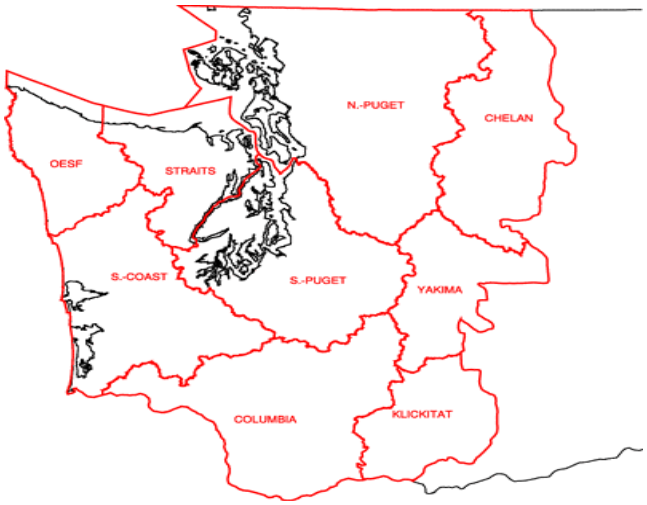
WASHINGTON STATE DEPARTMENT OF
Natural Resources

# Washington State Department of Natural Resources
# Habitat Conservation Plan
## Implementation Monitoring Pilot Project 2002 Report




**HCP PLANNING UNITS**

Boulderwash Timber Sale DNR Photo

Nellita Timber Sale DNR Photo

# Washington State Department of Natural Resources
## Habitat Conservation Plan
### Implementation Monitoring Pilot Project 2002

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## Data Analysis and Observations

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Washington State Department of Natural Resources
Land Management Division

## Introduction

The Washington State Department of Natural Resources (DNR) developed a multi-species Habitat Conservation Plan (HCP) to comply with the federal Endangered Species Act (ESA) for management of state trust lands (DNR 1997). The HCP includes several main conservation strategies for the conservation of the northern spotted owl, marbled murrelet, western Washington runs of several salmonids and other federal and state listed, unlisted and candidate species. In addition, the incidental take permit covers seven other upland species listed by the federal government as endangered or threatened. The plan covers approximately 1.6 million acres of state trust lands within the range of the northern spotted owl. All DNR management activities are covered. The DNR has a contractual agreement with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service to implement the HCP. The DNR has also agreed to monitor this HCP on DNR-managed lands according to the following objectives for all planning units:

- To determine whether the HCP conservation strategies are implemented as written; and
- To determine whether implementation of the conservation strategies results in anticipated habitat conditions.

The first objective can be referred to as implementation monitoring (U.S. Department of Agriculture et al. 1994), and was the fundamental purpose of this pilot project. In order to meet our commitment under the HCP to document the types, amounts, and locations of forest management activities carried out on DNR-managed lands in each HCP planning unit, implementation monitoring staff will compile data necessary to document compliance with the requirements of the conservation strategies. In the future, implementation monitoring will also periodically describe changes in landscape-level habitat conditions in areas managed to provide spotted owl and marbled murrelet habitat, and statistically valid sampling will be conducted in order to evaluate the reliability of information stored in DNR databases (DNR 1997).

In June 2002, the department proposed a pilot project to initiate the first comprehensive, centralized “on the ground” implementation monitoring and began preparing for the field monitoring the following month. Information from the pilot project should provide information necessary for the development of an implementation monitoring plan expected to be implemented in all planning units beginning in July 2003.

## Pilot Project Monitoring Objectives

In addition to determining whether the HCP conservation strategies are implemented as written, the other objectives of the pilot project were:

- To calculate approximate costs of monitoring different activities. This will help us in the selection of monitoring alternatives that will produce desired confidence intervals, and will guide us in the development of future budgets.
- To test and refine technical aspects of monitoring and methods of measurements.
- To refine the implementation monitoring plan; which we expect to implement in the eight HCP planning units plus the OESF in 2003.
- To determine the educational and training needs of division and region staff in proper implementation of the HCP.
- To prepare a report of compliance from the pilot project area.

## Methods

Two HCP planning units were selected for the pilot project, and were selected primarily based on their proximity to Olympia. They were the North Puget and South Puget planning units, and they encompass three DNR regions, including Northwest, South Puget Sound and parts of Central region.

The activities selected for monitoring were categorized into three general classifications: timber management activities, silvicultural management activities, and non-timber management activities. Within the three classifications, we calculated activity compliance for each of strategies we reviewed (expressed as percent compliance) and included the 95% confidence interval. The activities selected for review were required to have been initiated after January, 1999 (the date when all activities were required to meet all of the HCP strategies) and completed by June 30, 2001. Each activity was evaluated to determine if the applicable conservation strategies were properly identified and implemented.

#### Timber Management Activities

Twelve timber management activities were selected for review out of 28 total activities (43% sample) (Activities Summary – Appendix A). Timber management activities were selected based upon the number of strategies that applied to each activity. We purposefully selected timber management activities that incorporated the greatest number of strategies to insure that we monitored as many strategies as possible.

