RESOURCES

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Habitat Conservation Plan for State Trust Lands

2004 Implementation Monitoring Report

February 2005

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Doug Sutherland - Commissioner of Public Lands

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HCP Implementation Monitoring Group
Land Management Division

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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 primary conservation strategies for threatened and endangered species including 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 HCP provides an incidental take permit that covers seven upland species listed by the federal government as endangered or threatened. The plan covers all DNR management activities on approximately 1.6 million acres of state trust lands within the range of the northern spotted owl. The DNR has a contractual agreement with the U.S. Fish and Wildlife Service and NOAA Fisheries (formerly the National Marine Fisheries Service) to implement and monitor this HCP according to the following objectives for all planning units:

- To determine whether the HCP conservation strategies are implemented as written (Implementation Monitoring);
- To determine whether implementation of the conservation strategies results in anticipated habitat conditions (Effectiveness Monitoring); and
- To evaluate cause-and-effect relationships between habitat conditions resulting from implementation of the conservation strategies and the animal populations these strategies are intended to benefit (Validation Monitoring)

The first objective, implementation monitoring, is the fundamental purpose of this field review. To meet DNR's 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, the implementation monitoring team compiles data necessary to document compliance with the conservation strategies. In the future, the implementation monitoring team will periodically describe changes in landscape-level habitat conditions in areas managed to provide spotted owl and marbled murrelet habitat. In addition, statistically valid sampling will be conducted in order to evaluate the reliability of information stored in DNR's GIS, Planning and Tracking, and other databases (DNR 1997).

DNR's implementation monitoring team reviews selected conservation strategies or HCP components, rather than reviewing all of the HCP conservation strategies that were implemented with select timber sale activities. Different conservation strategies are reviewed each year. The advantage of this is that better statistical inferences can be made regarding the implementation of the reviewed conservation strategies. The disadvantage of this approach is that only a select group of strategies is sampled each year. In addition, no assessment can be made regarding whether DNR failed to implement a strategy altogether (by, e.g. not recognizing and buffering a wetland).

Implementation Monitoring Objectives

The main objective of implementation monitoring is to determine whether the selected conservation strategies were implemented as written. The other objectives of the 2004 review were:

- To determine the overall level of compliance for the monitored conservation strategies;

- To develop field forms to collect compliance data for the wetland, wind buffer, and large, structurally unique trees strategies; and
- To determine the educational and training needs of division and region staff in regards to proper implementation of the HCP

Methods

Sample Selection

Implementation monitoring examines the department's management activities in all nine HCP planning units. HCP implementation monitoring for 2004 was conducted in all westside HCP planning units, plus the OESF, and encompassed four DNR regions (Northwest, Olympic, Pacific Cascade [formerly Central and Southwest], and South Puget Sound). The strategies monitored this year do not apply to eastside HCP planning units.

Three major conservation strategy components were selected for review in 2004: large structurally unique trees (hereafter referred to as leave trees), and the wetlands and wind buffer components of the riparian conservation strategy. In addition, several infrequently implemented strategies (cliffs, caves, talus, and protection of bald eagle and pileated woodpecker habitat) were reviewed. Selected conservation strategies were evaluated to determine if they were properly identified and implemented.

Non-Timber and Silvicultural Management Activities

In the first two years of implementation monitoring (2002 pilot project and 2003 review) the team monitored non-timber and silvicultural management activities as well as timber management activities. The team has always found it difficult to identify which non-timber activities to monitor. Most of the activities do not create a "footprint", or meet any of the other criteria that would require an HCP checklist to be completed (a prerequisite for implementation monitoring) (DNR 2003b). In addition, many activities (especially recreation maintenance and improvement activities) take several years to complete. When the team receives reports on big projects with multiple components (e.g. replacement of several bridges, improvements to many miles of trail), it is rarely clear which activities were completed in a given fiscal year. In effect, this led the team to monitor the same recreation trail or campground improvements, bridge and culvert replacements, etc., year after year.

In the case of silvicultural management activities, no new footprint is created, because all of the silvicultural activities occur in the same footprint as the timber management activity that preceded them. If the timber management activity was compliant with the HCP, the likelihood of non-compliance in the silvicultural activity is extremely low. More importantly, very few of the silvicultural activities meet the criteria that require an HCP checklist to be prepared.

Due to the ambiguous relationship of the silvicultural and non-timber management activities to HCP compliance monitoring, the team decided not to include any of those activities or results in the monitoring analyses this year. Before attempting any future implementation monitoring of non-timber or silvicultural activities, the implementation monitoring team will discuss these issues with the programs responsible for implementing these activities to determine if there are more effective ways to monitor the activities.

Timber Management Activities
The reviewed timber management strategies were initiated after January 1999 and had close dates in DNR's Revenue Management System (RMS) between July 1, 2002 and June 30, 2003 (Fiscal Year (FY) 2003). There were 173 timber management activities that met these criteria. Samples were selected for each of the reviewed strategies in the following manner.

For the leave tree strategy, a population that included all sales with one or more regeneration harvest (clearcut) units was created. Region staff were then sent a questionnaire, asking three questions regarding whether or not leave trees could be distinguished or counted on those sales. (See Appendix A.) For the regions that provided detailed responses, a portion of the sales region staff thought the team could count trees on were selected for review. For the regions that did not provide answers, a portion of all sales implementing the strategy were selected for review. Prior to counting trees on a selected sale, monitoring staff walked through the sale looking for any problems that might prevent accurate or complete leave tree counts. If any such problems were found, no attempt was made to count the trees.

The wetland strategy sample selection was conducted randomly from the stratified population of activities with a positive response for wetlands on the HCP checklist. A portion of the sales implementing the strategy was selected for review.

Wind buffers must be considered for all Types 1 and 2 streams and for Type 3 streams greater than 5 feet wide. Application of a wind buffer is based on an assessment of "risk of windthrow," and where at least a moderate probability of windthrow exists, a wind buffer is applied. Initially, two categories of timber management activities were created: those with at least one Type 1, 2, or 3 stream, and those without such a stream. The stratification process was complicated by the fact that not all Type 3 streams require consideration of a wind buffer – only those greater than 5 feet wide require such consideration. This created some false positives (where there were no Type 1 or 2 streams present and any Type 3s were less than 5 feet wide) that could only be detected through field measurements of stream width. Since the team wanted to gain an understanding of how well field staff determine the need for wind buffers, both activities that applied wind buffers and activities where wind buffers were considered but not applied were monitored. The team monitored 100% of activities that applied a wind buffer and a portion of those that the team thought – based on the presence of a Type 1, 2, or 3 stream – required consideration of a wind buffer.

Since they are infrequently implemented, the team attempted to monitor 100 percent of the activities implementing an uncommon habitat protection strategy.

Field Reviews
Prior to conducting field reviews, a field packet was prepared to help in the review. This packet consisted of topographic, hydrology, and soils maps; a soils report; and a "special concerns report" from DNR's forest management activity tracking database, Planning and Tracking (P&T). The special concerns report provides information about species or habitats of concern, fish populations, forest practices sensitive areas, and significant rain on snow. In addition, HCP checklists and Management Activity Summaries (MAS) were used to assist in determining how HCP strategies were applied. When applicable,

information such as biologist's reports, compliance data, or reports on when sales or haul roads were inactive was also used.

For the wetland, wind buffer, and leave tree strategies, field forms were created to log data. (See Appendices C, D, and E, respectively.)

Compliance Determination

HCP implementation procedures described in the Forestry Handbook (DNR 2003a) and in the Final Habitat Conservation Plan (DNR 1997) 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. Where the HCP requires compliance with Forest Practices Rules, or where Forest Practices Rules do not allow substitution by HCP strategy, Washington Forest Practices Rules (Washington Forest Practices Board 2001) and Washington Administrative Code (WAC) (WDFW 2004) were also used.

Data for individual activity compliance is on file with the Department of Natural Resources.

Evaluation Criteria

Leave Trees

Large trees may contain structural qualities, such as large limbs, open crowns, open hollow trunks, and broken tops or limbs, that make them valuable habitat. The HCP calls for retaining large trees that have, or may develop, such structural characteristics. When choosing which trees to retain at a site, the HCP dictates:

- preference should be given to large trees with structural qualities important to wildlife or those considered old-growth remnants
- at least 1 tree per acre must belong to the largest pre-harvest diameter class (based on 2-inch increments); at least 1 other tree per acre must belong to the dominant crown class
- retention trees will be left in the harvest unit when possible; they can be clumped or scattered, but clump density should be at least 1 clump per 5 acres
- retention trees must not pose safety hazards to those harvesting the timber

In addition, the HCP has the following rules for conserving snags:

- an average of at least 3 snags will be left per acre harvested; all snags should be left if possible
- when available, snags will be at least 30 feet tall and 15 inches diameter at breast height (dbh, measured 4.5 feet above ground); all snags will be left where safe and practical
- priority is given to large hollow snags, large snags with bark, and snags that are at least 20 inches dbh and 40 feet tall
- an average of at least 5 live trees per acre harvested will be permanently retained; two will be as described for large structurally unique trees, the other three will belong to the dominant, co-dominant or intermediate crown classes and will, if possible, have at least one-third their height in live crown
- priority is given to tree species with a propensity for developing cavities (e.g. maple), but the post-harvest stand should represent pre-harvest diversity

- if fewer than three snags per acre can be safely left, additional live trees will be retained so that an average of 8 stems per acre is retained after harvest
- snags and retention trees can be clumped, but the density should not fall below one clump per five acres
- snags and retention trees cannot pose a hazard to workers harvesting timber

The implementation monitoring team performed 100% leave tree counts in 18 timber sales; all applicable (i.e. clearcut) units within each chosen sale were counted.

All trees and snags were counted and classified according to species and size class (2-inch intervals). For each leave tree, dbh was measured using either a Biltmore stick or a diameter tape. In the case of snags, only those that were at least 30 feet tall (as estimated by the field crew), and had a dbh of at least 8 inches were counted. The HCP states that snags will have a dbh of at least 15" and a height of at least 30' "if available", but all snags will be left where practical (DNR 1997 p.IV.157). While snags with dbhs between 8 and 14 inches were counted, these were not included in any analysis of snags (they were included in other analyses involving leave trees). Each unit within a sale was counted and tracked separately; if a tree could not be safely accessed its dbh was estimated and the tree was tracked separately. In addition, any blown down leave trees were tracked by size and species. The general distribution of the trees (clumped, scattered, or both) was noted, and locations of any clumps were noted on the timber sale map.

The field data were tallied to determine the number of trees left in each timber sale harvest unit, as well as the timber sale as a whole. The analyses looked at the total number of leave trees versus the required number; percentage and number of trees in each species and diameter class; number and size of snags; and percentage and species of blow down among the leave trees. Data for the three commonly left conifer species (western redcedar, Douglas-fir, and western hemlock) was also analyzed.

Early in the field season, the team determined that the leave tree field forms were not capturing all necessary data, so the forms were revised. The original form did not track blown down trees separately from live trees, and had its largest diameter class listed as "38+ inches". Due to lack of data, sales using the first form were removed from some analyses.

Wetlands

DNR's Forest Resource Policy No. 21 allows "no overall net loss of naturally occurring wetland acreage and function" (DNR 1997 p. IV.69). The main conservation objective in wetland protection is to maintain hydrologic function through maintaining a plant canopy, ensuring stand regeneration, and maintaining evaporation and thus natural water flow.

In the westside planning units, all wetlands greater than 0.25 acres require buffers. Those between 0.25 and 1 acre must have a buffer that is 100 feet wide. Wetlands greater than 1 acre in size must have a buffer equal to the site potential tree height for 100-year old conifers or 100 feet, whichever is greater. Timber harvest can occur in a WMZ as long as it maintains and perpetuates a stand that is wind firm, has large root systems, and that retains a basal area of at least 120 ft^2 per acre.

In the OESF, wetland protection rules are slightly different. All wetlands .25 acres or greater and bogs .1 acres or greater are to be protected with a buffer. Harvesting is

allowed in forested wetlands and their buffers, and up to 50 feet from the wetland's edge in the buffers of non-forested wetlands, as long as a basal area of at least 120 square feet is maintained. Leave trees must be representative of the dominant and co-dominant species in the intact forest edge of the wetland. Buffer widths for wetlands greater than 5 acres should be equal to the average site potential tree height. For forested wetlands between 0.25 and 5 acres, the average buffer width should be about 2/3 of the site potential tree height. Series of smaller wetlands are protected if they collectively function as a larger wetland.

In monitoring the wetland conservation strategy, the team randomly selected at least one site per wetland to take a variable plot (for basal area) and – when necessary – a buffer measurement. In larger wetlands, several plots and buffer measurements were taken and averaged. Basal area was determined for live trees in wetland buffers using a relaskop. For buffer widths, three readings were taken per location and averaged. All measurements were taken with a laser rangefinder set in the horizontal distance (HD) mode, and a correction factor applied. (See Appendix B.) The team also noted whether or not the wetland buffer was thinned.

