES:
Region	**Northwest**	The cliffs were located on the edge of Unit I, which is 6 acres in size. Doug Hooks, the Deming unit forester for Northwest region, accompanied us to this timber sale. The cliffs were excluded from the timber sale. In addition, a leave tree area was left along the edge of this unit where the cliffs were located. We were able to identify 2 cliffs, both similar in size (approximately 40 feet in height by 80 feet in width). We measured the height of the first cliff (see below), but did not measure the height of the second cliff because of its similar size and also because of extremely steep slopes. The only difference between the two cliffs is that the second one was less vertical and had more vine maple at its base. Both cliffs had a moss layer covering the majority of the surface area. There was vine maple growing around both cliffs and in a few places on the cliff faces. There were Douglas fir trees above and below the cliffs. We found no evidence of significant wildlife value. The timber sale jacket identifies the presence of cliffs in the HCP checklist. The cliffs are also referenced in SEPA B.5.d. under proposed measures to preserve or enhance wildlife. Here the notes indicate the following, "The cliff has been excluded from the timber sale harvest area. It was determined to have little wildlife value. A leave tree patch has been established below and around the area". The timber sale jacket only references a single cliff, however it is possible that since both cliffs have a south facing aspect and there are several patches of exposed rock between the two cliffs (approximately 10-12 feet in height and 10 feet in length) that the forester considered these two areas to be one cliff. Measured height with clinometer- 42 feet Measured height with laser range finder- 40.62 feet and 40.9 feet Average measured height- 41.17 feet Pictures # 3172-3174
Timber Sale	**Jackstraw Aerial**	
Date	10/18/2007	
Your Name	Kosterman, Munzing, Hooks	
Type of Uncommon Habitat	**Cliffs**	
Is the cliff greater than 25 feet tall?	Yes	
Is the cliff below 5,000 feet in elevation?	Yes	
Is there disturbance to the cliff face?	No	
Is there retention of trees on cliff benches and the base and top of cliff?	Yes	
Is there any damage to cavities, fissures or ledges?	No	

UNCOMMON HABITAT DATA SHEET		NOTES:
Region	**Northwest**	Cliffs are indicated in the timber sale jacket in SEPA B.5.a and also in the HCP Checklist. Lisa Egtvedt's Wildlife Field Assessment indicated that "there are no notable unique habitats or special features within this unit that are protected under the HCP. The rock outcrops with the madrona trees are definitely an 'anomoly' within the stand. Some of the rock faces within this patch are about 25 feet high. Some have vertical faces, while others are "rubbly" or broken. None of them contain any significant fissures, ledges, holes, or talus and there were no signs of use by wildlife". Calvin Ohlson-Kiehn, a forester from the Northwest region, accompanied us to this timber sale. We located a leave tree area with madrona trees and located the 'rock outcrop' Lisa documented in her notes. The feature was located in the northern portion of Unit 1. There were retention trees above and surrounding this cliff. Our average measured height of this feature was 50.36 feet. The width was approximately 50 feet. There was no evidence of wildlife use. Measurement of cliff using laser range finder- 50.11 and 50.62 feet Average measured height- 50.36 feet
Timber Sale	**North Russian**	
Date	10/15/2007	
Your Name	Kosterman, Munzing, Ohlson-Kiehn	
Type of Uncommon Habitat	**Cliffs**	
Is the cliff greater than 25 feet tall?	Yes	
Is the cliff below 5,000 feet in elevation?	Yes	
Is there disturbance to the cliff face?	No	
Is there retention of trees on cliff benches and the base and top of cliff?	Yes	
Is there any damage to cavities, fissures, or ledges?	None present	