#### Silvicultural Management Activities

Thirty-four silvicultural management activities were randomly selected for review out of 340 total activities (10% sample), and they consist of the following types of silvicultural management activities (Activities Summary – Appendix B):

- Hand regeneration/planting
- Vegetation management/ground herbicide application
- Vegetation management/hand cutting
- Site preparation/aerial herbicide application
- Pre-commercial thinning

The data currently collected by the silvicultural program for their program compliance purposes differs slightly from what we require to evaluate activities for

implementation monitoring. The additional parameters necessary to evaluate implementation compliance were added to the silvicultural program data forms. In the future, a combined field data collection form will be developed so that HCP implementation information is gathered at the same time as program compliance information.

**Non-timber management activities**

Forty-eight non-timber activities were randomly selected for review out of 179 total activities (27% sample) (Activities Summary Appendix C). All 48 non-timber activities were office-reviewed and 9 of the 48 were field-reviewed. The following types of non-timber management activities were reviewed:

- Public land use/recreational trails
- Communication sites
- Grazing leases
- Rights of way/easements
- Land transactions
- Oil and gas leases
- Mineral, rock, sand and gravel sales
- Specialized forest products
- Special use leases

Each of the timber, non-timber and silvicultural management activities were reviewed against 9 of the HCP conservation strategies or strategy components. They include:

- Riparian conservation strategy
  - Stream typing
  - Riparian buffers
  - Unstable slopes
  - Hydrologic maturity in the rain-on-snow zone
- Spotted owl conservation strategy
- Marbled murrelet conservation strategy
- Large, structurally unique tree strategy
- Other federally listed species conservation strategy
- Multi-species conservation strategy for unlisted species

HCP implementation procedures described in the Forestry Handbook and in the Final Habitat Conservation Plan were used as the primary sources for determining required protection measures and verification of conservation strategies. Only those procedures pertaining to HCP strategies and components were used. These procedures are listed in the DNR on-line Forestry Handbook, Procedures (Web address: **http://146.76.5.203/handbooks/forestry/Procedure_list.htm**). Where the HCP requires compliance with Forest Practice Rules, or where Forest Practice Rules do not allow substitution by HCP strategy, Washington Forest Practice Rules (WAC- 222, July 2001) were used as well.

Prior to field inspections, a field packet was prepared for review. This packet consisted of a topographic map, hydrology and water type map, soils map and soils information, a Planning and Tracking (P&T) “info-pack”, which provides information about designated NRF habitat, designated dispersal habitat, owl nest patch/buffers, owl circle information as well

as slope stability and hydrologic maturity within the location of the management activity. If required by the type of management activity, a summary HCP checklist was included as well. This material was reviewed prior to the field visits, to see if the particular activity would prompt the implementation of any HCP conservation strategies. Regions provided staff to accompany us for each field inspection. U.S. Fish and Wildlife Service staff was also present on two different field inspections. Field visits were conducted during the months of June through October 2002.

All measurements used for determining horizontal distance incorporated one of the following three methods. They were taped, and adjusted for horizontal distance using a clinometer; paced, and adjusted for horizontal distance using a clinometer; or measured with a laser rangefinder (Laser Technology Inc.) set in the horizontal distance (HD) mode. To accommodate errors in measurements, a correction factor was calculated (Appendix F) using a taped distance on level ground as the control. For analysis purposes, all original distance measurements were adjusted using the correction factor. To verify residual density in the wetland management zone (WMZ), variable plots were taken using a relascope and 1/10 of an acre fixed plots. Leave trees in one timber management activity were 100% counted and diameters recorded. Yellow tree marking paint was used to mark counted trees and a diameter-tape and Biltmore stick were used to measure the diameter at breast height (dbh) of the leave trees.

After all of the management activities were reviewed in the field, we determined that a more detailed evaluation of unstable slopes be undertaken to compliment the pilot project. Consequently, 11 (of the 12 reviewed) timber management activities were remotely evaluated from air photos by the department's state licensed geologist for:

- Accuracy and consistency of landform identification, and
- Function and adequacy of the riparian buffers with respect to protecting unstable slopes

Results of this evaluation are presented in Appendix D.

**Data Analysis Methods**

Level of compliance is expressed as the percentage of management activities completed in a given fiscal year that are in compliance with HCP strategies and their components. Therefore, the sampling populations are the number of compliant and non-compliant activities for each HCP planning unit according to type of activity and HCP strategy. Because the populations are relatively small and sampling with replacement cannot be assumed, sampling probabilities were based on hypergeometric distributions (Steel and Torrie, 1960). The percent compliance ($P_{i, j, k}$) for each combination of planning unit **i**, activity type **j**, and strategy **k** was estimated by the expression:

$$P_{i, j, k} = (X_{i, j, k}/n) \times 100;$$

where **X** is the number of sampled activities that are compliant, and **n** is the sample size.

