

FINAL BRIEFING REPORT TO THE  
WASHINGTON STATE FOREST PRACTICES BOARD  
REGARDING SPOTTED OWL STATUS AND  
FOREST PRACTICES RULES



Joseph B. Buchanan and Paula Swedeen  
Washington Department of Fish and Wildlife

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## EXECUTIVE SUMMARY

The current Washington State Forest Practices Rules for the Spotted Owl (*Strix occidentalis*) were adopted by the Forest Practices Board on 22 May 1996, and became effective 1 July 1996. These rules contain provisions for assessing potential impacts to Spotted Owls that might result from forest practices on non-federal lands. The rules establish “critical habitat state,” provide definitions of suitable Spotted Owl habitat, and define key landscapes, referred to as Spotted Owl Special Emphasis Areas, where owl conservation is important. In addition, although the rules protect habitat in owl management circles centered on site centers, an option is provided for voluntary landscape management plans to replace circle-by-circle management. Due to uncertainties about the effectiveness of the current Forest Practices Rules in protecting sub-populations of Spotted Owls, the rules contain language requiring their periodic assessment.

The purpose of this report is to provide the Forest Practices Board with objective information on the Spotted Owl in the context of the Board’s evaluation of the Forest Practices Rules as they relate to Spotted Owls. This briefing report contains information on: 1) the population status of the owl in Washington; 2) the ecology and behavior of the owl, including factors that may influence subpopulation status; 3) the federal- and state-level regulatory context at the time of rule development; 4) an overview of the Forest Practices Rules developed for the Spotted Owl; 5) areas of concern regarding Spotted Owl rule implementation; and 6) information gaps that are relevant to future assessments or effective implementation.

### Distribution of the Spotted Owl

The Northern Spotted Owl (*S. o. caurina*) is one of three Spotted Owl subspecies, and the only one found in Washington. Northern Spotted Owls are distributed from extreme southwestern British Columbia to northern California. In Washington, Spotted Owls now occur primarily on the eastern and western slopes of the Cascade Mountains and the Olympic Peninsula. Although records are few, it apparently formerly occurred in the Puget Trough and throughout the western Washington lowlands, but now occurs only rarely in the southwestern Washington portion of that province. Spotted Owls are found between sea level and about 3500 to 5000 feet, the upper elevation limit varying by region.

### Status of the Spotted Owl in Washington

The Spotted Owl population in Washington is experiencing a prolonged and accelerating decline. This decline has been well documented in a series of workshops where analyses of long-term data sets were conducted according to standardized procedures. Results of the January 2004 demography workshop indicated a continuing decline in Spotted Owl subpopulations. Substantial portions of six Spotted Owl Special Emphasis Areas (Entiat, Hoh-Clearwater, I-90 East, I-90 West, North Blewett, White Salmon), key Spotted Owl management areas for non-federal lands in Washington, were included as study areas in

the long-term demography research. The annual rates of decline in three Washington study areas (6.2 to 10.4%) were higher than elsewhere in the range of the Northern Spotted Owl. Supplemental data from several monitoring efforts indicate an overall decline of 65% in the number of owl pairs detected between the early 1990s and the present.

In November 2004, the U.S. Fish and Wildlife Service completed a five-year review of the Northern Spotted Owl. As part of this review, a panel of scientists (organized through Sustainable Ecosystems Institute) was contracted to review information on Spotted Owls. The panel of scientists concluded that important real or potential threats to Spotted Owl populations included loss of habitat and competition with Barred Owls (*Strix varia*), a closely related owl species that has only recently invaded the Pacific Northwest. The threat of West Nile Virus impacting Spotted Owls in the near future is also a concern. Although the U.S. Fish and Wildlife Service five-year review concluded that the information needed to assess habitat loss on non-federal lands was generally lacking, such data should soon be available from a study conducted by Washington Department of Fish and Wildlife. The U.S. Fish and Wildlife Service reiterated opinions expressed by the Sustainable Ecosystems Institute panel of scientists. The ultimate conclusion of the U.S. Fish and Wildlife Service five-year review was that the threatened status of the species was justified and that no change in status would be made at this time.

### Ecology and Behavior of Spotted Owls

The ecology, behavior and habitat use of Spotted Owls have been intensively studied in the Pacific Northwest and northern California. Spotted Owls have very large home ranges; in Washington the reported median annual home ranges were 6,610 acres in the eastern Cascade Mountains, 8,205 acres in the western Cascade Mountains and 14,232 acres in the Olympic Peninsula. Within these home ranges, Spotted Owls use large areas (thousands of acres) of suitable habitat. Most forests used by Spotted Owls in Washington is old-growth forest, but owls also use comparatively younger forest that contains complex structure such as large snags, coarse wood debris and residual trees from previous stands. In the eastern Cascade Mountains Spotted Owls use a substantial amount of comparatively younger forest. Spotted Owls in Washington nest in cavities, in “chimneys” atop broken-topped trees, and in the eastern Cascade Mountains use abandoned Northern Goshawk (*Accipiter gentilis*) nests and open platforms created by accumulation of debris, often associated with clusters of branches infected by dwarfmistletoe (*Arceuthobium douglasii*). Spotted Owls hunt in suitable forest habitat for a variety of prey species including their preferred prey, the northern flying squirrel (*Glaucomys sabrinus*).

Spotted Owls breed in the spring and the young disperse from the natal area beginning in September and October. Dispersing juveniles experience high mortality rates, likely due to their general inexperience while traversing landscapes that are foreign to them. The primary causes of mortality for juveniles appear to be starvation and predation. The single study conducted on habitat use during dispersal indicates that Spotted Owls made substantial use of old forest, but also used various categories of younger forests.

Juveniles disperse until they die or colonize a territory. Some juveniles linger in the periphery of territories that they do not control – such owls are considered “floaters” – and eventually may acquire the territory when one of the existing owls leaves or dies. Adults rarely disperse; such dispersal occurs after “divorce” or the death of a pair member, in which case one or both birds, as the case may be, seek a new territory.

Reproductive output of Spotted Owls varies spatially and temporally, but for reasons that are not well understood. Research in the eastern Cascade Mountains indicates that owls in the lower and drier easternmost portion of the species’ range have higher reproductive rates than owls closer to the Cascade Mountain crest. This spatial pattern may be related to winter weather conditions and prey resources. Throughout the range of the species there is marked variation from year to year in the proportion of pairs that reproduce and the number of young produced. Over much of the Pacific Northwest a pattern of alternating years with poor or good productivity existed for a decade or more and ended only recently. Although weather is a factor that influences productivity in Spotted Owls, the factor(s) that explain the unique pattern of poor reproduction (nearly total failure in some years) in alternating years is unknown.

