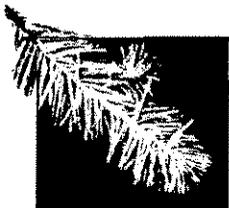




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4-1 4.1 Chapter  
Organization

4-1 4.2 Five West-Side  
Planning Units  
(Excluding OESF)



## **4. Affected Environment and Environmental Consequences**

### **4.1 Chapter Organization**

This chapter presents information on the affected environment and the environmental consequences related to the proposed HCP, other reasonable action alternatives, and No Action alternatives.

Three resources are discussed and analyzed in detail first. These are the northern spotted owl, the marbled murrelet, and riparian habitat. Each of these is examined by major planning subarea. Information is presented on all three resources within the five west-side planning units (Section 4.2), then the three east-side planning units (Section 4.3), and, finally, the Olympic Experimental State Forest (Section 4.4). There is one exception. Information about marbled murrelets in the OESF is presented in Section 4.2 rather than the OESF section.

Next, Section 4.5 presents the affected environment and evaluations of the environmental consequences of the alternatives (HCP and OESF) to other wildlife and plants. Individual species are discussed in three categories: section 10(a) permit species throughout the range of the spotted owl, federal and state candidate species which may occur within the five west-side planning units and the OESF, and plants (range-wide) listed by the federal government. Since many other species occur in habitats on these lands and are too numerous for individual attention, this subsection ends with a habitat-based assessment of the alternatives.

Other resources, including soils, air and water quality, and cultural resources, are discussed in the context of the full planning area, the range of the spotted owl. The chapter ends with a discussion of the potential social and economic consequences and an overview of potential cumulative effects.

### **4.2 Five West-Side Planning Units (excluding OESF)**

This section presents information on the affected environment and the environmental consequences to the northern spotted owl, marbled murrelet, and riparian habitat within the five west-side planning units. Direct, indirect, and cumulative impacts which may occur under the No Action alternative, Alternative B, and Alternative C are analyzed in detail.

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The discussion about marbled murrelets, however, is unique; it addresses all of western Washington, including the OESF Planning Unit. This is done because the same strategies are being applied. The murrelet strategy for the west-side No Action alternative is also the strategy in the OESF No Action alternative. The murrelet strategy under Alternative B is the same applied in OESF Alternative 2 and the murrelet strategy under Alternative C is the same applied in OESF Alternative 3.

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4-3	Summary of Comparison of Alternatives		
	- Habitat		- Evaluation Criteria
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	- Dispersal Habitat		- Criterion 2: Impact of Alternatives to Present and Future Spotted Owl Sites
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	- Regional Context for Five Western Washington HCP Planning Units		
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	- Current Conditions on DNR-managed Lands for The Five West-Side Planning Units		

## **4.2.1 Northern Spotted Owl**

This chapter describes the affected environment in terms of regional context for the status and conservation of the northern spotted owl and current conditions of habitat and activity centers on DNR-managed lands. The impacts of the three alternatives are analyzed for five criteria: (1) change in amount and distribution of nesting, roosting, and foraging habitat; (2) impacts to current and future spotted owl activity centers; (3) a qualitative comparison of provision of dispersal habitat; (4) qualitative comparisons of demographic support; and, (5) maintenance of species distribution. Readers should refer to the draft HCP for a summary of spotted owl ecology. A summary matrix of the spotted owl alternatives is included for the reader's reference. A summary of the comparison of alternatives is described immediately below, followed by the fully developed analysis.

### **Summary of Comparison of Alternatives**

The amount and distribution of habitat that would be provided under each alternative is the most influential factor in determining impacts. The level of near-term impacts to spotted owls arises from where and how much habitat will be harvested in relation to known spotted owl sites. The potential for long-term demographic support and maintenance of species distribution derives from the level of habitat that would be managed for, the quality of that habitat, and its proximity to federal reserves. The bulk of spotted owl conservation in Washington State occurs on federal reserves as designated under the President's Forest Plan (USDA and USDI 1994a and 1994b). Thus, the alternatives described in this document are analyzed largely in terms of how they complement the President's Forest Plan. Refer to the discussions under Criterion 4: Demographic Support and Criterion 5: Maintenance of Species Distribution below for a full description of the importance of conservation measures on nonfederal lands in relation to federal lands for the survival of the spotted owl population. A comparison of the alternatives across all the evaluation criteria is summarized in Matrix 4.2.1a.

**Matrix 4.2.1a: Comparison of the alternatives by all criteria**

Criterion		Alternative A	Alternative B	Alternative C
NRF Habitat	Amount	70,000 acres	81,500 acres	146,100 acres
	Distribution	Dispersed, fragmented	Near federal reserves in western Cascades	Near federal reserves in all planning units
Incidental Take (impacts)	Current Sites	None	81 - 85	31 - 33
	Future Sites <sup>1</sup>	27 - 31	8 - 36	3 - 22
Dispersal Habitat	Amount	70,000 acres	139,500 acres	204,100 acres
	Distribution	Around current spotted owl sites	In large blocks near and between federal reserves	In large blocks near and between federal reserves
Demographic Support	Near term	Contribute at current level	Decreasing contribution due to incidental take	Decreasing contribution due to incidental take, but higher than under Alternative B
	Long term	Declining contribution	Increasing to a moderate contribution near federal reserves	Increasing to a high contribution near federal reserves
Maintenance of Range	Near term	Maintain current range	Contract range to western Cascades near federal reserves	Contract range to west Cascades and Olympic Peninsula near federal reserves
	Long term	Contract range to near federal lands, low connectivity	Maintain connectivity within western Cascades	Maintain connectivity near federal reserves within Cascades, northern Olympic Peninsula

<sup>1</sup> The numbers for future take represent the lowest estimate from our model of the worst-case scenario for population recovery and the highest estimate from the best-case scenario. For Alternative A, sites will not be at risk for incidental take, but are at risk of extirpation. See sections on potential impacts to future sites under each alternative.

**Matrix 4.2.1b: Management strategies for HCP (excluding OESF)**

	<b>Alternative A No Action</b>	<b>Alternative B Proposed HCP</b>	<b>Alternative C</b>
<b>Spotted Owl</b>			
Nesting, Roosting, and Foraging (NRF) habitat	Within spotted owl site centers (1.8- or 2.7- mile radius), 40% of total acreage is maintained in suitable owl habitat. The remaining area will be harvested. No additional acreage will become habitat.	202,000 acres designated for NRF function in N. Puget, S. Puget, Columbia, Chelan, Yakima, and Klickitat planning units with at least 101,000 acres (50%) developed and maintained at any time.  On the west side, two 300-acre nest patches <sup>2</sup> per 5,000 acres (approximate) of NRF are identified and retained until knowledge is acquired allowing provision of adequate nesting structure while managing entire acreage. Balance of acreage may be sub-mature forests.	337,000 acres designated for NRF function in Straits, N. Puget, S. Puget, Columbia, Chelan, Yakima, and Klickitat planning units with 202,000 acres (60%) developed and maintained in a late-seral forest condition at any time.
Dispersal Habitat	No provision for dispersal habitat.	200,000 acres designated for dispersal function in Yakima, N. Puget, S. Puget, Klickitat, and Columbia planning units with at least 100,000 acres developed and maintained at any time.	172,000 acres designated for dispersal function in Yakima, N. Puget, S. Puget, Klickitat, and Columbia planning units with 86,000 acres developed and maintained at any time.
Experimental Areas	No provision for experimental areas.	No provision for experimental areas.	43,000 acres designated for experimental management in S. Coast Planning Unit.

<sup>2</sup> See draft HCP for details of the nature and configuration of these areas for various planning units.

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## Habitat

DNR estimates that there are presently between 186,000 and 366,000 acres of potential suitable spotted owl habitat on DNR-managed lands within the five west-side planning units. Implementation of Alternative A would result in the retention of 70,000 acres of spotted owl habitat on DNR-managed lands. Management of DNR trust lands under Alternative B would result in the retention and development of at least 81,500 acres of spotted owl habitat. Implementation of Alternative C would result in the retention and development of at least 146,500 acres of spotted owl habitat (see Matrix 4.2.1a). All three alternatives result in a loss of total potential habitat from what occurs on DNR-managed lands in 1996, compared to the amount of habitat that is predicted to be present in the year 2096 (see Table 4.2.14). Given that Alternative A is the No Action alternative, a loss of potential habitat would occur under the current policy of owl circle management.

The largest loss of potential habitat occurs under Alternative A. Most of the loss of potential habitat under Alternatives B and C occurs in areas farther than 4 miles from federal reserves. Both Alternatives B and C result in improved habitat conditions within 4 miles of federal reserves compared to Alternative A. Thus both of these alternatives would make higher contributions to the overall demographic support of the spotted owl population that occurs on federal lands than Alternative A.

## Spotted Owl Site Centers

There are presently 145 known territorial spotted owl site centers that influence DNR-managed lands in the five west-side planning units (i.e., these sites occur either on or within a median home range radius of DNR-managed lands). There are a projected 42 additional sites that influence DNR-managed lands that have not yet been surveyed for spotted owls in the five west-side planning units. Alternative B would result in putting an estimated 81-85 of the total 187 known and projected unknown sites at risk for incidental take of resident owls. Alternative C would put an estimated 31-33 sites at risk for incidental take of resident spotted owls. Under Alternative A, DNR would continue a take-avoidance policy. Thus, its management activities would not result in the intentional incidental take of spotted owls. However, Alternative A does not offer the prospect of improving habitat conditions on DNR-managed lands. In the long term, an estimated 27-31 sites have a low chance of persistence due to presently poor habitat conditions and isolation from other sites or clusters of sites (see Matrix 4.2.1a and Table 4.2.18).

Under Alternatives B and C, management of spotted owl habitat would occur within NRF management areas such that at least 50 (Alternative B) or 60 percent (Alternative C) of these areas would be in a spotted owl habitat condition at any one time. Any spotted owl habitat that occurs above target conditions within each WAU (refer to the proposed HCP, DNR 1996a, for details) would be available for harvest. The number of future spotted owl sites that could be negatively affected by such a management strategy in the long term depends on: (1) current population trends; (2) how quickly habitat conditions improve on federal reserves to the point that the population stabilizes; and, (3) where new sites are established relative to DNR NRF management areas and federal reserves. DNR conducted an analysis based on these factors in which it was concluded that Alternative B could result in between 8 and 36 spotted owl sites being at risk of negative biological

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impacts over the course of a 100-year HCP. Alternative C could result in between 3 and 22 sites being at risk of negative biological impacts over a 100-year HCP.

An important point to keep in mind however, is that once NRF management areas have reached their target habitat condition, these areas would provide a constant level of support to spotted owls. This is a more certain situation than under Alternative A in which habitat would likely decline in quantity and become increasingly fragmented. While a number of sites may be at risk for negative biological impacts in the future in NRF management areas under either Alternative B or C, the existence of more habitat near federal reserves would contribute to an overall situation in which spotted owls would persist and make reproductive contributions to the population over the long term.

### **Dispersal Habitat**

Alternative A would provide opportunities for dispersal of juvenile spotted owls in the form of NRF habitat retained in spotted owl circles under the current take guidelines. This alternative then would provide habitat through which spotted owls could potentially disperse on 70,000 acres whose location is dependent upon the location of known spotted owl sites. Alternative B would provide dispersal opportunities on 139,500 acres in both NRF management areas (suitable nesting, roosting, and foraging habitat) and in Dispersal management areas (dispersal habitat). Dispersal management areas are located on DNR-managed lands that occur between large areas that will be managed for spotted owl NRF habitat (mostly federal reserves). Alternative C would also provide dispersal opportunities in NRF management areas and in Dispersal management areas. The Dispersal management areas designated in Alternative C are the same as those designated in Alternative B. A total of 204,100 acres of NRF habitat and dispersal habitat would be provided under Alternative C.

Under Alternative A, large portions of DNR-managed lands could be in conditions that are inhospitable to dispersing spotted owls at any one time. In comparison, because of the proximity of NRF management areas to federal reserves, Alternatives B and C both decrease the effective distance that spotted owls would need to disperse between large blocks of federal habitat. They also provide areas that would be managed specifically for dispersal habitat in areas that are important for population connectivity as identified in the Final Draft Recovery Plan for the Northern Spotted Owl (USDI 1992b). Thus Alternatives B and C both support spotted owl dispersal better than Alternative A. Alternative C provides the highest level of support.