The reliability of the estimates was determined by estimating the 95 percent confidence intervals. This means there is a 95 percent chance that the true compliance level for the population is included within the interval. A wide interval is less precise than a narrower range. The estimates were based on binomial approximations from published tables

(Beyer, 1976). Because the sample size **n** is a relatively high proportion of the population size **N**; the confidence intervals were corrected by the factor SQRT (1-n/N) (Cochran, 1963).

## Results

### Timber Management Activities

The monitoring results for the timber harvest activities are summarized in Appendix A and in the Table below.

Initially, monitoring results were to be used to estimate the level of compliance for each activity within a planning unit. However, the level of compliance of timber management activities with the Large, Structurally Unique Trees strategy was not determined because we were not able to verify compliance in the field for most of the samples. Because we were unable to calculate compliance levels for the Structurally Unique Trees strategy, only eight strategies were evaluated for compliance. Out of 96 possible combinations (12 activities and 8 strategies or strategy components) only four were found to be non-compliant. All four were associated with the Riparian strategy. Three of the four had buffer widths that were too narrow; the fourth was mistyping of a stream, however, the proper width buffer had been applied.

**ESTIMATED LEVELS OF COMPLIANCE WITH HCP STRATEGIES**
**FOR TIMBER HARVEST ACTIVITIES**
**FISCAL YEAR 2001**

| STRATEGY | % COMPLIANCE** | 95% CONFIDENCE INTERVAL † |
|---|---|---|
| **Stream Typing** | 92 | 71-96 |
| **RMZ Buffers** | 75 | 51-90 |
| **Owls** | 100 | 80-100 |
| **Murrelets** | 100 | 80-100 |
| **Structurally Unique Trees** | * | * |
| **Unstable Slopes** | 100 | 80-100 |
| **Listed Species** | 100 | 80-100 |
| **Unlisted Species** | 100 | 80-100 |
| **Hydrologic Maturity** | 100 | 80-100 |

*Level of compliance for the Structurally Unique Trees strategy was not computed because of the inability to verify the number of leave trees on most of the sampled activities.
**% Compliance is the percent of activities in compliance with each listed strategy.
†The 95% confidence interval means that there is a 95% chance that the interval includes the true level of compliance based on a sample size **n** taken from a population size **N**.

**Silvicultural Management Activities**
Silvicultural management activities are summarized in Appendix B and in the Table below. Thirty-four silvicultural management activities for the pilot project were randomly selected from a total of 340 silvicultural management activities, a 10% sample. They were evenly split between the two HCP planning units (seventeen each from North Puget and South Puget planning units).

## ESTIMATED LEVELS OF COMPLIANCE WITH HCP STRATEGIES
### FOR SILVICULTURAL ACTIVITIES
### FISCAL YEAR 2001

| STRATEGY | % COMPLIANCE** | 95% CONFIDENCE INTERVAL |
|---|---|---|
| **Stream Typing** | 100 | 90-100 |
| **RMZ Buffers** | 100 | 90-100 |
| **Owls** | 100 | 90-100 |
| **Murrelets** | 100 | 90-100 |
| **Structurally Unique Trees** | 100 | 90-100 |
| **Unstable Slopes** | 100 | 90-100 |
| **Listed Species** | 100 | 90-100 |
| **Unlisted Species** | 100 | 90-100 |
| **Hydrologic Maturity** | 100 | 90-100 |

**% Compliance is the percent of activities in compliance with each listed strategy.
†The 95% confidence interval means that there is a 95% chance that the interval includes the true level of compliance based on a sample size **n** taken from a population size **N**.

**Non-timber Management Activities**
Non-timber management activities are summarized in Appendix C and in the Table below. Forty-eight non-timber management activities were randomly selected for review from a total of one hundred seventy nine non-timber management activities in the North and South Puget HCP planning units. All forty-eight were office reviewed; nine of the forty-eight were reviewed in the field.

## ESTIMATED LEVELS OF COMPLIANCE WITH HCP STRATEGIES
### FOR NON-TIMBER MANAGEMENT ACTIVITIES*
### FISCAL YEAR 2001

| STRATEGY | RECREATIONAL USE | | LAND TRANSACTIONS | | MINERAL, ROCK, SAND & GRAVEL | |
|---|---|---|---|---|---|---|
| | % Compliance** | 95% † Confidence Interval | % Compliance | 95% † Confidence Interval | % Compliance | 95% † Confidence Interval |
| Stream Typing | 100 | 78-100 | 100 | 65-100 | 100 | 71-100 |
| RMZ Buffers | 100 | 78-100 | 100 | 65-100 | 100 | 71-100 |
| Owls | 100 | 78-100 | 100 | 65-100 | 100 | 71-100 |
| Murrelets | 100 | 78-100 | 100 | 65-100 | 100 | 71-100 |
| Structurally Unique Trees | 100 | 78-100 | 100 | 65-100 | 100 | 71-100 |
| Unstable Slopes | 100 | 78-100 | 100 | 65-100 | 100 | 71-100 |
| Listed Species | 100 | 78-100 | 100 | 65-100 | 100 | 71-100 |
| Unlisted Species | 100 | 78-100 | 100 | 65-100 | 100 | 71-100 |
| Hydrologic Maturity | 100 | 78-100 | 100 | 65-100 | 100 | 71-100 |

*****Rights of way/easements, communication sites, grazing leases, and special forest products are not listed in the table because 100% were reviewed and all were compliant with the strategies considered.
**% Compliance is the percent of activities in compliance with each listed strategy.
†The 95% confidence interval means that there is a 95% chance that the interval includes the true level of compliance based on a sample size **n** taken from a population size **N**.