Wind Buffers

Wind buffers are designed to protect the ecological integrity of riparian buffers on Type 1, 2, and 3 waters in areas prone to windthrow. These buffers are placed outside of the required riparian buffer. Decisions about whether or not to apply wind buffers should be based on models, local knowledge, and evidence of past windthrow. Since there is little scientific data on windthrow and buffer stability, the current HCP conservation strategy is considered interim, and will be modified based on research and data from ongoing timber sales (DNR 1997).

In the westside planning units, wind buffers must be considered for all Type 1 or 2 waters and any Type 3 streams wider than 5 feet. These buffers must be placed on the windward side(s) of any water bodies where there is at least a moderate risk of windthrow. For Type 1 and 2 waters, the wind buffer must be at least 100 feet wide; for Type 3 streams greater than 5 feet wide, a wind buffer must be at least 50 feet wide.

For the westside planning units, riparian buffer widths for type 1, 2, and 3 streams are defined by the HCP as being "equal to the site potential height of trees in a mature conifer stand or 100 feet, whichever is greater" (DNR 1997 p. IV. 56) and are applied to each side of the stream. The site potential tree height is derived from "standard site index tables (King 1966), using 100 years as the age at breast height of a mature conifer stand. When determining the width of the buffer, the site productivity used …will be that occurring in the upland portions of the riparian ecosystem for that particular site" (DNR 1997 p. IV. 56).

Although the OESF has different wind buffer requirements than the westside planning units, none of the monitored activities in the OESF implemented wind buffers.

Each stream segment where a wind buffer was not applied was first evaluated for stream typing and width. The team attempted to find the widest part of the stream within the unit and take an initial measurement there. If the stream was a Type 1 or 2 or a Type 3 greater than 5 feet wide, it remained in the sample for further analysis.

If a wind buffer was applied, the combined width of the wind buffer and RMZ was measured. All measurements were taken with a laser rangefinder set in the horizontal distance (HD) mode, and a correction factor applied. (See Appendix B.) Three buffer width measurements were taken and averaged for each spot measured.

For sales both with and without wind buffers, the percent blow down in the entire riparian buffer (RMZ and/or wind buffer) was estimated in a line from the edge of the buffer to the 100-year flood plain stretching out approximately 50 feet on either side of where the width measurement was taken. This estimate was based on the percentage of total stems that were blown down.

Cliffs

Cliffs greater than 25 feet tall and below 5,000 feet in elevation are considered priority habitat by Washington Department of Fish and Wildlife, as they provide nesting, roosting, and foraging sites for species of concern. There are two conservation objectives for cliffs: protecting species that inhabit cliffs and minimizing disturbance to geomorphic features. Management is done on a site-specific basis, giving consideration to protection of wildlife habitat and potential usage by peregrine falcons (known peregrine falcon usage triggers Forest Practices and HCP regulations related to this species).

Talus

According to the HCP, the conservation objectives for this feature are to minimize microclimatic change and maintain the physical integrity of the talus. This is generally done through limiting timber harvest and road construction in and around talus fields.

Caves

According to the Washington Department of Fish and Wildlife (1995 as quoted in DNR 1997 p. IV.153), a cave is “a naturally occurring cavity, recess, void, or system of interconnected passages which occurs under the earth in soils, rock, ice, or other geological formations, and is large enough to contain a human.” When a cave is found on DNR land, DNR and US Fish and Wildlife Service staffs jointly decide whether the cave is important wildlife habitat requiring protection. When protection is deemed critical, the goals are to maintain the microclimate at the cave’s entrance; maintain the cave’s physical integrity; and minimize human disturbance of any bats utilizing the cave. This protection is provided through establishing buffers, limiting road construction within 0.25 miles of the cave entrance and 300 feet of the cave passages, mapping the cave, and keeping the location of the cave confidential.

Bald Eagle

Bald eagles and their habitat are primarily protected by existing state and federal policies, Forest Practices Rules, and state wildlife regulations. The HCP riparian conservation strategies and leave tree rules also provide and protect nesting and roosting habitat. Bald eagle management plans must consider all relevant rules (Policy Nos. 20, 22, and 23 of the Forest Resource Plan; Forest Practice Rules WAC 222-16-080; and state wildlife regulations WAC 232-12-292) and also work to protect nesting and foraging sites. This may include timing or other restrictions on activities within a set distance of known eagle nests.

To determine strategy compliance, the team looked for documentation that timing restrictions on road usage or other policies or restrictions were followed.

Pileated Woodpecker
Pileated woodpecker foraging, breeding, and roosting habitat is primarily protected through the riparian, marbled murrelet, and spotted owl conservation strategies, which protect snags and mature and old growth forests. The RCW 77.16.120 dictates the retention of trees and snags known to contain current or historical pileated woodpecker nest sites (DNR 1997).

For activities that applied this strategy, the team looked for documentation on the location and protection of any nest sites or trees and snags with known usage by pileated woodpeckers.

Monitoring Results

Leave Trees
Leave trees were counted on 18 sales with 35 total clearcut units, covering 1,454 acres statewide.

Although the HCP has specific requirements in terms of leaving trees from the dominant, co-dominant, and intermediate crown classes, detailed information on pre-sale stand composition was not available. This meant that determinations regarding whether leave trees were of the correct size and crown class could not be made. Instead, the team counted all live trees that had a dbh of at least 8 inches, and snags greater than 30 feet tall and with a dbh of at least 8 inches. Compliance was simply based on having at least 8 stems per acre with at least an 8-inch dbh [and taller than 30 feet if they were snags]. (See Table 1.) Within each sale, compliance was determined on a unit-by-unit basis.

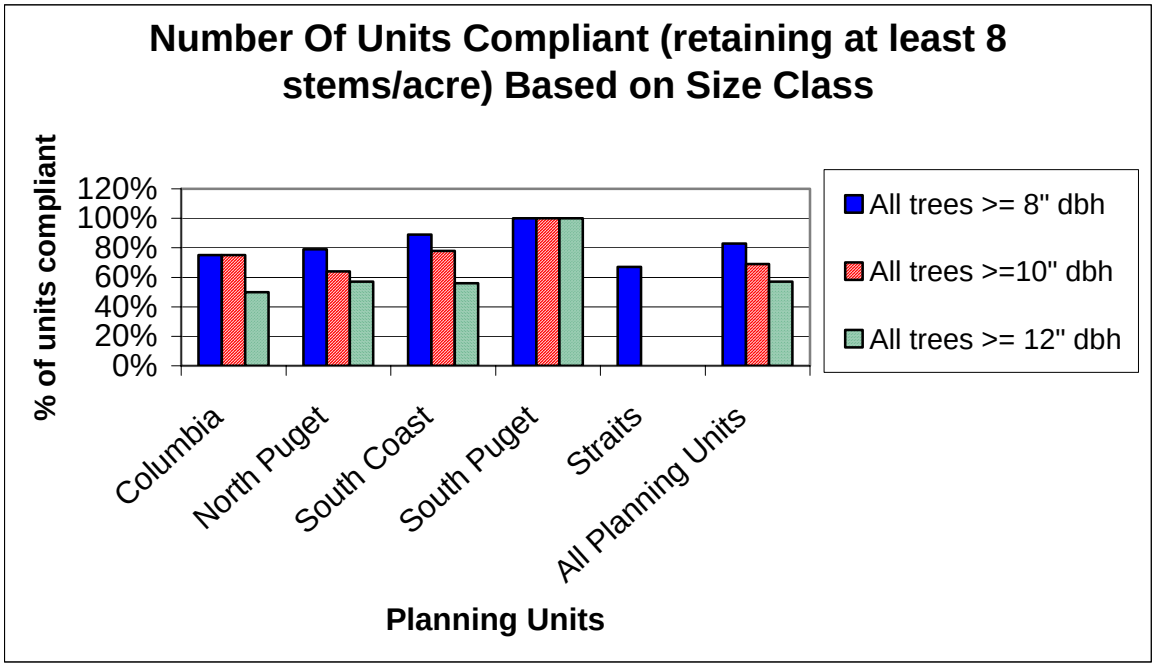
Table 1. Compliance with the large, structurally unique tree strategy

HCP Planning Unit	# Units Sampled	Unit Compliance*		% Range of Required Trees Left
		#	*%*	
Columbia	4	3	*75*	89-188
North Puget	14	11	*79*	70-368
OESF	0	N/A	*N/A*	N/A
South Coast	9	8	*89*	83-151
South Puget	5	5	*100*	105-186
Straits	3	2	*67*	98-126
All Planning Units	**35**	**29**	***83***	**70-368**

*Compliance means leaving at least 8 live trees and/or snags per acre with a dbh of at least 8 inches (and a height of at least 30 feet for snags).

Often, trees from the intermediate and larger crown classes have a dbh of at least 12 inches; in some regions, foresters are trained to only count trees with a minimum dbh of 12 inches towards their leave tree totals. Based on this, the team also looked at whether the sale would still have 8 trees per acre if trees from smaller diameter classes were excluded. This was done simply for informational purposes, and was not used in determining strategy compliance. As Figure 1 shows, with one exception, strategy compliance decreases as smaller trees are excluded.

Figure 1. Variations in leave tree compliance based on including or excluding all live trees and snags of various diameter classes (compliance requires leaving at least 8 stems per acre).



Although the available data was not sufficient to determine crown class for the leave trees, a method of comparing pre- and post-harvest stand composition in terms of trees per acre (TPA) and diameter class distribution was found. This process used both cruise and leave tree data. This data was analyzed on a timber sale (rather than a timber sale unit) basis for those sales with available cruise data. (See Appendix F.)

When timber sales are cruised, only the take trees in each plot are counted and their dbh measured; marked leave trees are not counted. The cruise data (BAF, number of plots, and number of trees in each diameter class) was used to determine the TPA in each diameter class for the sale. The cruise data was combined into the same diameter classes as the leave tree data for a given sale. In a few cruises, 7-inch trees were counted, and a separate diameter class had to be made for them (only 8 inch or larger leave trees were counted). The TPA were calculated for the leave trees by dividing the number of trees in a given diameter class by the number of acres in the sale. By adding the leave trees from the 100% count to the take trees represented by the cruise, a good representation of the pre-harvest stand diameter distribution can be obtained. The post-harvest data was based solely on leave trees.

Both pre- and post-harvest data were then normalized to determine the relative distribution of each diameter class. To normalize the data, the number of TPA in each diameter class was divided by the total number of TPA in the sale. This normalized data was then graphed to show what percentage of the trees each diameter class comprised. (See Appendix F.)

Finally, for each diameter class, the number of post-harvest trees was divided by the number of pre-harvest trees to determine what percentage of the pre-harvest trees remained following harvest. (See Appendix F.)

As the graphs in Appendix F show, a high percentage of trees from the largest diameter classes are being left. In nearly every case, 100% of the trees from the largest diameter classes were retained as legacy trees, while smaller percentages of the trees from the smaller diameter classes were left.

The number and percentage of snags that are at least 30 feet tall and 15-inches dbh were analyzed for the monitored sales. The HCP states that, when possible, 3 out of the 8 stems left per acre – or 37.5% of leave trees - should be snags. However, sales may not have that many snags available that can be safely left. When snags are not available, additional live trees must be left for snag recruitment, so at least 8 stems per acre are retained post-harvest. Since many sales left more leave trees than required, both the percentage of required leave trees that are snags and the percentage of actual leave trees that are snags were calculated. As Table 2 shows, in either case, a low percentage of snags are being left in regeneration harvests. This could be due to a lack of available snags, harvesting of snags for safety reasons, or both.

Table 2. Snags ≥15" dbh and ≥30' tall left post-harvest

Planning Unit	Total # Snags	Required # Leave Trees	% of Required Leave Tees That are Snags	Actual # Leave Trees	% of Actual Leave Trees That are Snags
Columbia	99	2,136	5	2,944	3
North Puget	277	4,416	6	6,304	4
OESF	N/A	N/A	N/A	N/A	N/A
South Coast	45	1,728	3	2,245	2
South Puget	68	2,168	3	3,189	2
Straits	109	1,184	9	1,302	8
All Planning Units	**598**	**11,632**	**5**	**15,984**	**4**

Three conifer species are commonly left or managed for in westside planning units – western redcedar, Douglas-fir, and western hemlock. Some analyses of leave trees for these three species were done, looking at what percentage of the total leave trees they comprised. Blow down for these species was also analyzed to determine how likely the species were to blow down. Such data may help field staff make decisions regarding which species to leave in a given landscape.