### **Demographic Support**

Over the short term, Alternative A provides a higher level of demographic support than Alternatives B and C. This is because current levels of habitat contributions to all known activity centers would most likely be retained. In the long term, however, Alternative B would provide a higher level of support to the population than Alternative A because habitat will be provided at higher landscape levels at a watershed scale near federal reserves, and because there is a commitment to develop new habitat in areas where habitat levels are presently low but demographic support to the population is important. The nest habitat provisions (see Matrix 4.2.1b), in conjunction with the riparian and marbled murrelet components of Alternative B, result in a projected 51,000 acres of forest

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older than 150 years old within NRF areas by the year 2096 (see Table 4.2.10). Therefore, NRF areas in Alternative B would likely be in an adequate condition to contribute individuals to the metapopulation over the course of a 100-year HCP.

Alternative C would provide the most and the highest quality habitat in terms of older forest and high concentrations of large habitat patches near federal reserves. It would lead to a lower impact to spotted owl sites in the near term than in Alternative B, and a higher contribution to the support of a productive owl population in the next 100 years than either Alternatives A or B. Thus, the level of overall, long-term demographic support to the population is highest in Alternative C. Alternative C has the highest probability of providing source habitat to sub-populations at a watershed level and provides NRF areas that support federal reserves in all (of the five west-side) planning units where significant acreage of federal reserves occur. Alternative C would not provide long-term support for spotted owls that are not part of clusters that are associated with the federal reserve system.

### **Maintenance of Species Distribution**

In terms of contributing habitat in a wider range of ecological conditions, providing nesting, roosting, foraging habitat in areas of distributional concern, and maintaining connectivity among federal reserves, Alternative C contributes more to long-term maintenance of species distribution than the other two alternatives. Alternative B provides the next best level of support. Alternative A contributes the most to maintenance of species distribution over the short term, but contributes the least over the next 100 years.

None of the alternatives provide a long-term contribution to the maintenance of spotted owls in southwest Washington or the rest of the Western Washington Lowlands Province. Thus, all of the alternatives will contribute to an eventual contraction of the species range in western Washington. Alternative B would likely lead to the most rapid loss of sites and thus contribute the most to increasing the risk of extirpation of the population from the Western Washington Lowlands Province. Alternative C would provide some prospect for five sites to persist in southwest Washington, but would not provide a much higher chance for the population to recover in this province than Alternative B.

## **Affected Environment**

### **Spotted Owl Conservation on Federal Lands**

Federal land management has a very large influence on the survival of the spotted owl as a species. This is due to the fact that most of the remaining suitable spotted owl habitat occurs on federal lands (USDA and USDI 1994a). In addition, the Endangered Species Act requires that federal agencies undertake activities that lead to the recovery of threatened and endangered species (16 U.S.C. § 1536(a)(1)). Thus, the analysis of impacts of the HCP alternatives to spotted owls contained in this chapter is best understood in the context of conservation measures taken to date on federal lands.

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The Final Draft Recovery Plan for the Northern Spotted Owl (USDI 1992b) recommended the establishment of a system of Designated Conservation Areas (DCAs) based on the Habitat Conservation Areas proposed by the Interagency Scientific Committee (ISC) report (Thomas et al. 1990). The recovery team intended that this system of "reserves" on federal lands, plus contributions of habitat from nonfederal landowners and managers in key areas, would be sufficient for the recovery of the spotted owl. The DCA system included 58 percent (and thus excluded approximately 42 percent) of currently suitable nesting, roosting, and foraging (NRF) habitat and 55 percent (excluding 45 percent) of known spotted owl site centers on federal lands within reserve areas (including Congressionally Reserved Areas such as national parks and wilderness areas) (USDA and USDI 1994a p. 3&4-220, 240). The authors of the ISC report and the draft recovery plan determined that it was an acceptable risk to allow a decline in the population before it stabilized at some lower level. They hypothesized that the population would stabilize in approximately 50 years after habitat conditions improved in portions of the reserve areas that are now younger forest (Thomas et al. 1990 p. 38-39; USDI 1992b p. 202-211).

The recovery plan has not been approved by the Secretary of Interior. However, a system of Late-Successional Reserves has been established on federal lands within the range of the northern spotted owl under the President's Forest Plan (USDA and USDI 1994b). Under this federal plan, 66 percent of currently suitable NRF habitat and 61 percent of known occupied sites on federal lands would be protected (USDA and USDI 1994a p. 3&4-222, 240). Thus, there is an additional 8 percent of currently suitable habitat and an additional 6 percent of the known occupied sites protected over that proposed under the draft recovery plan.

Under the President's Forest Plan, dispersal habitat on federal lands is to be provided by a network of Riparian Reserves and 100-acre residual habitat areas around spotted owl activity centers in the matrix and Adaptive Management Areas. This approach is a departure from the 50-11-40 rule originally proposed in the ISC report (Thomas et al. 1990) and included in the draft recovery plan. Replacing the 50-11-40 rule with Riparian Reserves and residual owl habitat was considered to provide sufficient connectivity on federal lands by the U.S. Fish and Wildlife Service (USDA and USDI 1994a Appendix G Biological Opinion p. 19-20).

Overall, the Supplemental Environmental Impact Statement (SEIS) Interdisciplinary Team determined that Alternative 9 (which became the President's Forest Plan) had an 83 percent likelihood of providing habitat that is of sufficient quality, distribution and abundance to allow the species population to stabilize, well-distributed across federal lands. However, there was an 18 percent likelihood that the spotted owl population would stabilize with significant gaps in the historic species distribution on federal lands (USDA and USDI 1994a p. 3&4-243). The USFWS determined in its Biological Opinion that Alternative 9 (the President's Forest Plan), results in the same or a lesser amount of "...risk of loss of a well-distributed, reproducing population of spotted owls due to lack of NRF habitat..." as is posed by the draft recovery plan (USDA and USDI 1994a Appendix G Biological Opinion p. 18).

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## **Role of Nonfederal Lands in the Regional Spotted Owl Population**

The Northern Spotted Owl Recovery Team stated that in many parts of the owl's range, conserving habitat on federal lands alone would not be adequate for recovery of the species (USDI 1992b p. 91). The Forest Ecosystem Management Assessment Team (FEMAT 1993) acknowledged the need for a nonfederal contribution of habitat in their development of the options that were assessed as part of the process that led to the President's Forest Plan. They stated:

"In all options, we recognize areas of special concern where current habitat conditions on federal lands are deficient in portions of the owl's range, or where private, state, and federal lands are intermingled or federal lands are absent. In these areas of special concern contributions by nonfederal lands remain important to recovery of the species and should be addressed by the final recovery plan for the northern spotted owl." (USDA and USDI 1994a p. 3&4-244.)

The USFWS is in the process of preparing an environmental alternatives analysis (EAA) on its proposed 4(d) special rule which identifies areas of special concern for the spotted owl on nonfederal lands. In its Biological Opinion for the President's Forest Plan, the USFWS states that nonfederal landowner compliance with take guidelines inside proposed 4(d) special rule areas of concern will not assure the maintenance of dispersal habitat or contribute to an improving condition for the spotted owl population on nonfederal lands (USDA and USDI 1994a Appendix G p. 44-45). The SEIS Interdisciplinary Team stated that "...the 4(d) rulemaking and potential Habitat Conservation Plans are expected to address these issues" (USDA and USDI 1994a p. 3&4-245). As of the writing of this DEIS, the proposed 4(d) special rule EAA has not yet been published.

The role of nonfederal lands for spotted owl recovery is discussed in detail in sections that follow and evaluate the DNR HCP alternatives for contributions to demographic support and maintenance of species distribution. The reader may also refer to Hanson et al. (1993) for a discussion of specific nonfederal landscapes in Washington State that are important for demographic support, demographic interchange and maintenance of species distribution.

### **Regional Context for Five Western Washington HCP Planning Units**

The five western Washington HCP planning units fall within the Western Washington Cascades, Western Washington Lowlands, and Olympic Peninsula spotted owl provinces (USDI 1992a p. 32) (Map 29). The North Puget, South Puget, and Columbia planning units roughly east of Interstate 5 are within the Western Washington Cascades Province. The North Puget, South Puget and Columbia planning units roughly west of Interstate 5, and the South Coast Planning Unit, roughly south of an imaginary line running from the southern end of the Hood Canal west to the Pacific Ocean, are in the Western Washington Lowlands Province. The portion of the South Coast Planning Unit north of an imaginary line running from the southern end of the Hood Canal west to the Pacific Ocean, and the Straits Planning Unit, are within the Olympic Peninsula Province.

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**Threats.** The Northern Spotted Owl Recovery Team (USDI 1992b) described the major known threats to spotted owl populations in each province. (See the draft HCP Chapter III for a more detailed background discussion of each type of threat.) With the exception of the Olympic Peninsula Province (see below), no reassessment of the severity of threats in each province has been done since the writing of the Final Draft Recovery Plan for the Northern Spotted Owl (USDI 1992b). Severity of threats in each spotted owl province are summarized in Table 4.2.1.

In the northern portion of the Western Washington Cascades Province (north of Mount Rainier) declining habitat, limited habitat, low populations, distribution, and province (or sub-province) isolation were all considered severe threats. In the southern portion of the Western Washington Cascades Province (south of Mount Rainier), declining habitat was considered a severe threat, while in contrast to the northern portion of the province, limited habitat, low populations, distribution, and sub-province isolation were considered moderate threats. Declining population was considered a moderate threat and natural disturbance was considered a low threat in the both the northern and southern portions of the Western Washington Cascades Province.

In the Western Washington Lowlands Province, declining habitat, limited habitat, declining populations, low populations, distribution, province isolation, and predation are all considered severe threats to the population. Natural disturbance was considered a moderate threat.

In the Olympic Peninsula Province, low populations, province isolation, and natural disturbance were considered severe threats. Declining habitat, limited habitat, declining populations, distribution, and predation were considered moderate threats. In 1994, the federal Reanalysis Team (Holthausen et al. 1994) analyzed results from updated population estimates, demographic estimates and modeling of population response to different potential configurations of suitable habitat on the Olympic Peninsula. Their conclusions indicate that low populations and province isolation may not be as severe a threat to the Olympic Peninsula population as the recovery team originally thought. However, the Reanalysis Team also stated that there was enough uncertainty associated with interpretation of demographic results that they could not conclude that the maintenance of a stable population of spotted owls on the peninsula was assured with either retention of significant portions of habitat on federal lands or with the retention of additional habitat on nonfederal lands (Holthausen et al. 1994 p. 1-2).

**Table 4.2.1: Threats to the spotted owl population as described in the Final Draft Recovery Plan for the Northern Spotted Owl (USDI 1992b)**

	<b>Declining Habitat</b>	<b>Limited Habitat</b>	<b>Declining Populations</b>	<b>Low Populations</b>	<b>Distribution</b>	<b>Province Isolation</b>	<b>Natural Disturbance</b>	<b>Predation</b>
Western Washington Cascades (north)	Severe	Severe	Moderate	Severe	Severe	Severe	Low	Unknown
Western Washington Cascades (south)	Severe	Moderate	Moderate	Moderate	Moderate	Moderate	Low	Unknown
Western Washington Lowlands	Severe	Severe	Severe	Severe	Severe	Severe	Moderate	Severe
Olympic Peninsula	Moderate	Moderate	Moderate	Severe	Moderate	Severe	Severe	Moderate

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### **Habitat and Reserves Provided on Federal Lands**

The following description of habitat and site centers protected in federal reserves is summarized in Table 4.2.2. In the Western Washington Cascades Province, the President's Forest Plan establishes 22 Late-Successional Reserves (LSRs) which encompass a total of 978,182 acres of federal land. An estimated 459,022 acres (47 percent) of the LSR area is suitable spotted owl habitat. There are a total of 156 spotted owl activity centers within these reserves (USDA and USDI 1994a Appendix G part 3 p. 13). There are an additional 354,200 acres of suitable habitat in Congressionally Reserved Areas (not counted in the above acreage) (Table 4.2.2).

There are no federally-designated Late-Successional Reserves or Congressionally Reserved Areas in the Western Washington Lowlands Province. The vast majority of land in this province is privately owned (88 percent). The state of Washington, tribal lands, and U.S. Department of Defense comprise the other ownerships (USDI 1992b p. 106).