## Observations and Conclusions

Based on the data collected in the pilot project HCP planning units for silvicultural management activities and non-timber management activities, we found none to be out of compliance with the HCP strategies.

Only four timber management activities were determined to be out of compliance with the HCP conservation strategies that we evaluated. The non-compliant activities were associated with the Riparian conservation strategy; however, the mistyped stream did receive the proper width riparian buffer.

There are concerns with regard to our inability to verify leave trees in the timber management activities. This has resulted in our not being able to calculate a confidence interval for the Structurally Unique Trees strategy. In most instances, it was not possible to verify whether adequate leave trees were left to meet the requirements of the HCP strategy. In some cases, the differentiation of leave trees and adjoining timber stands was not possible, while in other cases removal and subsequent replacement of required leave trees that had blown down was not well documented.

Another observation, and a subject of concern, is the frequency and severity of windthrow. The department's current strategy regarding the stability and longevity of riparian buffers requires a determination or estimation of "moderate potential" for windthrow, and where at least a moderate potential for windthrow exists, placement of wind buffers along Types 1-3 riparian buffers is required. Our current process for determining when wind buffers should be applied has not been well developed nor well understood. DNR initiated a pilot riparian windthrow research project in 1998 in the OESF planning unit, with the intent of using the information gathered to modify the riparian windthrow guidance. In the meantime, we recognize that our windthrow prediction rates may be less than satisfactory, both along riparian zones and with respect to the stability and longevity of leave trees. In addition to the "loss" of these trees (whether from windthrow or salvage of windthrow), the original intent of creating structure within the future stand is lost as well.

Another issue needing further evaluation and discussion is unstable slopes. A detailed review of the 11 office-reviewed timber management activities is included in Appendix D. The summary review shows that all appear to be compliant with respect to HCP requirements in place at the time these activities were prepared.[1] Future implementation monitoring should incorporate a more in-depth evaluation of unstable slopes in order to assess the accuracy and consistency of landform identification, and the function and adequacy of riparian buffers with respect to protecting unstable slopes.

Our inability to verify that adequate leave trees were left within many of the timber management activities, our observations with regard to windthrow and unstable slopes, as well as our findings showing that the Riparian strategy (RMZ buffer widths and stream typing) has not always been properly implemented, provides us opportunities to work with

[1] Subsequent changes in Forest Practices rules now require evaluation and protection of unstable slope features not evaluated under the HCP guidance in effect at the time these activities were planned. For example, activities falling within the groundwater recharge area of glacial deep-seated landslides would require evaluation under our current requirements.

management and the regions to provide education and training, and to find solutions that better implement and meet the intent of the HCP strategies.

The utilization of the pilot project concept to initiate the HCP required implementation monitoring was, in our estimation, a success. This vehicle afforded the department a cost effective way to complete the required monitoring. As initially envisioned, this approach has allowed the monitoring team, as well as the cooperating regions, adequate latitude in adjusting time schedules. It also provided for refinements of techniques in measurements and verifications. The pilot project also provided the needed information to estimate "unit costs" of monitoring activities, a much needed parameter for future implementation monitoring and budget development, and has provided us with the ability to make the next step in selecting monitoring alternatives that meet our objectives.

## Costs

One of the main objectives of the pilot project was to estimate the costs of implementation monitoring. A separate project code was assigned to the pilot project to aid in the tracking of costs, and both region and division staff coded their time to the project. Calculation of monitoring costs has provided us with a basis for development of future implementation monitoring budgets and, consequently, the ability to better select monitoring alternatives that meet our implementation monitoring objectives. The following table is derived from the department's cost tracking database and estimates the costs and staff months used for the pilot project:

**Implementation Monitoring Pilot Project 2002**
**Estimated Total and Unit Costs**

| | | TOTAL COSTS | | | | UNIT COSTS | |
|---|---|---|---|---|---|---|---|
| Management Activity | Monitoring Component | Total Staff Months Expended | Total Costs | % | # of Activities Sampled | Staff Months/Monitoring Component | Monitoring Component Cost |
| Timber Management Activities | Office Preparation | 1.300 | $7,264.40 | | 12 | 0.108 | $605.37 |
| | Field Monitoring | 9.380 | $52,415.44 | | | 0.782 | $4,367.95 |
| | Data Analysis | 0.072 | $402.34 | | | 0.006 | $33.53 |
| Timber Activities Totals | | 10.752 | $60,082.18 | 65% | | 0.896 | $5,006.85 |
| Silvicultural Activities | Office Preparation | 0.450 | $2,514.60 | | 34 | 0.013 | $73.96 |
| | Field Monitoring | 1.860 | $10,393.68 | | | 0.055 | $305.70 |
| | Data Analysis | 0.204 | $1,139.95 | | | 0.006 | $33.53 |
| Silvicultural Activities Totals | | 2.514 | $14,048.23 | 15% | | 0.074 | $413.18 |
| Non-timber Activities | Office Preparation | 0.480 | $2,682.24 | | 48 | 0.010 | $55.88 |
| | Field Monitoring | 1.800 | $10,058.40 | | | 0.038 | $209.55 |
| | Data Analysis | 1.074 | $6,001.51 | | | 0.022 | $125.03 |
| Non-timber Activities Totals | | 3.354 | $18,742.15 | 20% | | 0.070 | $390.46 |
| Project Totals | | 16.620 | $92,872.56 | | 94 | | |

**Avg. Cost/Staff Mo. = $5588.00**

**Total costs and staff months were derived from project costs tracked in Datamart database and from records kept prior to initiation of cost tracking**

**Field Monitoring Component costs will be adjusted with a Travel Adjustment Factor (TAF), a multiplier that accounts for travel costs from Olympia to the HCP Planning Units**
**The TAF for the North Puget HCP Planning Unit = 1.07 and was calculated as follows: approx. 500 miles of travel @ $0.74/mile=$370.00/$5588.00 S.M.= 0.07+ 1.00**

## Acknowledgements

The implementation monitoring team wishes to acknowledge the contribution of the many individuals who contributed in the production and support for this pilot project. To date we have received many pieces of correspondence and feedback from region and division staff from DNR as well as the U.S. Fish and Wildlife Service. The feedback and comments were taken into account in preparing the pilot project, as well as this report, and will be incorporated into the revised implementation monitoring plan for the HCP. We thank everyone who has taken the time to provide us with their thoughts and suggestions.

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Washington State Department of Natural Resources, 1997. Final Habitat Conservation Plan

# Appendices

# Appendix A

## Timber Management Activities Summary

### Implementation Monitoring Pilot Project 2002

| Activities Reviewed | Activity Type | Stream Typing | | RMZ Buffer Width | | | Owls | | Murrelets | | Structurally Unique Trees | | Unstable Slopes | | Listed Species | | Unlisted Species | | Hydrologic Maturity | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Applies? | Compliant? | Applies? | Compliant before correction? | Compliant after correction? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? |
| Victory | Regen Harvest | yes | yes | yes | no | no | no | n/a | yes | yes | yes | unable to count | yes | yes | yes | yes | no | n/a | no | n/a |
| Nellita | Regen Harvest | yes | yes | yes | no | yes | no | n/a | no | n/a | yes | yes (100% count) | yes | yes | no | n/a | no | n/a | no | n/a |
| Distribution Pole | Selective Product Logging | yes | yes | yes | no | no | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a |
| Corked Too | Regen Harvest | yes | yes | yes | yes | yes | no | n/a | no | n/a | yes | unable to count | yes | yes | no | n/a | no | n/a | no | n/a |
| Hannus Road Blowdown | Salvage Logging | no | n/a | no | n/a | n/a | no | n/a | no | n/a | yes | unable to count | yes | yes | no | n/a | no | n/a | no | n/a |
| Old Blue | Regen Harvest | yes | yes | yes | no | yes | no | n/a | no | n/a | yes | unable to count | no | n/a | no | n/a | no | n/a | no | n/a |
| Pitch Black | Regen Harvest | yes | yes | yes | no | no | no | n/a | no | n/a | yes | unable to count | yes | yes | no | n/a | no | n/a | no | n/a |
| Grub Flats | Regen Harvest | yes | yes | no | n/a | n/a | no | n/a | yes | yes | yes | unable to count | no | n/a | yes | yes | no | n/a | no | n/a |
| Fall Out | Regen Harvest | yes | yes | yes | yes | yes | no | n/a | yes | yes | yes | unable to count | no | n/a | yes | yes | yes | yes | no | n/a |
| Welcome Mat | Regen Harvest | yes | yes | yes | yes | yes | no | n/a | no | n/a | yes | unable to count | no | n/a | no | n/a | no | n/a | no | n/a |
| Boulderwash | Regen Harvest | yes | no | yes | yes | yes | no | n/a | no | n/a | yes | unable to count | yes | yes | no | n/a | no | n/a | no | n/a |
| Hazel PC U4 | Late Rotation Thinning | yes | yes | yes | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a |

Shaded entries = North Puget Planning Unit, Unshaded entries = South Puget Planning Unit

Twelve (12) timber management activities were selected for review from 28 total timber activities (43% sample).

Out of 96 possible combinations (12 activities and 8 strategies), only four were found to be non-compliant.

All distance measurements were corrected for margin of error with the following factors (-4.9% for paced distances; -1.70% for laser rangefinder distances).

