

# Chapter 2

## THE ALTERNATIVES

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# The Alternatives

In this chapter, DNR describes six alternatives being considered for the sustainable harvest level for the fiscal year 2015–2024 planning decade for forested state trust lands in western Washington.

## 2.1 Developing the Sustainable Harvest Alternatives

The sustainable harvest alternatives include three key components: 1) the marbled murrelet long-term conservation strategy (impacts of which are analyzed in the marbled murrelet long-term conservation strategy FEIS); 2) how to best address the arrearage volume from the fiscal year 2005–2014 planning decade; and, 3) how much riparian harvest will be considered as part of the sustainable harvest level.

### Text Box 2.1.1

#### What Are the Main Differences Among the Alternatives?

The alternatives differ in the amount of forestland designated for marbled murrelet conservation, method for incorporating arrearage, and riparian thinning level.

### ■ Marbled Murrelet Options

Incorporating the marbled murrelet long-term conservation strategy within the alternatives is consistent with the purpose, need, and objectives set by the Board for the sustainable harvest calculation. According to the first objective, the sustainable harvest calculation process will coordinate with the marbled murrelet long-term conservation strategy so that the Board can integrate the effects of the murrelet conservation strategy on the sustainable harvest level and arrearage. At their November 2015 meeting, the Board directed DNR to incorporate five marbled murrelet long-term conservation strategy options into the alternatives analyzed in the DEIS. This FEIS also includes DNR’s marbled murrelet long-term conservation strategy as specified in DNR’s Amendment (refer to Appendix Q of DNR 2019a).

The six conservation options cover a range of acres and configurations of long-term forest cover for marbled murrelet on DNR-managed lands. The options differ in the amount of land that is designated for marbled murrelet conservation, where conservation is located, and how conservation areas will be managed. These options are based on the eight alternatives analyzed in the marbled murrelet long-term conservation strategy FEIS. The options do not include marbled murrelet conservation strategy Alternative C because it is similar in long-term forest cover area (refer to Appendix B for an explanation of long-term forest cover) to Alternatives D and E, would result in harvest levels similar to those alternatives, and is within the range of harvest levels analyzed in this FEIS. Similarly, the options also do not include Alternative G which provides more acres of long-term forest cover than Alternatives A, B, C,

D, E, H and DNR's Amendment, but less than Alternative F. Alternative H in the *Final Environmental Impact Statement for the Long-Term Conservation Strategy for the Marbled Murrelet* (DNR 2019a) differs slightly from the long-term conservation strategy in DNR's Amendment, analyzed in this FEIS, in terms of area and location of long-term forest cover (refer to DNR 2019a Chapter 2, Appendix F, and Appendix Q for acres and location of forest cover for Alternative H and the Amendment). Thus, while not analyzed in this FEIS, Alternative H would have a similar harvest level to the Amendment and is within the range of harvest levels analyzed in this FEIS.

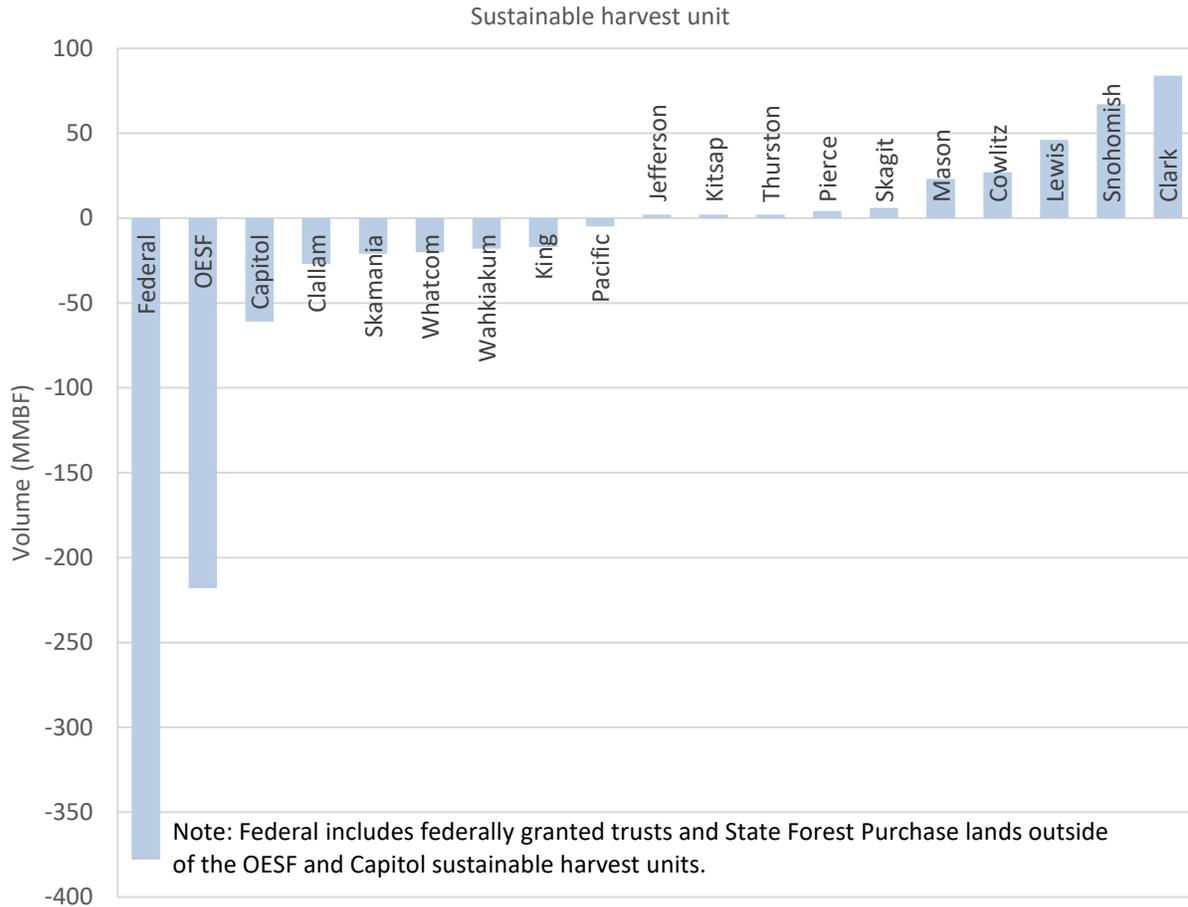
## ■ Arrearage Harvest Options

DNR is required to identify arrearage that exists at the end of any planning decade to analyze alternatives for addressing the arrearage to provide the greatest returns to the trusts and conduct an analysis on the environmental impacts of harvesting the additional timber (RCW 79.10.330). Arrearage occurs when the actual harvest volume is less than the sustainable harvest level set by the Board (refer to Appendix C for more information). The arrearage for the fiscal year 2005–2014 planning decade was 462 million board feet (MMBF). In March 2015, the Board formed a subcommittee to study arrearage further. After consideration of the subcommittee's recommendations, and to comply with RCW 79.10.330, the Board directed staff to incorporate four options for addressing arrearage into the sustainable harvest level alternatives for environmental analysis in this FEIS.

In the fiscal year 2005–2014 planning period, in some sustainable harvest units, the actual harvest exceeded the planned level while, in others, the harvest level was below the planned level. The Board directed DNR to consider the harvest of the volume from the sustainable harvest units where actual harvest levels were below planned harvest levels. This difference between the planned and actual harvest level is called a deficit (Figure 2.1.1). The sum of the deficits for these sustainable harvest units is 702 MMBF. The Board directed that this volume also be considered as arrearage volume.

At the November 7, 2017 meeting, the Board developed an arrearage harvest option that considered volume transacted through the Trust Land Transfer Program or through state forest lands reconveyance as harvest volume for the sustainable harvest units where these transactions occurred. This removed the entire deficit in the Whatcom sustainable harvest unit and 302 MMBF of the deficit in the Federal sustainable harvest unit. The resulting sum of the deficits is 382 MMBF.

Figure 2.1.1. Difference in Volume Between Fiscal Year 2005–2014 Sustainable Harvest Level and Actual Harvest



The Board had originally requested that DNR include an option for using “ecological catchup” to obtain arrearage by conducting thinning in places where DNR had not conducted thinning in the past decade so as to provide better habitat or other ecological function. The Board later determined that implementation of the recently completed *Olympic Experimental State Forest (OESF) HCP Planning Unit Forest Land Plan* (OESF Forest Land Plan) (DNR 2016b) addresses this concept, by providing for harvests that hasten the development of northern spotted owl habitat. The OESF Forest Land Plan is included in all of the sustainable harvest calculation alternatives, including the no action alternative.