In the Olympic Peninsula Province, there are 10 Late-Successional Reserves encompassing a total of 394,460 acres. There are an estimated 205,195 acres (52 percent) of suitable spotted owl habitat and a total of 80 known site centers within these LSRs (USDA and USDI 1994a Appendix G part 3 p. 14). Congressionally Reserved Areas contribute an additional 341,000 acres of suitable habitat to reserved federal lands on the Olympic Peninsula (USDA and USDI 1994a p. 3&4-214).

In the western Washington HCP planning area (not including the OESF Planning Unit) there are a total of 1,372,642 acres of Late-Successional Reserves established by the President's Forest Plan. An additional 2,704,934 acres are in a congressionally reserved status. An estimated 664,217 acres of suitable spotted owl habitat fall within Late-Successional Reserves and an additional 695,200 acres of suitable habitat occur in Congressionally Reserved Areas.

**Table 4.2.2: Habitat and spotted owl site centers protected under the President's Forest Plan**

Province	Number of LSRs	Acres in LSRs	Acres (%) spotted owl NRF habitat in LSRs	Additional spotted owl habitat in Congressionally Reserved Areas	Number of spotted owl sites protected <sup>3</sup>
Western Washington Lowlands	0	0	0	0	0
Western Washington Cascades	22	978,182	459,022	354,200	156
Olympic Peninsula	10	394,460	205,195	341,000	80
Totals	32	1,372,642	664,217	695,200	236

The SEIS Team that analyzed the President's Forest Plan estimated the amount of late-successional forest that could develop over time on federal reserves. Within reserves, the overall trend is that the amount of forest greater than 80 years old will increase in the next 150 years such that on average 80 percent of the area of federal reserves will be covered by forests older than 80 years old (USDA and USDI 1994a p. 3&4-42, 43). The SEIS team combined their estimates for Washington and Oregon reserve lands so there is not a separate estimate for Washington or for each spotted owl province in Washington. Applying the 80 percent average to the area of federal reserves (Congressionally Reserved Areas plus designated Late-Successional Reserves) in the western Washington HCP planning area results in a projected total of 3,240,463 acres of forest with mature and late-successional forest characteristics in 150 years.

### **Current Conditions on DNR-managed Lands for The Five West-Side Planning Units**

This section describes current habitat conditions on, and spotted owl use of, DNR-managed lands in the five west-side planning units (not including the OESF). Methods for estimating habitat and rationale for describing habitat distribution are discussed. The information in this section provides background data that is useful for understanding the subsequent analysis sections.

#### **AMOUNT AND DISTRIBUTION OF SUITABLE SPOTTED OWL HABITAT**

##### **Methods: Amount**

The amount of suitable spotted owl habitat currently on DNR-managed lands in the five west-side planning units is estimated using two methods. Suitable spotted owl habitat is

<sup>3</sup> This total only includes sites within LSRs. There are additional sites within Congressionally Reserved Areas which were not tabulated in the FSEIS for the President's Forest Plan.

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defined as any forest type that meets some or all of the life needs of the spotted owl including nesting (breeding), roosting (resting), and foraging (feeding). Given the data available for assessing the amount of suitable habitat on all of the lands it manages, DNR was not able to distinguish everywhere between habitat that may only serve a roosting and foraging function versus higher quality habitat that also provides a nesting function. Thus "suitable spotted owl habitat" in this chapter refers to a mix of habitat qualities that provide for some or all of the life needs of the spotted owl. This definition does **not** include habitat that only meets a dispersal function. Two methods are used because there is no reliable means of predicting which method is more accurate. We suspect that the real amount of habitat that occurs on DNR-managed lands likely lies somewhere in between the amounts predicted by each method. The level of impact to each component of the affected environment differs depending on which habitat estimation method is used. Thus, for most of the analyses described below, two numbers derived from each method are given.

The first estimation method consists of using age class of the primary tree species in a stand as a surrogate for potential habitat. Elevational limits for spotted owl use appropriate to each spotted owl province were also applied (Stearns 1991). Two ranges of age classes are assigned as potential spotted owl habitat. Forests that are between 70 and 200 years old are assumed to contain at least the characteristics of sub-mature habitat.<sup>4</sup> Sub-mature habitat in western Washington contains the structural elements necessary to support roosting and foraging functions, and may occasionally be used for nesting (Hanson et al. 1993; DNR 1996a p. IV-22). Depending on past harvest or disturbance history of a stand, forests in this age range can have the residual structure and large enough trees to provide roosting and foraging functions. The older age classes within the 70-200 year range are, on average, more likely to contain the elements of sub-mature habitat and may contain some nest structure. Younger stands in this age class range that originated from natural disturbance events or from harvest methods that left some residual structure are also likely to contain the characteristics of sub-mature habitat. Those stands that originated from clearcut harvest are not likely to meet the sub-mature habitat definition. This method likely overestimates the amount of sub-mature habitat to the extent that clearcut-originated stands are included. It likely underestimates the amount of habitat in areas where forest stands younger than 70 years old originated from natural disturbance and contain enough residual structure to provide habitat function. This situation is known to occur on DNR-managed lands in the South Coast Planning Unit. Stands that are older than 200 years are assumed to contain elements of nesting habitat as well as roosting and foraging habitat. The acreage of DNR-managed forest lands in stands 200 years old and older is likely a good minimum estimate of the amount of high quality habitat available to support a nesting function.

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<sup>4</sup> The use of 70 years as a minimum for sub-mature habitat is based on a field assessment by DNR foresters and wildlife biologists of average forest conditions on DNR-managed lands in western Washington and ages of forest stands that met the sub-mature habitat definition. As is described in the text following the footnote, there are situations in which a 70-year-old stand will not meet the sub-mature definition. There are also situations in which stands younger than 70 years will contain the structural elements of sub-mature habitat. For assessing average conditions for the five west-side planning units, the analysts believe that 70 years is an adequate minimum.

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The second method for estimating the amount of currently suitable habitat consists of combining data from several sources to achieve full coverage for all ownerships in the state. These sources include field-verified habitat maps from both DNR and USFS habitat mapping efforts, age class data (same as used above) for DNR-managed lands in western Washington, and satellite data that was classified by Pacific Meridian Resources (Green et al. 1993) into forest types for other purposes than identifying spotted owl habitat. The same elevational limits were applied to this method as were applied to the first method. GIS technology was used to compare each data source to the field-typed data for its accuracy in predicting whether a forest stand could be classified as habitat or non-habitat. Different age classes and different combinations of satellite classifications were tested against field-typed data to find the most accurate match. The data source that most accurately predicted habitat and non-habitat in each planning unit was then used for areas not covered by field-verified habitat typing. The accuracy of data sources used as surrogates for field-typed habitat data on DNR-managed lands ranged from 65 percent in the South Coast Planning Unit to 79 percent in the South Puget Planning Unit. For the five west-side planning units, age class data proved to be a more accurate predictor of field-typed data than did satellite data. For the South Puget, South Coast, and Columbia planning units, stands that were 60 years old and older most closely matched field-assessed suitable habitat. In the North Puget Planning Unit, age class data for stands 50 years old or older was the most accurate. In the Straits Planning Unit, age class data for forests 80 years old and older was the most accurate predictor of field-typed suitable habitat.

There are three limitations to this method. The first is that only 20 percent (approximately 240,000 acres) of DNR-managed lands in the five west-side planning units have been reliably field-typed; thus there was only a small sample as the basis of comparison for other data sources. The second is that habitat typing in the field was not recorded in a standardized way. All field-typing was done as part of the regulatory process and was done prior to DNR's HCP process. Some DNR field staff recorded a differentiation between Types A, B, and C habitat while others only recorded forest lands as habitat or non-habitat. In order to achieve the largest sample size possible, DNR analysts decided to combine data that differentiated between quality of habitat types with data that was only a binary habitat versus non-habitat distinction. What was used as a basis of comparison then can be within a range of quality from marginal roosting and foraging habitat to high quality nesting habitat. In addition, more acres of habitat for which the type (A, B, or C) was recorded is Type C habitat than Type A or B habitat. This means that the "calibration" for suitable habitat used by this method is biased toward more marginal habitat types. Thus, a large proportion of acres identified as suitable spotted owl habitat by surrogate sources (i.e., different age class ranges) is likely to be marginal habitat. This potential needs to be kept in mind when interpreting the results of habitat estimations using this method. The third limitation stems from the use of age class as a surrogate of habitat. As mentioned above, young stands that have abundant residual structure can be used by spotted owls. Some stands that are younger than the age classes used as a habitat surrogate in any particular planning unit and that have abundant residual structure would not be counted as habitat. In such cases, age class data will underestimate the amount of suitable spotted owl habitat.

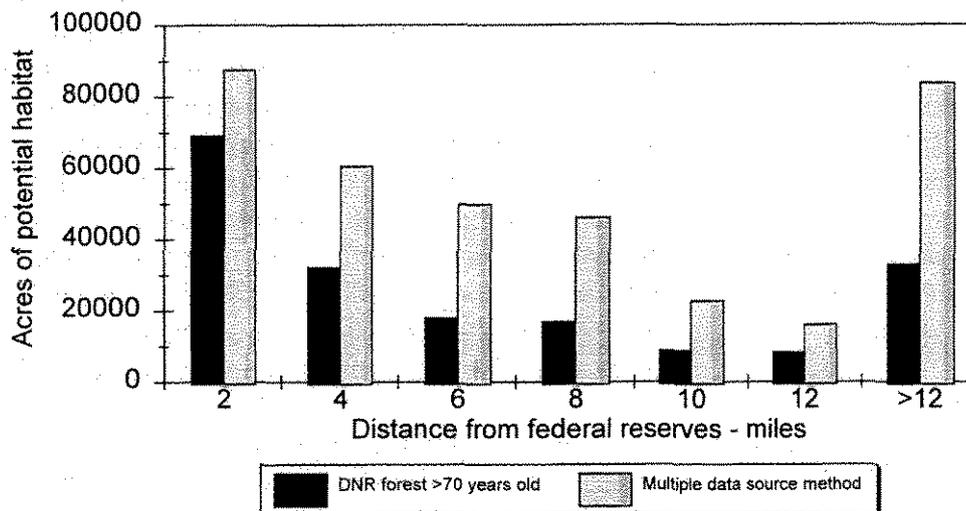
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**Methods: Distribution of Habitat**

Another important criterion for describing the current condition of habitat on DNR-managed lands is the distribution of habitat across the landscape. Habitat occurrence was broken out by 2-mile distance bands from federal reserve lands (Figure 4.2.1). This method of describing distribution of habitat was chosen to reflect the fact that federal reserves provide the largest blocks of currently suitable spotted owl habitat in the western Washington spotted owl provinces. Given that federal reserves are to be managed for late-successional forest into the future, current habitat conditions are expected to improve in terms of overall amount of habitat and in terms of decreasing fragmentation of existing habitat patches. In assessing the overall contribution of DNR-managed lands to demographic support of the population, describing the amount of habitat in relationship to federal reserves provides a picture of how habitat on DNR-managed lands adds to existing large habitat blocks on federal reserve lands. Two-mile distance bands were selected because they represent approximate median home range radii for spotted owls in western Washington. The median annual home range radius for pairs tracked for a minimum of

9 months is 2.0 miles in the western Washington Cascades and 2.7 miles in the western Washington lowlands and Olympic Peninsula (Hanson et al. 1993). Thus the 0-2-mile distance band would capture habitat likely used by spotted owls located on the interface of federal reserves and DNR-managed lands in the western Washington Cascades and the 2-4-mile distance band would capture the remainder of habitat likely to be used by spotted owls with activity centers on the interface between federal reserves and DNR-managed lands on the Olympic Peninsula.

**Figure 4.2.1: Acres of potential spotted owl habitat on DNR-managed lands in the five west-side planning units**



**Results**

Using age class data resulted in an estimate of 186,000 acres of potentially suitable spotted owl habitat on DNR-managed lands within the five west-side planning units (Table 4.2.3). Employing the second method of multiple data sources that most closely predict habitat based on field-typed habitat data resulted in an estimate of 366,000 acres of currently suitable habitat on DNR-managed lands in the five west-side planning units (Table 4.2.4). Based on the above discussion of limitations of the multiple data source method of estimation, it is likely that this method includes more marginal habitat than the age class method which counts habitat as stands that are at least 70 years old or older. Using forest stands that are 70 years old or older may more accurately represent the current amounts of sub-mature and old forest habitat types on DNR-managed lands than the multiple data source method. The multiple data source method probably gives a more accurate picture of the total amount of suitable habitat including more marginal habitat types. However, this method will also probably capture more habitat that occurs in younger stands with adequate residual structure than does the method using only stands 70 years old or older.