A total of 29 streams within the 12 management activities were field reviewed. Three buffer widths were non-compliant after the margin of error was applied.

A mistyped stream on one activity was adequately buffered with an RMZ of 100' on each side of the stream.

# Appendix B

## Silvicultural Management Activities Summary

### Implementation Monitoring Pilot Project 2002

| Activities Reviewed | Activity Type | Stream Typing | | RMZ Buffer Width | | Owls | | Murrelets | | Structurally Unique Trees | | Unstable Slopes | | Listed Species | | Unlisted Species | | Hydrologic Maturity | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? |
| Eberley Christie 2 | Hand Plant | no | yes | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Red Star 2 | Hand Plant | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Sweet and Sour 2 | Hand Plant | yes | yes | n/a | yes | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Redi-Cash | PCT | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Zinger 1 | Hand Plant | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Go For It 2 | Hand Cut | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Mustard 1 | Ground Herb | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Silver View 0 | Hand Plant | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Iced Tea 2 | Hand Cut | yes | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Over Squire | Ground Herb | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Good-By-Don 2 | Ground Herb | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Wilbur 1 | Hand Cut | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Carpenter Road 1 | Hand Cut | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Astro 1 | Hand Plant | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Gettysburg 3 | Aerial Herb | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Kirk 1 | Hand Cut | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Ridge Cleanup | Ground Herb | no | n/a | no | n/a | yes | yes | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Mud Bay Grade 3 | PCT | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| North Slope U-6 | Hand Plant | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Thorny U1-A | Aerial Herb | yes | yes | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Buck Flats U-2 | Hand Cut | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Page Flat 1 | Hand Cut | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| 5400-2P | PCT | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | yes | n/a |
| Flag Forever 3 | PCT | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Muskrat Luv | PCT | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Olalla Unit 2 | Hand Plant | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Skeleton Key 5 | Hand Plant | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Blacksmith U 1 A | Hand Plant | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Powergate | Hand Plant | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Topnotch 1 | Hand Plant | no | n/a | no | n/a | no | yes | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| UPS1 | Hand Plant | no | n/a | no | n/a | no | yes | no | n/a | no | n/a | yes | yes | none | n/a | none | n/a | no | n/a |
| Old Wildberry 2 | PCT | yes | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Morgan 3B | Hand Cut | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Tin Mine Overlook 1 | Hand Cut | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | yes | yes | none | n/a | none | n/a | no | n/a |

**Shaded entries = North Puget Planning Unit, Unshaded entries = South Puget Planning Unit**

**Thirty-four (34) silvicultural management activities were randomly selected for review from 340 total silvicultural activities (10% sample).**

**All 306 possible combinations (34 activities and 9 strategies) were found to be in compliance.**

**In many instances, conservation strategies did not apply to the activities we reviewed. However, we considered them to be in compliance because they did not violate the strategy.**

# Appendix C

## Non-Timber Management Activities Summary

### Implementation Monitoring Pilot Project 2002

| Activities Reviewed | Activity Type | Activities Reviewed X=Field Review | Stream Typing | | RMZ Buffer Width | | Owls | | Murrelets | | Structurally Unique Trees | | Unstable Slopes | | Listed Species | | Unlisted Species | | Hydrologic Maturity | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? | Applies? | Compliant? |
| Walker Valley Trail Upgrade | Rec.Trails+Bridge | X | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Walker Valley Jeep Trail | Rec.Trails | X | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Subtotal | | 2 | | | | | | | | | | | | | | | | | | |
| Capitol Forest M&O | Recreation Trails | X | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Capitol Forest ORV Trail | Recreation Trails | X | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Capitol Forest ORV Bridge | Bridge reconstruction | X | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Tiger Mtn.Iverson Trai Bridge | Trail construction | X | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Tahuya ORV Trail | Trail and a Bridge | X | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Gold Creek Trail | Parking relocation | X | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Tahuya/Green Trail Maint | Rec.Trail reconstruct. | X | yes | yes | yes | yes | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Subtotal | | 7 | | | | | | | | | | | | | | | | | | |
| Western Wireless | Easements | | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Crown Pacific | Rights of Way | | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Subtotal | | 2 | | | | | | | | | | | | | | | | | | |
| Mtn. To Sound Greenway | Easements | | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Pierce Co. Public Works | Easements | | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Simgle Track Mind | Easements | | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Mason Co. Public Works | Easements | | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Subtotal | | 4 | | | | | | | | | | | | | | | | | | |
| Walville | Communication Site | | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Raging River | Communication Site | | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Subtotal | | 2 | | | | | | | | | | | | | | | | | | |
| Birdwell#10055854 | Grazing Lease | | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Ault #10A55854 | Grazing Lease | | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Ashe # 10A68793 | Grazing Lease | | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| WDFD #10071964 | Grazing Lease | | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Subtotal | | 4 | | | | | | | | | | | | | | | | | | |
| Grays Harbor Block | Spec.Forest Products | | n/a | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Lewis Block | Spec.Forest Products | | n/a | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Pacific Block | Spec.Forest Products | | n/a | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Thurston Block | Spec.Forest Products | | n/a | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Subtotal | | 4 | | | | | | | | | | | | | | | | | | |
| NW Contractors#35-00-5602 | Spec.Forest Products | | n/a | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| NW Contractors#35-00-5614 | Spec.Forest Products | | n/a | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| NW Contractors#35-00-5604 | Spec.Forest Products | | n/a | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Mt.Baker Evergreen#35-00-5611 | Spec.Forest Products | | n/a | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Mt.Baker Evergreen#35-00-5407 | Spec.Forest Products | | n/a | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Subtotal | | 5 | | | | | | | | | | | | | | | | | | |
| North Puget | Land Transaction | 4 | n/a | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| South Puget | Land Transaction | 4 | n/a | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| South Puget | Mineral,Rock,Sand,Gr. | 5 | n/a | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| Noth Puget | Mineral,Rock,Sand,Gr. | 5 | n/a | n/a | no | n/a | no | n/a | no | n/a | no | n/a | no | n/a | none | n/a | none | n/a | no | n/a |
| North Puget Total | All Activities | 18 | | | | | | | | | | | | | | | | | | |
| South Puget Total | All Activities | 30 | | | | | | | | | | | | | | | | | | |