The arrearage options in the sustainable harvest calculation are to:

- Harvest 702 MMBF proportionally from the sustainable harvest units with deficits over 5 years;
- Harvest 462 MMBF proportionally from the sustainable harvest units with deficits over 10 years;
- Harvest 462 MMBF proportionally from sustainable harvest units with deficits in 1 year, and then harvest the remaining sustainable harvest level volume for the decade over the next 9 years;

- Harvest 382 MMBF proportionally from sustainable harvest units with deficits over 10 years; or
- Set harvest levels without specifying arrearage quantity.

## ■ Updates to the Policy for Sustainable Forest

In developing the sustainable harvest calculation EIS and alternatives, DNR had to consider how existing laws, policies, and management practices would apply. DNR has identified two updates to the *Policy for Sustainable Forests* proposed for Board consideration.

The first is the addition of an End of Decade Analysis: Arrearage policy. As part of the sustainable harvest calculation process, RCW 79.10.330 requires an analysis of any arrearage volume resulting from the previous planning decade (fiscal years 2005–2014) to determine the best course of action. Consistent with Board direction in Objective #2 (described in Chapter 1), DNR conducted an end of decade analysis to determine the amount of and how to address arrearage volume from the fiscal year 2005-2014 planning decade. Following presentation of the analysis at the November 7, 2017 Board meeting, the Board directed DNR to develop a policy on arrearage to provide consistency in how arrearage is calculated and addressed. See Appendix M for the proposed *Policy for Sustainable Forests* End of Decade Analysis: Arrearage policy. The department also identified needed clarifications to the Definition of Sustainability for the Sustainable Harvest Calculation within the *Policy for Sustainable Forests* regarding mean annual timber volume fluctuations between and within decades. See Appendix N for the proposed changes to the *Policy for Sustainable Forests* Definition of Sustainability for the Sustainable Harvest Calculation.

Determining impacts of harvest level fluctuations within and between decades as well as impacts of arrearage harvest requirements are necessary to establish the sustainable harvest level. Upon adoption of a sustainable harvest level by the Board, these amendments to the *Policy for Sustainable Forests* will be considered for adoption.

## ■ Riparian Thinning Options

As a part of the process to establish the sustainable harvest level, the Board stated an intention to incorporate new information into an updated model, including information concerning the prior decadal arrearage and its causes. The Board identified low riparian harvest and thinning volumes as a factor that contributed to that arrearage. The 2007 sustainable harvest level assumed that 10 percent of the total riparian area available for thinning would be thinned in the decade. The resulting volume estimate was 394 MMBF, including the OESF HCP Planning Unit. However, only 39 MMBF was thinned from riparian areas during the fiscal year 2004–2015 period.<sup>1</sup> About 1 percent of the total area thinned or harvested by DNR in the fiscal year 2004–2015 period was in riparian areas.

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<sup>1</sup> Some of the reasons for this deficit include that riparian thinning is more expensive than other thinning or harvests due to pre-sales costs, operability challenges, and regulatory uncertainty regarding the conservation of marbled murrelet.

The riparian thinning options differ only in the amount of riparian thinning that can occur in the five west-side planning units excluding the OESF HCP Planning Unit. The options are to:

- Thin in riparian areas in a decade an area up to 10 percent of the total riparian area in the five west-side planning units. Riparian areas cover 361,000 acres and are comprised of streams, wetlands, and associated buffers. The buffers range from 100 to over 190 feet wide depending on stream type or wetland area. This sustainable harvest calculation option would set the riparian thinning area maximum limit at 36,100 acres for the decade. Thinning levels in the alternatives (described in Chapter 2.3) are lower due to other considerations such as cost and potential revenue.
- Thin in riparian areas in a decade an area less than or equal to 1 percent of the acres thinned or harvested in non-riparian areas in a decade in the five west-side planning units. For example, if DNR expected to harvest or thin 100,000 acres outside of riparian areas in the five west-side planning units, this sustainable harvest calculation option would set the riparian thinning area maximum limit at 1,000 acres for the decade.
- Thin riparian areas consistent with the 1997 HCP and the *Riparian Forest Restoration Strategy* (RFRS) (DNR 2006c) but do not include riparian volume when setting the sustainable harvest level. During implementation, volume harvested from riparian areas will count toward attaining the sustainable harvest level. This option would give DNR the flexibility to thin within riparian areas on a case-by-case basis following the procedures for the RFRS or the OESF Forest Land Plan.

No difference in management of riparian areas is proposed for the OESF HCP Planning Unit. Thinning and limited harvest can occur in riparian areas in the OESF HCP Planning Unit under the OESF Forest Land Plan. The harvest levels are limited by the 1997 HCP, forest practice rules, the *Policy for Sustainable Forests*, and marbled murrelet long-term conservation strategy.

## ■ Settlement Agreement

The no action alternative retains the commitments in *Washington Environmental Council et al. v. Sutherland et al.* (Settlement Agreement) (King County Superior Court No. 04-2-26461-8SEA, dismissed April 7, 2006; refer to Appendix D for the Settlement Agreement). The Settlement Agreement requires short-term conservation of isolated patches of northern spotted owl habitat, mostly in the Columbia, Straits, and South Coast HCP planning units, and requires that acres of thinning equal the acres of harvest in the OESF HCP Planning Unit. The Settlement Agreement terminates when “the BNR approves a sustainable harvest calculation extending beyond FY 2014, but no earlier than June 30, 2014.” Therefore, the Settlement Agreement is included as part of the no action alternative, but the action alternatives assume that the Settlement Agreement is terminated. Any environmental impacts that result from this termination are analyzed for each action alternative. The key change resulting from the termination of the Settlement Agreement is the reinstatement of harvest practices authorized under the 1997 HCP.

## ■ How Were the Alternatives Developed?

The alternatives were developed by pairing different management options for three areas of interest—marbled murrelet conservation, arrearage harvest, and riparian thinning level—to **create a range of harvest levels for the fiscal year 2015–2024 planning period**. Based on the options for murrelet conservation strategy approaches, arrearage harvest, and riparian harvest levels, there are 120 total possible combinations (eight marbled murrelet conservation approaches multiplied by five arrearage harvest options multiplied by three riparian thinning levels), not including the no action alternative. SEPA does not require DNR to evaluate every alternative iteration. Instead, based on Board input, DNR selected six alternatives to analyze in this FEIS, each of which includes a murrelet long-term conservation strategy, an arrearage harvest option, and a riparian thinning option. These alternatives represent the widest possible range of fiscal year 2015–2024 sustainable harvest level options for the Board to consider. The action alternatives along with the no action alternative, which assumes a sustainable harvest level consistent with the last Board resolution to set a sustainable harvest level, which was passed in 2007 (refer to Appendix E), are analyzed for their impacts on the affected environment as discussed in Chapter 3.

### *Management Approaches That Were Not Developed Into Alternatives*

#### OTHER COMBINATIONS OF OPTIONS

Other combinations of marbled murrelet long-term strategy, arrearage harvest, and riparian thinning were considered but eliminated when their impacts were represented by the range of the alternatives and analysis in the DEIS and this FEIS. The alternatives analyzed encompass the full range of short-term and long-term harvest levels of different combinations of marbled murrelet long-term conservation strategy, arrearage harvest, and riparian thinning. The final action chosen by the Board need not be identical to any single alternative in the FEIS but must be within the range of the alternatives analyzed and discussed.

## ■ What if DNR Policies Change During the Planning Decade?

Future policy changes within the planning decade may result in the need to adjust the sustainable harvest level. If the need for this arises, DNR would evaluate the proposed change in the sustainable harvest level and then assess both the likely environmental impacts and the significance of those impacts.

## ■ The Sustainable Harvest Calculation Forest Estate Model

The forest estate model is a mathematical computer model of the forest. Capable of manipulating vast quantities of data, the model is used to solve problems that are too complex for other tools.

The model is built with information on current conditions, management objectives, and management activities and an understanding of natural growth processes and how forests respond to management

activities. The model stratifies DNR's forested land base into areas that have similar geographic attributes (refer to Appendix F). These similar areas are known as development types. By simultaneously considering all of this information, the model develops an optimal solution of which development types to harvest (when, where, and by what harvest method) and which not to harvest across forested state trust lands over time to meet both revenue production and ecological value objectives as effectively and efficiently as possible. To make these decisions, the model considers numerous interrelated factors, such as when the development type will be mature enough to harvest, whether or not it is deferred from harvest, how it may contribute to the objectives of DNR's conservation strategies, and how it may contribute to revenue production. Refer to Appendix F for an explanation of how the model works and changes made to the model between the DEIS and FEIS.