UNCOMMON HABITAT DATA SHEET		NOTES:
Region	**Northwest**	This cliff is located along the eastern edge of Unit 2. Kevin Killian, a forester from Northwest region, accompanied us to this timber sale. There was a large leave tree area surrounding the cliff. The cliff was approximately 200 feet wide and an average measured height of 32 feet. There is a small Type 5 stream that trickles over approximately 100 feet of the cliff face. The cliff consists of phyllite and charcoal in color. The western edge of the cliff was mostly covered in dirt and there were some trees where the rock outcrop was not as exposed. Below the section where the water is running, it looks like sections have slumped down. This is not a new slump- maybe several hundred years old. Since the cliff is in a leave tree clump, there has been very little, if any, disturbance to the cliff. The cliff was indicated on the HCP Checklist and referenced in the timber sale jacket as "one leave tree patch approximately 1.0 acre in size against a small cliff in Unit #2, that is intended to preserve the microclimate of the cliff habitat and protect it from logging disturbance" which is found in SEPA B.4.b.2. Measured height using clinometer- 31 feet and 33 feet Average measured height- 32 feet Pictures # 3134-3136
Timber Sale	**Quark**	
Date	10/16/2007	
Your Name	Kosterman, Munzing, Killian	
Type of Uncommon Habitat	**Cliffs**	
Is the cliff greater than 25 feet tall?	Yes	
Is the cliff below 5,000 feet in elevation?	Yes	
Is there disturbance to the cliff face?	No	
Is there retention of trees on cliff benches and the base and top of cliff?	Yes	
Is there any damage to cavities, fissures or ledges?	No	

UNCOMMON HABITAT DATA SHEET		NOTES:
Region	**Northwest**	Doug Hooks, the Deming Unit forester for Northwest region, accompanied us to this timber sale. The cliff is located approximately 700-800 feet outside of the timber sale boundary, near the northwest corner of Unit 1. There is pink flagging approximately 200 feet above the cliff indicating that the original layout of this boundary was much closer to the cliff. Hooks believes that the boundary may have been moved due to marbled murrelet habitat. The portion of the cliff that was visible was located along a small drainage. Since the cliff was so far outside of the timber sale boundary, we did not investigate any further. The cliff was documented in the HCP Checklist and also in SEPA B.5.a. We could not find any documentation indicating that the original boundary was moved and for what reason. In SEPA B.5.b. there is documentation that the "DNR TRAX system indicates that the Rutsatz bald eagle winter communal night roost is located approximately 0.25 miles to the west of the proposal area". Also, in regards to marbled murrelets, SEPA B.5.d.1 indicates that "both units contain 're-classified plus' modeled marbled murrelet habitat. Two years of marbled murrelet surveys in the sale proposal area and vicinity have been completed as of August 2003. No detections were recorded. Trees with platforms have been marked to remain as part of our legacy tree strategy."
Timber Sale	**Rutsatz Pass**	
Date	10/17/2007	
Your Name	Kosterman, Munzing, Hooks	
Type of Uncommon Habitat	**Cliffs**	
Is the cliff greater than 25 feet tall?	NA	
Is the cliff below 5,000 feet in elevation?	NA	
Is there disturbance to the cliff face?	NA	
Is there retention of trees on cliff benches and the base and top of cliff?	NA	
Is there any damage to cavities, fissures or ledges?	NA	

UNCOMMON HABITAT DATA SHEET		NOTES:	
Region	**Northwest**	This cliff was located in Unit 1. Kevin Killian, a forester from Northwest region, accompanied us to this timber sale. Cliffs were indicated on the HCP checklist and referenced in the Retention Tree Plan (B.4.b.2) in the SEPA section of the timber sale jacket. The notes indicate that a leave tree area approximately 1 acre in size was left around this cliff. According to our measurements, this cliff is 36 feet high. The cliff is approximately 300 feet in length. This cliff showed no evidence of value for wildlife such as fissures, ledges, cavities, etc. Retention trees were left above and surrounding the cliff including Douglas Fir trees (DBH ~15-18). Unit 1 was thinned and this leave tree area was thinned as well. We found this cliff to have low value for wildlife. Height measurement using clinometer- 36 feet Pictures #3144-3145	
Timber Sale	**Shenandoah PC**		
Date	10/16/2007		
Your Name	Kosterman, Munzing, Livingston, Killian		
Type of Uncommon Habitat	**Cliffs**		
Is the cliff greater than 25 feet tall?	Yes		
Is the cliff below 5,000 feet in elevation?	Yes		
Is there disturbance to the cliff face?	No		
Is there retention of trees on cliff benches and the base and top of cliff?	Yes		
Is there any damage to cavities, fissures, or ledges?	None present		