**Shaded entries = North Puget Planning Unit, Unshaded entries = South Puget Planning Unit**

**Forty-eight (48) non-timber management activities were randomly selected for review from 179 total non-timber activities (27% sample)**

**All 48 non-timber activities were reviewed in the office; nine (9) of the forty-eight were also field reviewed.**

**In many instances, conservation strategies did not apply to the activities we reviewed. However, we considered them to be in compliance because they did not violate the strategy**

# Appendix D

**Unstable Slopes Report and Matrix**

**Implementation Monitoring Pilot Project 2002:**
**Unstable Slopes Component**

## Background

This slope stability review of 5 Northwest Region, 3 South Puget Sound Region, and 3 Central Region timber sales was completed in support of the 2002 Implementation Monitoring Pilot Project. The reviewed timber sales were planned and harvested under the guidelines of DNR's HCP, and evaluated in that context only. The objectives of the slope stability review were to complement the pilot project by; 1.) assessing the accuracy and consistency of landform identification, and, 2.) evaluating the function and adequacy of the riparian buffers with respect to protecting unstable slopes.

## Methods

Due to time and other resource constraints the review was conducted entirely in-office. Information on the 11 timber sales was gathered from SEPA comments, slope stability modeling results, soils/geology report (if there was one), and other information in the timber sale packets relevant to a slope stability assessment. Concurrently, air photos of the sale area (post-harvest when available) were reviewed for any indications of pre- or post-harvest slope instability. The results are compiled in the attached Table.

Monitoring questions posed for this pilot project 2002 included the following:

- Did Slope Morphology (SMORPH) modeling indicate any high or moderate potential for mass wasting within or adjacent to the harvest boundaries?
- Was there a review done for other (non-modeled) indications of slope instability?
- Was there a report submitted by a slope stability specialist outlining mitigation recommendations?'

## Results

In remotely evaluating the 11 timber sales, all appear to be compliant with the HCP with respect to protection of unstable slopes. However, some question remains on Old Blue (Central Region). There is no documentation that predicted areas of instability, identified by SMORPH within the boundaries of the unit, were field verified. Although not required by the implementation procedures (1997), without the documentation there is no way to evaluate whether or not field verification was completed, and what was observed.

## Concerns

This review was conducted on the premise that harvest activities were planned under HCP guidelines, and were to be evaluated in that context only. This is not an easy task, as there is much ambiguity in the interpretation of the intent of the HCP with respect to unstable slopes. Issues raised under the Forest Practices Rules were not documented in this monitoring review, and may have been overlooked during sale planning. For example, "Welcome Mat" (NW Region) lies within the groundwater recharge area of glacial deep-seated landslides along the Nooksak River. Under current protocol, effects of timber harvest on groundwater recharge and potential landslide activation, would need to be evaluated, with particular consideration of the potential impact on human safety (homes and roads), and other public resources (Nooksak River) at the base of the slope. Another example is "Old Blue" (Central Region), where SMORPH modeling indicated a high potential for mid-slope, shallow-rapid type failures. The packet contained no memo documenting field verification of the modeling, or mitigation recommendations.

## Future monitoring

Subsequent monitoring should address the following:

- Were the mitigation recommendations captured in the contract language?
- Were the mitigation recommendations followed?
- Did mitigation work? - short term? - long term?