The distribution of current potential habitat on DNR-managed lands in distance bands from federal reserves in the five west-side planning units is described in Figure 4.2.1 and Tables 4.2.3 and 4.2.4.

**Table 4.2.3: Distribution of potential spotted owl habitat estimated by forest stands 70 years old and older on DNR-managed lands in the five western Washington planning units by distance band from federal reserves**

Distance from federal reserves (miles)	Acres DNR-managed lands	Acres DNR-managed lands in forest between 70 and 200 years old	% DNR-managed lands in distance band in forest between 70 and 200 years old	Acres DNR-managed lands in forest older than 200 years	% DNR-managed lands in distance band in forest older than 200 years	Total% DNR-managed lands in distance band in forest older than 70 years	% of total habitat on DNR-managed lands within distance band
0.0 - 2.0	254,534	46,198	18.1	22,845	9.0	27.1	37.1
2.1 - 4.0	171,062	23,809	13.9	8,324	4.9	18.8	17.3
4.1 - 6.0	140,215	16,863	12.0	1,090	0.8	12.8	9.7
6.1 - 8.0	122,052	15,275	12.5	1,569	1.3	13.8	9.1
8.1 - 10.0	85,210	8,610	10.1	171	0.2	10.3	4.7
10.1 - 12.0	71,916	8,037	11.2	194	0.3	11.5	4.4
> 12.1	337,702	32,185	9.5	633	0.2	9.7	17.7
Totals	1,182,691	150,977	12.8	34,826	2.9	15.7	100.0

There are a total of 1,182,691 acres of DNR-managed forest lands within the five west-side planning units. Thus, approximately 16 percent of DNR-managed lands contain potentially suitable spotted owl habitat as estimated by combining both 70-200-year old age classes and 200-year-plus age classes. Thirty-seven percent of the total amount of currently suitable habitat on DNR-managed lands lies within 2 miles of federal reserve lands. Another 17 percent lies between 2-4 miles, giving a total of 54 percent of potentially suitable habitat that occurs within 4 miles of federal reserve lands. Only 3 percent of DNR-managed lands is covered by forests 200 years old and older, most of which occurs within 4 miles of federal reserves.

**Table 4.2.4: Distribution of potential spotted owl habitat estimated by the multiple data source method on DNR-managed lands in the five western Washington planning units by distance band from federal reserves**

Distance from federal reserves (miles)	Acres of DNR-managed lands	Acres DNR-managed lands in potential spotted owl habitat	% DNR-managed lands in potential spotted owl habitat within distance band	% total habitat on DNR-managed lands within distance band
0.0 - 2.1	254,534	87,439	34.3	23.9
2.1 - 4.0	171,062	60,592	35.4	16.5
4.1 - 6.0	140,215	49,717	35.6	13.6
6.1 - 8.0	122,052	46,086	37.7	12.6
8.1 - 10.0	85,210	22,673	26.6	6.2
10.1 - 12.0	71,916	16,052	22.3	4.3
> 12.1	337,702	83,702	24.8	22.9
Totals	1,182,691	366,261	31.0	100.0

Using the multiple data source method results in an estimated 31 percent of DNR-managed lands in potentially suitable habitat, compared to 16 percent using forests older than 70 years as potential habitat. Nearly 24 percent of all potential habitat (using the multiple data source method) lies within 2 miles of federal reserves and 40 percent of all potential suitable habitat lies within 4 miles of federal reserves.

**DISPERSAL HABITAT ON DNR-MANAGED LANDS**

DNR silviculturalists estimate that the structural characteristics of dispersal habitat can be attained in managed forests in western Washington starting in stands that are 35-45 years old. These characteristics include stands that are dominated by conifer species, have at least 70 percent canopy closure, and contain trees with an average dbh of 11 inches (see DNR 1996a p. IV-22). There are currently 787,000 acres of DNR-managed forest lands in the five west-side planning units that are 40 years old or older. However, not all of DNR-managed forest lands are located in areas that would provide a dispersal function even if they contained the characteristics of dispersal habitat. These are areas where there are currently no spotted owl activity centers or no available habitat (present or potential) to which spotted owls could disperse. In addition, under current management practices DNR does not intentionally plan its harvest rotations on a spatial scale to meet landscape requirements for dispersal habitat. There are broad portions of DNR-managed lands that would not meet a 50 percent coverage of forest stands that are at least 40 years old and

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have been managed specifically to produce the stand characteristics of dispersal habitat. Thus, any benefit to dispersing spotted owls from the current distribution of forest stands that meet the stand level definition for dispersal habitat is incidental.

One potential indicator of the current dispersal capabilities of DNR-managed lands is the percentage of the areas designated to be managed for dispersal habitat that are in forests stands 40 years old or older. Lands designated for a dispersal function in Alternatives B and C are placed where DNR manages lands between federal reserves or other large areas to be managed for older forests. While these areas do not represent all DNR-managed lands that could potentially serve a dispersal function (see analyses under criteria (3) and (5)), they provide a good assessment of current conditions on lands that are very likely being used or may be used in the future by dispersing juvenile spotted owls. There are a total of 115,851 acres of DNR-managed lands designated for a dispersal role in three of the five west-side planning units (for both Alternatives B and C). A total of 77.9 percent (90,212 acres) of the designated dispersal areas are presently in forests that are 40 years old or older. By planning unit, the percentage of dispersal areas in forests 40 years old and older is as follows: North Puget Planning Unit - 51 percent; South Puget Planning Unit - 55 percent; and Columbia Planning Unit - 82 percent.

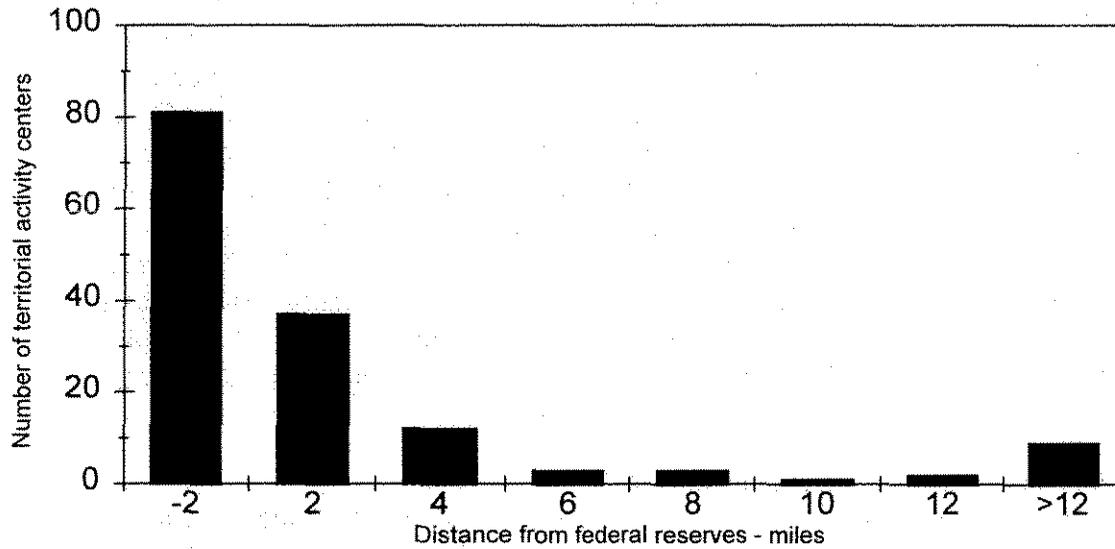
#### **SPOTTED OWL USE OF DNR-MANAGED FOREST LANDS**

There are 145 territorial spotted owl site centers that are either on DNR-managed lands or potentially use DNR-managed lands in the five west-side planning units (WDFW 1995c). Territorial sites are considered to be those classified as either status 1, status 2 or status 3 sites by the Washington Department of Fish and Wildlife. Status 1 sites are those at which spotted pairs have been confirmed. Status 2 sites are those at which the presence of two resident birds has been confirmed, but the pair status of the two birds has not been confirmed. For the purposes of this analysis, status 2 sites are counted as "pair" sites. Status 3 sites are those at which one resident spotted owl has been confirmed. These are the only sites discussed in this analysis. Status 4 sites are also recorded in the WDFW database, but the resident (i.e., territorial) status of spotted owls located at these sites has not been confirmed. In landscapes that have been well-surveyed, status 4 sites are not likely to be territorial sites that were simply missed through incomplete surveys. However, in landscapes that have not been well surveyed, it is possible that status 4 sites could actually be territorial sites. The present analysis did not attempt to estimate the number of status 4 sites that occur in landscapes that are considered to not be thoroughly surveyed.

DNR-managed lands that are within the radius of a circle that most closely approximates a median annual home range of spotted owl pairs for a particular spotted owl province are considered to be potentially used by the owl pairs or territorial single owls that have been recorded at activity centers. This radius is 2.7 miles for the Olympic Peninsula and western Washington lowlands and 2.0 miles for the western Cascades (Hanson et al. 1993).

The distribution of site centers by distance band from federal reserves is shown in Table 4.2.5 and Figure 4.2.2. Almost 80 percent of the spotted owl sites that affect DNR-managed lands occur on or within 2 miles of federal reserves.

**Figure 4.2.2: Distribution of territorial activity centers affecting DNR-managed lands in the five west-side planning units**



**Table 4.2.5: Number of territorial spotted owl activity centers within a median home range radius of DNR-managed lands in distance bands from federal reserves**

Distance from federal reserves (miles)	Number of territorial pair and single activity centers	Percent of total number of activity centers within distance band
-2.0 - 0.0 <sup>5</sup>	79	54.4
0.0 - 2.0	36	24.8
2.1 - 4.0	12	8.3
4.1 - 6.0	3	2.0
6.1 - 8.0	3	2.0
8.1 - 10.0	1	0.7
10.1 - 12.0	2	1.4
> 12.1	9	6.2
Totals	145	100

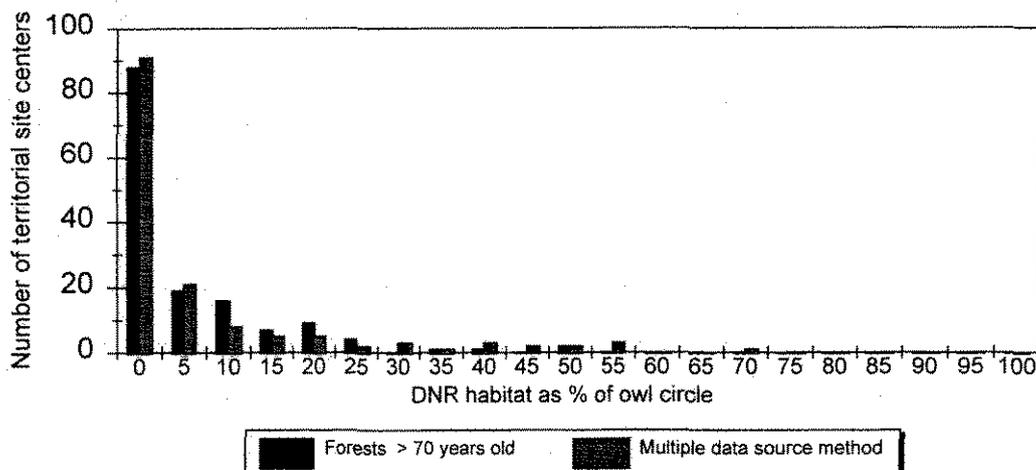
**Contribution of habitat to individual site centers**

DNR-managed lands currently contribute between 64,900 (forests greater than 70 years old) and 89,700 (multiple data source method) acres of suitable habitat to known territorial spotted owl activity centers that are within a median home range radius of DNR-managed lands in the five west-side planning units. The mean contribution of habitat per activity center using forests older than 70 years as habitat is 705 acres. The mean contribution of habitat per activity center using the multiple data source method is 849 acres.<sup>6</sup> The distribution of amount of habitat per activity center using both methods is shown in Figure 4.2.3. There are between 4 and 12 site centers to which DNR-managed lands contribute 40 percent or more of the total area of median home range-sized circle, depending on the estimation method used. Over 70 percent (between 107 and 112 activity centers) of the 145 spotted owl circles which overlap DNR-managed lands include habitat on DNR-managed lands that amounts to between 0-10 percent of the total area of the circle.