UNCOMMON HABITAT DATA SHEET		NOTES:
Region	**South Puget Sound**	The cliffs are located in the southern portion of the timber sale. They are found at the end of the 1220-1 road and parallel the eastern side of a Type 5 stream. The trees were harvested to the slope break near the top of the cliffs. The cliffs have a western aspect. The cliffs were included in the RMZ for the Type 5 stream. There are retention trees on the tops of the cliffs and also surrounding the cliffs. There is some blowdown on the eastern edge of the RMZ. We did not see any damage to the cliffs. The cliffs range in height from 17.8 feet to 114.9 feet (see measurements below). The width of the cliffs is at least 500 feet. Cracks, fissures and ledges were present. The forest surrounding the cliffs is mostly Douglas Fir and Western Hemlock. The documentation found in the timber sale jacket regarding the cliffs is in SEPA B.5.a under unique habitats, in the HCP checklist, and in the Mitigated Determination of Non-significance document. No specific information such as location, number of cliffs, cliff height, indication of wildlife use, etc was provided in the timber sale jacket. There is reference to a wildlife report by DNR biologist Heather McPherson dated 10/13/2003 in SEPA A.8, but it is not included in the timber sale jacket. We were able to get information about the location of the cliffs from Brian Ballard in South Puget Sound Region. Measurements taken using vertical distance option with a laser range finder: A. 17.8 feet B. 25.06 feet C. 79.05 feet D. 83.46 feet E. 93.59 feet F. 114.99 feet
Timber Sale	**Swan Overlook**	
Date	12/10/2007	
Your Name	Kosterman, Munzing	
Type of Uncommon Habitat	**Cliffs**	
Is the cliff greater than 25 feet tall?	Yes	
Is the cliff below 5,000 feet in elevation?	Yes	
Is there disturbance to the cliff face?	No	
Is there retention of trees on cliff benches and the base and top of cliff?	Yes	
Is there any damage to cavities, fissures or ledges?	No	

UNCOMMON HABITAT DATA SHEET		NOTES:
Region	**Olympic**	There are four cliffs located in this particular timber sale. The Sale Narrative in the timber sale jacket states that "unique cliff habitats created by small rock outcroppings have been identified, and buffered with leave tree clumps". The cliffs are also recognized in the HCP checklist. We observed two cliffs in the southern portion of Unit 1. The first cliff is located near the edge of a leave tree area, approximately 50 feet from the southeastern edge of the LTA. There were no trees retained immediately above or surrounding the cliff. There were no significant cracks, fissures or ledges present. The cliff was approximately 80 feet in width and the average measured height using the vertical distance option with the laser range finder was 26.28 feet (26.25ft +26.30/2= 26.28). There was no visible damage to the cliff due to harvest activities. The second cliff was located in a leave tree area just west of the first cliff. This leave tree area consists mostly of Douglas Fir and a few Red Cedar. There was retention of trees above and surrounding the cliff. This cliff had areas of exposed rock but there was also a lot of moss and ferns growing on the cliff face. There are a few cracks and fissures present, however they are small. A few trees have blown down in this leave tree clump, but there is no visible damage to the cliff. We found this cliff to have an average measured height of 31.35 feet (31.4+31.3/2=31.35 feet). The next two cliffs were found in Unit 2. We visited the cliff that is located near the southern boundary of this unit first. This cliff has a north facing aspect. There is an RMZ for a wetland and the confluence of two Type5 streams just north of this cliff. This RMZ is almost entirely blown down. There was retention of trees left above and below the cliff. There are a few cracks and fissures present, however they are small and there is no evidence of wildlife use. There are several small trees growing out of the cliff face. This cliff borders private land. The fourth cliff is located just outside of the northern boundary of Unit 2. It has a south facing aspect. There were a few leave trees left along the bottom of the cliff, however they have blown down. These trees did not impact the cliff face. The rest of the cliff is outside of the timber sale boundary and is in an area that is currently forested. The height of this cliff was measured using the vertical distance option on a laser range finder. The average measured height of this cliff is 134.2 feet (133+135.4/2=134.2). This cliff is surrounded by steep slopes making it difficult to look closely at cracks, fissures and ledges which are present in the cliff face. Pictures for cliff 1- 343-345 Pictures for cliff 2- 338-342 Pictures for cliff 3- 331 Pictures for cliff 4-
Timber Sale	**Taylor Ranch**	
Date	11/19/2007	
Your Name	Kosterman, Cahill	
Type of Uncommon Habitat	**Cliffs**	
Is the cliff greater than 25 feet tall?	Yes	
Is the cliff below 5,000 feet in elevation?	Yes	
Is there disturbance to the cliff face?	No	
Is there retention of trees on cliff benches and the base and top of cliff?	See Notes	
Is there any damage to cavities, fissures or ledges?	No	