#### Federal and State Regulatory Context

The Washington Fish and Wildlife Commission listed the Northern Spotted Owl as an endangered species in Washington in 1988. The owl was listed as a federally threatened species in 1990. Wildlife species associated with forest ecosystems are considered protected public resources of the state under forest practices law (RCW Chapter 79.06). Furthermore, the Forest Practices regulations require that both state and federally listed species be considered for designation of “critical habitat state” – a designation that serves as a trigger for State Environmental Policy Act review (WAC 222-16-050(1)(b)). In addition, Section 9 of the Endangered Species Act prohibits unauthorized take, which includes modification of habitat that leads to impairment of an animal’s ability to meet its life requisites, of listed species on non-federal lands. Taken together, the regulatory requirements of the Endangered Species Act, the listing authority of the Washington Fish and Wildlife Commission, and the regulatory requirements of the Forest Practices Act created the conditions under which management of federal and non-federal lands would eventually be considered together to help achieve species recovery and limit the economic impact to private landowners as much as possible.

Following the development of a conservation strategy and a draft final recovery plan for the owl, neither of which was implemented, the Northwest Forest Plan in 1994 was enacted to address management of species associated with late-successional forests on federal lands. The Northwest Forest Plan reserve design included 7.87 million acres of federal forest and was designed to address multiple species (not just Spotted Owls) and consequently some reserves have little or no habitat or owls whereas others support many owls and large amounts of habitat. Approximately 62 percent of known territorial Spotted Owl sites received protection under the Northwest Forest Plan.

The Northwest Forest Plan, recommendations from the Spotted Owl Recovery Plan and a stakeholder advisory group (the Spotted Owl Scientific Advisory Group), and a proposal to develop a federal 4(d) rule (i.e., a proposed revision to the default application of the Endangered Species Act take prohibition), served to anchor discussions on where to manage for Spotted Owls on nonfederal lands. A Timber-Fish-Wildlife policy group negotiated a rule package based on these planning initiatives. Their proposed rule was adopted by the Forest Practices Board and evaluated in a Final Environmental Impact Statement released in 1996. In that Final Environmental Impact Statement, the Forest Practices Board adopted a goal to enact a rule that “captures all forest practices that have potential for a substantial adverse impact on the environment.” The Board specified that in the case of the owl, this would include “any forest practice that damages the long-term viability of populations of Spotted Owls in Washington State.” The Final Environmental Impact Statement further defined viability as “the long-term persistence and adaptation of a species or population in a given place.” A viability standard thus became a defining goal for the development of a rule. The Final Environmental Impact Statement compared the strengths and weaknesses of various alternatives and pointed out some risk areas in the rule alternative that was adopted by the Board.

### Overview of State Forest Practices Rules for the Spotted Owl

The Forest Practices Rules for Spotted Owls can be described as containing three basic types of provisions. These provisions include: 1) regulations that apply outside Spotted Owl Special Emphasis Areas, 2) a circle-based protection scheme for Spotted Owl sites inside Spotted Owl Special Emphasis Areas, and 3) landscape-level planning options for inside Spotted Owl Special Emphasis Areas.

Forest Practices Rules outside the Spotted Owl Special Emphasis Areas are designed to protect the immediate vicinity of Spotted Owl site centers during the nesting season. During the nesting season (1 March to 31 August), the best 70 acres of habitat around the site center is protected from harvest. Outside the nesting season there are no owl-related protections that constrain harvest of suitable Spotted Owl habitat in Spotted Owl management circles.

In Spotted Owl Special Emphasis Areas, suitable owl habitat inside management circles established for territorial Spotted Owls is regulated under the default component of the Forest Practices Rules. In addition to defining the boundaries and conservation functions of the Spotted Owl Special Emphasis Areas, the rules describe critical habitat (state) and provide information that the Department of Natural Resources would use to evaluate potential impacts from proposed harvest activity.

The Forest Practices Rules also contain two options for managing Spotted Owl habitat in Spotted Owl Special Emphasis Areas. The Landowner Option Plan was designed to allow landowners to manage habitats for Spotted Owls without using owl management circles. Because Spotted Owls do not have circular home ranges and often use habitat areas beyond the management circle, implementation of such plans in Spotted Owl Special Emphasis Areas will likely provide better landscape-level conditions for owls.

Landowner Option Plans are agreements between the landowner and the Department of Natural Resources. The other optional component of the rules is the Cooperative Habitat Enhancement Agreement. This provision of the rule allows landowners to make agreements with the Department of Natural Resources to retain or recruit Spotted Owl habitat that is not currently associated with a known owl site. It provides assurances that should an owl colonize the retained or recruited habitat the landowner could manage to the conditions spelled out in the agreement and would not be constrained by protective regulations. Any category of landowner (i.e., industrial, non-industrial) may participate in these two planning options.

### Areas of Concern Regarding Rule Implementation

Several areas of concern were identified in this report. The most important of these issues include: a) a lack of landscape planning (see page 44), b) a lack of protection of habitat at locations where owls do not respond during surveys (see page 45), c) various examples of ambiguous language (see page 49), d) implementation issues relating to the definitions of suitable habitat (see page 55), and e) the need for additional biological information to support certain elements of the habitat definitions (see pages 56 and 69).

One area where rule implementation appears to fall short of the Board's expectations is the lack of incentives for landowners to engage in landscape-level conservation planning that addresses Spotted Owl habitat needs. As a result, while some landowners chose to develop Habitat Conservation Plans, or to protect habitat within owl circles, significant portions of some Spotted Owl Special Emphasis Areas have no owl habitat planning underway. This is particularly important recognizing that habitat in some owl circles in Spotted Owl Special Emphasis Areas is not protected if surveys indicate no owl responses during three consecutive years. Demonstrating site inactivity, regardless of whether inactivity is temporary or permanent, eliminates State Environmental Policy Act protections for the particular Spotted Owl management circles, and can thus enable harvest of suitable Spotted Owl habitat and the subsequent degradation of landscape conditions for Spotted Owl subpopulations.

Landscape-level conservation planning is a recognized tool with the potential to provide important conservation measures for wildlife while providing management flexibility for landowners. This value was reflected during rule making by the inclusion of an option that permitted replacement of circle-by-circle management with two forms of landscape-level planning: the Landowner Option Plan and the Cooperative Habitat Enhancement Agreement. To date, one Landowner Option Plan (for 540 acres) and no Cooperative Habitat Enhancement Agreements have been approved. Negotiations recently began for a Landowner Option Plan with an industrial landowner and other landowners have expressed an interest in developing plans. Habitat Conservation Plans have been developed in parts of each Spotted Owl Special Emphasis Area, but about 54% of the area contained within Spotted Owl Special Emphasis Areas have no such plans. Several Habitat Conservation Plans were negotiated prior to implementation of the 1996 rules, and some plans contain provisions that are consistent with conservation functions of the Spotted Owl Special Emphasis Areas, while others are inconsistent in some way.