# Appendix D cont.

## Slope Stability Review of HCP Timber Sales - Implementation Monitoring – Pilot Project 2002:

| Region | Sale Name | App approval date | FPA class. | Harvest completion date | in-unit SMORPH "hits"? | Geology/ soils report? | WAU (landslide map source) | Air photo coverage year | Geology / Slopes |
|---|---|---|---|---|---|---|---|---|---|
| NW | Welcome Mat | 1/20/00 | III-30 | 11/29/00 (ground) | yes | yes (Wolff) | Deming (geo cover) | NW-C-01 | "Hits" along buffered streams. Loam over Chuckanut. Glacial ds, houses below (slope instability not identified as issue). |
| NW | Fall Out | 12/17/98 | III-30 | 7/5/00 | no | no | Cavanaugh (ds map to n) | NW-C-01 | Old meander channel banks, poss. slumps need wider buffer in places, back from slope break. Nearby d-s slides. |
| NW | Hazel PC | 1/26/00 | III-30 | 2/28/01 (ground) | yes | yes (Wolff) | Ebey H, French Bldr. (Hazel WA) | NW-C-01 | U1,2,4,5 (south side) have hits within. Roads/skid trails cross pot. unst. areas. Lots of d-s slides along Boulder River. |
| NW | Grub Flats | 12/17/98 | III-30 | 2/28/01 (ground) | yes | yes (Fisher/Wolff) | Cavanaugh (ds map to n) | NW-C-01 | Most U2 many hits, some n part U1, roads cross both, no eng design. Hi water table, don't rut. No grnd yard n of slope break. |
| NW | Boulderwash | 9/3/98 | III-30 | 8/3/00 (cbl,grnd) | yes | yes (Wolff) | Canyon Creek (geo cover?) | NW-C-01 | Hits nw, e side U2. Riparian buff has slumps. Memo: Chuck Fm, on v. large complex old ds slides, road concerns, not harvest. |
| | | | | | | | | | |
| SPS | Nellita | 12/28/99 | III-30 | 3/15/01 | yes | no | W Kitsap (wsw, ds ls geo) | OL-97 | Lots of hits to w and sw, broad area of channels. Well buffered. |
| SPS | Pitch Black | 1/8/99 | III-30 | 8/28/00 | yes | yes (Bohle) | Cherry (1 ds ls mid WAU) | NW-C-01 | Esp. U4, steep slopes. Old channel meander in U2 not protected, steep, lots of hits, maybe old slump? No HCP memo. |
| SPS | Victory | 4/22/99 | III-30 | 12/1/00 | no | no | Puget (CZA ls haz) | OL-97 | Buffered incised channels and broad upland wetland(?) area. Few hits within buffers. |
| | | | | | | | | | |
| Central | Corked Too | 3/19/99 | III-30 | 10/29/00 | no | yes (Gerstel) | Skookumch. (w side ds, geo) | SW-C-99 | Area not prone to s-r failures. Northcraft Volc., thick soils, slumps/ ds slides, s-r on terrace edges, slides from old roads. |
| Central | Distribution Pole | 5/17/02 | III-30 | 10/5/00 | no | no | Kennedy Cr. (w side ds, geo) | SW-C-99 | Hits surround U2, but none within. Glacial seds over Crescent Basalt, prone to d-s slides, shallow groundwater in glacial |
| Central | Old Blue | 5/21/99 | III-30 | 9/13/00 | yes | no | Kennedy Cr. (w side ds, geo) | SW-C-99 | Hits scattered east 2/3 of unit. Glacial seds over Crescent Basalt, prone to d-s slides, shallow groundwater in glacial. |

# Appendix E

## Boulderwash Timber Sale – RMZ Type 1 Stream
### Northwest Region – North Puget Planning Unit

# Appendix E cont.

## Tahuya Trails – South Puget Region
### Decommissioned trail

# Appendix E cont.

## Hazel Thinning Timber Sale – NW Region
### Thinning Prescription measurement

# Appendix E cont.

## Fall Out – NW Region
## Riparian Management Zone blowdown

# Appendix E cont.

**Walker Valley – NW Region**
**Motorcycle trail – hardening of surface to reduce erosion**

# Appendix E cont.

## Tahuya Trail Bridge – South Puget Region
## Recreational trail bridge approach

# Appendix F

## Distance Correction Factors

Horizontal distance measurements were taped, and corrected for slope, paced, and corrected for slope or measured with an electronic laser rangefinder (model Impulse) set in the Horizontal Distance (HD) mode. To accommodate errors in measurements a correction factor was calculated for the paced as well as the rangefinder measured distances (see Table below).

The control distance for the laser rangefinder was established by measuring between two trees on level ground with a tape. The correction factor was then calculated for the rangefinder. The control distance for pacing was then measured with the laser rangefinder adjusted using the correction factor for the rangefinder.

| PACED DISTANCE CORRECTION FACTOR | | | LASER RANGEFINDER CORRECTION FACTOR | | |
|---|---|---|---|---|---|
| **Control Distance** | **Paced Distance** | **Correction Factor** | **Control Distance** | **Laser Measured Distance** | **Correction Factor** |
| 176.2 ft | 163.68 ft | 1.076 | 73 ft | 72.16 ft | 1.012 |
| 168.28 ft | 163.68 ft | 1.028 | 73 ft | 71.91 ft | 1.015 |
| | | | 73 ft | 71.22 ft | 1.025 |
| **Average Correction Factors** | | **1.052** | | | **1.017** |