## 2.2 Elements Common to All Alternatives

All six alternatives continue DNR operations as authorized under the 1997 HCP, forest practices rules, department policy, and the *Policy for Sustainable Forests*. The alternatives also include the 1997 HCP for species other than marbled murrelet, for which multiple options are considered. All alternatives also include implementation of the OESF Forest Land Plan and the *South Puget HCP Planning Unit Forest Plan*. All alternatives contain riparian thinning rules based on the 1997 HCP and RFRS, forest practices rules, the *Policy for Sustainable Forests*, and marbled murrelet long-term conservation strategy. In addition, all six alternatives include the same assumptions of discount rate and management fund balance. DNR set the forest estate model to discount net present value by 3 percent to reflect assumptions about inflation and risk. The model also sets a budget constraint for all alternatives that requires management activities to generate at least \$1.5 million more than the costs of the management activities per decade.

The data used in the forest estate model, including but not limited to forest inventory, northern spotted owl habitat classification, marbled murrelet long-term forest cover, and land ownership, are current as of January 12, 2018.

Establishing a sustainable harvest level does not authorize any project-specific timber sales but rather establishes the level of timber volume scheduled for harvest from state trust lands during a planning decade. All commercial harvests are reviewed by a Forest Practices program forester to ensure compliance with forest practices rules. Forest practices applications can be reviewed through the Forest Practices Application Review System.<sup>2</sup>

All alternatives would result in a continuation of DNR's timber sale program and associated forest management activities. Under all alternatives, DNR would continue to sell timber from state trust lands as allowed by existing regulations, policies, and procedures. Existing regulations and policies are designed to minimize the impacts of timber harvests and associated road construction.

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<sup>2</sup> Refer to Forest Practices Application Review System at <https://www.dnr.wa.gov/programs-and-services/forest-practices/forest-practices-application-review-system-fpars>.

## 2.3 Profiles of the Alternatives

### ■ Alternative 1

Alternative 1 is the “no action” alternative. In this alternative, the sustainable harvest level is set at 5.5 billion board feet for the new planning decade, an average of 550 MMBF per year. This level was approved by the Board in 2007 for the fiscal year 2005–2014 planning decade. Without a new Board resolution, the annual target of 550 MMBF would remain in place. This alternative assumes that the Settlement Agreement remains in place.

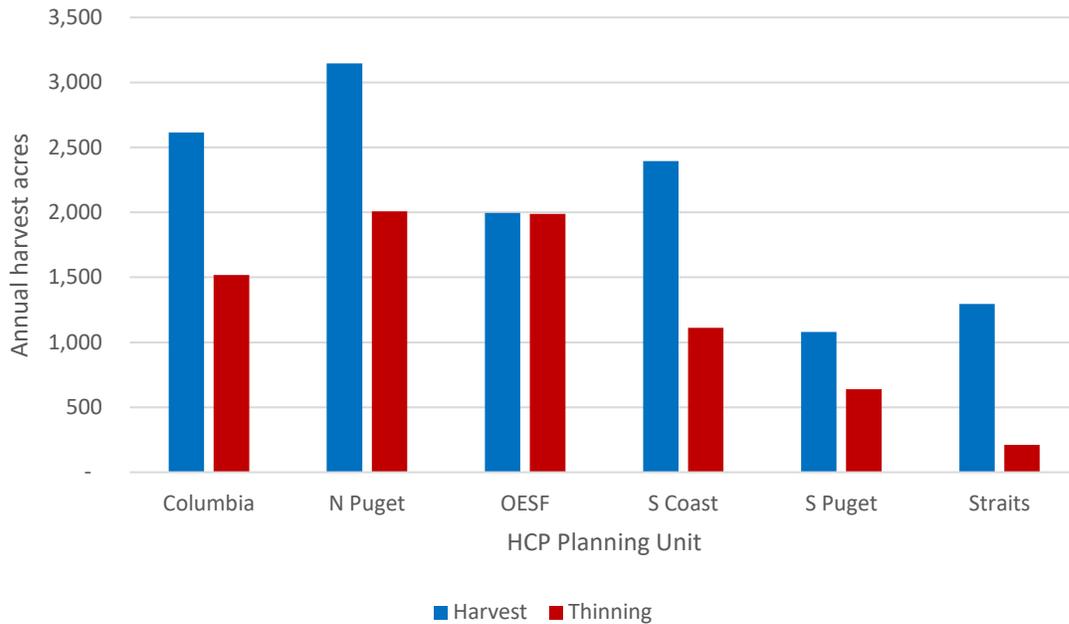
Alternative 1 does not assume harvest of volume from arrearage in the last planning decade. This alternative assumes no decision regarding arrearage volume has been made. This alternative includes the riparian thinning assumption from 2004 for the five western Washington HCP planning units to schedule an area up to 10 percent of the riparian area for thinning. Finally, the alternative assumes a continuation of DNR operations as authorized under the 1997 HCP and incidental take permits for all of west-side planning units (Table 2.3.1; refer to the marbled murrelet long-term conservation strategy Alternative A, DNR 2019a).

The average annual harvest volume for Alternative 1 is 550 MMBF. Harvest activities are expected to take place on an average of 12,529 acres and thinning on 7,478 acres per year (Figure 2.3.1). In the five west-side planning units, riparian thinning will occur on 3,300 acres per year.

**Table 2.3.1. Alternative 1 Key Components**

Key component	Description
<b>Marbled murrelet</b>	Continue with the interim marbled murrelet conservation strategy (Alternative A in the marbled murrelet long-term conservation strategy FEIS).
<b>Arrearage</b>	Assume no harvest of arrearage volume.
<b>Riparian thinning in the five west-side planning units</b>	Thin in the west-side planning units, excluding the OESF HCP Planning Unit, up to 10 percent of the riparian area.

**Figure 2.3.1. Average Annual Harvest Activity Acres in Each HCP Planning Unit Expected in the Planning Decade Under Alternative 1**



## Alternative 2

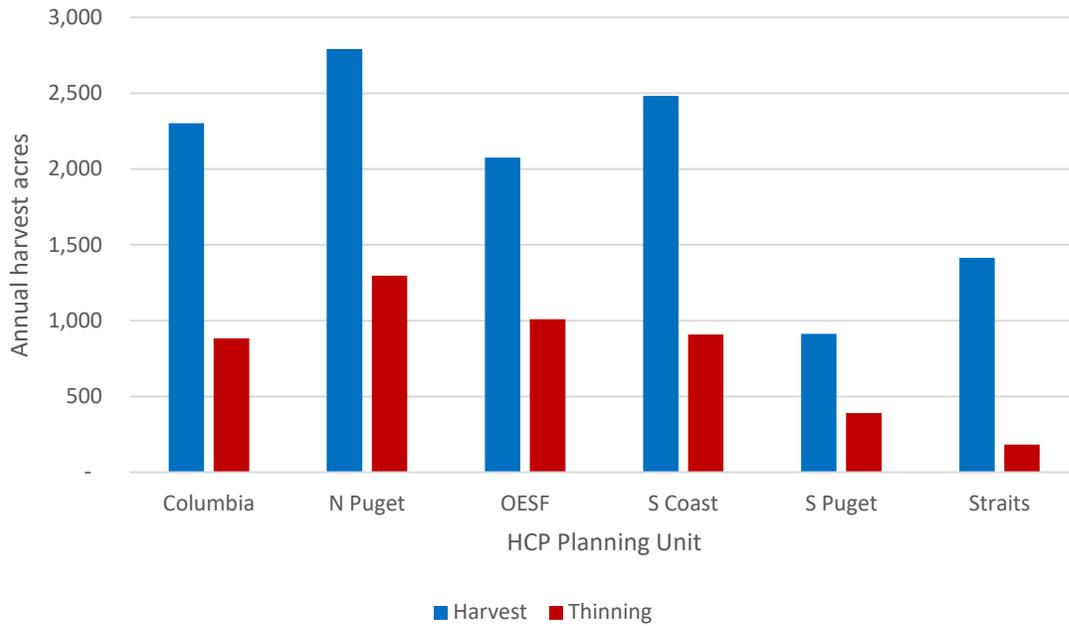
Alternative 2 presents the highest volume of harvest under the proposed action alternatives. The alternative incorporates an arrearage volume of 702 MMBF to be harvested over 5 years, the high riparian thinning level in the five west-side planning units (up to 10 percent of the riparian area per decade), and a murrelet conservation strategy that conserves occupied sites (marbled murrelet long-term conservation strategy Alternative B; Table 2.3.2.).

The average annual harvest volume for Alternative 2 is 520 MMBF. Harvest activities are expected to take place on an average of 11,981 acres and thinning on 4,672 acres per year (Figure 2.3.2). In the five west-side planning units, riparian thinning will occur on 2,634 acres per year.