First, the total number of leave trees – standing and blown down – that these three species comprised was calculated. Based on this data, it was determined what percentage of the total leave trees (all species – standing and down) each of these conifer species comprised. As Table 3 shows, a large majority of the total leave trees are one of these three species. In most planning units, the majority of leave trees are Douglas-fir. In Straits, the majority of leave trees are western redcedar (46%), but it is important to note that this data is based on only one sale.

Table 3. Conifer species component of total leave trees – all species, standing and down – by planning unit

Planning Unit	Western Redcedar		Douglas-fir		Western Hemlock		3-Species Totals	
	# Left	*% of Total**	# Left	*% of Total**	# Left	*% of Total**	# Left	*% of Total**
Columbia	138	*5*	1,680	*57*	549	*19*	2,367	*80*
North Puget	1,306	*21*	2,339	*37*	1,323	*21*	4,968	*79*
OESF	0	*N/A*	0	*N/A*	0	*N/A*	0	*N/A*
South Coast	131	*27*	1,786	*80*	185	*8*	2,102	*94*
South Puget	139	*4*	2,577	*81*	162	*5*	2,878	*90*
Straits	598	*46*	334	*26*	185	*14*	1,117	*86*
All Planning Units	**2,312**	***14***	**8,716**	***55***	**2,404**	***15***	**13,432**	***84***

*These figures are the percentage of all species (conifer and deciduous) left post-harvest that a given species comprises.

Since blow down is an issue in many parts of the state, information on blow down among leave trees was analyzed. This data may be useful in determining what areas and species are most prone to wind throw, which can help field staff in determining whether wind buffers are needed, which species to leave, and how to lay out leave trees. In areas that are particularly prone to wind throw, region staff may want to leave additional trees to ensure standing trees remain for habitat and snag recruitment. However, the blown down trees may also function as habitat by becoming large down woody debris.

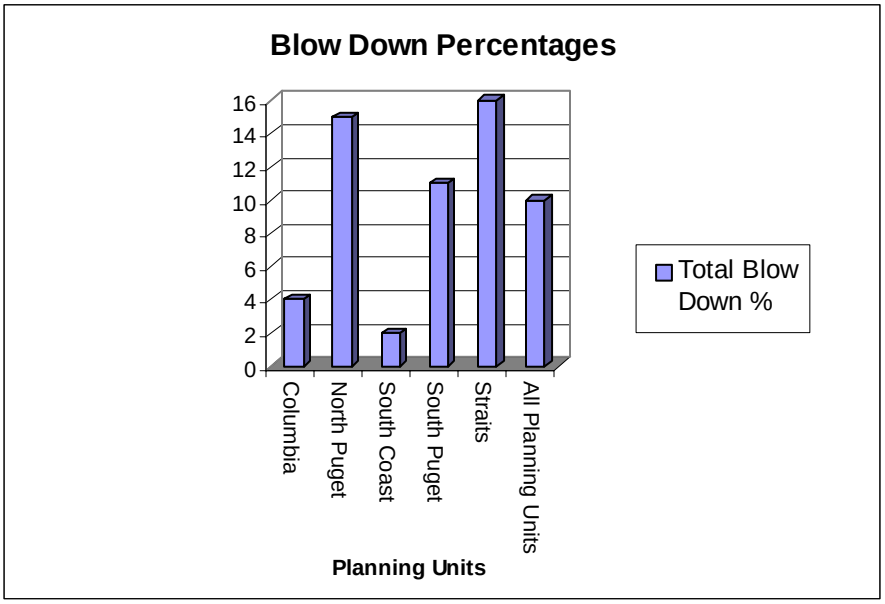
The amount of blow down often varied considerably between planning units, sales, and sometimes between units within a sale. (See Table 4 and Figure 2.) In one sale in North Puget planning unit, for instance, there was 43% blow down in one unit. Most of the trees in this unit were left in a large clump, which was heavily impacted by windthrow. The other unit in this sale had 18% blow down.

Table 4. Range and percentage of leave trees that were blown down

HCP Planning Unit	# Units Sampled	Total # of Leave Trees	Total # of Blown Down Leave Trees	Total % of Blow Down Leave Trees	% Blow Down Range
Columbia	4	2,944	105	4	0-7
North Puget*	12	4,849	730	15	0-43
OESF	0	N/A	N/A	N/A	N/A
South Coast*	2	1,722	42	2	2-3
South Puget	5	3,189	356	11	0-20
Straits	3	1,302	203	16	11-19
All Planning Units*	**26**	**14,006**	**1,436**	**10**	**0-43**

*For 2 units in N Puget and 7 in S Coast, blown down trees were not tracked separately (they were instead counted as live trees). These units are not included in Table 4.

Figure 2. Percentage of leave trees blown down on a planning unit basis*



*For 2 units in N Puget and 7 in S Coast, blown down trees were not tracked separately (they were instead counted as live trees). These units are not included in Figure 2.

Next, the leave tree data for just the three major conifer species was looked at to determine the relative wind-firmness of these species. When working in areas prone to wind throw, or when required to leave "wind-firm" trees, it might help field staff to know which species are most likely to blow down. Leave tree percentages of the major conifer species, as well as percentages of blow down among the conifers were determined. This was a two-part analysis. First, the number of trees in a given species was divided by the total number of leave trees for the three conifer species, to determine the percentage of leave conifers that each species comprised (% of total conifers left). Second, the number of blown down trees for each individual species was divided by the three-species blow down total to determine percentages (% of blown down conifers) of blow down by species. (See Table 5.)

Although only 18 percent of the leave trees for these three species are western hemlock, 40 percent of the blown down trees are western hemlock. This could be partly attributed to the fact that many hemlocks left post-harvest are smaller trees with smaller, more shallow root systems and less stability, therefore making them less wind firm. While Douglas-firs comprised 66% of the leave trees for these three species, they were only 41% of the blown down conifers. Data for Douglas-firs were skewed by one sale in the South Puget planning unit, where a large number of Douglas-firs were left (1,268), and roughly 22% of those trees blew down. If this sale is excluded, Douglas-firs drop to 26% of the blown down conifers on monitored sales, while western redcedars and western hemlocks rise to 23% and 51%, respectively.

Table 5. Percent of the three major conifer species (western redcedar, Douglas-fir, and western hemlock) that each species comprises and percent of the blown down conifers that each species comprises

Planning Unit	Western Redcedar		Douglas-fir		Western Hemlock	
	% of Total Conifers Left	*% of Blown Down Conifers*	% of Total Conifers Left	*% of Blown Down Conifers*	% of Total Conifers Left	*% of Blown Down Conifers*
Columbia	6	*3*	71	*34*	23	*63*
North Puget*	25	*25*	46	*19*	29	*56*
OESF	N/A	*N/A*	N/A	*N/A*	N/A	*N/A*
South Coast*	6	*3*	87	*83*	7	*15*
South Puget	5	*0*	90	*94*	6	*6*
Straits	53	*38*	30	*19*	17	*43*
All Planning Units*	**16**	***18***	**66**	***41***	**18**	***40***

*For 2 units in N Puget and 7 in S Coast, blown down trees were not tracked separately (they were instead counted as live trees). These units are not included in Table 5.

Finally, the percentage of the leave trees that were blown down for each of the three major conifer species was determined on an individual species basis. In other words, for each species, the percentage of the total (standing and down) leave trees for that species that were blown down was calculated. As Table 6 shows, a relatively large percentage (26%) of western hemlock blew down, while comparatively few (7%) Douglas-fir blew down.

Table 6. Percentage of total (standing and down) leave trees for each of the three major conifer species that blew down (e.g. blown down cedar/total cedar left)

Planning Unit	% Western Redcedar Blown Down	% Douglas-fir Blown Down	% Western Hemlock Blown Down
Columbia	2	2	11
North Puget*	18	8	34
OESF	N/A	N/A	N/A
S Coast*	1	2	5
S Puget	0	13	12
Straits	13	11	46
All Planning Units*	**13**	**7**	**26**

*For 2 units in N Puget and 7 in S Coast, blown down trees were not tracked separately (they were instead counted as live trees). These units are not included in Table 6.

Wetlands

In 2004, 48 wetlands in thirteen timber sales were monitored for adequate basal area and - when applicable - proper buffer width.

In the westside planning units, compliance with the wetland conservation strategy was evaluated in terms of both the number of wetlands adequately buffered and the number maintaining sufficient basal area. In the OESF, all monitored wetlands were part of thinning sales. Since such sales don't have prescribed buffer widths, buffers were not measured for these wetlands, but basal area was calculated.

The first criterion monitored in wetlands was the buffer width. For each wetland where a specific buffer was required, the buffer was measured in at least one place. The percentage of the required buffer width that was actually applied was determined for

each wetland. (See Table 7.) The monitoring team found 8 wetlands with inadequate buffer widths. However, at least 90 percent of the required buffer was maintained in 21 of the 23 monitored wetlands.

Table 7. Wetland buffers – compliance and applied width as a percentage of the required width

Planning Unit	# Wetlands Sampled	Buffer Width Compliance		Range of Buffer Width	Mean Buffer Width ± Standard Error (SE)
		#	%		
Columbia	1	1	*100*	N/A	N/A
North Puget	14	8	*57*	78-160	109 ± 6
OESF*	0	N/A	*N/A*	N/A	N/A
South Coast	0	N/A	*N/A*	N/A	N/A
South Puget	3	3	*100*	107-111	109 ± 1
Straits	5	3	*60*	87-170	112 ± 15
All Planning Units	**23**	**15**	***65***	**78-170**	**111 ± 5**

* All 25 wetlands monitored in OESF were part of a thinning sale with no prescribed buffer, so they are not included in Table 7.

The basal area component of the wetland strategy was also monitored. To be compliant, a wetland buffer must maintain a basal area of at least 120 square feet per acre. Thinning can be done in wetland buffers, as long as adequate basal area is maintained. Overall, compliance with this component of the wetland strategy was high. (See Table 8.) Only two of forty-eight monitored wetlands were not compliant with regards to basal area, and both had a basal area of 100 square feet per acre. Both were part of thinning sales in the OESF, where the high number of skid trails throughout the forested areas – and in one case a wetland - influenced the measurements and likely contributed to the low basal area in those wetland buffers.

Table 8. Wetland compliance* in terms of basal area in wetland buffers

Planning Unit	# Wetlands	# Compliant	% Compliant
Columbia	1	1	100
North Puget	14	14	100
OESF	25	23	92
South Coast	0	N/A	N/A
South Puget	3	3	100
Straits	5	5	100
All Planning Units	**48**	**46**	**96**

*Compliance requires having a total basal area (conifer and deciduous) of at least 120 ft^2/acre.

Since thinning is allowed in wetland buffers, the team looked to see if there were notable differences in total buffer basal area between wetlands with thinned buffers and wetlands with unthinned buffers. On a planning unit basis, comparisons are difficult, as many planning units had few or no sales in one of these categories. Overall, the team found smaller average basal areas in wetlands with thinned buffers. (See Table 9.) However, the thinning activities nearly always maintained adequate basal area.

Table 9. Mean and average total basal areas in wetland buffers

Planning Unit	# Thinned Wetland Buffers	Basal Area Range - Thinned	Basal Area Mean ± SE - Thinned	# Unthinned Wetland Buffers	Basal Area Range - Unthinned	Basal Area Mean ± SE - Unthinned
Columbia	0	N/A	N/A	1	N/A	N/A
North Puget	2	150-212	181 ± 31	12	180-460	263 ± 21
OESF	25	100-300	178 ± 10	0	N/A	N/A
South Coast	0	N/A	N/A	0	N/A	N/A
South Puget	0	N/A	N/A	3	213-280	254 ± 21
Straits	1	N/A	N/A	4	210-380	290 ± 35
All Planning Units	**28**	**100-300**	**181 ± 9**	**20**	**210-460**	**261 ± 16**

The HCP states that timber harvests within wetland buffers should perpetuate a stand that "(1) is as wind-firm as possible; and (2) has large root systems to maintain the uptake and transpiration of ground water" (DNR 1997 p. IV.70). No clear guidelines exist for determining compliance with these two criteria. Maintaining a stand of primarily conifers when possible may help with both counts, but this is not a guarantee of wind firmness. To help with anecdotal observations, the team gathered information on total basal area versus conifer basal area, as well as wind throw. This data was not adequate to determine compliance, but it does offer an idea of how wind-firm the monitored wetland buffers were.

In the majority of the monitored wetland buffers, wind throw was minimal. The wind throw (estimated as the percentage of stems blown down out of total stems left in a circle of approximately 100 foot radius around the variable plot center) averaged less than 5% in 47 of the monitored wetlands. In the other wetland buffer, blow down averaged approximately 20 percent.

In looking at conifer basal area versus total basal area in wetland buffers, there was little difference in most planning units. (See Table 10.) In other words, the majority of the trees left in wetland buffers are conifers. Although based on small sample sizes, this anecdotal evidence, combined with observations about wind throw, suggests most of the monitored wetlands maintained wind firm buffers.