UNCOMMON HABITAT DATA SHEET		**NOTES:**	
Region	**Northwest**	Munzing, Livingston and Kosterman were accompanied by Doug Hooks, a forester from the Northwest region. The first area that we observed was located just north of the optional construction road that extends from the V-1000 road. There were two potential balds located here. The first one was small, approximately 1/8 acre in size. The second one was located approximately 50-100 feet east of the first one and was about twice the size. There was little canopy cover in between the two areas. Both areas looked like a rock outcrop with a layer of moss covering the top. The potential balds were located in a Leave Tree Area. There were a couple trees that had blown down, however the majority of the leave tree clump was still standing. There was evidence of bear and deer scat in this area. There were no trees growing on top of the potential balds. Vegetation identified included alpine bitter-cress, common velvet-grass and rose. There were no plants present that would indicate presence of a high quality bald ecosystem. This area had a south-southwest aspect at 195 degrees. Next, we visited the potential balds located due east from the end of the optional construction road. This area was approximately one acre in size and also looked like large rock outcrops with a very thin layer of soil and moss on top. The area had a northeast aspect (balds generally have a south facing aspect). The vegetation located here included kinnickinnick, yarrow, common velvet-grass, common snowberry, knotweed, St. Johns Wort, huckleberry, tiger lily, bentgrass, broom moss, *Selaginella douglasii* and *Selaginella densa.* Kinnickinnick and Bentgrass can both be indicators of balds, however they were not present in large quantities. Alder was found surrounding this area. Livingston is going to speak with John Fleckenstien to see if he believes that these areas should be considered balds. Pictures for area one- 3151-3153 (Munzing) Pictures for area two- 3155-3159 (Munzing) and 234-236 & 237-239 (Livingston)
Timber Sale	**Vedder Top**		
Date	10/17/2007		
Your Name	Kosterman, Munzing, Livingston, Hooks		
Uncommon Habitat Type	**Balds**		
Balds <u>Plant species identified in area one</u> 1. Alpine Bitter-Cress *Cardamine angulata* 2. Common Velvet-Grass *Holcus lanatus* 3. Rose <u>Plant species identified in area two</u> 1. Kinnikinnick *Arctostaphylos uva-ursi* 2. Yarrow *Achillea millefolium* 3. Common Velvet-Grass *Holcus lanatus* 4. Common Snowberry *Symphoricarpus albus* 5. Knotweed *Polygonum* 6. St. Johns Wort 7. Huckleberry *8.* Tiger Lily? *Lilium columbianum* Grasses 1. Bentgrass Mosses 1. Broom Moss *Dicranum scoparium* *2. Selaginella douglasii* *3. Selaginella densa*			