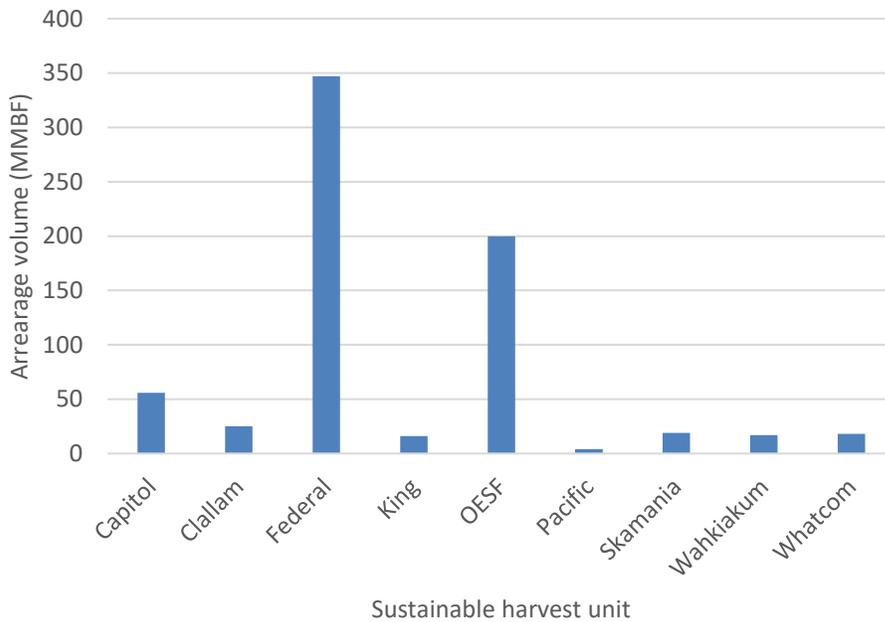
**Table 2.3.2. Alternative 2 Key Components**

Key component	Description
<b>Marbled murrelet</b>	Protect occupied sites (Alternative B in the marbled murrelet long-term conservation strategy FEIS).
<b>Arrearage</b>	Harvest 702 MMBF proportionally from sustainable harvest units with deficits over 5 years.
<b>Riparian thinning in the five west-side planning units</b>	Thin in the west-side planning units, excluding the OESF HCP Planning Unit, up to 10 percent of the riparian area.

**Figure 2.3.2. Average Annual Harvest Activity Acres in Each HCP Planning Unit Expected in the Planning Decade Under Alternative 2**



**Figure 2.3.3. Arrearage Harvest by Sustainable Harvest Unit Under Alternative 2**



## Alternative 3

Alternative 3 combines the harvest of 462 MMBF of arrearage volume over a 10-year period with a low level of riparian thinning in the five west-side planning units (1 percent of upland harvest and thinning area) and the murrelet conservation strategy with conservation in special habitat areas (marbled murrelet long-term conservation strategy Alternative D; Table 2.3.3).

The average annual harvest volume for Alternative 3 is 459 MMBF. Harvest activities are expected to take place on an average of 11,155 acres and thinning on 2,060 acres per year (Figure 2.3.4). In the five west-side planning units, riparian thinning will occur on 104 acres per year.

**Table 2.3.3. Alternative 3 Key Components**

Key component	Description
<b>Marbled murrelet</b>	Protect occupied sites and special habitat areas (Alternative D in the marbled murrelet long-term conservation strategy FEIS).
<b>Arrearage</b>	Harvest 462 MMBF proportionally from sustainable harvest units with deficits over 10 years.
<b>Riparian thinning in the five west-side planning units</b>	Thin in the five west-side planning units, excluding the OESF HCP Planning Unit, an area up to 1 percent of total upland harvest and thinning area.

**Figure 2.3.4. Average Annual Harvest Activity Acres in Each HCP Planning Unit Expected in the Planning Decade Under Alternative 3**

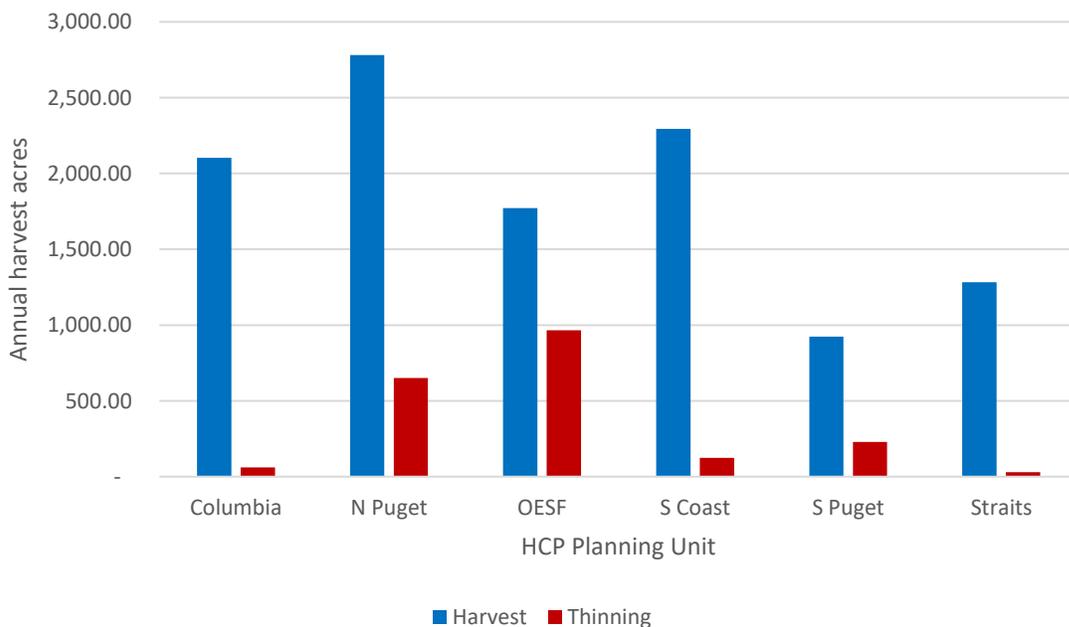
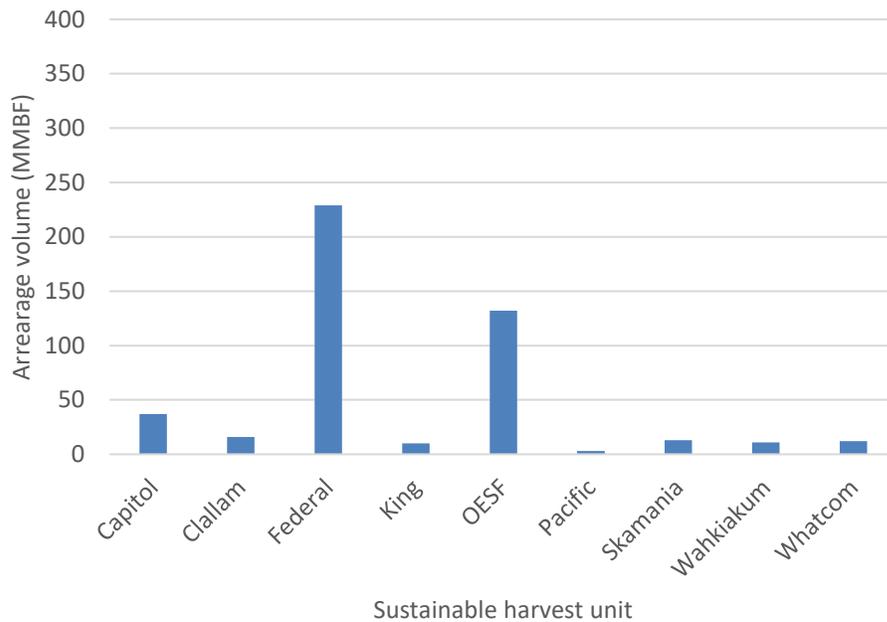