There are various issues associated with effective implementation of habitat definitions in the rules. Definitions were largely derived from the 1993 Spotted Owl Scientific Advisory Group report. The Spotted Owl Scientific Advisory Group stated that their definitions should be periodically updated with new research and that research should be conducted in which the relationship among various attributes of Spotted Owl habitat were studied. New research since rule negotiation and implementation is summarized in this report. However, no research program has been undertaken to further overall understanding of Spotted Owl habitat use in Washington since 1996. From an implementation perspective, the rule language is written such that if any one habitat attribute is missing in a forest stand, that stand is technically non-habitat and thus available for harvest. Such “near-miss” situations could be functioning as suitable habitat, or could, with appropriate management, provide function in the near future.

A major element of the rule is the conservation function assigned to each Spotted Owl Special Emphasis Area or portions of these landscapes. These are demographic support, dispersal, and combination support functions. We believe that the concept of “combination support” as a goal for some Spotted Owl Special Emphasis Areas or parts of these landscapes is ambiguous (by describing contradictory conservation functions) and offers little specific guidance for landscape planning in these areas.

### Information Gaps

While compiling information for this assessment we noted a number of substantive information or database needs. Addressing these information gaps will improve efficiency of rule implementation by increasing conservation effectiveness and reducing conflicts. In addition, addressing some of the information gaps should enhance conservation planning efforts and address fire risk reduction in the eastern Cascade Mountains. These information needs relate to: a) a dedicated database or a process for monitoring changes in suitable habitat in Spotted Owl Special Emphasis Areas; b) a database, including Geographic Information System data, to store essential information on the location and conservation functions of implemented management plans (e.g., Landowner Option Plans, Cooperative Habitat Enhancement Agreements, Habitat Conservation Plans) in Spotted Owl Special Emphasis Areas; c) a better understanding of the 500-acre exemption; d) improvement and clarification of habitat definitions; and e) a better understanding of habitat use by Spotted Owls, both in forests that have been managed in some way, and those used during natal dispersal.

### Briefing Report Development Process

The technical stakeholder process sponsored by the Washington Department of Fish and Wildlife, through facilitated group discussion, confirmed the significance of several key aspects of Spotted Owl Forest Practices rule implementation that were identified in the draft briefing report. These issues were: 1) the need for more landscape planning in Spotted Owl Special Emphasis Areas, 2) the use of surveys to remove protections from Spotted Owl sites, 3) vague language related to the combination function landscapes, and



4) implementation of habitat definitions. The stakeholder discussions improved the depth of understanding of these issues and their relationships to each other. In addition, other issues were either raised by stakeholders or emerged as a result of discussions. These issues included: 1) establishment of measurable objectives for Spotted Owl Special Emphasis Areas; 2) a variety of issues related to the location, function, and boundaries of existing or potential Spotted Owl Special Emphasis Areas; 3) incentives and disincentives for landscape planning; 4) the contribution of federal lands and existing Habitat Conservation Plans to meeting Spotted Owl conservation goals; and 5) the role of non-habitat limiting factors in influencing Spotted Owl management. Some of these issues that are directly related to either Spotted Owl biology or implementation of the existing rule were addressed in this document. However, some were outside of the scope of this document, but are important to the Board's wildlife assessment process



## INTRODUCTION

The current Washington State Forest Practices Rules for the Northern Spotted Owl (*Strix occidentalis caurina*) were adopted by the Forest Practices Board on 22 May 1996, and became effective 1 July 1996. These rules marked the culmination of a lengthy negotiation process involving Washington Department of Fish and Wildlife, forest landowners, environmental groups, Native American Tribes, the Washington Department of Natural Resources, and the U.S. Fish and Wildlife Service. These rules provide a framework for processing Forest Practices Applications and evaluating potential impacts to the environment by establishing stand- and landscape-level conditions considered important to Spotted Owls, and describing guidance to the Department of Natural Resources for situations when the State Environmental Policy Act (SEPA) is invoked.

One of the central concepts of the new rules was that Spotted Owl conservation on nonfederal lands would be limited to certain landscapes (Spotted Owl Special Emphasis Areas) in various strategically important parts of the state. Within these areas, modification of habitat within territorial spotted owl circles would serve as the basic trigger for additional review under the State Environmental Policy Act. A decision on whether a Forest Practice would result in a determination of significance would be largely based on whether the proposed activity reduced the amount of essential habitat, which was defined as 40 percent of the area of the median annual home range of a territorial Spotted Owl (details on the rules are provided in a subsequent section). Outside these landscapes, protections would not be intended to maintain Spotted Owl territories in the long-term. The concept of focusing long-term owl conservation in specific landscape areas rather than within the entire range of the Spotted Owl in the state was based on a strategy first proposed in the Draft Final Recovery Plan for the Spotted Owl (United States Department of the Interior 1992) and subsequently supported by the Spotted Owl Scientific Advisory Group (Hanson et al. 1993). The new rules also contained a provision for landscape planning, an alternative to circle-by-circle management in the Spotted Owl Special Emphasis Areas.

Assessments of conservation and management strategies are rarely made, yet their importance is clearly recognized (Kleiman et al. 2000, Mace et al. 2001). Due to an interest in monitoring the effectiveness of the new Forest Practices Rules in protecting Spotted Owls (Washington Forest Practices Board 1996), the rules contain language requiring their periodic assessment. Specifically, WAC 222-16-080 (7) states that the Department of Natural Resources, in consultation with the Washington Department of Fish and Wildlife, must "... review each SOSEA to determine whether the goals for that SOSEA are being met through approved plans..." and that the Department of Natural Resources could use this information to recommend to the Forest Practices Board "... the suspension, deletion, modification or re-establishment of the applicable SOSEA from the rules." In addition, WAC 222-16-080 (8) states that the same two agencies "... shall report annually to the board on the status of the Northern Spotted Owl to determine whether circumstances exist that substantially interfere with meeting the goals of the SOSEAs." Finally, the Forest Practices Rules direct the Department of Natural

Resources in consultation with all affected stakeholders to review the effectiveness of all Forest Practices rules and voluntary measures on an annual basis (WAC 222-08-035). This language provides a broad directive for assessments of how all forest practice rules are working.

On 12 February 2004, the Forest Practices Board was given a draft briefing report that provided an overview of the rules, summarized the population status of the owl in Washington, and identified areas of concern regarding Spotted Owl rule implementation (Buchanan and Swedeen 2004). Delivering that report constituted the first step of the Forest Practices Board's assessment process for the Spotted Owl Forest Practices Rules, as outlined in the Board's wildlife workplan. Subsequently, a group of biologists, representing stakeholders in the state, was convened by Washington Department of Fish and Wildlife to advise the agency on technical issues associated with the draft briefing report (see Silver 2004). Group members or their organizations submitted comments that were used to modify the draft report. Specific responses to these comments were compiled by the Washington Department of Fish and Wildlife. There is substantial new text that was added to the present report to address concerns and questions from the stakeholder community. There are new sections briefly describing the general regulatory context in which the rules were developed, explanations for the development of specific rule components, and an enhanced section on spotted owl biology including an update on demography and limiting factors to the population. Consequently, this revised report includes the material from the first report and the new material just described. The rule implementation section from the original report was also edited in light of stakeholder comments.