<sup>5</sup> This distance band is for activity centers located on federal reserve lands and within 2.0 miles of DNR-managed lands.

<sup>6</sup> These acreage figures were calculated on a per site basis, i.e., by counting habitat in individual owl circles separately. Some habitat contributes to more than one spotted owl activity center.

**Figure 4.2.3: Amount of habitat on DNR-managed lands within territorial spotted owl circles in the five west-side planning units**



**Evaluation of Alternatives for Their Impact on the Northern Spotted Owl - Five Western Washington Planning Units**

**Evaluation Criteria**

Alternative A (the No Action alternative), Alternative B, and Alternative C are evaluated for their impacts to spotted owls using five criteria. These are: (1) change in the amount and distribution of nesting, roosting and foraging habitat over 100 years; (2) impacts to spotted owl activity centers over the next 100 years; (3) qualitative comparison of provision of dispersal habitat; (4) contribution to demographic support of the spotted owl population in the five west-side planning units; and, (5) contribution to maintenance of species distribution in the five west-side planning units. The discussions of contribution to demographic support to the population and maintenance of species distribution are synthesized and the information presented in items 1, 2 and 3.

**Criterion 1: Change in Amount and Distribution of Nesting, Roosting, and Foraging Habitat**

The purpose of this criterion is to assess the change in (1) the overall amount of suitable spotted owl nesting, roosting, and foraging habitat on DNR-managed lands; and, (2) the distribution of suitable habitat on DNR-managed lands relative to federal reserves as a result of implementing each alternative. The two estimation methods previously described are used as the basis for comparing amounts of suitable habitat that would be retained on DNR-managed lands under implementation of each alternative. The results of

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forest growth and harvest models are used to predict amounts of spotted owl habitat under one potential set of management regimes for Alternatives A and B. Harvest modeling was not conducted for Alternative C. Rationales for predicting both amount and distribution of habitat that are specific to each alternative are discussed in a short methods section under each alternative.

#### **AMOUNT**

##### **Alternative A**

Under Alternative A, management for spotted owls will continue on a circle-by-circle basis. Harvest of suitable spotted owl habitat will generally occur within spotted owl circles down to 40 percent of the area of the circle. A full discussion of incidental take and associated habitat requirements is included in this DEIS. Habitat outside of spotted owl circles will eventually be harvested. For those circles that are already below 40 percent, no new habitat will be developed. Given that DNR would not manage its lands to develop any new spotted owl habitat (i.e., the incentive under Alternative A is to not allow forests within spotted owl circles to reach an age where they would be considered suitable spotted owl habitat because this would put more acres under constraint from harvest), any habitat within spotted owl circles that is lost due to natural or human-caused disturbance will not be replaced. In addition, under Alternative A DNR would have the opportunity to decertify (change to historic status) existing spotted owl circles through a 3-year survey protocol. Any suitable habitat on DNR-managed lands within spotted owl circles that would be decertified would be available for harvest. The amount of suitable habitat lost depends on the number of circles decertified over the next 100 years.

**Methods.** In order to assess how much spotted owl habitat would be retained under Alternative A, the following simplifying assumptions are made. The first major assumption is that the rescinded federal take guidelines (USDI 1990) as followed under present Board of Natural Resources policy will continue to be applied to DNR-managed lands for the next 100 years. These guidelines are generally interpreted to mean that the amount of habitat within a specified radius of an established spotted owl site center must remain above 40 percent of the area of the circle. This radius is currently 1.8 miles for the Western Washington Cascades Province and 2.7 miles for the Western Washington Lowlands Province and the Olympic Peninsula Province (Frederick 1994). Some further generalizations are made about how these guidelines will be applied under Alternative A. If the amount of habitat is at or below 40 percent, no landowner or manager can harvest habitat (unless they have an incidental take permit). Thus, it is assumed that any habitat on DNR-managed lands that is within spotted owl circles with 40 percent habitat or less would be unavailable for harvest. It is also assumed that if more than 40 percent of a circle has extant habitat within a federal reserve, other landowners or managers would not generally "take" owls, or put the site at risk for taking owls, by harvesting habitat on their lands. In reality, a case-by-case assessment of incidental take would consider the proximity of nonfederal habitat to the site center and the amount of habitat within a 0.7-mile core of the site center (USDI 1990). DNR's habitat databases do not allow for a high level of confidence in the accuracy of assessing habitat conditions within a 0.7-mile core of all known spotted owl locations. Thus the assessment of when implementation of incidental take guidelines would prohibit or allow harvest of habitat is based on whether or not the overall habitat level within an owl circle is at 40 percent. It is further assumed

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that if a circle has more than 40 percent habitat and the majority of the habitat is divided among multiple landowners and there is less than 40 percent habitat on federal reserves, whatever habitat exists on DNR-managed lands would not be harvested. This assumption is based on a scenario in which other landowners or managers would harvest habitat on their lands such that the overall level would decrease to 40 percent before DNR harvested habitat on the lands it manages.

The second major simplifying assumption is that owl sites known in 1996 will remain static throughout the life of the analysis time frame (100 years). This assumption is made because it is difficult, if not impossible, to predict when and how owl sites will move over time. In reality, owl sites will move and any habitat that is no longer within a regulatory circle will become available for harvest. Thus the amount of habitat predicted to be retained over the next 100 years by following the rescinded federal take guidelines based on known locations of spotted owl site centers is likely an overestimate.

The third simplifying assumption is that no habitat will be lost to disturbance or attrition over the next 100 years. Again, it is difficult to predict how much could be lost to such factors. Thus the amount of habitat predicted to remain within known spotted owl circles is again overestimated using this assumption.

The fourth major assumption is that there are probably spotted owls that presently use DNR-managed lands that have not yet been discovered due to lack of surveys. Because the amount of spotted owl habitat that would be retained under Alternative A depends on **both** the number of known spotted owl sites **and** the number of undiscovered sites that may presently affect DNR-managed lands that have not yet been surveyed for spotted owls, it is assumed that at some point during the analysis period, these unknown sites would be discovered through surveys. The method for estimating the number of unknown sites is described immediately below.

Thirty-one percent of DNR-managed lands (515,900 acres) in the entire HCP planning area outside of the OESF have not been surveyed for spotted owls. Of this, the multiple data source method of habitat classification shows that 110,800 acres are spotted owl habitat. The method used to estimate the number of unknown spotted owls using unsurveyed DNR-managed forests follows that of Holthausen et al. (1994). Their estimate for the Olympic Peninsula was done by dividing the number of known owl sites by the estimated proportion of land area that was surveyed. Their estimate is equivalent to that obtained using the following relationship:

$$\frac{\text{acres surveyed land}}{\text{acres unsurveyed land}} = \frac{\text{number of known owls}}{\text{number of unknown owls}}$$

There are several assumptions implicit to this calculation. The weakest of these assumptions is that all unsurveyed lands are equally likely to support spotted owls. In fact, this is far from true. Many unsurveyed lands lack adequate habitat to support spotted owls. Unserved areas may have forests too young to function as spotted owl habitat or may lie in areas where forests are highly fragmented. Another weak

assumption is that the survey effort is unbiased with respect to spotted owl habitat. Spotted owl surveys are conducted where there is a reasonable possibility for the presence of spotted owls. To overcome these weaknesses two analyses were performed which, in combination, allow the elimination of some unsurveyed lands from the above calculation.

The objective of the first analysis was to describe the typical landscape conditions surrounding known spotted owl site centers. The amount of owl habitat is tabulated within an exclusive home range radius for all known site centers in the HCP planning area, excluding the OESF. It was thought that an examination of exclusive home ranges rather than median home ranges would yield a better model for predicting the occurrence of spotted owls. The exclusive home range radius was calculated by reducing the area of the median annual home range by 30 percent. This same method was used by USDA (1992) and is based on the average proportion of overlap between annual home ranges of spotted owl pairs. The exclusive home range radii for the Western Washington Cascades, Western Washington Lowlands and Olympic Peninsula (same radius for both provinces), and Eastern Washington Cascades provinces were 1.67, 2.26, and 1.51 miles, respectively. The results of this analysis are given in Table 4.2.6. In all provinces, 90 percent of known site centers had approximately 20 percent or more owl habitat within an exclusive home range radius. This indicates that areas on the order of an exclusive home range that have less than 20 percent habitat are very unlikely to support territorial spotted owls. This concurs with an analysis by Bart and Forsman (1992) which showed that spotted owls are very rarely found in landscapes dominated by younger forest (less 80 years old). In their study, all measures of owl abundance were significantly lower on areas with less than 20 percent older forest.

**Table 4.2.6: Analysis of spotted owl habitat within an exclusive home range radius of all known territorial site centers in the HCP planning area**

Habitat classification based on the multiple data source method. Olympic Peninsula excludes the OESF Planning Unit.

Province	mean (percent habitat)	median (percent habitat)	90th percentile (percent habitat)	n
Western Cascades	43	45	20.5	431
Olympic Peninsula, Washington Lowlands	46	48	18	242
Eastern Cascades	45	44	19	291

The objective of the second analysis was to describe spotted owl habitat conditions in and around DNR-managed lands. A binary habitat grid was constructed from the multiple

data source habitat classification.<sup>7</sup> Grid cells were 1 acre in size. Grid cells classified as habitat were set to one and cells classified as nonhabitat were set to zero. A circular analysis window with a radius equal to the exclusive home range radius was moved across the habitat grid from cell to cell. At each grid cell the focal sum of habitat within the analysis window was calculated. In this way, the amount of owl habitat within an exclusive home range radius of every DNR-managed acre was determined. The analysis window looked at all lands: federal, tribal, private, and DNR-managed. The end result of this analysis is a map which shows DNR-managed lands that have 1 percent habitat within an exclusive home range radius, 2 percent habitat within an exclusive home range radius, 3 percent habitat, and so on.

Using the results of the two analyses, all unsurveyed DNR-managed lands with less than 20 percent habitat within an exclusive range radius from the estimate for unknown site centers are eliminated. To maintain the proportional relationships of the calculation the same elimination process was done for surveyed lands. Hence, the relationship used to estimate the number of unknown spotted owls was:

$$\frac{\text{acres surveyed land with greater than 20 percent habitat within an exclusive home range radius}}{\text{acres unsurveyed land with greater than 20 percent habitat within an exclusive home range radius}} = \frac{\text{number of known owls}}{\text{number of unknown owls}}$$

To arrive at the number of unknown owls then, rearrange the above equation is rearranged as follows:

$$\text{number of unknown owls} = \frac{\text{acres of unsurveyed land}^8 \times \text{known owls}}{\text{acres of surveyed land}}$$

The above methodology results in a projection of 42 territorial activity centers that are on or within a median spotted owl home range radius of DNR-managed lands in the five west-side planning units (36 in the Western Washington Cascades Province and six in the Western Washington Lowlands and Olympic Peninsula provinces excluding all lands in the OESF Planning Unit).<sup>9</sup>

<sup>7</sup> The age class method was not used. This is because the intent was to calculate the amount of habitat on other ownerships surrounding DNR-managed lands. DNR does not have access to age class data for other ownerships or management jurisdictions. The data layer developed using the multiple data source method is the only data available for all ownerships.

<sup>8</sup> Assume acres of unsurveyed and surveyed lands includes the process for eliminating areas with less than 20 percent habitat within an exclusive home range radius.

<sup>9</sup> For the western Washington Cascades, there are 124 known sites on 319,430 acres of surveyed lands with greater than 20 percent habitat within an exclusive home range radius. This works out to 0.0004 sites per acre. Multiplying 0.0004 by 91,995 (the acres of unsurveyed lands with greater than 20 percent habitat within an exclusive home range radius) yields an estimate of 36 spotted owl sites on unsurveyed

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The acreage of habitat that would be included within spotted owl circles for these undiscovered activity centers is estimated by multiplying the average contribution of habitat on DNR-managed lands to current site centers (448 acres using forests older than 70 years as habitat and 619 acres for the multiple data source method<sup>10</sup>) by the number of undiscovered activity centers. This estimate rests on an assumption that habitat on unsurveyed lands occurs in a similar distribution and configuration to that on surveyed lands. These elements were not analyzed in detail on unsurveyed lands. This procedure results in an estimate of an additional 18,816 acres of habitat within spotted owl circles (forests older than 70 years as habitat) or 25,998 acres (multiple data source method).