Figure 2.3.5. Arrearage Harvest by Sustainable Harvest Unit Under Alternative 3



## Alternative 4

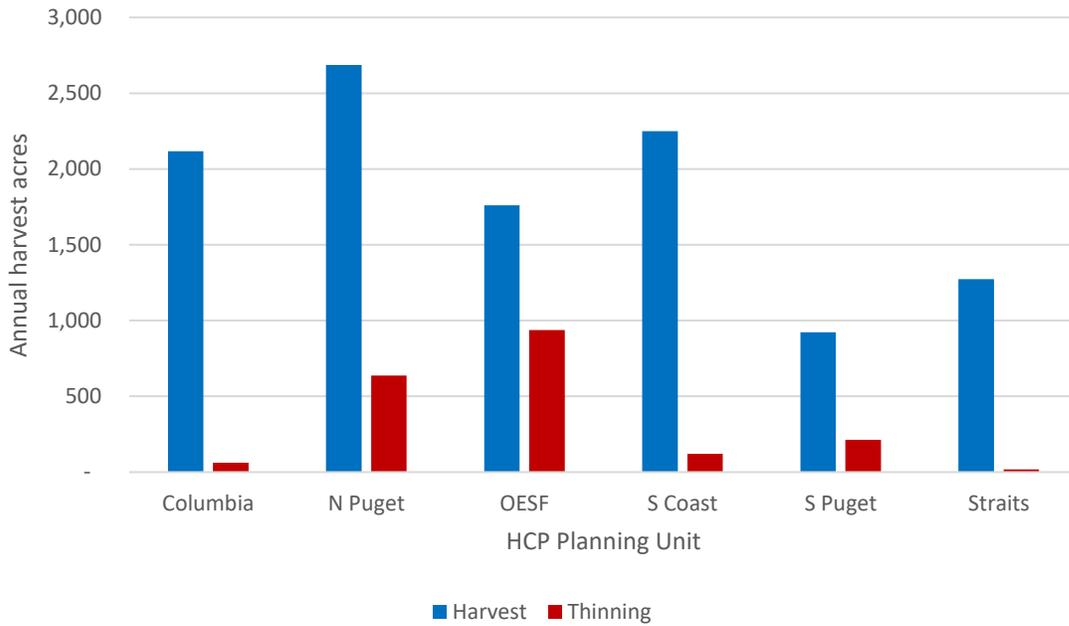
Alternative 4 combines the harvest of 462 MMBF of arrearage volume in 1 year with a low level of riparian thinning in the five west-side planning units (1 percent of upland harvest and thinning area) and the murrelet conservation strategy with conservation in special habitat areas, emphasis areas, and isolated P-stage (P-stage values  $\geq 0.47$ ) habitat (marbled murrelet long-term conservation strategy Alternative E; Table 2.3.4).

The average annual harvest volume for Alternative 4 is 453 MMBF. Harvest activities are expected to take place on an average of 11,015 acres and thinning on 1,990 acres per year (Figure 2.3.6). In the five west-side planning units, riparian thinning will occur on 102 acres per year.

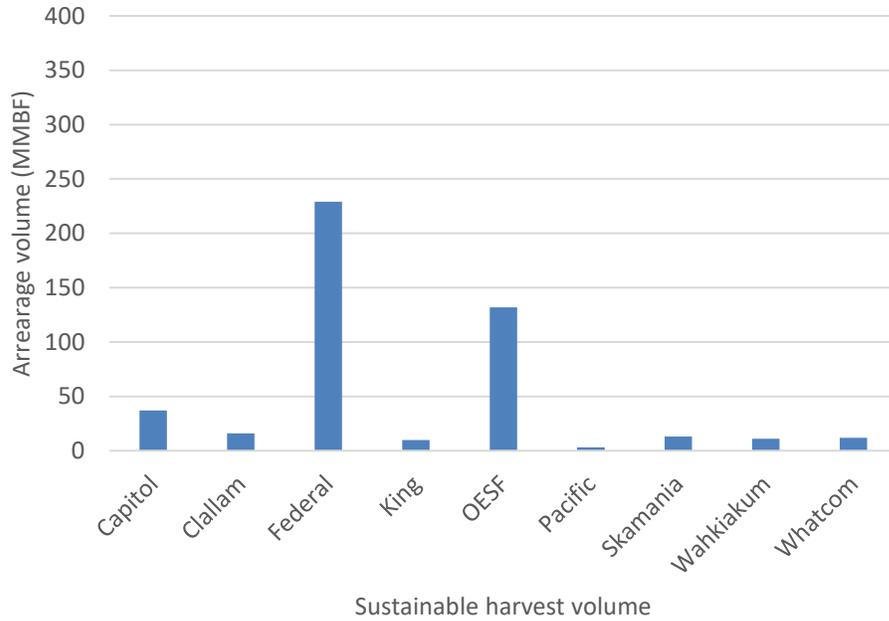
Table 2.3.4. Alternative 4 Key Components

Key component	Description
<b>Marbled murrelet</b>	Protect occupied sites and a combination of emphasis areas, special habitat areas, and high-quality murrelet habitat throughout the analysis area (Alternative E in the marbled murrelet long-term conservation strategy FEIS).
<b>Arrearage</b>	Harvest 462 MMBF proportionally from sustainable harvest units with deficits in 1 year.
<b>Riparian thinning in the five west-side planning units</b>	Thin in the five west-side planning units, excluding the OESF HCP Planning Unit, an area up to 1 percent of total upland harvest and thinning area.

**Figure 2.3.6. Average Annual Harvest Activity Acres in Each HCP Planning Unit Expected in the Planning Decade Under Alternative 4**



**Figure 2.3.7. Arrearage Harvest by Sustainable Harvest Unit Under Alternative 4**



## Alternative 5

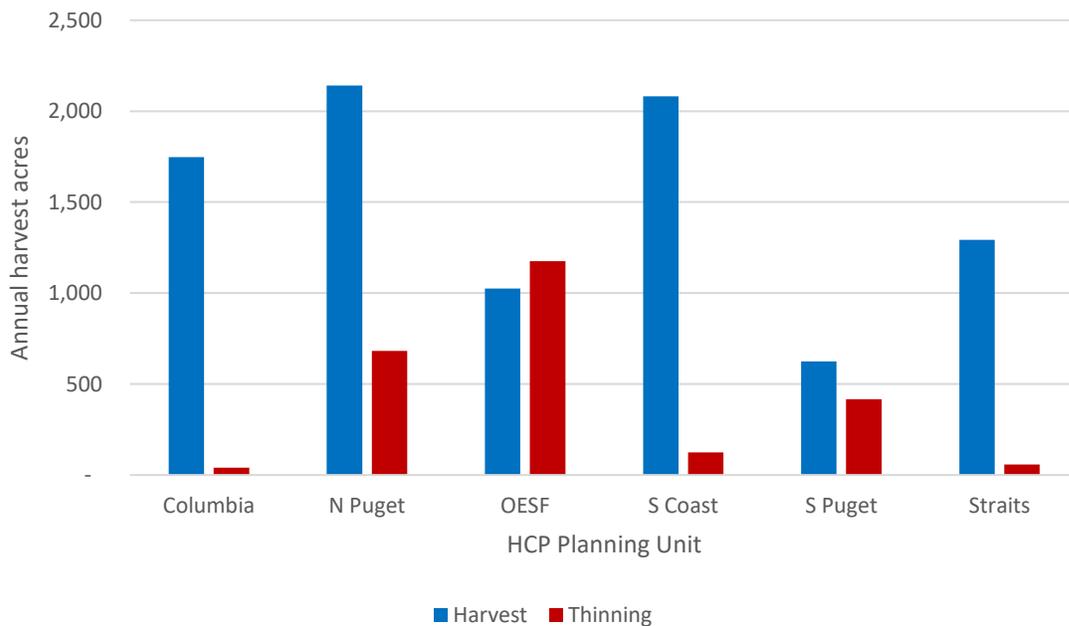
Alternative 5 produces the lowest harvest level by assuming the arrearage volume is included in the inventory and by incorporating a low level of riparian thinning in the five west-side planning units (1 percent of upland harvest and thinning area) and the murrelet conservation strategy with conservation in marbled murrelet management areas (MMMA) similar to those in the Science Team Report (Raphael and others 2008) that also includes conservation in the North Puget HCP Planning Unit (marbled murrelet long-term conservation strategy Alternative F; Table 2.3.5).

The average annual harvest volume for Alternative 5 is 384 MMBF. Harvest activities are expected to take place on an average of 8,911 acres and thinning on 2,497 acres per year (Figure 2.3.8). In the five west-side planning units, riparian thinning will occur on 91 acres per year.

**Table 2.3.5. Alternative 5 Key Components**

Key component	Description
<b>Marbled murrelet</b>	Protect occupied sites and marbled murrelet management areas, similar to the strategy described in the Science Team Report (Raphael and others 2008) (Alternative F in the marbled murrelet long-term conservation strategy FEIS).
<b>Arrearage</b>	Arrearage volume is incorporated into the inventory.
<b>Riparian thinning in the five west-side planning units</b>	Thin in the five west-side planning units, excluding the OESF HCP planning unit, an area up to 1 percent of total upland harvest and thinning area.

**Figure 2.3.8. Average Annual Harvest Activity Acres in Each HCP Planning Unit Expected in the Planning Decade Under Alternative 5**



## Alternative 6

Alternative 6 is DNR’s preferred alternative. This alternative combines the harvest of 382 MMBF of arrearage volume over ten years period with DNR’s Amendment for the marbled murrelet long-term conservation strategy (refer to Marbled Murrelet Options of this Chapter). In this alternative, projected riparian volume is not included in the sustainable harvest level, but if harvested, would count toward the harvest calculation.