## REGULATORY CONTEXT FOR RULE DEVELOPMENT IN 1996

The following is a brief summary of the background and context that is reflected in the 1996 Spotted Owl Rules – an approach in which the role of particular areas of non-federal lands are thought to be key to supporting conservation of the species on federal lands as well as meeting the requirement to protect public resources under the Forest Practices Act. Longer descriptions of the evolution of Spotted Owl management policy in the Pacific Northwest, with different emphases, can be found in Yaffee (1994), Noon and McKelvey (1996), and Marcot and Thomas (1997). The section that follows on regulatory context was added at the request of stakeholders.

The Washington Fish and Wildlife Commission listed the Northern Spotted Owl as an endangered species in Washington State in 1988. The owl was listed as a federally threatened species in 1990. Loss of habitat due to logging was the primary threat to persistence of the species identified in the federal listing process (U.S. Department of Interior 1990). Wildlife species associated with forest ecosystems are considered protected public resources of the state under forest practices law (RCW Chapter 79.06). Furthermore, the Forest Practices regulations require that both state and federally listed species be considered for designation of “critical habitat state” – a designation that serves as a trigger for State Environmental Policy Act review (WAC 222-16-050(1)(b)). In

addition, Section 9 of the Endangered Species Act prohibits take, which includes under the definition of “harm,” significant habitat modification or degradation that actually kills or injures wildlife by significantly impairing essential behavioral patterns, including, breeding, feeding, or sheltering of listed species on non-federal lands. Taken together, the regulatory requirements of the Endangered Species Act, the listing authority of the Washington Fish and Wildlife Commission, and the regulatory requirements of the Forest Practices Act created the conditions under which management of federal<sup>1</sup> and non-federal lands would eventually be considered together to develop a strategy to simultaneously achieve species recovery and limit the economic impact to private landowners as much as possible. The significant events leading up to the development of the 1996 Forest Practices Rule for Spotted Owls after state and federal listings are briefly summarized in Table 1.

The first ecologically plausible strategy for managing Spotted Owl populations on federal lands was published in 1990 by the Interagency Scientific Committee (Thomas et al. 1990). Prior to this time, the Forest Service and Bureau of Land Management had proposed several land management schemes that focused on protecting habitat around individual pairs. These proposals called for lesser amounts of habitat than telemetry studies suggested owls needed, did not take into account the impact of harvesting habitat in potential owl territories, and did not consider the population dynamics and movement patterns of owls in larger landscapes (see Yaffee 1994 for a detailed account of pre-1990 conservation strategies). The Interagency Scientific Committee’s report moved to a concept of managing for large blocks of habitat, based on several conservation biology principles that they thought important as a foundation for achieving viability of owl populations throughout its range. These principles served to guide all subsequent strategy documents, including the 1992 Draft Recovery Plan (U.S. Department of Interior 1992), the 1993 Forest Practice Board Scientific Advisory Group recommendations for owl conservation on non-federal lands in Washington State (Hanson et al. 1993), and the 1994 Northwest Forest Plan (U.S. Department of Agriculture and U.S. Department of Interior 1994b). They are:

- ❖ Species that are well-distributed across their range are less prone to extinction than species confined to small portions of their range.
- ❖ Large blocks of habitat, containing multiple pairs of the species in question, are superior to small blocks of habitat with only a few pairs.
- ❖ Blocks of habitat that are close together are better than blocks far apart.
- ❖ Habitat that occurs in less fragmented blocks is better than habitat that is more fragmented.
- ❖ Habitats between blocks function better to allow owls to move (disperse) through them the more nearly they resemble suitable habitat for those species in question (that is, blocks that are well connected in terms of habitat are better than blocks that are not) (Thomas et al. 1990).

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<sup>1</sup> Federal land management, specifically on Forest Service land, is also driven by the National Forest Management Act. Lawsuits over the species viability clause of the National Forest Management Act were a major driver in the development of the Northwest Forest Plan.

Table 1. Significant events leading up to development of the 1996 Forest Practices Rules for Spotted Owls in Washington.

Year	Action
1990	Interagency Scientific Committee develops a comprehensive conservation strategy for federal lands (Thomas et al. 1990).
1990	U.S. Fish and Wildlife Service issues incidental take guidelines for non-federal lands; guidelines rescinded in October 1991 but still considered reliable advice for avoiding take of Spotted Owls on non-federal lands.
1991	Department of Natural Resources issues a guidance document for harvest of Spotted Owl habitat on non-federal lands (Owl memo #3).
1992	Final Draft Recovery Plan published.
1992	Forest Practices Board adopts “500 acre rule” as an interim strategy that was to expire on February 9, 1994.
1993	President Clinton convenes Forest Summit in Portland, Oregon, and directs federal scientists to develop a comprehensive strategy to address late-successional species management and social and economic concerns within the bounds of federal law.
1993	Forest Ecosystem Management Assessment Team publishes a report with nine options for management of federal lands. President Clinton chooses option 9 as the preferred alternative.
1993	Forest Practices Board directs the formation of a science advisory group to make recommendations for owl management on non-federal lands in Washington.
1994	Forest Practices Board “500 acre” rule expires; it is re-adopted as an emergency rule while the board works on a permanent rule.
1994	Final Supplemental Environmental Impact Statement for Option 9 published along with a Record of Decision; becomes known as the Northwest Forest Plan.
1994	U.S. Department of Interior proposes 4(d) rule for the Spotted Owl in order to lift incidental take restrictions on non-federal lands in some parts of the owl’s range.
1995	Forest Practices Board publishes Draft Environmental Impact Statement for proposed Spotted Owl rules.
1996	Forest Practices Board publishes Supplemental Draft Environmental Impact Statement for Spotted Owl proposed rules.
1996	Forest Practices Board publishes Final Environmental Impact Statement for proposed Spotted Owl rules and adopts a permanent rule package.

The Interagency Scientific Committee used these guidelines to craft a proposed reserve strategy on federal lands. Population dynamics models were used to refine subsequent proposals in terms of size and spacing of reserves (see review by Noon and McKelvey 1996). The Final Draft Recovery Plan included a reserve design similar to the Interagency Scientific Committee proposal. The 1992 Final Draft Recovery Plan, although completed, was not approved or implemented. Its essential structure, however,

was largely incorporated into the approach used by the Forest Ecosystem Management and Assessment Team (FEMAT), convened in 1993 by President William J. Clinton. The Northwest Forest Plan, derived from options developed by the Forest Ecosystem Management and Assessment Team, became the operative federal land management strategy for Spotted Owls in 1994 (U.S. Department of Agriculture and U.S. Department of Interior 1994b). The Northwest Forest Plan reserve design included slightly more acres than the Final Draft Recovery Plan (7.87 million acres versus 7.29 million acres). However, the Northwest Forest Plan was designed to address multiple species, not just the Spotted Owl, and therefore contains some reserves, in addition to those that provide for Spotted Owl conservation, that have little or no habitat or owls (Washington Forest Practices Board 1996).