Table 10. Conifer basal area versus total (conifer and deciduous) basal area in wetland buffers

Planning Unit	# Wetlands Sampled	Mean BA ± SE Conifers	Range BA Conifers	Mean BA ± SE Total	Range BA Total
Columbia	1	N/A	N/A	N/A	N/A
North Puget	14	236 ± 22	140-460	251 ± 20	150-460
OESF	25	178 ± 10	100-300	178 ± 10	100-300
South Coast	0	N/A	N/A	N/A	N/A
South Puget*	0	N/A	N/A	N/A	N/A
Straits	5	245 ± 40	160-380	282 ± 28	210-380
All Planning Units	**45**	**201 ± 11**	**100-460**	**211 ± 11**	**100-460**

*One sale (with 3 wetlands) in S Puget planning unit is not included in this analysis because no distinction was made between conifer and total basal area.

Wind Buffers

In assessing wind buffers, the team visited a total of 41 Type 1, 2, or 3 stream segments. Eleven stream segments where wind buffer consideration was not required (Type 3 streams less than 5 feet wide) were found and removed from the sample. Of the remaining 30 stream segments, 8 streams (in 7 sales) where wind buffers were applied were monitored. In addition, 22 streams where wind buffers had to be considered, but were not applied, were monitored.

If a wind buffer was applied, it was considered compliant if the total combined width of the wind buffer and the RMZ was greater than or equal to the combined required widths. Of the monitored sales, only half maintained all of the required width, but the shortest applied combined RMZ and wind buffer width was 90 percent of that required. (See Table 11.)

Table 11. Applied RMZ and buffer widths as a percentage of the required combined widths

HCP Planning Unit	# Streams Sampled	Buffer Width Compliance		Buffer Width Range	Buffer Width Mean ± SE
		#	%		
Columbia	2	1	*50*	90-100	95 ± 5
North Puget	5	3	*60*	91-141	107 ± 9
OESF	0	N/A	*N/A*	N/A	N/A
South Coast	1	0	*0*	N/A	N/A
South Puget	0	N/A	*N/A*	N/A	N/A
Straits	0	N/A	*N/A*	N/A	N/A
All Planning Units	**8**	**4**	***50***	**90-141**	**103 ± 6**

The blow down percentage - estimated as the percentage of total stems that were blown down – was compared between streams where wind buffers were and were not applied. (See Table 12.) The amount of blow down was estimated on a straight line from the outer edge of the buffer to the edge of the 100-year flood plain and approximately 50 feet on either side of this line. This information provides anecdotal evidence on how well field staff are doing in determining the need (or lack thereof) for wind buffers. The sample size is small, and the numbers are estimates, not exact measurements. However, this limited data seems to suggest that, for the monitored sales, determinations of when wind buffers are needed were adequate.

Table 12. Blow down ranges on streams where wind buffers were applied compared to streams where wind buffers were not applied

HCP Planning Unit	No Wind Buffer - # Streams	*No Wind Buffer - % Blow Down Range*	Wind Buffer Applied - # Streams	*Wind Buffer Applied - % Blow Down Range*
Columbia	4	*0*	2	*0*
North Puget	3	*0-5*	5	*5-60+*
OESF	0	*N/A*	0	*N/A*
South Coast	6	*0-5*	1	*N/A*
South Puget	0	*N/A*	0	*N/A*
Straits	7	*0-10*	0	*N/A*
Statewide Totals	**20**	***0-10***	**8**	***0-60+***

Infrequently Implemented Strategies

Fifteen infrequently implemented strategies were monitored this year: two bald eagle nests; eight cliffs; three pileated woodpecker nests; one cave; and one talus. All of these strategies were found to be compliant with the HCP. While monitoring, the team noted that field staff are often extra cautious in applying the strategies. For instance, there were several sales where protection was provided for cliff-like or cave-like structures that did not meet the HCP's definition of a cliff or cave. In several cases, the pileated woodpecker strategy was marked as applied on the HCP checklist when no evidence of active or historic nest sites was documented in the official agency file (sale jacket).

Recommendations and Discussion

The HCP implementation monitoring team is continually working to improve its performance and procedures to make implementation monitoring a useful process for all involved. In reviewing this field season and analyzing the data, two major themes arose. One is a need for the monitoring team to create and follow clear, consistent guidelines and procedures, and do a better job of communicating these guidelines and procedures to region staff. The other is the need for field staff to provide the team with complete, thorough documentation and information.

Leave trees

A number of sales where leave trees were not clearly differentiated from other trees left on site (e.g. WMZ trees) were found. This lack of distinction made it impossible to count the leave trees or determine compliance for those sales. One common problem was leave tree clumps left adjacent to required RMZs or WMZs but not distinguished from those trees. Although the questionnaire sent to the regions didn't ask if leave trees were left adjacent to any required RMZ and not distinguished from the RMZ, the field crews found several sales they could not count due to this issue. This could be remedied by creating a clear line between the two areas, with timber sale boundary tags on one side and blue painted trees or leave tree boundary tags on the other. On other sales, leave trees were left adjacent to Type 5 streams, but not delineated from downstream required RMZ's. Finally, in a few sales, leave trees were left outside the timber sale boundary or adjacent to another stand and not clearly distinguished. Again, clear documentation and a clear line between the leave trees and other trees would alleviate these problems.

In some cases, leave trees are left outside the timber sale boundary. This generally happens when an area with unstable slopes or other issues is found and bounded out of the harvest area, but it remains part of the timber sale. For compliance monitoring purposes, only trees that are clearly identified and marked on the ground (tags, paint, etc.) can be counted toward the HCP requirement for leave trees. For longer-term tracking, leave trees left outside a cutting unit boundary would be easier to identify and track if a separate Forest Management Unit (FMU) polygon, named for the sale, were established in P&T.

During field reviews, monitoring staff found a number of uncommon situations, which were handled on a case-by-case basis, often in consultation with region staff. These situations included – but were not limited to - stumps with blue paint (the trees could have been swapped by the purchaser or stolen); trees with both blue paint (indicating

that they are intended as leave trees) and boundary tags (for e.g. an RMZ); and trees that had their tops broken off after timber harvest (some were counted as snags, some as live trees). These situations were discussed with the monitoring field crews, and implementation monitoring staff plan to provide more thorough training and strategy-specific guidelines for future monitoring reviews.

In discussions between program and region staff, it became clear that the issue of leave trees for right of way acreage needs clear guidance. Right of way acres were not included when calculating leave tree compliance or performing related analyses for this report. Since the HCP is not clear on whether right of way acreage should be included when determining the required number of leave trees, the HCP Science Section will issue programmatic guidelines regarding leave trees for rights of way acreage later in the year.

The initial monitoring sample included some sales where the regions told the team that leave trees could not be counted. Two such sales were counted before the mistake was caught and corrected. The sales were discussed with region staff, and everyone agreed that all the leave trees were likely identified and counted, so the sales remained part of the sample. When counting another sale, the monitoring team missed an area of leave trees bounded out of the sale and not clearly marked. Region staff pointed this out and directed the team to clear documentation in the MAS regarding this group of trees. Based on this information, the sale was removed from the sample.

Wetlands

While walking through a timber sale, the team noticed a wetland that was not mentioned in the timber sale documentation and not buffered in any way. This previously forested wetland had been clearcut and the only "buffer" was the trees remaining throughout the thinning sale. While this was the only such wetland noted this year, DNR staff have noticed other undocumented and improperly harvested wetlands in other sales. Without walking every acre of every sale, it is impossible to identify all such "missed" wetlands. These observations raise the question of how widespread the problem is and whether field staff need more training on wetland identification.

Wind Buffers

Very few sales implement the wind buffer strategy; only 7 activities out of 173 (or about 4%) completed in FY03 are known to have applied this strategy. In monitoring this strategy, the team noted that there is no spot on the HCP checklist for wind buffers. Instead, there is a table in the riparian section of the timber Management Activity Summary with a column labeled "wind buffer (Yes or No)". With Management Activity Summaries no longer required, this could present a problem if this strategy is monitored again. The HCP checklist or other documentation could also include information on the width of Type 3 streams. HCP Science Section staff will evaluate the HCP checklist to determine the best way to modify it to include a spot for this information. This could be achieved through a two part question: (a) are there any Type 1 or 2 streams or any Type 3 streams greater than 5 feet wide; and (b) if the answer to (a) was yes, was a wind buffer applied to any of these streams? Such information will allow the team to better stratify the sample and determine which activities should or should not be monitored for this strategy.

The limited data seems to suggest that field staff are doing an adequate job of determining the need for wind buffers. However, documentation on how the need (or

lack thereof) for a wind buffer is determined is generally lacking from the official file. In addition, the sales were typically monitored within a year or two of harvest. Visiting sales 5 or 10 years post-harvest could provide a more thorough picture of how wind-firm the stands are in the long-term and whether a buffer should have been applied.

In analyzing the data, the monitoring team determined that gathering additional data could help determine strategy compliance as well as increase the understanding of wind throw patterns and severity. This data might include both prevailing and storm wind directions, the direction the trees fell in, and the species and size of trees that fell compared to those that were left. Such information could also help DNR in revising the wind buffer strategy, providing more explicit guidance to field staff.

Infrequently Implemented Strategies

Many infrequently implemented strategies are difficult to monitor on the ground. To monitor these strategies, the team relies on good documentation from the regions regarding such things as locations of cliffs or nesting sites, and any restrictions resulting from implementation of the strategy. Compliance notes, memos, and other documentation, along with conversations with region staff, help when determining strategy compliance. Some of these strategies might better be monitored by visiting timber sales before and after harvest or by having better documentation available. For instance, it would help to see where trees being used by pileated woodpeckers are pre-harvest (or have their location clearly mapped and/or marked with a GPS), to ensure that they remain post-harvest.

Documentation

Proper documentation is essential in making a determination regarding compliance with the HCP conservation strategies. Thorough information provides a more complete picture regarding strategy implementation. Having detailed documentation on the determination of the need – or lack of need – for wind buffers would have been invaluable, but was often lacking. In addition, documentation on the thoughts and actions behind the implementation of infrequently implemented strategies was often not readily available.

The team found several sales with no HCP checklist in the official agency file (sale jacket), but was usually able to acquire a checklist through the region. However, in one sale, the team could not find an HCP checklist or Management Activity Summary in the official agency file. When monitoring staff contacted the region, they searched their files, and could not find either document. Without this documentation, the sale is essentially out of compliance. Currently, the division pre-sales section requires that a hard copy of the HCP checklist be in the official agency file before the sale can be approved for auction. In the near future, electronic versions of the HCP checklist (and other documents) will be required as part of the pre-sales documentation process for both Region sales and Board sales.

Lessons Learned

Looking back on this past season's monitoring effort, the team discovered several possible changes that should improve DNR's accuracy and consistency in collecting data, reduce errors in sampling, and generally improve the team's efficiencies in the field.

The implementation monitoring team will establish guidelines (on, e.g., sample and activity selection) to help in the sampling process. These guidelines should reduce the likelihood of the team sampling activities that fall outside the established parameters. The team will also work with a statistician to ensure that the methodologies are statistically valid.

The team's data forms will be designed to capture all information necessary to make compliance determinations. Sometimes non-crucial or anecdotal information may be gathered, but with a clear purpose for doing so. The field forms will be field tested on a sample sale before monitoring begins, and adjustments made as needed. When appropriate, the forms will be designed to allow data collection using handheld data loggers.

The monitoring team found several errors that made sample stratification difficult. Several sales were in P&T under the wrong agreement number, making them difficult to find. Other sales were listed under misspelled names. One sale was in the P&T database under two different agreement numbers, with conflicting information. Finally, several Region sales were not entered into the P&T database. Monitoring staff will work with region and division staff to determine a process to eliminate such errors and/or correct them when they are found.

Communication

The compliance monitoring team encourages region participation and provides a program code for region staff to charge their time to. When region staff participate in field visits, the interaction improves everyone's understanding of both activity objectives and monitoring compliance criteria. In addition, region staff can provide monitoring staff with information that may not be readily available in timber sale jackets, but which is useful in determining strategy compliance. This ensures that the strategies are fairly and accurately monitored.

In order for field staff to participate in monitoring visits, they need adequate notice of when the monitoring team will be visiting a particular region or sale. In the past, timely notice was not always given, meaning region staff could not visit some sales. Monitoring staff are working to improve this, and plan to work more closely with key region staff to provide earlier and better notice of future monitoring visits.

Acknowledgements

The implementation monitoring team wishes to acknowledge the contributions of the many individuals who provided support for this project. We thank everyone who has taken the time to provide us with his or her thoughts and suggestions. We are especially grateful for the many region staff members who took the time to accompany us on our field reviews and provide feedback on our monitoring process. Their participation enabled us all to gain a more thorough understanding of the design, implementation, and monitoring of our targeted strategies.