**Results.** Following the above four sets of assumptions (general application of incidental take guidelines, static owl circles, no loss of habitat to disturbance, and habitat retained at projected unknown sites), an evaluation of the amount of suitable spotted owl habitat that would be retained under Alternative A can be made. There are an estimated 60,090-81,427 acres of suitable spotted owl habitat within known spotted owl regulatory circles (circles of 1.8-mile radius in the western Washington Cascades and 2.7 miles in the western Washington lowlands and the Olympic Peninsula). Of this, between 32,420 and 41,584 acres<sup>11</sup> of habitat are within circles that currently have less than 40 percent habitat. It is assumed that these acres will be unavailable for harvest. Between 4,995 and 5,934<sup>12</sup> acres of habitat on DNR-managed lands are within circles in which the 40 percent habitat requirement is met entirely within federal reserves. It is assumed that the habitat on DNR-managed lands within these circles will be available for harvest because incidental take would not likely occur as a result of removal of habitat on DNR-managed lands. For the remaining acres of suitable habitat on DNR-managed lands (i.e., those that are within circles that have more than 40 percent total habitat currently, but that habitat is split among multiple landowners and managers), it is assumed DNR will stay in compliance with take guidelines and thus the habitat will be unavailable for harvest. For projected sites that may occur within 2 miles of federal reserves, it is assumed that approximately 20 percent of these sites would have more than 40 percent of their median home range circles in habitat on federal lands and that in these circles, habitat on DNR-managed lands would be available for harvest. It is also assumed that any habitat on DNR-managed

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lands. In the western Washington lowlands, there are 21 sites on 100,610 acres of surveyed lands with greater than 20 percent habitat within an exclusive home range radius giving 0.0002 sites per acre. Multiplying 0.0002 by 30,619 acres yields an estimate of six sites on unsurveyed lands.

<sup>10</sup> These acreage figures do account for overlap of circles which is why they are smaller than the figures cited previously.

<sup>11</sup> In this instance, this lower figure is the habitat estimate based on the multiple data source method and the higher acreage figure is the estimate based on forests older than 70 years. This is because there are more spotted owl activity centers with less than 40 percent habitat based on using forests older than 70 years as a surrogate for habitat on DNR-managed lands (76) versus using the multiple data source method (67) for habitat on DNR-managed lands.

<sup>12</sup> For acres of habitat on DNR-managed lands that are within spotted owl circles with more than 40 percent habitat in federal reserves, using forest older than 70 years gave a higher acreage estimation for DNR-managed lands than did the multiple data source method. This is again an exception to the overall pattern.

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lands within projected owl circles that occur farther than 2 miles from federal reserves would be retained to comply with take guidelines.

For the purposes of analysis, the 42 projected unknown sites were distributed by distance band in proportion to the distribution of acres of unsurveyed lands that had more than 20 percent habitat within an exclusive home range radius and the proportion of known sites that occur within each distance band. The results of the "moving window" analysis for unsurveyed lands described above were broken out by distance band to estimate where unknown site centers might occur. Analysis started with the assumption that the distribution of known sites would serve as a good predictor of how projected unknown sites influencing unsurveyed lands might be distributed, then examined the distribution by distance band of unsurveyed lands that would likely support spotted owl sites to assess whether the number of unknown sites that would occur in each distance band if distributed in the same proportion as known sites could be supported by the habitat patterns occurring on and around unsurveyed lands. Based on the distribution of habitat that could support owls on unsurveyed lands, it is reasonable to assume that site center distribution is proportional to the distribution of known sites is reasonable. The results of this distribution of projected unknown site centers are in Table 4.2.7.

**Table 4.2.7: Distribution of projected unknown spotted owl site centers that may influence unsurveyed DNR-managed lands and known sites that influence DNR-managed lands**

Distance from Federal Reserves (miles)	Number of projected unknown site centers that influence DNR-managed lands	Number of known sites that influence DNR-managed lands	Total known and projected site centers that influence DNR-managed lands
0.0 - 2.0 <sup>13</sup>	33	115	148
2.1 - 4.0	4	12	16
4.1 - 6.0	1	3	4
6.1 - 8.0	1	3	4
8.1 - 10.0	0	1	1
10.1 - 12.0	1	2	3
>12	2	9	11
Totals	42	145	187

After subtracting acres of habitat that would be available for harvest from spotted owl circles in which DNR would not likely be required to provide habitat,<sup>14</sup> an additional 15,700 acres (age class older than 70 method) to 21,700 acres (multiple data source method) of habitat would be retained around projected unknown sites. A total of between 69,600 (age class older than 70) and 98,100 (multiple data source method) acres of habitat would be within spotted owl circles and unavailable for harvest.

In summary, 37 percent of the 186,000 acres of suitable spotted owl habitat on DNR-managed lands (forests 70 years old and older) and 27 percent of the 366,00 acres of habitat (using the multiple data source method) would remain to contribute to spotted owl activity centers. Under Alternative A, the rest of the suitable habitat outside of spotted owl regulatory circles on DNR-managed lands would not be managed specifically for spotted owl habitat. There are an additional 52,089 acres of DNR-managed forest lands

<sup>13</sup> Includes sites that may be (projected sites) or are known to be on federal reserves and within 2 miles of DNR-managed lands.

<sup>14</sup> The amount of habitat that is subtracted from what we estimate to be retained around unknown sites is 3,136 acres using forests older than 70 years as habitat and 4,333 acres using the multiple data source method. These acreage figures were calculated by assuming that 20 percent of the unknown sites within 2 miles of federal lands would have more than 40 percent habitat on federal reserves. Thus seven sites multiplied by an average contribution of habitat from DNR-managed lands of 448 acres (age class older than 70 years) or 619 acres (multiple data source method).

that are older than 70 years old that will be managed as off-base lands (i.e., no harvest will take place on these lands) for reasons other than compliance with spotted owl take guidelines. These reasons include compliance with Washington Forest Practices Rules and DNR's Forest Resource Plan for riparian management zones and unstable slope protection and deferral of potential marbled murrelet habitat. (Lands managed by DNR as Natural Area Preserves and Natural Resource Conservation Areas are included in the calculation of off-base lands because they contribute habitat. They are not, however, legally included under the terms of the proposed HCP. See draft HCP Chapter 1, section on "Lands Covered," and the Implementation Agreement.) These acres of off-base lands older than 70 years may or may not contribute habitat to spotted owls, depending on their spatial arrangement. Large contiguous blocks of older forest managed to avoid take of marbled murrelets for example, could contribute functional habitat to spotted owls. Older forests in narrow riparian leave areas probably would not make a significant contribution to the life needs of the spotted owl. For the purposes of analysis it is assumed that any benefit to spotted owls from these off-base lands will be incidental. The change in the amount of suitable spotted owl habitat under Alternative A is summarized in Tables 4.2.8. and Table 4.2.9.

**Table 4.2.8: Change in amount of potentially suitable spotted owl habitat on DNR-managed lands in the five west-side planning units under Alternative A (using forests 70 years old and older as habitat estimation method)**

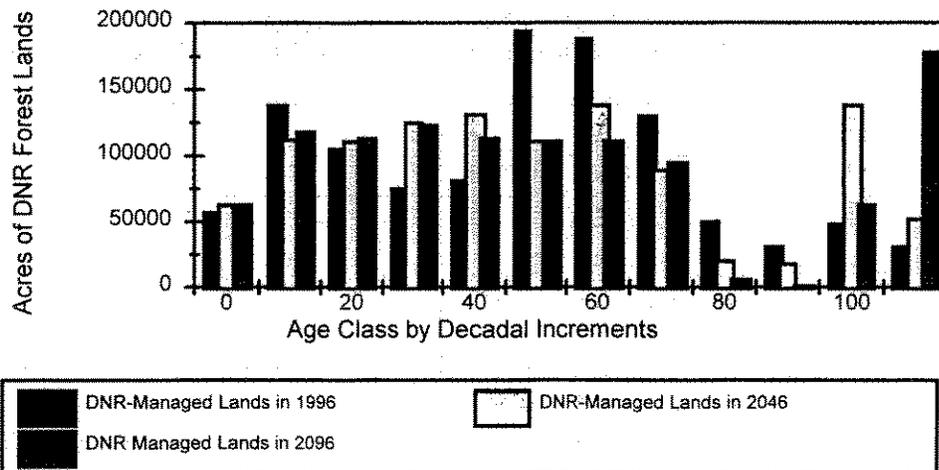
A.	Total estimated acres of potential suitable habitat in 1996	186,000
B.	Estimated acres of potential suitable habitat unavailable for harvest within known spotted owl circles in 1996	54,300
C.	Estimated acres of potential suitable habitat within projected unknown spotted owl circles that are <u>unavailable</u> for harvest	15,700
D.	Total acres potential suitable habitat to be retained under Alternative A (B. plus C.)	70,000
E.	Acres present potential suitable habitat not to be managed for spotted owls (A. minus D.)	116,000

**Table 4.2.9: Change in amount of potentially suitable spotted owl habitat on DNR-managed lands in the five west-side planning units under Alternative A (using multiple data source method of habitat estimation)**

A.	Total estimated acres of potential suitable habitat in 1996	366,000
B.	Estimated acres of potential suitable habitat unavailable for harvest within known spotted owl circles in 1996	76,400
C.	Estimated acres of potential suitable habitat within projected spotted owl circles that are <u>unavailable</u> for harvest	21,700
D.	Total acres potential suitable habitat to be retained under Alternative A (B. plus C.)	98,100
E.	Acres present potential suitable habitat not to be managed for spotted owls (A. minus E.)	267,900

DNR modeled one potential set of harvest regimes for its lands for the next 100 years under Alternative A. Age class distributions in 1996, 2046 and 2096 are shown in Figure 4.2.4. The model predicts that there will be approximately 253,000 acres of forests older than 70 years by the end of the analysis period (100 years) under Alternative A. DNR estimates that there would be approximately 70,00 acres of forests older than 70 years inside spotted owl circles by 2096. Thus, there could be 183,000 acres of forests older than 70 years outside of spotted owl circles by 2096. However, modeling of Alternative A includes the maintenance of marbled murrelet habitat. Because of the uncertainty associated with continuation of a policy that defers harvest of potential marbled murrelet habitat on DNR-managed lands for the next 100 years, it is difficult to rely on the presence of this projected older forest habitat for potential use by spotted owls.

**Figure 4.2.4: Age Class Distribution on DNR-managed lands from 1996 to 2096 - Alternative A**



**Alternative B**

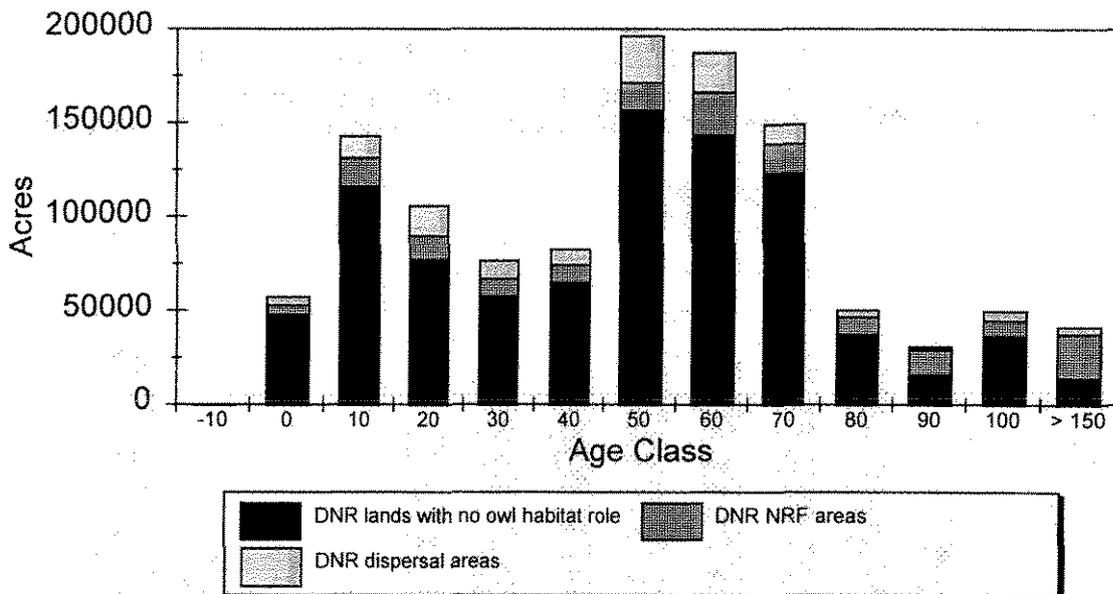
Under Alternative B, DNR would manage approximately 163,000 acres of its lands in the five west-side planning units as NRF management areas. DNR has proposed to maintain at least 50 percent of the area of its designated NRF management areas for nesting, roosting, and foraging habitat at any one time. The scale of measurement for the 50 percent requirement is on DNR-managed lands within a watershed administrative unit. Thus, 81,500 acres of DNR-managed lands should be in NRF habitat at any one time. DNR proposes to manage approximately 20,400 acres in high quality nesting habitat, arranged in 300-acre patches, and the remaining 61,100 acres in sub-mature quality habitat or better. Another element of Alternative B is that it allows for degradation of existing old forest habitat to sub-mature habitat as long as the nest habitat patch requirement is met. In addition, any new habitat that is developed need only meet the structural characteristics of sub-mature habitat.