The Northwest Forest Plan established 2.25 million acres of Late Successional Reserves and 500,000 acres as Adaptive Management Areas in addition to already Congressionally reserved areas within the range of the Spotted Owl in Washington. Of the areas designated as Late Successional Reserves or Adaptive Management Areas in Washington, 1.12 million acres were thought to be habitat (41%) as of the signing of the Record of Decision (U.S. Department of Agriculture and U.S. Department of Interior 1994b). In the eastern Cascade Mountains in Washington, the average proportion of Spotted Owl habitat in Late Successional Reserves was 33 percent. In the western Cascade Mountains and the Olympic Peninsula, where there was more suitable habitat, the proportions were 47 and 52 percent, respectively. Twenty-four Late Successional Reserves in Washington had less than 40 percent suitable habitat as of 1994. An additional 900,000 acres of suitable nesting, roosting and foraging habitat were estimated to be in areas already reserved by Congress (e.g., wilderness areas, national parks). Approximately 62 percent of known territorial Spotted Owl sites were thought to receive protection under the Northwest Forest Plan (U.S. Department of Agriculture and U.S. Department of Interior 1994a).

The science behind the Northwest Forest Plan was recently reviewed by a panel of independent scientists as background for a U.S. Fish and Wildlife Service review of the listing status of the Spotted Owl (Courtney et al. 2004). The scientists conducting the review re-affirmed the biological principles behind the reserve strategy on federal lands while identifying some risks that had not emerged by 1994 as being a factor in the survival of the species. This report, however, did not assess the success of conservation strategies on non-federal lands.

The Northwest Forest Plan, in addition to the recommendations of the Spotted Owl Recovery Team (U.S. Department of Interior 1992), served as an anchor for discussions on where to manage for Spotted Owls on nonfederal lands. While the majority of remaining habitat for Spotted Owls is on federal lands, contributions of habitat and reproductive owls on non-federal lands were (Hanson et al. 1993) and are still considered to be important to owl persistence and recovery. The Spotted Owl Recovery Team identified non-federal landscapes of concern that were important to maintaining species distribution and connectivity in areas between federal lands or in areas where federal lands were absent (U.S. Department of Interior 1992). The Forest Ecosystem

Management Assessment Team made recommendations for non-federal lands consistent with those of the Recovery Team (Forest Ecosystem Management Assessment Team 1993). The reliability of current estimates of the amount of Spotted Owl habitat, or of trends in change in the amount of habitat on nonfederal lands in Washington, is poorly understood (Courtney et al. 2004). A recently completed study funded by the Department of Natural Resources and conducted by the Washington Department of Fish and Wildlife should provide meaningful information about trends in habitat amount on nonfederal lands. That study (Pierce et al. 2005) was not completed in time to summarize in this report.

At the state level, the Forest Practices Board passed an emergency rule in 1992 that considered 500 acres of habitat around a site center to be critical habitat, and thus its modification would trigger an environmental review under the State Environmental Policy Act. In May 1993, the Forest Practices Board commissioned a scientific advisory group to examine questions of how much habitat an individual pair of Spotted Owls needed to reproduce and to identify strategies for managing owls on non-federal landscapes. The Spotted Owl Scientific Advisory Group published their recommendations in December 1993 (Hanson et al. 1993). The majority position of the advisory group was that 3,827 acres of habitat within 2.7 miles of the site center on the Olympic Peninsula and southwestern Washington, 3,586 acres of suitable habitat within 2.0 miles of a site center in the western Cascades, and 3,249 acres of habitat within 1.8 miles of a site center in the eastern Cascades were essential to meeting the life needs of a territorial pair in each of these regions of the state. They also recommended 15 separate non-federal landscapes with qualitative conservation functions as important for maintaining owl populations in Washington State (see pages 90-101 in Hanson et al. 1993).

Another important event that shaped discussions of non-federal management was the U.S. Fish and Wildlife Service's announcement of a proposed 4(d) rule in late 1994. Section 4(d) of the Endangered Species Act allows the Secretary of Interior to craft specific measures to avoid take of threatened species in place of blanket take prohibitions throughout the range of a listed species. The proposed 4(d) rule anticipated "Special Emphasis Areas" in parts of the owl's range in Washington where take prohibitions would remain in effect. The proposed rule identified seven landscapes in which take prohibitions would be retained (U.S. Department of Interior 1995). These landscapes differed from the state advisory group's recommendations by not including the north side of the Olympic Peninsula, all of southwestern Washington, and the Entiat area in the eastern Cascades. Boundaries were also different in the North Blewett area in the east Cascades.

The 4(d) rule and Habitat Conservation Plans were expected in conjunction to provide a more effective framework for addressing Spotted Owl recovery issues on non-federal lands than enforcement of a blanket federal take prohibition (see chapters 3&4, p. 245 in U.S. Department of Agriculture and U.S. Department of Interior 1994a). Southwestern Washington was not included as a proposed Special Emphasis Area in the proposed 4(d) rule based on the anticipation that landowners in the area would negotiate Habitat



Conservation Plans that benefited spotted owls (see page 9492 in U.S. Department of Interior 1995).

The Forest Practices Board began work on a rule package for Spotted Owls in early 1994. In preparing to develop a permanent Spotted Owl rule, the Forest Practices Board adopted a goal to: “Prepare a rule that captures all forest practices that have potential for a substantial adverse impact on the environment.” The Board specified that in the case of the owl, this would include “any forest practice that damages the long-term viability of populations of spotted owls in Washington State” (Washington Forest Practices Board Minutes, 10 March 1994). The Final Environmental Impact Statement adopted by the Board in 1996 further defined viability as “the long-term persistence and adaptation of a species or population in a given place” (quote taken from Soulé 1987; Washington Forest Practices Board 1996:S-7). The Final Environmental Impact Statement adopted by the Board further clarified the viability standard to represent “... a minimum level of protection consistent with the prevention of decline toward extinction” (Washington Forest Practices Board 1996:S-7). The Final Environmental Impact Statement analyzed the proposed rule (and the other alternatives) for the potential to meet the Board’s goal based on five criteria: number of known territorial sites involving non-federal lands included in Spotted Owl Special Emphasis Areas designated for demographic support, species distribution, or combination functions; dispersal habitat provided; affects on habitat in Spotted Owl Special Emphasis Areas designated for demographic support; regional population viability; and protection against catastrophic habitat loss.