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Appendix A

Leave Tree Review Questionnaire

Sale Name _____ Agreement # _____

Were any leave trees left *outside* the timber sale boundary or adjacent to contiguous forest and not delineated from adjacent stands? _____ Yes _____ No

Were any leave trees left along a Type 5 water and not delineated from downstream Type 4 or Type 3 required RMZs? _____ Yes _____No

Were any leave trees left adjacent to a required wetland RMZ buffer and not differentiated from the WMZ? _____ Yes _____No

What was the *general* distribution of the leave trees?
_____ Clumped
_____ Scattered
_____ Both clumped and scattered

Appendix B

Distance Correction Factors

Horizontal distance measurements were measured with electronic laser rangefinder units (model Impulse) set in the Horizontal Distance (HD) mode. To rectify measurement errors, a correction factor was calculated.

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

LASER RANGEFINDER CORRECTION FACTOR		
Control Distance	**Laser Measured Distance**	**Correction Factor**
73 ft	72.16 ft	1.012
73 ft	71.91 ft	1.015
73 ft	71.22 ft	1.025
Average Correction Factor		**1.017**

Appendix C

Wetland Conservation Strategy Field Form

Activity Name:	HCP Planning Unit:
Date of Visit:	Field Reviewed by:
DNR Region:	Weather:

Wetland Location on Sale Map	Wetland Size	Site Index/How Derived	100 yr. Site Potential Tree	Wetland Buffer Req.	Wetland Buffer Applied	Blow-down %	Notes	Pictures Taken?

Wetland Location Map Code	Thinning in Wetland?	Plot #	Tree count – variable plot		Ave. BA by plot in ft^2		TPA – Fixed Plot	TPA Total
			Conifer	Deciduous	Conifer	Total		
			_____trees _____BAF	_____trees _____BAF			_____trees ____ac plot	
			_____trees _____BAF	_____trees _____BAF			_____trees ____ac plot	
			_____trees _____BAF	_____trees _____BAF			_____trees ____ac plot	
			_____trees _____BAF	_____trees _____BAF			_____trees ____ac plot	
			_____trees _____BAF	_____trees _____BAF			_____trees ____ac plot	
			_____trees _____BAF	_____trees _____BAF			_____trees ____ac plot	
			_____trees _____BAF	_____trees _____BAF			_____trees ____ac plot	
			_____trees _____BAF	_____trees _____BAF			_____trees ____ac plot	

Appendix D

Wind Buffer Strategy Field Form

Activity Name:	**HCP Planning Unit:**
Date of Visit:	**Field Reviewed by:**
DNR Region:	**Weather:**

RMZ on Stream Type	RMZ Location on Timber Sale Map	Site Index/How Derived	100 yr. Site Potential Tree	RMZ buffer Requirement	Wind Buffer Requirement	Combined RMZ/Wind Buffer Applied	Pictures taken?

Wind buffer location on map	Streamflow direction	Streamflow grade	Prevailing wind direction	Plot Size and Tree Count	# of trees by species	DBH of trees in plot	% estimate of blowdown in this plot

Appendix E

Large, Structurally Unique Trees (Leave Trees) Strategy Field Form

Activity Name: _____ **Date of Visit:**_____

Unit #:_____ **DNR Region:** _____

Field Reviewed By:_____ **HCP Planning Unit:**_____

Weather:_____

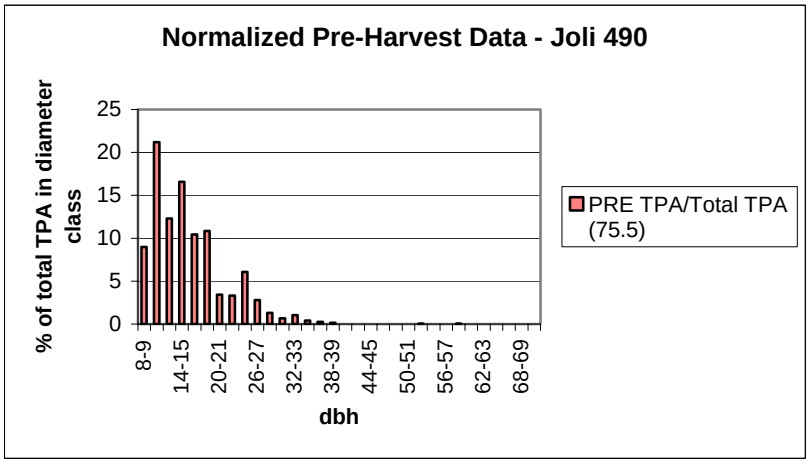
Guidelines:
For each tree, round the dbh to the nearest inch, then place the tree in the correct diameter class
For instance, a 9.5” tree would get rounded up to 10” and counted in the 10-11” class
A 9.4” tree would get rounded down to 9” and counted in the 8-9” class

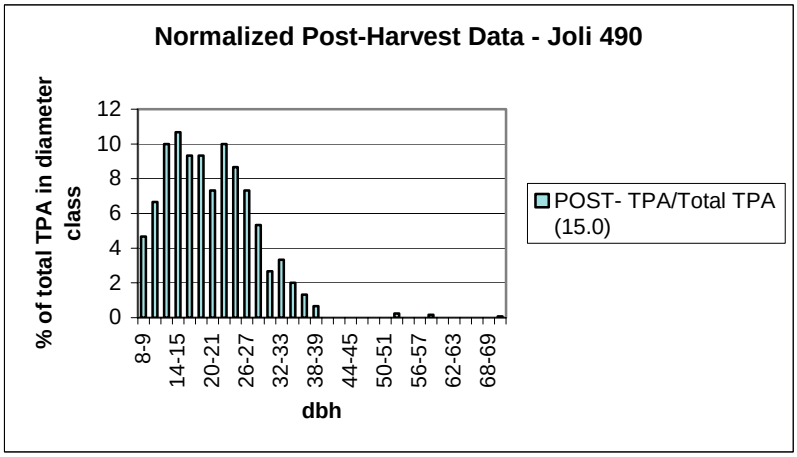
DBH Class "	DF	WH	RC	BLM	RA	SF	SS	WWP	Blow Down	Other	Snags
8-9											
10-11											
12-13											
14-15											
16-17											
18-19											
20-21											
22-23											
24-25											
26-27											
28-29											
30-31											
32-33											
34-35											
DBH Class "	DF	WH	RC	BLM	RA	SF	SS	WWP	Blow Down	Other	Snags
36-37											
38-39											
40-41											
42-43											
44-45											
46-47											
48-49											
50-51											
52-53											
54-55											
56-57											
58-59											