UNCOMMON HABITAT DATA SHEET		NOTES:
Region	**Northwest**	The potential cliff was located in the northern portion of Unit 1. Jay Guthrie, a forester from the Northwest region, accompanied us to this timber sale. A few leave trees were left around this large boulder. There was no visible damage to the rock outcrop due to the timber sale harvest. According to our measurements, this boulder is on average 13.78 feet high and would not qualify as a cliff since it is not greater than 25 feet in height. Cliffs were indicated on the HCP checklist. The cliffs were also referenced in SEPA B.5.a of the timber sale jacket. In this section, the notes indicate "25 foot high rock outcrops covered by HCP with no significant use by wildlife." According to Jay Guthrie, there are other large boulders in the area but none are within the timber sale boundary. There is another boulder on the edge of the northwest corner of Unit 1 of similar size to the one we measured. Also, we looked at a boulder field approximately 300 feet south of the sale with some house-sized boulders. Jay hypothesized that maybe the timber sale jacket notes weren't updated after Lisa Egtvedt visited this sale because of the close proximity in time to her automobile accident. He thinks that the boulder field might have been included in the original layout of the timber sale and the boundary was later adjusted to leave this area out. Measurement using laser range finder- 13.54 feet and 14.01 feet Average measured height- 13.78 feet Pictures #3128-3130
Timber Sale	**Velvet Hart**	
Date	10/15/2007	
Your Name	Kosterman, Munzing, Guthrie	
Type of Uncommon Habitat	**Cliffs**	
Is the cliff greater than 25 feet tall?	No	
Is the cliff below 5,000 feet in elevation?	Yes	
Is there disturbance to the cliff face?	No	
Is there retention of trees on cliff benches and the base and top of cliff?	Yes	

UNCOMMON HABITAT DATA SHEET		NOTES:
Region	**South Puget Sound**	The oak woodland is located in Unit 3 which is bordered by Goat Ranch Road and Kammenga Road. Oaks were indicated in the HCP Checklist and also in the Timber Harvest Section WAC 222-30-020 in the timber sale jacket, "Unit 3 is designed to fulfill an HCP commitment to preserve and promote Oregon white oak habitat. All conifers (except leave trees) within the unit will be felled, thus releasing the Oregon white oak understory. Leave trees include 2 conifers per acre and all Oregon white oak. The leave tree strategy was agreed upon by both DNR Natural Areas program and Forest Practices and is compliant with WAC 222-30-020 and the DNR's HCP". Even though the oak woodland is now more susceptible to wind there was no evidence of blowdown. There was a seasonal Type 5 stream that runs parallel to the southern boundary of Unit 3. There was no water present. We did locate some Oregon oak seedlings and saplings in the immediate area. At the base of one Oregon oak we saw 10 or more seedlings and saplings. We did not see any Oregon oak stumps or any negative impacts to the oak woodland due to timber management activities.
Timber Sale	**Wagon Wheel**	
Date	06/13/07	
Your Name	Kosterman, Munzing	
Uncommon Habitat Type	**Oak Woodland**	

Appendix B.

Descriptions of Streams of Concern that Washington State the Ecosystems Services Implementation Monitoring team examined in the field in 2007.

STREAM TYPING DATA SHEET		**NOTES:**
Region	**Olympic (OESF)**	This stream is not confirmed to be a Type 4 stream. It flows in a southwesterly direction, beginning near the eastern edge of Unit 1 at the C-3000 road. It empties into a Type3 stream near the southwestern corner of the same unit. There is little to no water present, and the channel is very ambiguous in most places. Much of the stream seems to be a series of small seeps, with occasional dry stream beds in between. The topography throughout the length of the stream is mostly flat. There is evidence of some pooling, but these bare muddy spots contain no water. There is a defined drainage where the stream enters the Type 3 stream, but it is overgrown and no defined channel is evident. At this time, it is unclear why this is typed as a Type 4 stream. Due to the nature of this stream, we were unable to conduct a stream survey.
Timber Sale	**C-3000**	
Date	6/06/07	
Your Name	Sweeney, Munzing, Kosterman	
Stream type indicated on timber sale map and ID	**4 B**	
Verify stream with timber sale map?	No	
If not verifiable, was survey conducted?	No (see notes)	
If survey was conducted what was the determined stream type?		