The Final Environmental Impact Statement identified several areas where the alternative that became the current rule package (the current rule is described in detail in the next section) had weaknesses in its ability to meet Board goals. The other alternatives analyzed in the Final Environmental Impact Statement also had weaknesses. In addition, the alternative chosen was the consensus proposal of the Timber-Fish-Wildlife policy group, which was crucial for completing a final rule package. For a more detailed account of the various rule alternatives considered by the Board we suggest interested readers consult the Final Environmental Impact Statement. That document contains a detailed assessment of rule alternative’s strengths and weaknesses on key subjects such as the placement and objectives of Spotted Owl Special Emphasis Areas, landscape planning alternatives and risks, and dispersal habitat value (Washington Forest Practices Board 1996). This analysis was the first pre-implementation assessment of the rule and therefore serves as an important historical benchmark.

The Final Environmental Impact Statement identified several risk areas in the 1996 rule that may have a negative impact on the ability of the rules to meet the Board’s goals: providing less habitat per pair than pairs need to replace themselves; contracting the range by not establishing a Spotted Owl Special Emphasis Area in southwestern Washington; providing reduced support to existing clusters of Spotted Owls; providing a definition of dispersal habitat that may not function for owls; and providing vague language in the definition of Spotted Owl Special Emphasis Area functions and approval standards for Landowner Option Plans.

However, given the issues identified in the Final Environmental Impact Statement, the current rule represents a substantial improvement in protections for Spotted Owls on non-federal lands over what was in place before rule adoption. These improvements include but are not limited to: designation of conservation landscapes; identification of State Environmental Policy Act thresholds for significant adverse impact based on scientific studies of owl habitat use in their home ranges; a mechanism for voluntary landscape planning that could ensure long-term commitments of owl habitat management designed to support specified conservation functions at ecologically meaningful scales for Spotted Owl sub-populations; and disturbance avoidance measures.

This document is intended to provide the Board with objective information in support of its first post-implementation evaluation of its Spotted Owl rules. Some aspects of a complete evaluation are beyond the scope of an assessment of the rules as defined by Forest Practice rule language, and beyond the current resources of the Department of Fish and Wildlife. Issues outside the scope of this analysis are, for instance, determining the impact of the absence of Spotted Owl Special Emphasis Areas in some parts of the owl's range on population performance, or establishing how much habitat an owl pair needs to survive and reproduce under a variety of circumstances.

## OVERVIEW OF THE FOREST PRACTICES RULES

Perhaps the most significant aspect of the Forest Practices Rules is the substantive guidance they provide to landowners on how to conduct timber harvest and to WDNR for reviewing forest practices applications. Forest Practices Rules were adopted for Spotted Owls and other species (e.g. Marbled Murrelet [*Brachyramphus marmoratus*]) and resource management issues (e.g. green tree retention, “forest and fish” riparian buffers) in an attempt to insure that potentially detrimental forest management activities could be reviewed, evaluated, and modified or otherwise conditioned, as appropriate, under the provisions of the Forest Practices Act (RCW 76.09) and the State Environmental Policy Act (SEPA; RCW 43.21C). Language in WAC 222-10-040 provides direction to the Department of Natural Resources on how to use its authority to apply the State Environmental Policy Act (granted under the Forest Practice Act) to evaluate forest practices applications.

To better understand the significance of various elements discussed in this report, it is necessary to have a basic understanding of the Forest Practices Rules for Spotted Owls. The “Spotted Owl rules” are very detailed and are somewhat difficult to understand due to the amount of information contained in the regulations. For this reason, the sections below provide an overview of the 1996 rules that should facilitate review of this document. In addition, in response to stakeholder comments, we provide information on the how the primary Forest Practices Rule elements were developed.

### **Important Landscapes and Their Functions**

The Spotted Owl Special Emphasis Areas were identified and adopted because the Timber-Fish-Wildlife group believed they represented landscape areas where the

protection of sites on non-federal lands would provide a necessary contribution to the conservation of the species in Washington (and see Hanson et al. 1993). The final rule package was selected from a number of alternatives, some of which had more or fewer, or a different configuration of, Spotted Owl Special Emphasis Areas than the alternative that was chosen by the Forest Practices Board (Washington Forest Practices Board 1996). The sections below briefly describe the Spotted Owl Special Emphasis Areas and their conservation functions.

### Important Landscapes

The most notable element of the current rules was the designation of landscapes wherein the main body of Forest Practices Rules for Spotted Owls would apply. Prior to this, two sets of rules (“Owl memo #3” and the “500-acre rule”) stipulated that State Environmental Policy Act review could be triggered by the proposed harvest of suitable Spotted Owl habitat in any status 1, 2, or 3 Spotted Owl site in the state. Based on a recommendation by Hanson et al. (1993), and data indicating that local clusters of sites would provide substantive conservation value in contrast to a sparse distribution of sites (United States Department of the Interior 1992), the 1996 rules identified 10 landscapes, or Spotted Owl Special Emphasis Areas (Figure 1), where owl protections on nonfederal lands would be emphasized. Protections provided under the State Environmental Policy Act for those portions of owl sites located beyond the boundaries of the 10 Spotted Owl Special Emphasis Areas were largely eliminated. See Hanson et al. (1993) for additional details about these landscape areas.

The 10 Spotted Owl Special Emphasis Areas designated in Washington comprise an estimated 1,541,831 acres of non-federal lands. Of this total area, about 327,527 acres (21%) is considered suitable Spotted Owl habitat (based on an assessment of “Hab97” data maintained by Washington Department of Natural Resources). (This estimate of Spotted Owl habitat will soon be updated; however, the relevant information was unavailable when this report was written [see Pierce et al. 2005].) The amount of suitable Spotted Owl habitat varies between Spotted Owl Special Emphasis Areas as a function of their size and management history. Seven of the 10 Spotted Owl Special Emphasis Areas are divided into units designated for specific conservation functions. The average proportion of suitable habitat in the three different types of Spotted Owl Special Emphasis Area units varied: demographic support (26.8%, 15 units), dispersal support (13.0%, 11 units), and combined function (24.2%, 9 units). The total area of the Spotted Owl Special Emphasis Areas is summarized in Appendix 1.