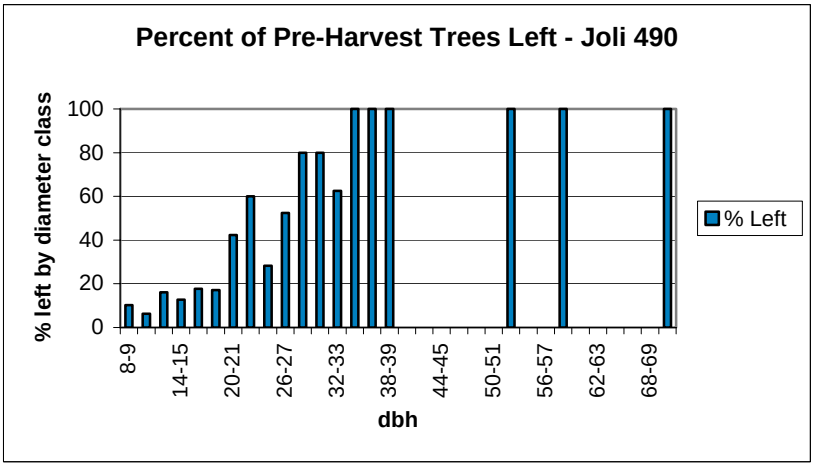
Appendix F

Pre- and Post-Harvest Diameter Class Distributions by Planning Unit

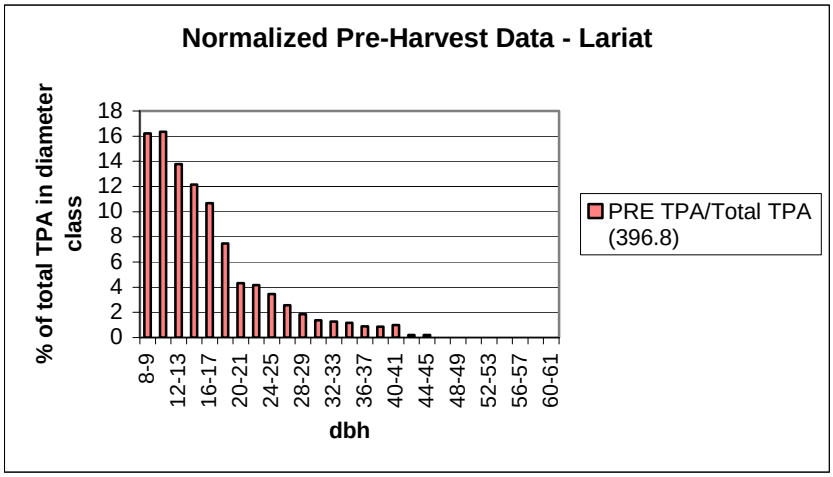
Columbia Planning Unit

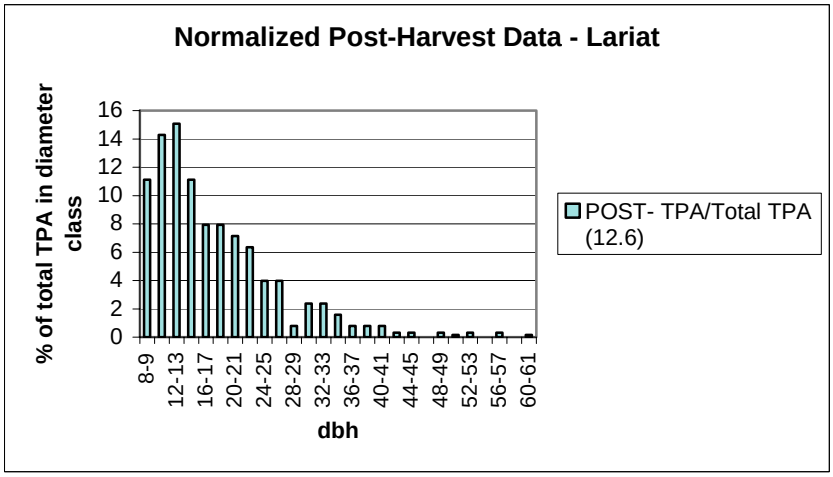


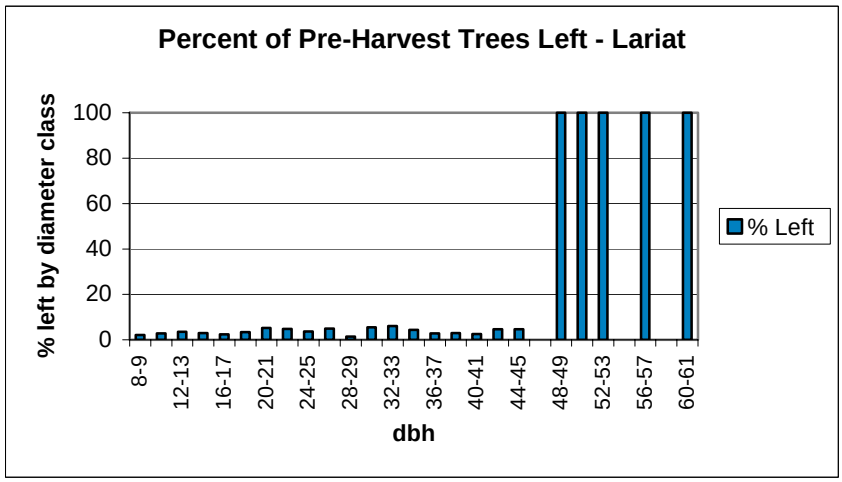




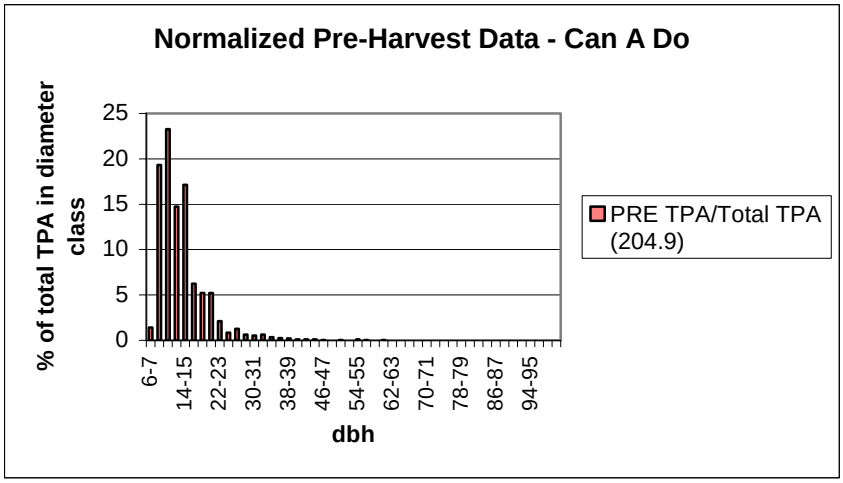
Columbia Planning Unit

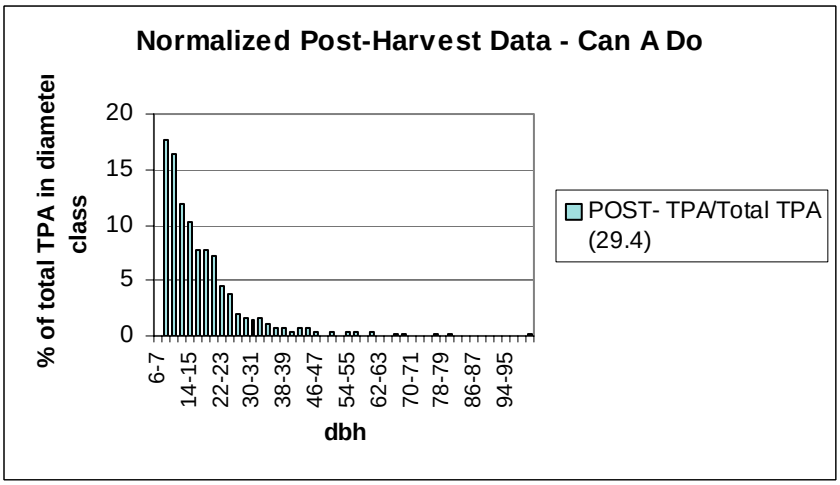


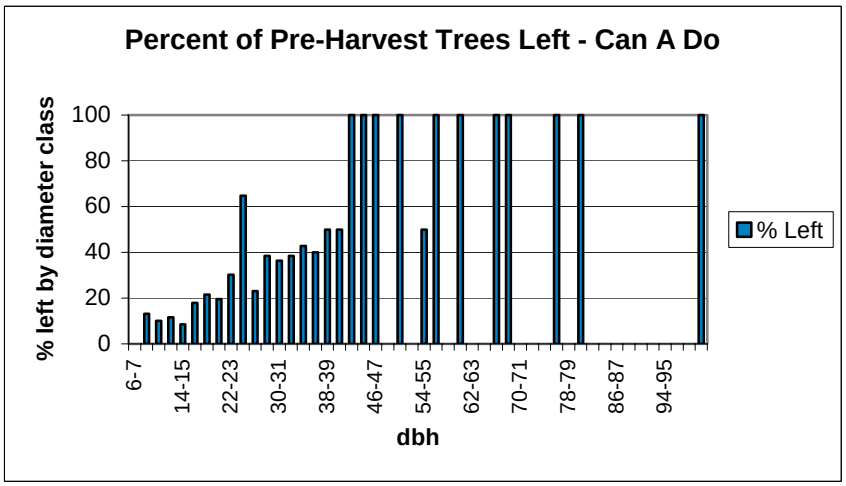




North Puget Planning Unit







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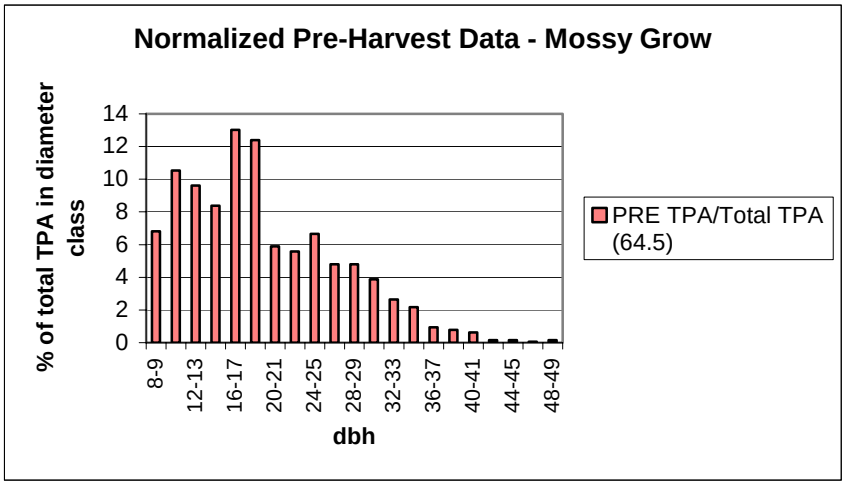

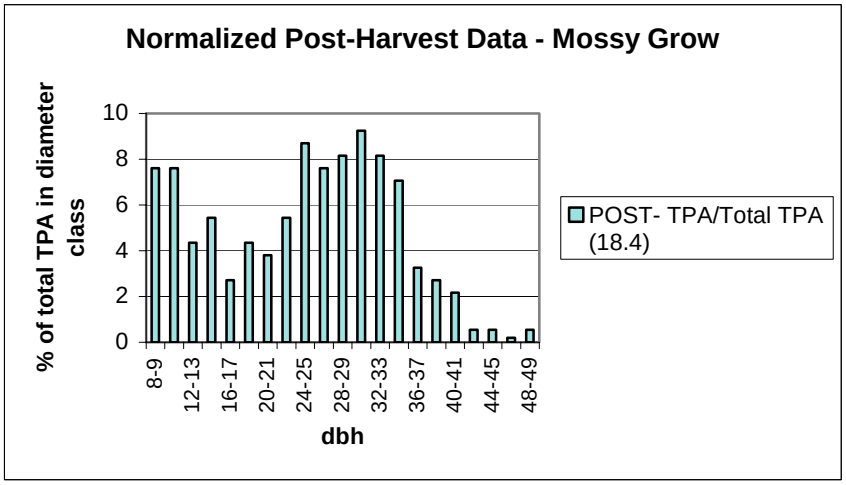

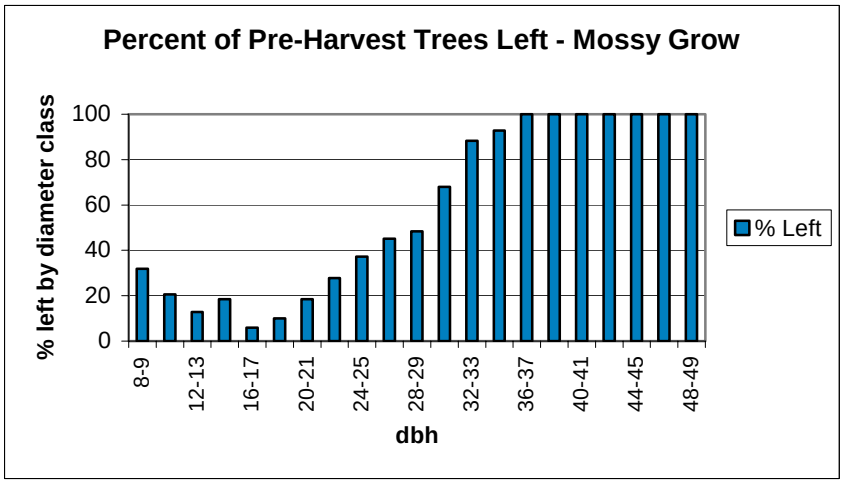

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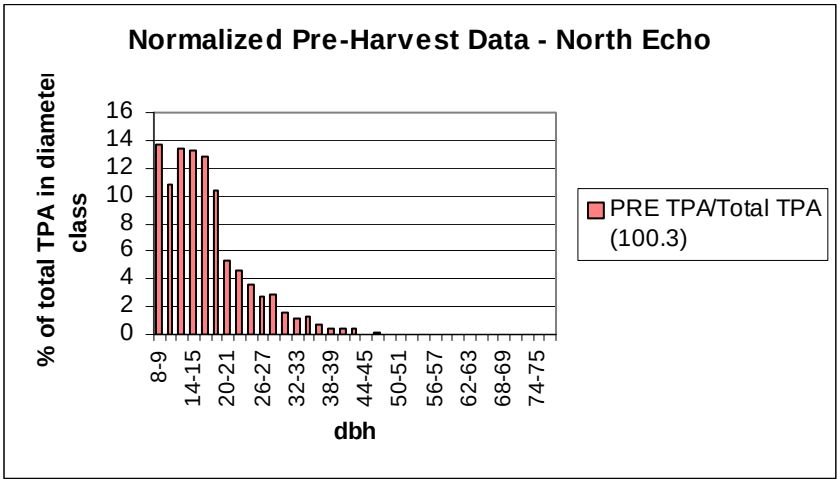

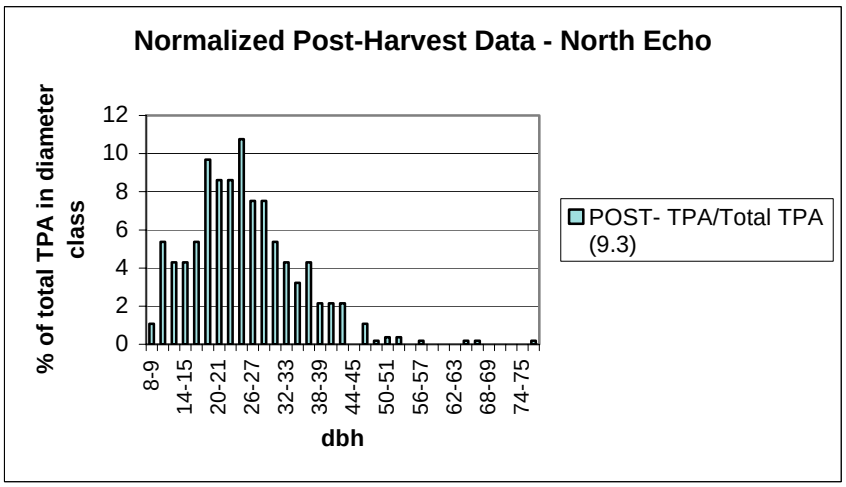

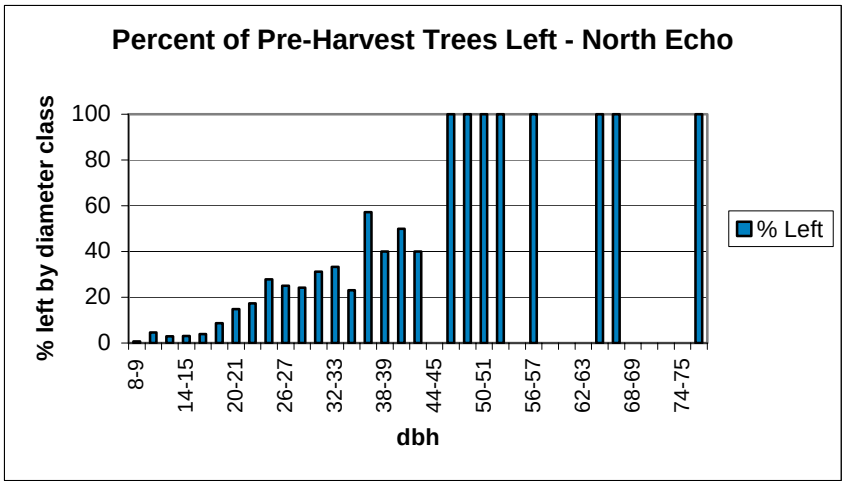

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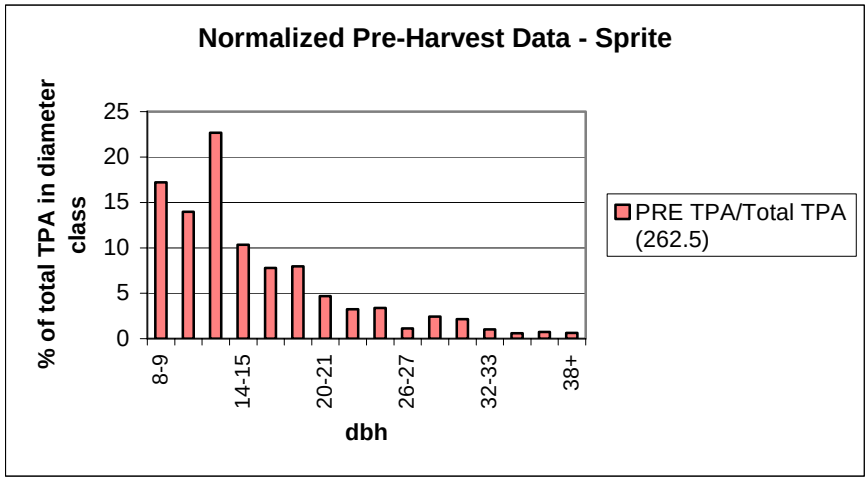