STREAM TYPING DATA SHEET		NOTES:
Region	**Olympic (OESF)**	This stream flows south near the eastern edge of Unit 1, until it crosses the C-3000 road and turns into a Type 4 stream. Water is present and running with a substantial volume throughout the reach. The width appears to be approximately 4 feet, while the gradient ranges between 16 and 19 percent. Thinning was conducted up to the slope break above the stream on the east side of the stream. The west side of the stream is bordered by a non-operational area. A few seeps were observed along the bank with water trickling into the stream. We will return to check to see if this stream is seasonal. *Second Visit (8/23/07) We returned to see if this stream is seasonal. We found the stream to still contain a substantial amount of water. We then conducted a stream survey. The average stream width was 5.46 feet and the average gradient was 18%. This stream has the characteristics of a Type 4 stream. 6/1/2008 We later checked the basin size, using GIS, to confirm basin size associate with a Type 4 stream. The estimated basin size was 10.3 acres which confirms the Type 4.
Timber Sale	**C-3000**	
Date	5/23/07	
Your Name	Sweeney, Kosterman	
Stream type indicated on timber sale map and ID	**Type 5E**	
Verify stream with timber sale map?	No	
If not verifiable, was survey conducted?	Yes	
If survey was conducted what was the determined stream type?	Type 4	

Stream Survey Data

	Width	**Slope up**	**Slope down**			
1	3.7	8%		Began survey at the south end of the stream segment heading north.		
2	9.7	6%				
3	3.6	15%				
4	5.5	17%				
5	12.5	17%				
6	3.3	20%				
7	4.8	20%				
8	5.2	29%				
9	3.5	30%				
10	2.8					
11						
12						

STREAM TYPING DATA SHEET		NOTES:
Region	**Olympic (OESF)**	This stream is located just below the C-3100 road in Unit 3. The stream width is greater than 2 feet. There was a fair amount of water flowing in this stream. Skunk cabbage was found around the stream. The stream had a steep gradient and characteristics of a Type 4 stream. We will have to return to see if this stream is seasonal. *Second Visit (9/25/07) Immediately below the road a large seep was present. Stream measurements were not taken here because of the obvious impact of the culvert on the stream. The survey began about 150 feet below the road. At the current time a small trickle of water was present. Factors to consider with this particular stream are large amounts of LWD, often with DBHs of 20-30, and unstable slopes contributing to wasting on the side slopes. According to our measurements, the average width of the stream was 2.74 feet, and average gradient of 30%. These are the characteristics of a Type 4 stream.
Timber Sale	**C-3000 Thinning**	
Date	5/30/2007	
Your Name	Kosterman	
Stream type indicated on timber sale map and ID	**5K**	
Verify stream with timber sale map?	Second visit required	
If not verifiable, was survey conducted?		
If survey was conducted what was the determined stream type?		

STREAM TYPING DATA SHEET		NOTES:
Region	**Olympic (OESF)**	This stream begins at the southern boundary of Unit #3. It empties onto the floodplain of a Type 1 stream and goes underground before it reaches the Type 1 stream. The stream channel is well defined and is greater than 2 feet wide in most places. The stream gradient is greater than 16%. The stream travels down a very steep slope until it reaches the Type 1 stream. This stream has the characteristics of a Type 4 stream. We will return to this stream later in the field season to see if this stream is seasonal and was classified as a Type 5 stream based on this characteristic. *Second Visit (9/25/07) According to our measurements, this stream has an average width of 2.9 feet and an average gradient of 54%. These are the characteristics of a Type 4 stream.
Timber Sale	C-3000 Thinning	
Date	5/30/2007	
Your Name	Kosterman	
Stream type indicated on timber sale map and ID	5L	
Verify stream with timber sale map?	ond visit required	
If not verifiable, was survey conducted?		
If survey was conducted what was the determined stream type?		

STREAM TYPING DATA SHEET		NOTES:
Region	**Olympic (OESF)**	This stream is located near the northeastern boundary of the timber sale. It travels in a northeast direction approximately 100 feet to the timber sale boundary and ends in a low spot where water may accumulate. This low spot could potentially be a sinkhole. There was no water present in the stream at the current time and the channel is not very well defined. This stream was classified as a Type 9 stream, most likely because there is no connectivity above surface to another stream. This stream should be classified as a Type 5 stream. We referenced the timber sale jacket to see if there was any indication that the stream was typed by the forester when the sale was laid out. In the Forest Practices Water Type Section, the stream is identified as a non-typed water (Type 9). This stream should have been given a Type 1-5 stream classification when the sale was set up.
Timber Sale	**G-2000 Strip**	
Date	7/9/07	
Your Name	Kosterman	
Stream type indicated on timber sale map and ID	9**B**	
Verify stream with timber sale map?		
If not verifiable, was survey conducted?		
If survey was conducted what was the determined stream type?		