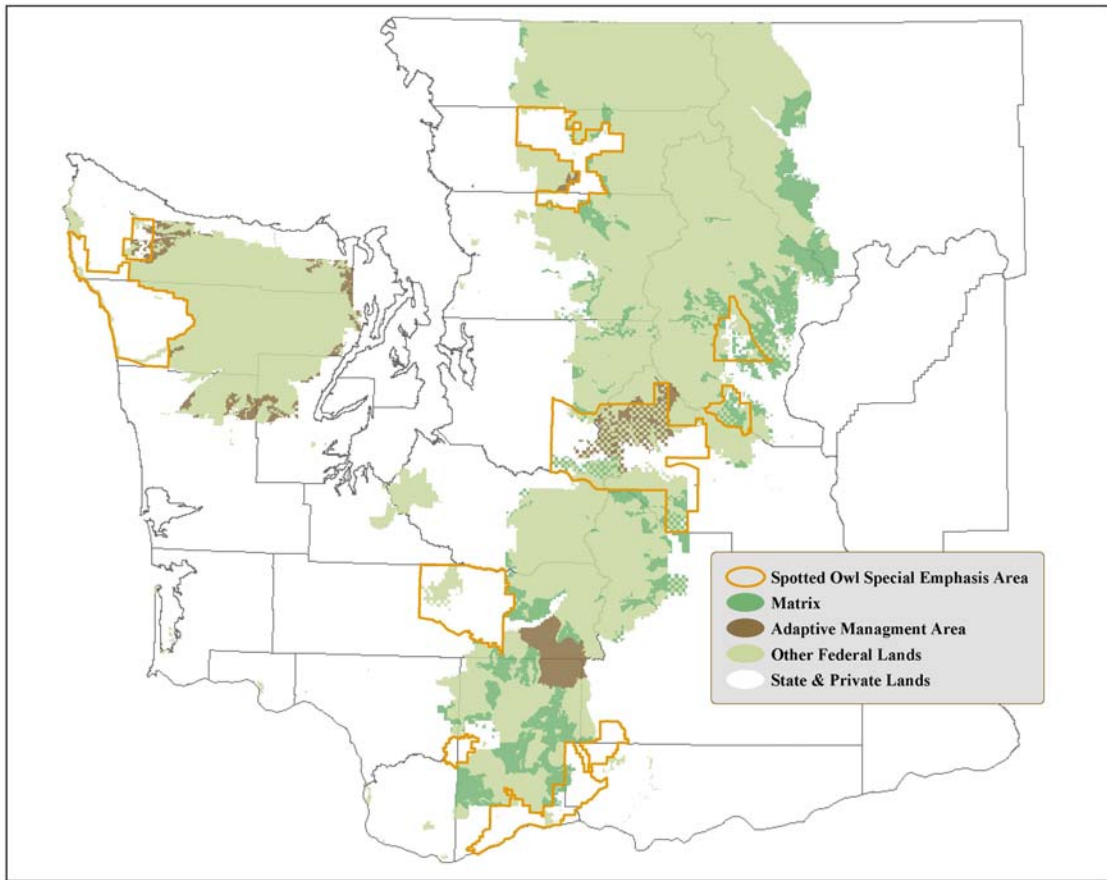


Figure 1. Spotted Owl Special Emphasis Areas and federal management designations. All federal lands where Spotted Owl protection is emphasized are shown in one color to simplify the map.

Two important landscapes proposed by Hanson et al. (1993) - North Olympic Peninsula and southwestern Washington (see pages 13-14 in Hanson et al. 1993) - were not included as Spotted Owl Special Emphasis Areas in the 1996 rules. The North Olympic Peninsula apparently was excluded based on results of a modeling effort used to evaluate proposed 4(d) rule scenarios on the Olympic Peninsula (Holthausen et al. 1995). Model results indicated that although non-federal lands on the Olympic Peninsula contributed to the status of the owl population, the Hoh-Clearwater area (in scenario 4 of Holthausen et al. 1995) contributed more to population performance than did the North Olympic Peninsula area because there was comparatively little suitable Spotted Owl habitat in the latter area (Holthausen et al. 1995). The model evaluated the influence only of existing habitat on population projections, and did not simulate habitat enhancements or the potential value of landscape areas (Holthausen et al. 1995).

Southwestern Washington was not included as a Spotted Owl Special Emphasis Area for reasons including modeling results and policy considerations. When the Clinton Administration began developing the Northwest Forest Plan, the U.S. Fish and Wildlife

Service decided against proposing a 4(d) rule Special Emphasis Area in southwestern Washington in exchange for a landowner's agreement to develop a landscape plan for part of the landowner's property in the area (J. Michaels, personal communication). During subsequent negotiations over Spotted Owl Special Emphasis Area boundaries, the Timber-Fish-Wildlife group decided not to include southwestern Washington as a Spotted Owl Special Emphasis Area because it was not identified as an important landscape in the 4(d) rule preferred alternative.

In addition to the above rationale for removing southwestern Washington from rule consideration, the "Reanalysis Team" suggested that a chain of "connectivity reserves" in southwestern Washington would not provide the needed juveniles to demographically support the Olympic Peninsula population (Holthausen et al. 1995). The primary reasons for this were that: a) most owls disperse short distances and settle in their natal clusters, b) the lack of directionality by dispersing juveniles meant that most owls would not move between source and target areas, c) the rather high rate of juvenile mortality would result in few owls successfully moving between source and target areas, and d) the likelihood that successful dispersers would find vacant territories (given the presence of existing adult and sub-adult Spotted Owls) in the target landscapes was low (Holthausen et al. 1995). The analysis did not address the value of maintaining the species' distribution in the state, a conservation function described for the landscape by Hanson et al. (1993), and an important element of reducing extinction risk (e.g. Donald and Greenwood 2001).

The boundaries of several Spotted Owl Special Emphasis Areas proposed by Hanson et al. (1993) were modified to address various concerns. The western boundary of the I-90 East Spotted Owl Special Emphasis Area was extended westward to the Cascade Mountain crest, thus enlarging the area, encompassing three more owl site centers (and portions of several other circles), and linking it with the I-90 West Spotted Owl Special Emphasis Area. The northern boundary of the North Blewett Spotted Owl Special Emphasis Area was modified to exclude an area that had been significantly altered by a large forest fire in 1994. A second segment, not impacted by the 1994 fires, which contained a Spotted Owl site in the northeastern part of the proposed Spotted Owl Special Emphasis Area, was also removed. Two segments of the White Salmon Spotted Owl Special Emphasis Area were also removed: an area of largely non-forested lands near Trout Lake and an area along the eastern edge of the Spotted Owl Special Emphasis Area. The decision to remove the latter area was largely influenced by an error in a map developed by the U.S. Fish and Wildlife Service for their proposed 4(d) rule (U.S. Fish and Wildlife Service 1995). The western edge of the Columbia Gorge Spotted Owl Special Emphasis Area was moved eastward because the western area had no owl sites and was dominated by younger-aged forest that was not suitable as Spotted Owl habitat. The eastern "panhandle" of the Siouxon Spotted Owl Special Emphasis Area was removed because the area had recently been harvested. Several townships were removed from the northern edge of the proposed Hoh-Clearwater Spotted Owl Special Emphasis Area. The area encompassing two owl sites was not included in the Spotted Owl Special Emphasis Area. In exchange for the modification of the Hoh-Clearwater Spotted Owl Special Emphasis Area boundary, the proponent landowner developed a strategy to manage dispersal habitat on their ownership in the area removed from the proposed

Spotted Owl Special Emphasis Area. In addition, the landowner agreed to develop a landscape plan for owls on the remainder of the landowner's property in the current Spotted Owl Special Emphasis Area.