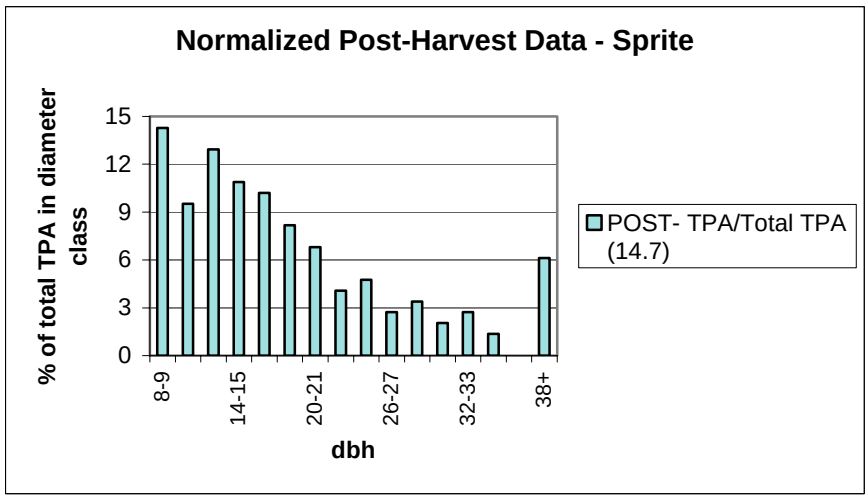

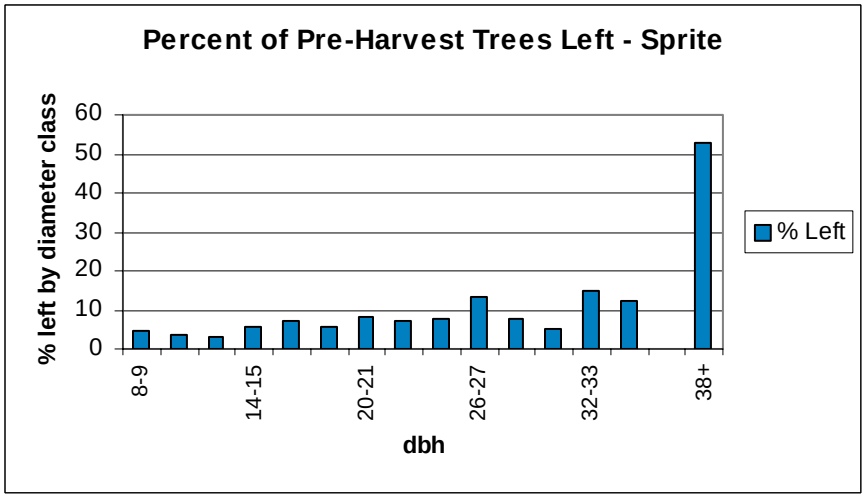

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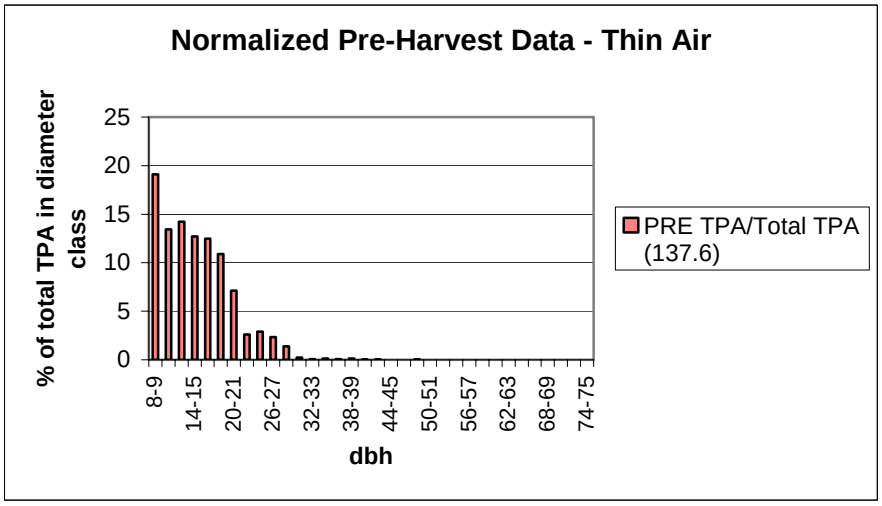
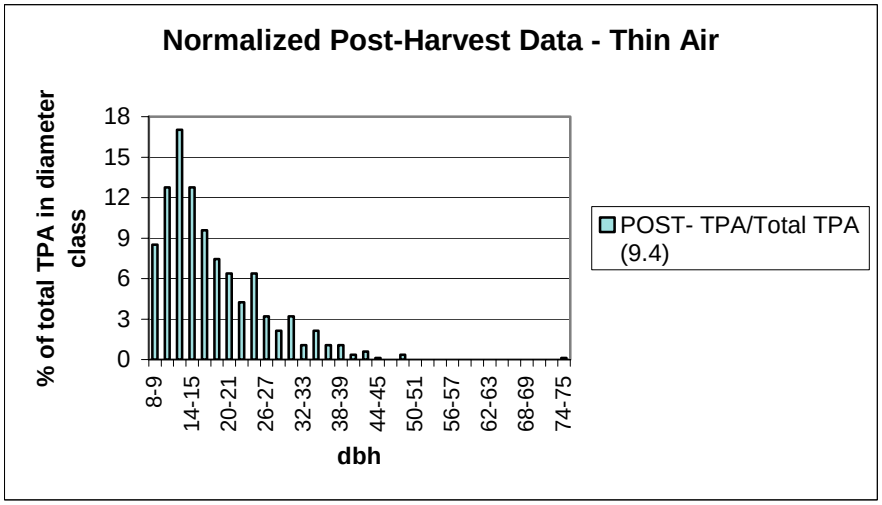
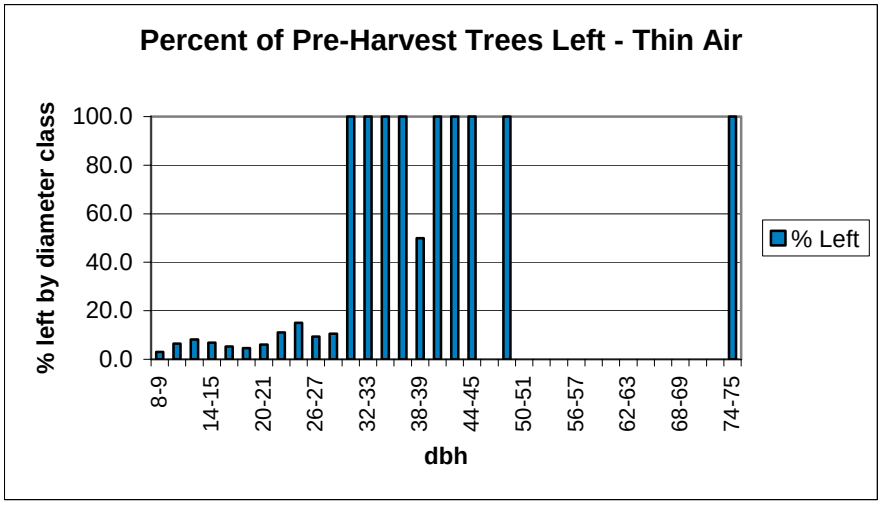
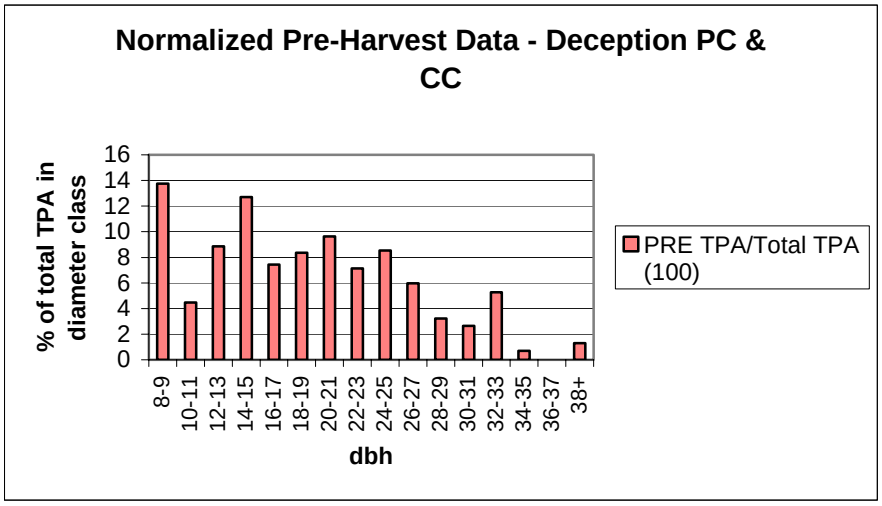
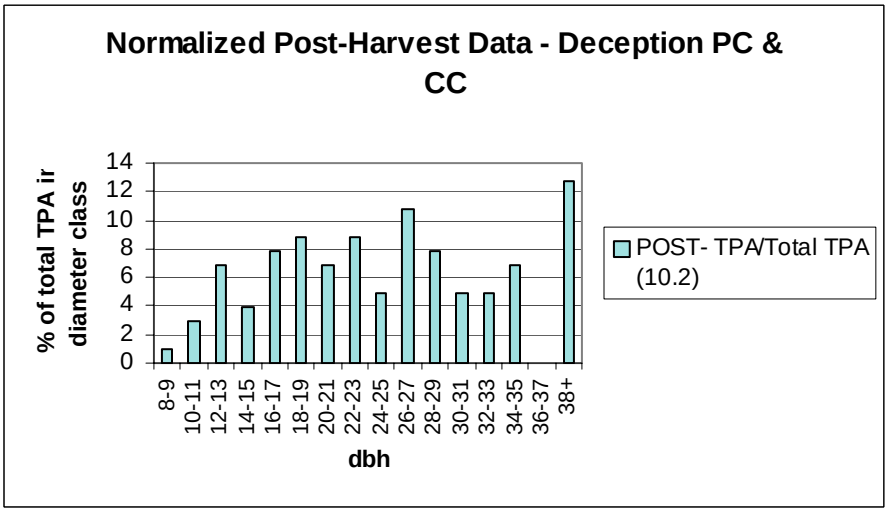