This arrangement of high quality nest habitat and sub-mature habitat is proposed for the initial "research" phase of the HCP (DNR 1996a p. IV.1). The 20,400 acres of nest habitat patches are deferred from harvest during the research phase of the proposed HCP. During this period DNR would conduct research to: (1) refine stand-level definitions of nest habitat in managed landscapes; (2) acquire a better understanding of what constitutes an adequate distribution of nesting structure at the landscape level; and, (3) develop silvicultural techniques to produce forest stands with sufficient nesting structure (DNR 1996a p. IV.1). DNR's goal is to provide nest habitat in a managed landscape (DNR 1996a p. IV.1). Because DNR does not specify the duration of its research phase, it is difficult to predict the specific outcome of DNR's proposed research program. The language in the draft HCP however, commits DNR to provide an amount and configuration of spotted owl nesting habitat that is consistent with the results of research findings regarding both stand and landscape requirements for successful nesting. Any

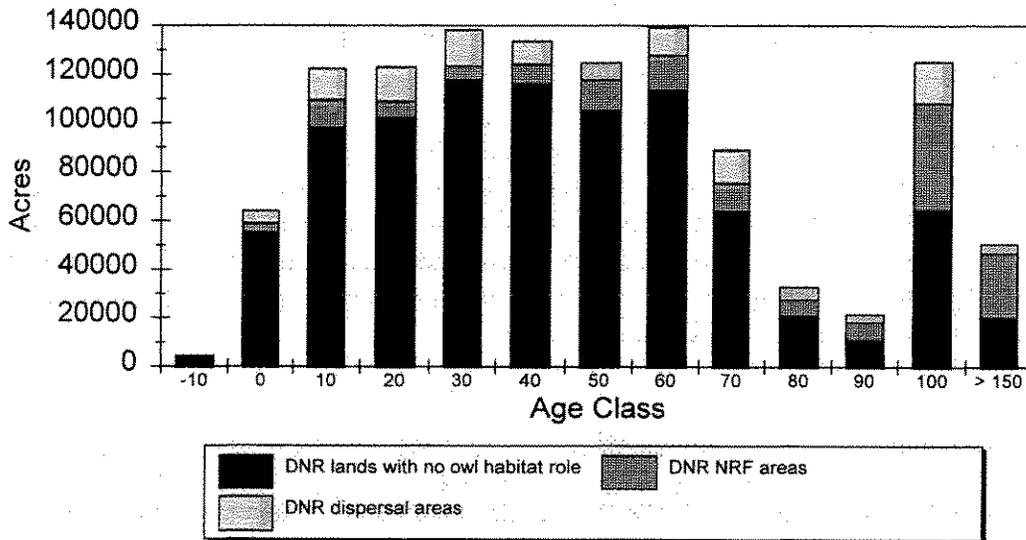
change in level of nesting habitat would have to be approved by the U.S. Fish and Wildlife Service (DNR 1996a p. IV.7). Further, any change that resulted in an increased level of take would require that DNR and U.S. Fish and Wildlife Service go through an amendment process (DNR 1996b). Based on these commitments, it is assumed for the purposes of analysis that over the term of its permit period under Alternative B, DNR would provide at least the same level of nesting habitat in the landscape as it would provide during the research phase.

The projected change in age class distribution on DNR-managed lands under Alternative B over the next 100 years is shown in Figures 4.2.5-4.2.7. (These figures include age class distribution in DNR-designated dispersal areas. Dispersal habitat is discussed under Criterion 3 below.) The projected change in age class distribution for NRF management areas only is shown in Figure 4.2.8. The change in amount of potentially suitable spotted owl habitat is summarized in Tables 4.2.10 and 4.2.11.

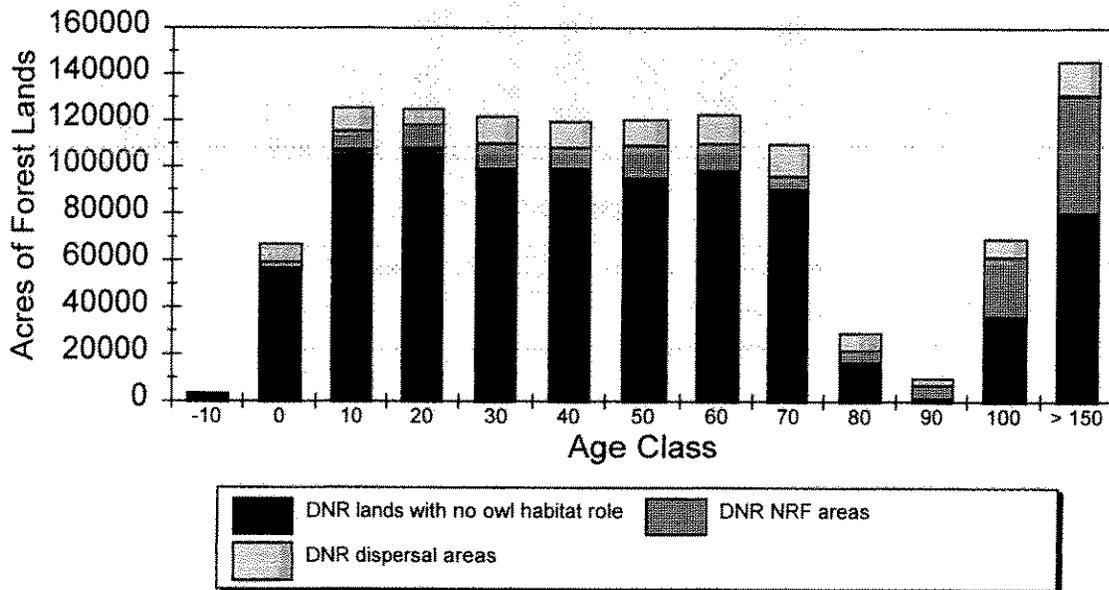
**Figure 4.2.5: Age class distribution within five west-side planning units under Alternative B - 1996**



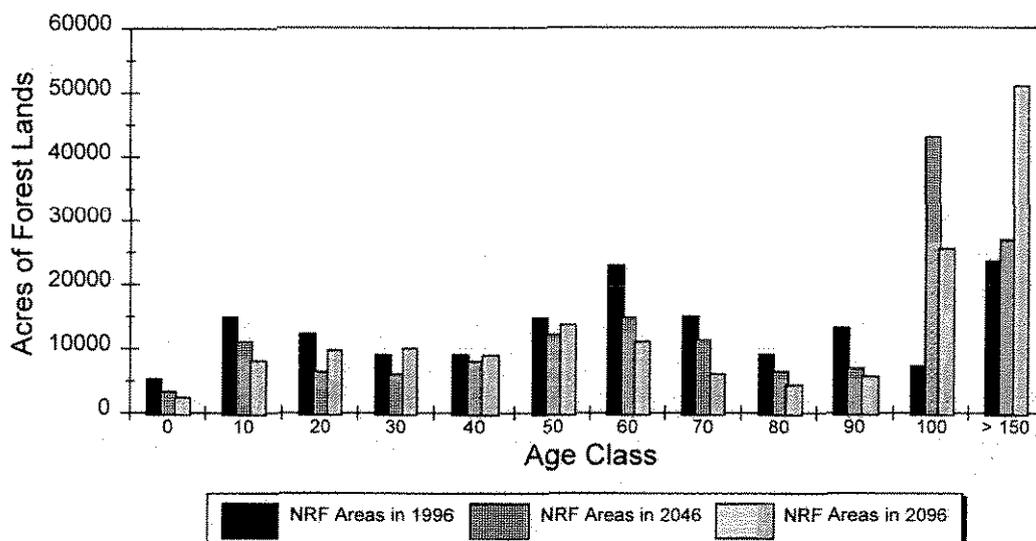
**Figure 4.2.6: Age class distribution within five west-side planning units under Alternative B - 2046**



**Figure 4.2.7: Age class distribution within five west-side planning units under Alternative B - 2096**



**Figure 4.2.8: Age class distribution within DNR NRF areas from 1996 to 2096 - Alternative B**



As discussed for Alternative A, there are between 186,000 and 366,000 acres of potentially suitable nesting, roosting, and foraging habitat currently on DNR-managed lands. Management of DNR-managed lands under Alternative B will result in the development and maintenance of at least 81,500 acres of suitable nesting, roosting and foraging habitat within proposed NRF management areas in the five west-side planning units. DNR modeled forest growth and one potential set of harvest regimes that will meet the conservation commitments made in its proposed HCP, including requirements of the marbled murrelet, riparian, and multispecies conservation strategies. The results of DNR's model predict the existence of 94,859 acres of forest older than 70 years within NRF areas by the year 2046, 27,000 acres of which will be older than 150 years. By the year 2096 the model shows the existence of 92,694 acres of forest older than 70 years, 51,000 acres of which will be in forest stands older than 150 years old. Nesting, roosting, and foraging habitat maintained within NRF management areas under Alternative B should occur in a size and spatial arrangement useful to spotted owls because of the 50 percent area requirement within watershed administrative units. This is a defensible assumption because of the proximity of NRF areas to federal reserves and because the average amount of habitat on NRF management areas within a WAU is 1,350 acres. Given the distribution of DNR-managed lands designated as NRF areas, most habitat patches are likely to either be contiguous or occur within a median home range distance of other habitat patches. Presently, 143,000 acres of NRF management areas (out of a total of 163,000) have 20 percent or more habitat within an exclusive home range radius (see previous description of the "moving window" analysis. These conditions will only improve as habitat develops on adjacent federal reserves and in NRF management areas that are currently below their target condition.

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The model shows the presence of 211,000 acres of forests older than 70 years in areas that will not be managed intentionally for spotted owl NRF habitat (including dispersal areas) in the year 2046; 23,700 of which will be older than 150 years. In the year 2096, the model predicts that there will be 271,500 acres of forest older than 70 years in areas outside of designated NRF management areas; 94,926 acres of which will be older than 150 years. Under Alternative B, between 117,513 and 281,046 acres of current potentially suitable habitat would not be managed specifically for spotted owls. Between 31,700 and 39,100 acres of this occurs within known spotted owl circles, so is likely functioning as spotted owl habitat.

While there is a net gain of over 150,000 acres of forests older than 70 years outside of NRF management areas over the 100-year analysis period, it cannot be said with confidence what the benefit of these stands will be to spotted owls outside of NRF areas. Their value will depend to a large degree on spatial arrangement, proximity to sources of colonization,<sup>15</sup> and past disturbance history of the stands. Larger contiguous blocks have a higher habitat value than older forest that occurs in small patches or narrow strips. Stands that are distant and isolated from occupied and reproductively successful owl sites would not have a high probability of becoming occupied themselves. Stands with past harvest or natural disturbance history that left little structural complexity (i.e., a few large snags, large live trees and down woody debris) would not likely function as spotted owl habitat. For stands within NRF management areas, management regimes would be applied that are designed to retain and/or create structural features used by spotted owls. There is no such commitment for DNR-managed lands outside of NRF areas. These uncertainties should be kept in mind when considering the acres of forests older than 70 years outside of NRF management areas. The change in amount of potentially suitable spotted owl habitat on DNR-managed lands under Alternative B is summarized in Tables 4.2.10 and 4.2.11.