The average annual harvest volume for Alternative 6 is 465 MMBF. Harvest activities are expected to take place on an average of 11,447 acres and thinning on 1,592 acres per year (Figure 2.3.9).

**Table 2.3.6. Alternative 6 Key Components**

Key component	Description
Marbled murrelet	Protect occupied sites and special habitat areas (See DNR 2019a Appendix Q for DNR’s application for amendment to the 1997 HCP incidental take permit).
Arrearage	Harvest 382 MMBF proportionally from sustainable harvest units with deficits over 10 years.
Riparian thinning in the five west-side planning units	Riparian volume not included when setting the sustainable harvest level.

**Figure 2.3.9. Average Annual Harvest Activity Acres in Each HCP Planning Unit Expected in the Planning Decade Under Alternative 6**

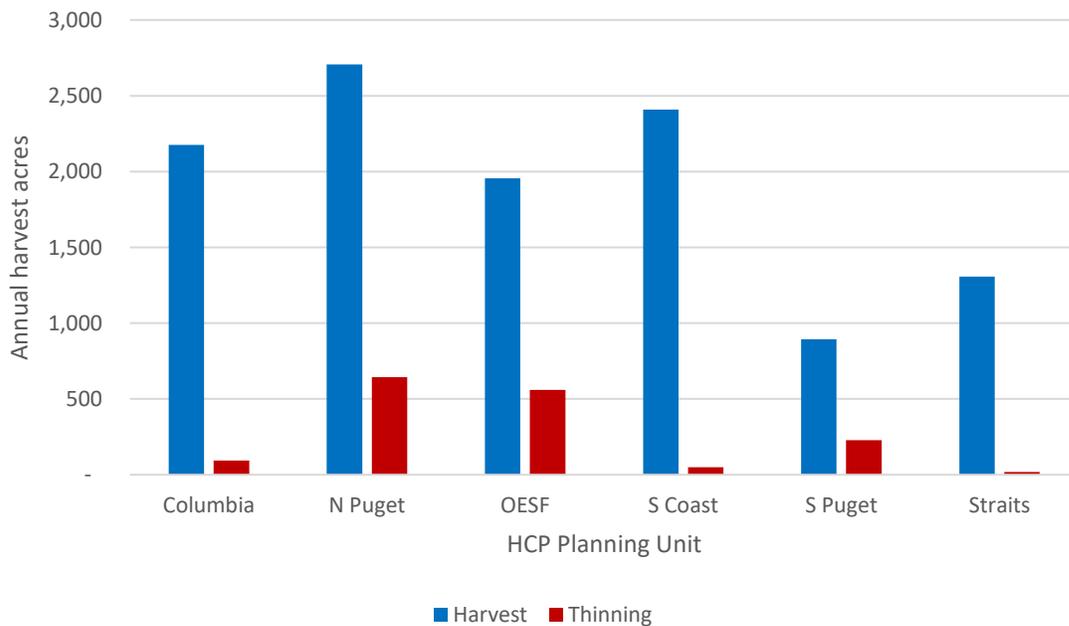
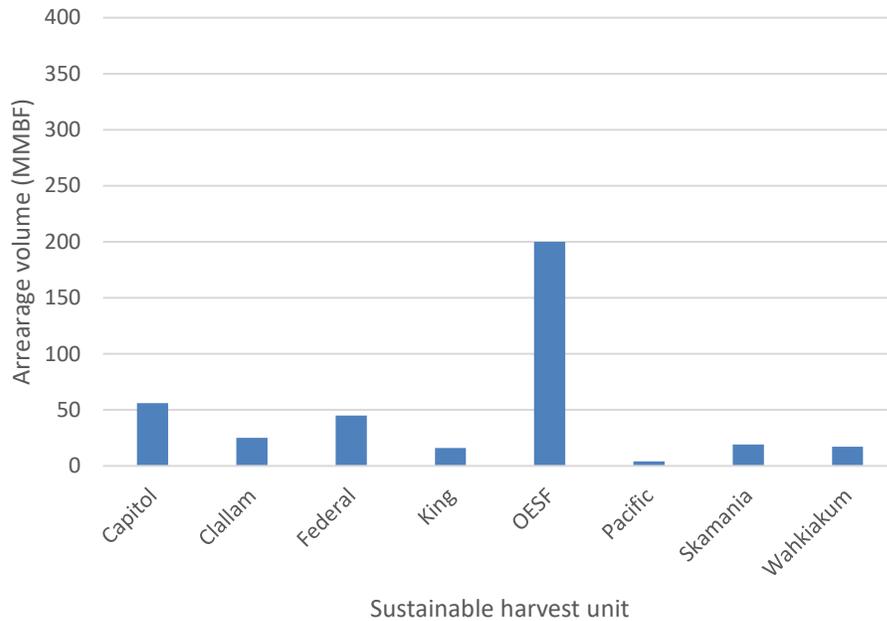


Figure 2.3.10. Arrearage Harvest by Sustainable Harvest Unit Under Alternative 6



## 2.4 Comparing the Alternatives

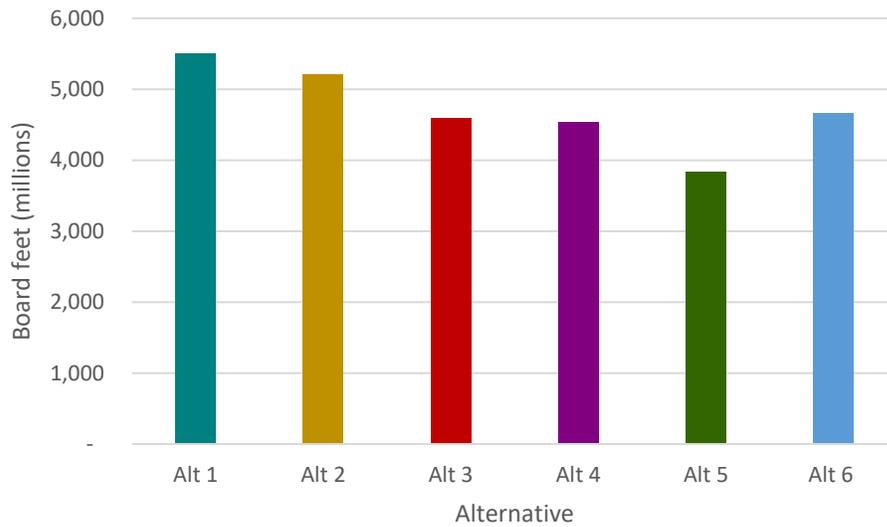
This section provides a comparison of the area of harvest and thinning and resulting timber volumes produced under each alternative (Table 2.4.1).

Table 2.4.1. Change in Volume of Harvest and Thinning in the Planning Decade Under the Action Alternatives

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
	Acres	Percent change in harvest volume compared to Alternative 1				
<b>Harvest</b>	125,293	0%	-7%	-8%	-25%	-5%
<b>Thinning</b>	74,783	-34%	-63%	-64%	-55%	-68%

The total volume harvested in the planning decade under each alternative ranges from 5,500 MMBF under the no action alternative to 3,840 MMBF under Alternative 5 (Figure 2.4.1).

Figure 2.4.1. Total Harvest Volume for the Planning Decade Under Each Alternative



Harvest volume is typically lower in each sustainable harvest unit under the action alternatives than under the no action alternative. However, Capitol, Clallam, Grays Harbor, Jefferson, King, Pacific, Wahkiakum, and Whatcom have increases in harvest volume under one or more action alternative (Tables 2.4.2 and 2.4.3). For annual harvest volumes within the planning decade, refer to Appendix G.