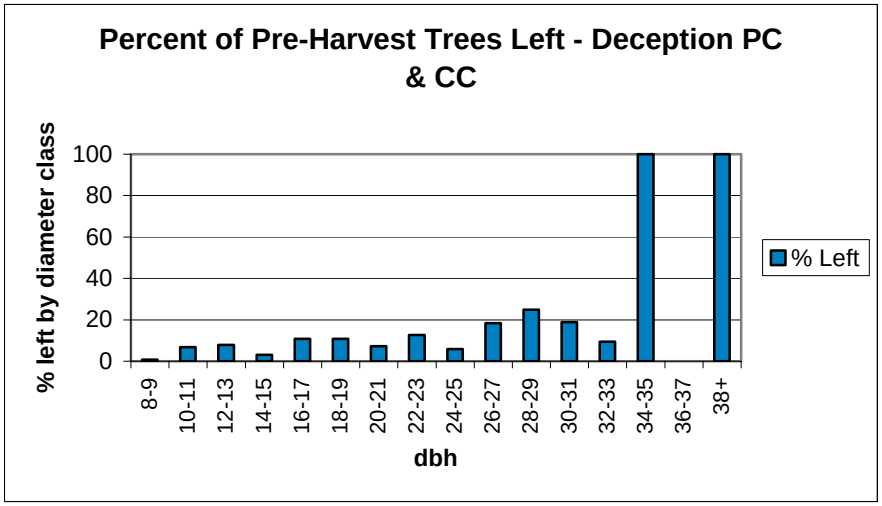




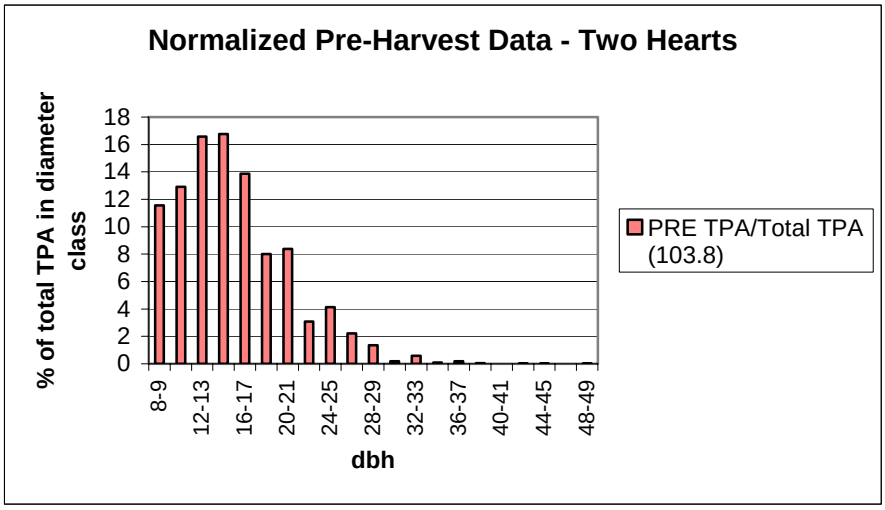
South Coast Planning Unit

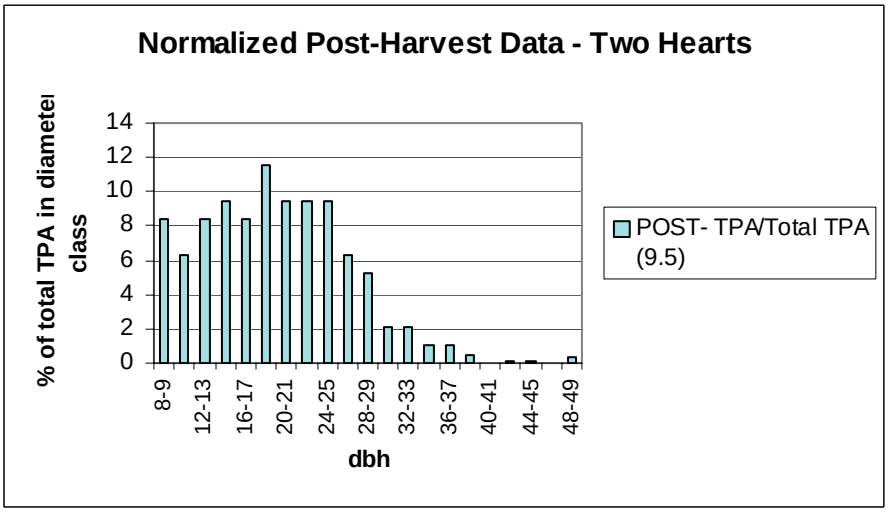


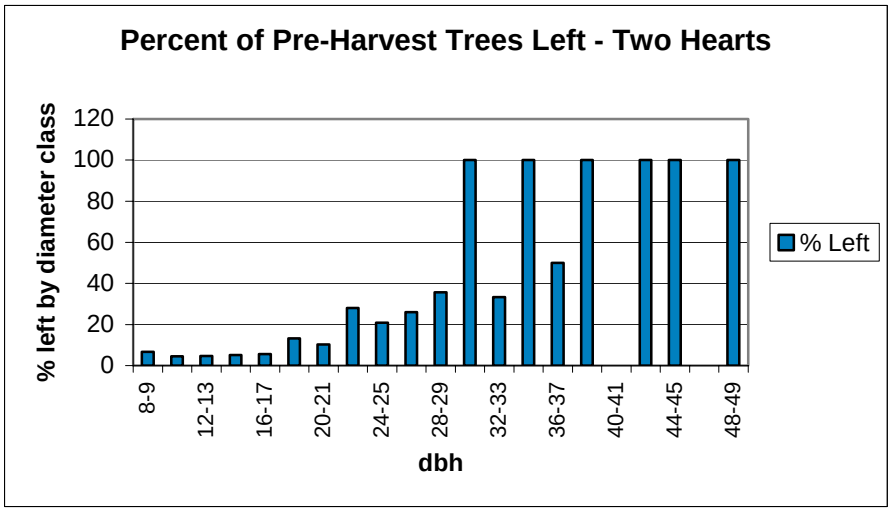




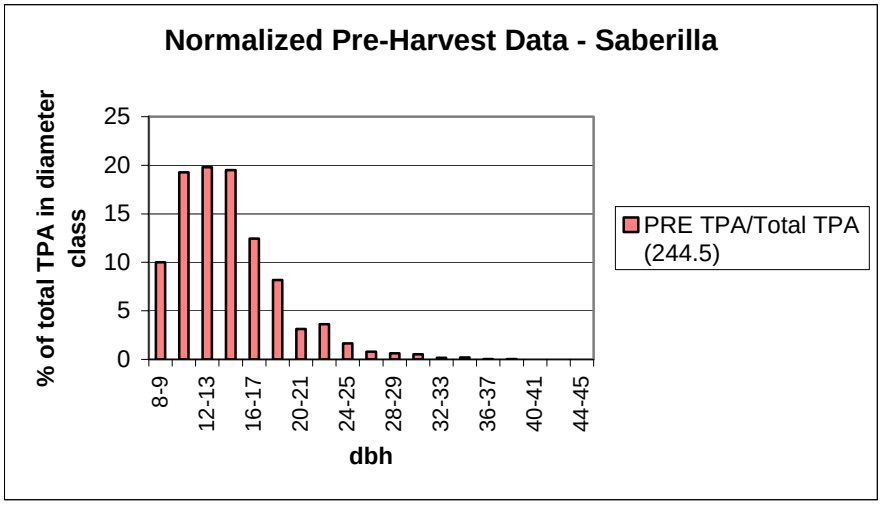
South Coast Planning Unit

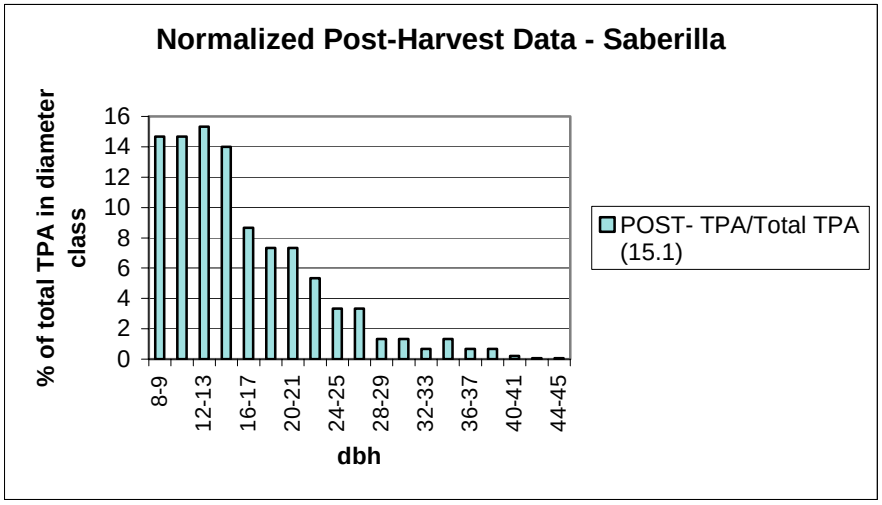


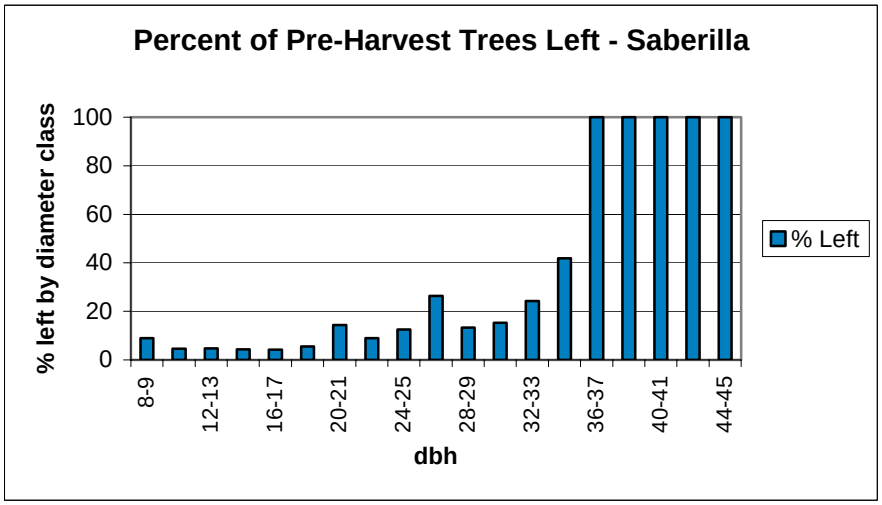




South Puget Planning Unit







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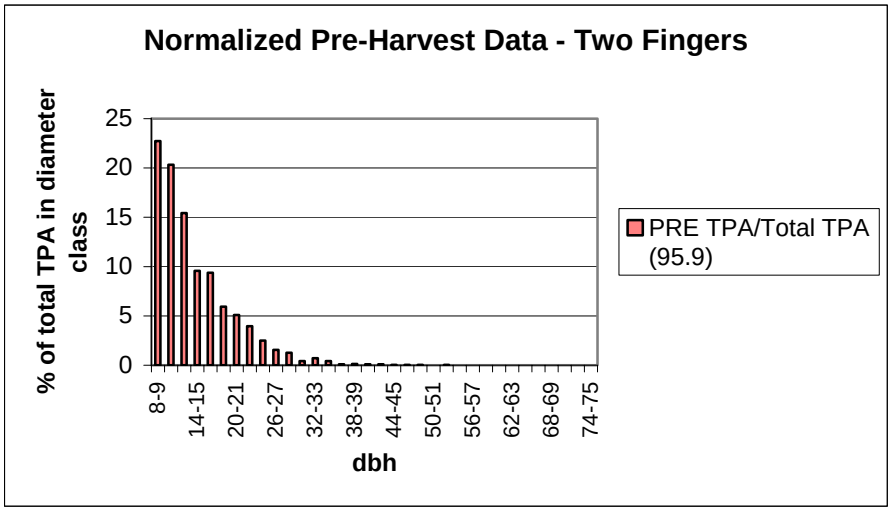

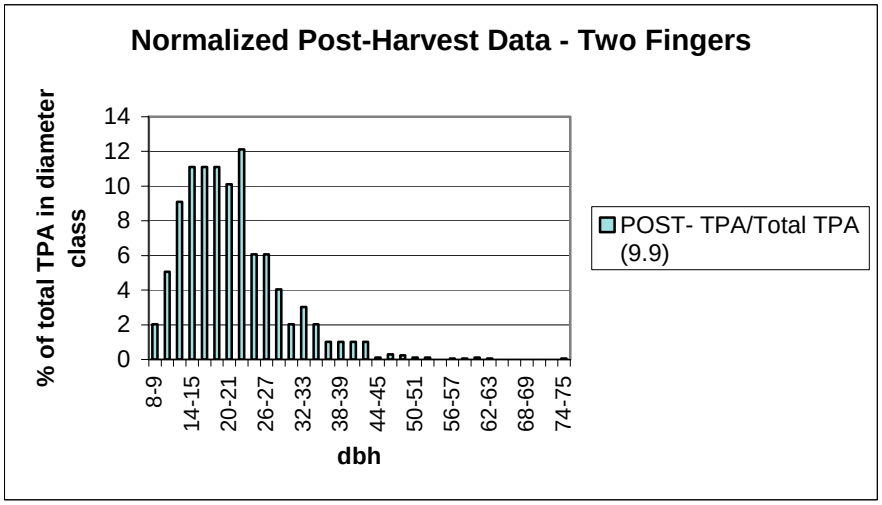

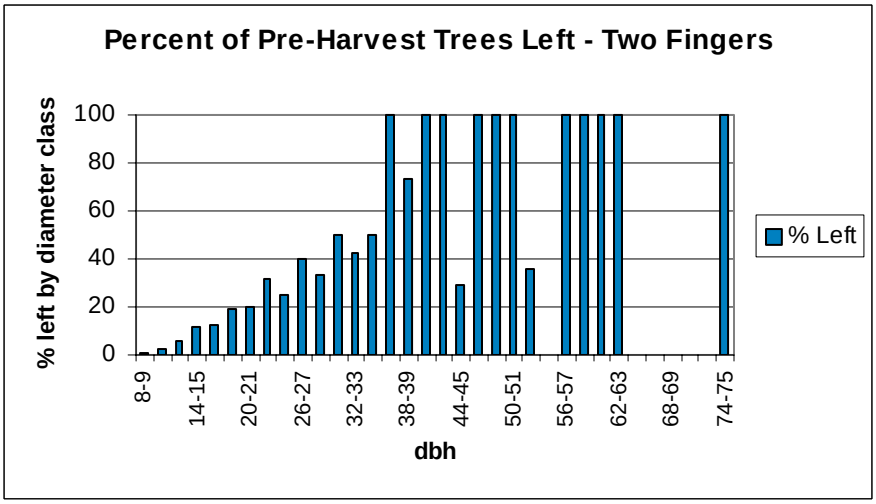

Straits Planning Unit