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<sup>15</sup> See discussion of source and sink dynamics in section on demographic support, p.-64

**Table 4.2.10: Change in amount of suitable spotted owl habitat expected by the year 2096 for the five west-side planning units under Alternative B (habitat estimated as forests 70 years old and older)**

<b>A. Within NRF Management Areas</b>	
<b>Expected Suitable Habitat:</b>	
Acres potential habitat in 1996	68,487
Net acres to be developed to meet HCP goal of 81,500 acres	13,013
Additional expected acres suitable habitat based on forest growth and harvest model	11,194
<b>Total:</b>	<b>92,694</b>
Acres suitable habitat in forests older than 150 years by 2096	51,000
<b>B. Outside NRF Management Areas</b>	
<b>Net Change in Potential Suitable Habitat</b>	
Acres of forests older than 70 years outside of NRF areas in 1996	117,513
Acres of forests older than 70 years with potential incidental benefit to spotted owls in 2096	271,500
Net gain in acres of forests older than 70 years with potential incidental benefit to spotted owls by 2096	153,987

**Table 4.2.11: Change in amount of potential suitable spotted owl habitat under Alternative B in the five west-side planning units using the multiple data source method of habitat estimation**

<b>A. Within NRF Management Areas</b>	
<b>Expected Suitable Habitat:</b>	
Acres potential habitat in 1996	84,954
Net acres to be developed to meet HCP goal of 81,500 acres	- 3,454
Additional expected acres suitable habitat <sup>16</sup> based on forest growth and harvest model	11,194
<b>Total:</b>	<b>92,694</b>
Acres of NRF management areas in forests older than 150 years by 2096	51,000
<b>B. Outside NRF Management Areas</b>	
<b>Net Change in Potential Suitable Habitat</b>	
Acres of habitat outside of NRF areas in 1996	281,046
Acres of forests older than 70 years with potential incidental benefit to spotted owls in 2096	271,500
Net loss in acres of forest with potential incidental benefit to spotted owls by 2096	9,546

<sup>16</sup> Potential suitable habitat in terms of the forest growth model is considered forest older than 70 years. For forest stands within NRF management areas, DNR's growth model took into account silvicultural regimes that would theoretically produce the structural characteristics of sub-mature habitat (Hanson et al. 1993) by the time a stand reached 70 years of age.

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Implementation of Alternative B would result in a decrease of 63-77 percent from the amount of potential habitat present in 1996 if just habitat to be managed for spotted owls is considered. Considering the total acres of forest older than 70 years that would exist in 2096, Alternative B would result in a increase of 83 percent from current acres of forests older than 70 years.

Alternative B results in the retention of 11,900 more acres of habitat that would be managed specifically for spotted owls than Alternative A when using forests 70 years old and older to estimate habitat. This alternative results in a decrease of 16,600 acres using the multiple data source method of estimating habitat.

### **Alternative C**

Under Alternative C, DNR would manage 243,496 acres of its lands in NRF management areas in the five west-side planning units. An additional 80,253 acres of designated NRF management areas occur in the Straits Planning Unit (Map 17). In this alternative, DNR would manage 60 percent of its lands designated as NRF management areas in suitable nesting, roosting, and foraging habitat at any one time.

No degradation of existing old forest habitat is allowed in this alternative and, any habitat that is developed in WAUs in which there is less than 60 percent habitat will be developed into old forest habitat. Thus, Alternative C seeks to improve habitat quality over time. Alternative C does not contain the nest habitat patch component that is contained in Alternative B. There are also 43,000 acres of experimental areas designated in the South Coast Planning Unit (Map 18). These experimental areas would be established as 4-mile management buffers around five known spotted owl site centers on DNR-managed lands. They would be managed with the goal of learning how to maintain successfully reproducing spotted owls in actively managed landscapes. The site centers contained within these experimental areas would actually be part of the incidental take permit to reflect the risk posed by conducting research activities within spotted owl home ranges.

DNR's goal under Alternative C would be to develop and maintain 146,100 acres of suitable nesting, roosting, and foraging habitat within NRF management areas over the life of the HCP. This does not include the habitat that may be maintained or developed in the experimental management areas in the South Coast Planning Unit. The change in amount of potential nesting, roosting, and foraging habitat on DNR-managed lands is summarized in Tables 4.2.12 and 4.2.13.

**Table 4.2.12: Change in amount of suitable spotted owl habitat expected by the year 2096 for the five west-side planning units under Alternative C (habitat estimated as forests 70 years old and older)**

<b>A. Within NRF Management Areas</b>	
<b>Expected Suitable Habitat:</b>	
Acres potential habitat in 1996	80,497
Net acres to be developed to meet HCP goal	65,603
<b>Total acres spotted owl habitat by 2096</b>	<b>146,100</b>
<b>B. Outside NRF Management Areas</b>	
Acres of forests older than 70 years outside of NRF areas in 1996	105,503
Acres of forests older than 70 years with potential incidental benefit to spotted owls in 2096	447,300

**Table 4.2.13: Change in amount of suitable spotted owl habitat expected by the year 2096 for the five west-side planning units under Alternative C (multiple data source method used to estimate habitat)**

<b>A. Within NRF Management Areas</b>	
<b>Expected Suitable Habitat:</b>	
Acres potential habitat in 1996	98,430
Net acres to be developed to meet HCP goal	47,670
<b>Total acres spotted owl habitat by 2096:</b>	<b>146,100</b>
<b>B. Outside NRF Management Areas</b>	
Acres of forests older than 70 years outside of NRF areas in 1996	267,570
Acres of forests older than 70 years with potential incidental benefit to spotted owls in 2096	447,300

Implementation of Alternative C would result in the maintenance and development of 146,100 acres of nesting, roosting, and foraging habitat on DNR-managed lands. This is a decrease of 21 to 60 percent of total present amount of habitat estimated to be on DNR-managed lands in 1996. This is 64,600 more acres of habitat to be maintained and developed than in Alternative B and between 48,000 and 76,500 acres more habitat than would be retained in Alternative A. Under Alternative C, between 105,503 and 267,570 acres of current potentially suitable habitat would not be managed specifically for spotted owls. Between 11,166 and 25,844 acres of this potential habitat currently occurs within known spotted owl circles which is a good indication that it is actually functional spotted owl habitat. The remaining acres may or may not be functional spotted owl habitat. Other provisions of the HCP under Alternative C have been modeled and could result in the retention of 447,300 acres) of forest older than 70 years outside of NRF areas, but it is difficult to predict what proportion of this potential habitat would occur in a configuration that would be useful to spotted owls.

**CHANGE IN DISTRIBUTION OF HABITAT**

Projections for the amount of habitat that would occur within each distance band from federal reserves were made as follows. For Alternative A, it was assumed (as described above) that habitat on DNR-managed lands that is within circles in which over 40 percent of the habitat was on federal lands would be available for harvest. This amount of habitat

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was subtracted from where these sites actually occur to give a spatially accurate estimate of habitat within distance bands from federal reserves. The acres of habitat estimated to be unavailable for harvest from projected unknown sites was added to acres of habitat within known owl circles for each distance band (for distribution of unknown sites refer to Table 4.2.7). It was then assumed that the remaining acres of habitat on DNR-managed lands within owl circles known to occur in 1996 and projected to be located on unsurveyed lands would be standing in 2096; i.e., none of it would be lost to natural disturbance, nor did the regulatory requirements change, nor did the habitat condition improve on any of the ownerships within an owl circle.

For Alternative B it is assumed that on average, 50 percent of the NRF areas within each distance band would be in a suitable habitat condition in 100 years. For Alternative C, it was assumed that 60 percent of the NRF areas within each distance band would be in a suitable habitat condition in 100 years. The growth models run for Alternative B indicate that it is likely that habitat conditions will be met or exceeded by the year 2096. Similar model results were not available to make that assessment for Alternative C.

**Table 4.2.14: Change in distribution of potential spotted owl habitat as estimated by forests older than 70 years from 1996- 2096 for Alternatives A, B, and C**

Distance from federal reserves - miles	Acres habitat in 1996 <sup>17</sup>				Acres habitat in 2096		
	Total acres potential habitat on DNR-managed lands	Alt. A	Alt. B	Alt. C	Alt. A	Alt. B	Alt. C
		(% change) <sup>18</sup>	(% change)	(% change)			
0.0 - 2.0	69,042	44,556	43,235	63,844	44,556 (-35.5)	62,788 (-9.1)	115,768 (+67.7)
2.1 - 4.0	32,133	13,470	10,670	14,901	13,470 (-58.1)	16,340 (-49.1)	27,337 (-14.9)
4.1 - 6.0	17,953	3,732	1,419	1,419	3,732 (-79.2)	1,976 (-89.0)	2,372 (-86.8)
6.1 - 8.0	16,844	2,474	333	333	2,474 (-85.3)	488 (-97.1)	586 (-96.5)
8.1 - 10.0	8,782	1,313	0	0	1,313 (-85.0)	29 (-99.7)	35 (-99.6)
10.1 - 12.0	8,230	528	0	0	528 (-93.6)	0 (-100.0)	0 (-100.0)
> 12	32,819	4,362	0	0	4,362 (-86.7)	0 (-100.0)	0 (-100.0)
<b>Totals</b>	<b>185,803</b>	<b>70,435</b>	<b>65,657</b>	<b>80,497</b>	<b>70,435 (-62.1)</b>	<b>81,621 (-56.1)</b>	<b>146,098 (-21.4)</b>

**Alternative A**

Implementation of Alternative A would result in a decrease of approximately 62 percent of potentially suitable spotted owl habitat (forests 70 years old and older) in the five west-side planning units. The smallest decrease occurs in the 0-2-mile distance band. Potential habitat in each distance band from 4-6 miles outward decreases by 80 percent or more. As discussed in the above section on change in amount of habitat for Alternative A, DNR models do predict there would be forests older than 70 years outside of spotted circles. It is, however, difficult to predict how much of this would actually function as spotted owl habitat.

<sup>17</sup> This tabulation of habitat acreage includes habitat within known and projected unknown spotted owl circles for Alternative A and within NRF areas for Alternatives B and C.

<sup>18</sup> Percent change refers to change in amount of habitat within the distance band under that alternative in 2096 compared to total amount of habitat existing within the distance band in 1996.

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### **Alternative B**

Implementation of Alternative B would result in a decrease of 56 percent of the total amount of potentially suitable habitat compared to what is estimated to exist in 1996. There is a 9 percent decrease in the 0-2-mile distance band compared to much larger decreases in the farther distance bands. Alternative B would provide at least 16 percent more habitat when compared to Alternative A (DNR harvest model indicates that there could be more than the target amount of habitat within NRF management areas by 2096). For DNR-managed lands within 4 miles of federal reserves, Alternative B would provide 36 percent (approximately 21,000 acres) more habitat than Alternative A. This increase in habitat within 4 miles of federal lands suggests a higher contribution to demographic support of the federal population under Alternative B than Alternative A. This issue is discussed further under Criterion 4: Demographic Support.

### **Alternative C**

Under Alternative C, the amount of habitat on DNR-managed land within NRF management areas within 2 miles of federal reserves would increase by 67.7 percent from the total amount of habitat on DNR-managed land within 2 miles of federal reserves -- from 69,042 to 115,768 acres. Implementation of Alternative C would result in an increase of 41,930 acres or 41 percent compared to the amount of potentially suitable habitat on DNR-managed lands within 4 miles of federal reserves in 1996. For lands farther than 4 miles from federal reserves, there would be a decrease of 81,635 acres or 96 percent of potential habitat that occurs on DNR-managed lands in 1996.

Compared to Alternative A, Alternative C would increase the amount of habitat within 4 miles of federal reserves by 85,080 acres. Compared to Alternative B, Alternative C would provide 64,000 more acres of habitat within 4 miles of federal reserves. The increase in habitat provided in Alternative C over Alternative B arises from the establishment of NRF management areas in the Straits Planning Unit and a higher percentage of habitat required within NRF areas (60 versus 50 percent).

All three alternatives result in a loss of total potential habitat from what is on DNR-managed lands today, compared to the amount of potential suitable habitat predicted to be present in the year 2096. Given that Alternative A is the No Action alternative, a loss of potential habitat would occur under the current policy of owl circle management. The largest loss of total potential habitat over the next 100 years would occur under Alternative A. Most of the loss of potential habitat under Alternatives B and C as compared to the total amount of potential habitat on DNR-managed lands in 1996 occurs in areas farther than 4 miles from federal reserves. The implications of this redistribution are discussed below, in the sections on demographic support and maintenance of species distribution of the spotted owl population.