STREAM TYPING DATA SHEET		NOTES:
Region	**Olympic (OESF)**	This stream is NOT confirmed to be a Type 4 stream. The stream flows west beginning in a small RMZ at the southwest corner of Unit 1. There is water present, mostly in the form of pools and saturated soil. The gradient of this section of the stream is about 10%, and the average width of the stream channel when visible is approximately 4 feet. Most of this stream appears to have wetland characteristics, specifically referring to an area that is approximately 50 feet wide. Here there is a lot of standing water, saturated, mucky soil, and an abundance of skunk cabbage. Also in this area, the seepy area reaches the edge of the RMZ boundary, and a small portion of this is visible within the timber sale unit. **NOTE:** We looked in the timber sale jacket and found that the foresters activity map shows the stream type change further downstream near the westernmost edge of the unit, thus making this portion a Type 5 stream. The type change on the timber sale map is not accurate and shows the type change to be located at the confluence of the two Type 5 streams. This stream is a Type 5 stream with no defined channel. Due to the nature of this seep area, a survey was not conducted.
Timber Sale	**Wentworthwhile**	
Date	7/11/07	
Your Name	Sweeney, Kosterman	
Stream type indicated on timber sale map and ID	4D	
Verify stream with timber sale map?	See notes	
If not verifiable, was survey conducted?		
If survey was conducted what was the determined stream type?		

Appendix C.

Complete list of timber sales showing measured width, documented width, and percent documented width for each riparian buffer measured by the 2007 HCP Implementation Monitoring team.

Timber Sale	Stream Type	Documented Average RMZ Width (in Feet)	Measured Average RMZ Width (in Feet)	Percent Documented RMZ Width
Capitol Split	1	150	192	128
	3	150	141	94
	3	150	156	104
Dickey Mountain Alder	4	100	92	92
	4	100	64	64
	4	100	89	89
	4	100	53	53
	5	25	107	427
	5	25	67	269
	5	25	28	114
	5	25	29	118
	5	25	27	108
	5	25	59	235
	5	25	32	130
	5	25	30	121
	5	25	67	266
Hoko Ridge	1	200	177	88
	3	150	225	150
	3	150	182	122
	3	150	149	99
	4	100	47	47
	4	100	97	97
	4	100	90	90
	5	25	24	98
	5	25	43	172
	5	25	37	148
	5	25	25	100
	5	25	26	103
	5	25	29	117
	5	25	32	127
	5	25	105	419
Kugel Alder	4	100	106	106
	4	100	244	244
	4	100	119	119
Shuwah Jigsaw	3	150	156	104
	3	150	170	114
	3	150	138	92
	4	100	105	105

Timber Sale	Stream Type	Documented Average RMZ Width (in Feet)	Measured Average RMZ Width (in Feet)	Percent Documented RMZ Width
Wentworthwhile	3	150	126	84
	3	150	121	81
	3	150	143	96
	3	150	150	100
	3	150	149	99
Tiedye	3	150	134	89
	3	150	157	105
	3	150	143	96
Section 440	3	150	243	162
Mustard and Relish	3	150	237	158
	3	150	75	50
	4	100	51	51
	4	100	59	59
	4	100	92	92
	4	100	86	86
	4	100	59	59
	4	100	110	110
	4	100	70	70
	4	100	196	196
	4	100	75	75
	4	100	85	85
	4	100	101	101
	4	100	59	59
	4	100	128	128
	4	100	42	42
	4	100	55	55
	5	60	83	139
	5	60	103	172
	5	60	60	100
	5	60	35	58
	5	60	49	82
	5	60	47	78
	5	60	38	64
	5	60	219	366