**Table 2.4.2. Total Harvest Volume by Sustainable Harvest Unit for the Planning Decade Under Each Alternative (Millions of board feet, rounded to nearest million)**

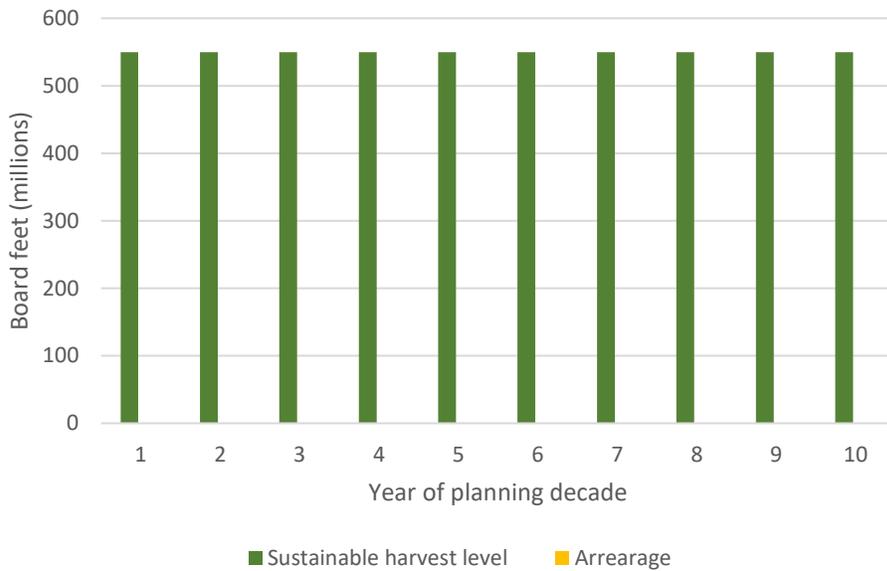
<b>Sustainable harvest unit</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>	<b>Alternative 5</b>	<b>Alternative 6</b>
<b>Capitol</b>	538	567	519	519	496	529
<b>Clallam</b>	185	242	203	201	209	210
<b>Clark</b>	74	54	48	48	48	48
<b>Cowlitz</b>	30	25	23	23	23	23
<b>Federal</b>	2,380	2,165	1,859	1,827	1,540	1,876
<b>Grays Harbor</b>	4	5	5	5	3	5
<b>Jefferson</b>	67	70	65	65	65	65
<b>King</b>	80	81	80	80	59	80
<b>Kitsap</b>	19	13	12	12	12	12
<b>Lewis</b>	208	203	192	190	154	191
<b>Mason</b>	99	98	95	95	95	95
<b>OESF</b>	948	835	730	720	508	739
<b>Pacific</b>	48	59	38	40	33	41
<b>Pierce</b>	36	29	29	29	9	29
<b>Skagit</b>	302	264	263	257	223	259
<b>Skamania</b>	118	107	97	97	89	101
<b>Snohomish</b>	224	212	199	198	179	203
<b>Thurston</b>	27	25	23	23	23	23
<b>Wahkiakum</b>	41	74	38	38	23	59
<b>Whatcom</b>	73	77	71	65	46	67
<b>Total</b>	5,500	5,202	4,590	4,533	3,837	4,654

Table 2.4.3. Change in Total Harvest Volume Between the Action Alternatives and the No Action Alternative by Sustainable Harvest Unit for the Planning Decade

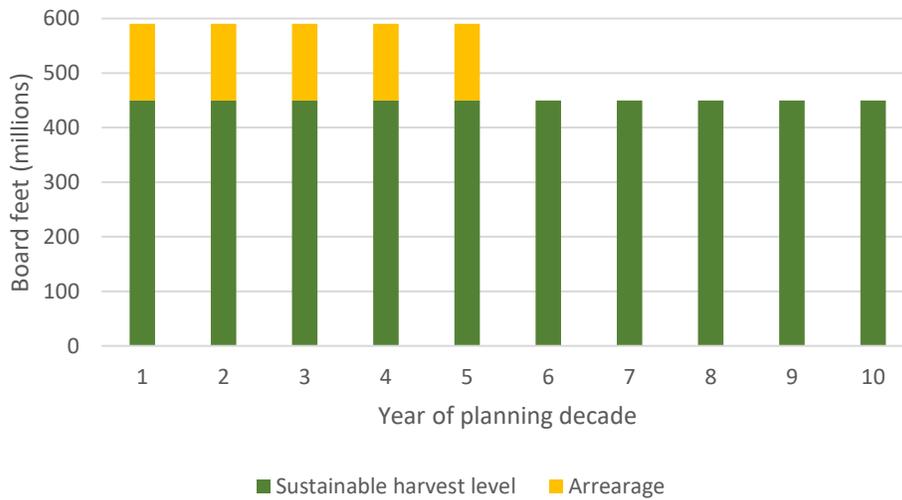
Sustainable harvest unit	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
	MMBF (rounded to nearest million)	% change in harvest volume compared to Alternative 1				
Capitol	538	5%	-3%	-3%	-8%	-2%
Clallam	185	31%	10%	9%	13%	14%
Clark	74	-28%	-36%	-36%	-36%	-36%
Cowlitz	30	-19%	-23%	-23%	-25%	-23%
Federal	2,380	-9%	-22%	-23%	-35%	-21%
Grays Harbor	4	25%	25%	25%	-25%	22%
Jefferson	67	5%	-2.3%	-2.4%	-2%	-2.2%
King	80	2%	1%	0%	-26%	1%
Kitsap	19	-32%	-36%	-36%	-36%	-36%
Lewis	208	-2%	-7%	-8%	-26%	-8%
Mason	99	-2%	-4%	-5%	-4%	-4%
OESF	948	-12%	-23%	-24%	-46%	-22%
Pacific	48	24%	-20%	-17%	-30%	-15%
Pierce	36	-20%	-20%	-20%	-75%	-20%
Skagit	302	-13%	-13%	-15%	-26%	-14%
Skamania	118	-9%	-18%	-18%	-25%	-15%
Snohomish	224	-6%	-11%	-12%	-20%	-10%
Thurston	27	-5%	-13%	-13%	-14%	-13%
Wahkiakum	41	79%	-8%	-6%	-44%	43%
Whatcom	73	5%	-4%	-12%	-37%	-9%
<b>Total</b>	<b>5,500</b>	<b>-5%</b>	<b>-17%</b>	<b>-18%</b>	<b>-30%</b>	<b>-15%</b>

All alternatives harvest the arrearage volume specified in the alternative profiles (Chapter 2.3). The timing of harvest of arrearage volume differs between alternatives, resulting in different annual harvest levels within the planning decade (Figures 2.4.2. through 2.4.6).

**Figure 2.4.2. Annual Harvest in the Planning Decade Under Alternative 1  
(Assumes no decision regarding arrearage volume has been made)**



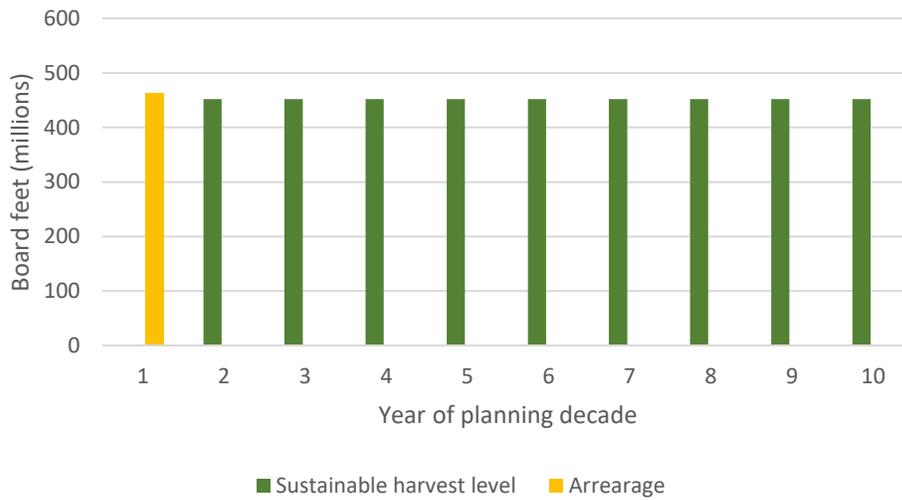
**Figure 2.4.3. Annual Harvest in the Planning Decade Under Alternative 2  
(702 million board feet of arrearage volume harvested in 5 years)**



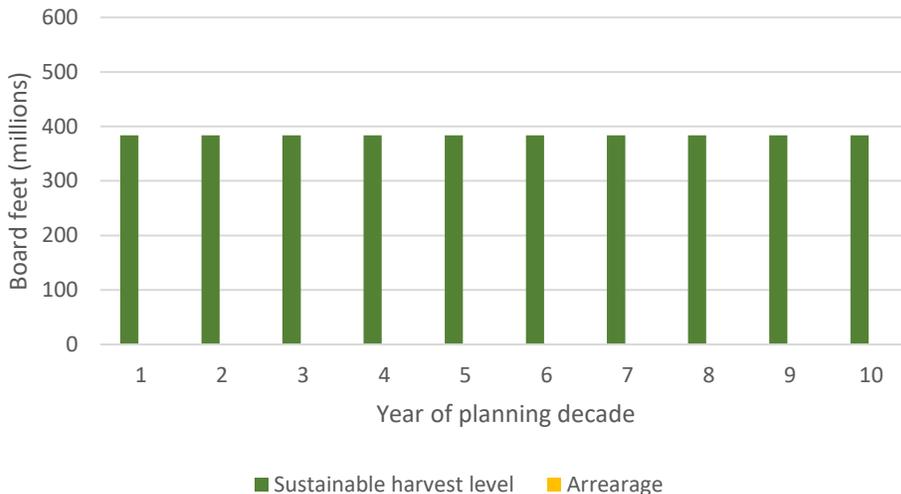
**Figure 2.4.4. Annual Harvest in the Planning Decade Under Alternative 3**  
 (462 million board feet of arrearage volume harvested in 10 years)



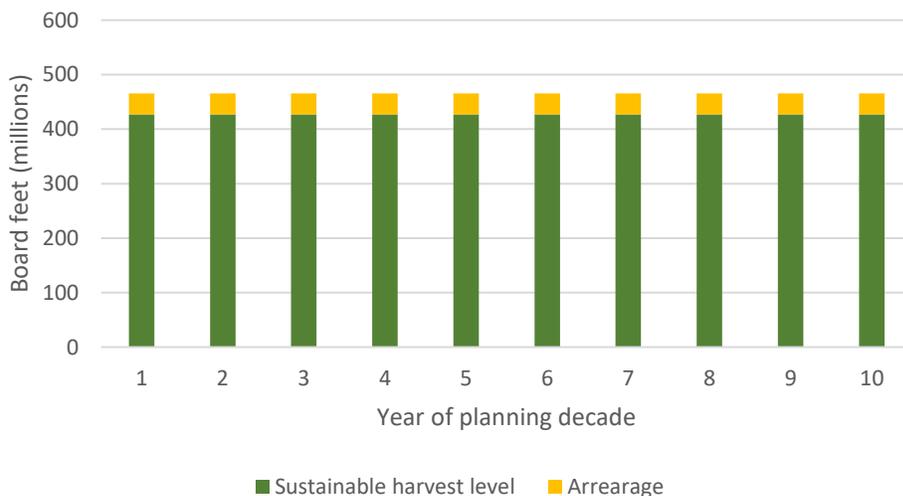
**Figure 2.4.5. Annual Harvest in the Planning Decade Under Alternative 4**  
 (462 million board feet of arrearage volume harvested in 1 year, and the sustainable harvest calculation volume is harvested in the remaining 9 years)



**Figure 2.4.6. Annual Harvest in the Planning Decade Under Alternative 5 (Arrearage is incorporated into the inventory)**



**Figure 2.4.7. Annual Harvest in the Planning Decade Under Alternative 6 (382 million board feet of arrearage volume harvested in 10 years)**



The alternatives include different options for riparian thinning levels in the five west-side planning units and result in different levels of riparian thinning in these planning units (Table 2.4.4). Differences in long-term forest cover in the marbled murrelet long-term conservation strategies result in differences in the amount of riparian thinning in the OESF HCP Planning Unit.

Table 2.4.4. Change from Alternative 1 in Average Annual Acres Thinned in Riparian Areas

HCP Planning Unit	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
	Acres	Percent change in acres of riparian thinning compared to Alternative 1				
Five west-side HCP planning units	3,300	-20%	-97%	-97%	-97%	-100%
OESF HCP Planning Unit	500	-22%	-26%	-27%	-23%	-100%
<b>Total</b>	<b>3,800</b>	<b>-20%</b>	<b>-87%</b>	<b>-87%</b>	<b>-87%</b>	<b>-100%</b>

The sustainable harvest calculation model does not include an estimate of the road-building needed to access the modeled harvest volumes. Road-building will be planned at the operational level. SEPA review of road-building activities will occur when those activities are planned. All road-building is done in compliance with forest practices rules and the 1997 HCP. In areas where harvest or thinning occurs, road density is expected to be similar under the action alternatives to the no action alternative.

## ■ How Do the Alternatives Address DNR’s Project Objectives?

The purpose, need, and objectives statement described in Chapter 1 includes four objectives that guided the development of alternatives. This section provides a brief summary of how the alternatives address DNR’s project objectives.

**Objective #1: Coordinate with the marbled murrelet (*Brachyramphus marmoratus*) long-term conservation strategy environmental analysis so that the Board of Natural Resources can integrate the effects of the range of marbled murrelet long-term conservation strategy alternatives on the sustainable harvest level and arrearage.**

Alternatives 1 through 5 incorporate one of the marbled murrelet long-term conservation strategies and Alternative 6 incorporates DNR’s Amendment, which is very similar to Alternative H in the *Final Environmental Impact Statement for the Long-Term Conservation Strategy for the Marbled Murrelet* (DNR 2019a) in terms of area and location of long-term forest cover. These options cover a range of acres and configurations of long-term forest cover for marbled murrelet on DNR-managed lands. Each alternative also includes an option for harvesting arrearage and an option for riparian thinning. The combinations of marbled murrelet conservation, arrearage, and riparian thinning options create a range of harvest volumes and acres that can be analyzed for their impacts on elements of the environment.

**Objective #2: Incorporate new information into an updated model to calculate the sustainable harvest level. New information includes changes in the land base, changes in forest inventory, information concerning the prior decadal arrearage and its causes, changes in technology, and any updates from the finalized forest land plans for the Olympic Experimental State Forest and South Puget HCP planning units.**

All alternatives include the same information sources. All incorporate updated land base and forest inventory information as of January 12, 2018. The alternatives that identify arrearage volume for sale in the first decade include the final arrearage volumes presented to the Board. The model used in the calculation uses the latest addition of the modeling software and newly developed yield tables that better match actual growth found on DNR-managed lands than older yield tables. Assumptions in the model, including cost of management and prices of DNR timber, were developed using data from recent fiscal years. All alternatives incorporate the finalized OESF and South Puget HCP planning units' forest land plans.

For all the action alternatives, this information is used to calculate a new sustainable harvest level. For the no action alternative, a new sustainable harvest level is not calculated. Instead, the level set in Board Resolution 1239 is retained. As a result, the no action alternative does not meet this objective. The no action alternative, however, must be analyzed under SEPA even if it does not meet objectives.

**Objective #3: Consider climate change as part of the affected environment, analyze climate change impacts and benefits of the alternatives, and identify possible mitigation measures that will reduce or eliminate any identified adverse environmental climate change impacts of the proposal.**

Climate change is considered as part of the affected environment in this FEIS. Current conditions are described in Chapter 3.2, and impacts of each alternative are described in Chapter 4.2. Chapter 4.2 includes an analysis of carbon sequestered on DNR-managed lands in western Washington and in timber harvest from these lands under each alternative.

**Objective #4: Ensure alternatives analyzed are reasonable, feasible, and consistent with DNR's trust management obligations, existing DNR policies, and applicable state and federal laws.**

All the action alternatives comply with existing DNR policies and state and federal law. The no action alternative complies with state and federal law but not all existing DNR policies since the no action alternative assumes that no new sustainable harvest level is calculated.

The alternatives result in different harvest volumes in the following order from most to least volume: Alternative 1, Alternative 2, Alternative 6, Alternative 3, Alternative 4, and Alternative 5. A revised financial analysis of the alternatives has been prepared (refer to the October 14, 2019 Revised Financial Analysis, Addendum to the *Long-term Conservation Strategy for the Marbled Murrelet FEIS*<sup>3</sup>) for the Board to consider in their decision making process.

## ■ Summary of Potential Impacts to the Environment

Chapter 4 includes an analysis of the alternatives for potential impacts to six different elements of the environment. A summary is provided in this section. Specific impacts are described in detail in Chapter 4. Chapter 5 describes potential cumulative effects.

Across DNR managed-lands in western Washington, the area of structurally complex forest is expected to increase with time. Elements of the natural environment are not expected to be adversely affected by

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<sup>3</sup> <https://www.dnr.wa.gov/mmltcs>

these changes. Soil resources and areas subject to landslide hazards would continue to be protected by existing laws and DNR policies and procedures. Climate change impacts are not expected to exacerbate impacts from the alternatives to any element of the environment, and carbon sequestration is expected to be greater than emissions under all alternatives. No alternative is expected to reduce climate-related forest resistance and resilience to a changing climate. Existing riparian protection implementation strategies remain in place under all the alternatives, and aquatic functions are expected to be maintained or enhanced under all alternatives. Alternative 2 has less riparian treatments compared to Alternative 1 but significantly more than the other action alternatives, which will accelerate restoration of some riparian objectives compared to the other action alternatives. Alternatives 3, 4, 5, and 6 allow for less active management and result in slower progress toward riparian objectives.

Many wildlife and plant species would benefit from an increase in structurally complex forest that will develop. Wildlife diversity is likely to increase over time with all alternatives. Some local changes in habitat conditions may temporarily affect some species. Commitments in the 1997 HCP to maintain habitat for threatened or endangered species are maintained under all alternatives.