### Conservation Functions

Each of the Spotted Owl Special Emphasis Areas has one or more conservation functions assigned to them. These conservation functions are associated with specific areas within the Spotted Owl Special Emphasis Area, or in some cases, with the entire Spotted Owl Special Emphasis Area (see Appendix 1). The conservation functions are demographic support, dispersal support, and combination support. These functions are defined below.

#### *Demographic Support*

Demographic support means that adequate amounts and arrangements of suitable habitat are maintained to support reproductive Spotted Owl pairs. Habitat required to support nesting is characterized by more complex structure, with larger trees, snags, and down wood than typical of managed, second growth forest. Thus, landscape plans in demographic support landscapes would place more stringent requirements on landowners for the maintenance, protection, or development of habitat than dispersal landscapes (see below). The function language in the rule for demographic support reads:

Suitable Spotted Owl habitat should be maintained either to protect the viability of the owl(s) associated with each Northern Spotted Owl site center or to provide demographic support for that particular SOSEA as described in the SOSEA goals [WAC 222-10-041 (1)].

#### *Dispersal Support*

Juvenile Spotted Owls disperse from the natal area beginning in early autumn. The quality, amount, and distribution of habitats they use likely influence the ability of juveniles to eventually locate and subsequently occupy suitable territories. The functional value of dispersal habitat therefore has great management importance (Thomas et al. 1990). Juvenile Spotted Owls were thought to be able to move through landscapes that were not primarily comprised of nesting, roosting, and foraging habitat as long as the stands had adequate stocking and canopy cover to provide a place to rest and hide from predators. In federal strategies, dispersal landscapes were designed to link subpopulations occupying large landscapes of suitable nesting, roosting and foraging habitat. The dispersal linkages were to be landscapes through which juveniles could move, based on known dispersal distance capability. Because some owls could spend a substantial amount of time in a dispersal landscape, the availability of suitable patches of foraging habitat is an important attribute. The function language in the rule reads:

Either suitable Spotted Owl habitat should be maintained to protect the viability of the owl(s) associated with each Northern Spotted Owl site center or dispersal habitat should be managed, over time, to provide the dispersal support for that particular

SOSEA as described in the SOSEA goals. Dispersal support is provided by a landscape that includes dispersal habitat at the stand level interspersed with areas of higher quality habitat. Stands of dispersal habitat should be managed to reduce gaps between stands and to maintain a sufficient level of dispersal habitat to meet the SOSEA goals over time [WAC 222-10-041 (2)].

### *Combination Support*

Combination support is a concept unique to the 1996 Forest Practices rules (i.e., it did not exist within previous owl conservation planning efforts). The language reads:

Either suitable Spotted Owl habitat should be maintained to protect the viability of the owl(s) associated with each Northern Spotted Owl site center or a variety of habitat conditions should be provided which in total are more than dispersal support and less than demographic support. This can be accomplished by providing:

- a) dispersal support as described in subsection (2) of this section;
- b) areas of suitable Spotted Owl habitat that contain some opportunities for nesting as well as roosting and foraging habitat; and
- c) connectivity between areas of SOSEAs designated for demographic support or adjacent federal lands which are designated as late successional reserves, congressionally reserved areas, or administratively withdrawn areas” [WAC 222-10-041 (3)].

### *How Conservation Functions Were Determined*

The final designation of conservation functions in the current Forest Practices Rules evolved over time in response to new information and policy decisions. The Spotted Owl Scientific Advisory Group originally proposed conservation functions for the landscapes that eventually became Spotted Owl Special Emphasis Areas (see Table 3 in Hanson et al. 1993). The conservation functions defined by Hanson et al. (1993) were demographic support, demographic interchange (similar to *dispersal support* in the Forest Practices Rules), and maintenance of the species’ distribution (the latter conservation function does not have an equivalent in the Forest Practices Rules). Single landscapes had one, two or three functions (Hanson et al. 1993).

During policy negotiations that produced the alternative eventually adopted (with slight modifications) by the Forest Practices Board, the Timber-Fish-Wildlife policy group desired greater spatial specificity in the Spotted Owl Special Emphasis Area conservation functions. A team of biologists was asked to recommend refinements of Spotted Owl Special Emphasis Area functions and to develop a third category of conservation functions, one that in some way combined demographic support and dispersal support functions. The biologists produced maps and a draft report outlining more specific designation of functions in the Spotted Owl Special Emphasis Areas (Buchanan et al.

1996). The Timber-Fish-Wildlife policy group adopted many of the designations and used the principle that Spotted Owl Special Emphasis Area designations would generally not place a greater responsibility on non-federal lands than existed on immediately adjacent federal lands. For example, the group generally believed that demographic support areas would not be situated adjacent to “matrix” areas managed under the Northwest Forest Plan. This policy decision explains some differences between decisions made by the policy group and recommendations made by Buchanan et al. (1996). Most of the remaining difference between solicited recommendations (Hanson et al. 1993, Buchanan et al. 1996) and the final alternative supported by the Timber-Fish-Wildlife group was related to the policy group’s use of the combined function definition. The concept of “combined function” was applied to Columbia Gorge, Mineral Block and White Salmon landscapes in their entirety, and to portions of Finney Block, Hoh-Clearwater, and I-90 East Spotted Owl Special Emphasis Areas. These particular areas had been proposed to have both demographic support and demographic interchange (i.e., dispersal support) functions by Hanson et al. (1993).

Final decisions regarding conservation function differed in certain areas from the recommendations presented to the Timber-Fish-Wildlife policy group. The size of demographic support areas were reduced in the Entiat and I-90 West Spotted Owl Special Emphasis Areas by the Timber-Fish-Wildlife policy group. The Entiat Spotted Owl Special Emphasis Area was not identified in the proposed 4(d) rule (United States Department of the Interior 1995) and therefore the originally proposed demographic support areas were added to the dispersal support portion of the Spotted Owl Special Emphasis Area. The western and southeastern portions of the I-90 West Spotted Owl Special Emphasis Area were originally defined as demographic support areas but were changed to dispersal support; 10 Spotted Owl sites were in the areas changed to dispersal support, including 7 sites in a large block in the southeastern part of the Spotted Owl Special Emphasis Area.

### **Regulations Outside Spotted Owl Special Emphasis Areas**

Forest Practices Rules for Spotted Owls that apply outside Spotted Owl Special Emphasis Areas are as follows. During the nesting season (1 March through 31 August) any harvest, road construction, or aerial application of pesticides within the 70 acres of highest quality suitable habitat surrounding an owl site center will be considered a Class IV-Special (WAC 222-16-080 [1] [h] [iii]). Harvest, road construction, or aerial application of pesticides outside the 70-acre area or in the area but outside the nesting season, are not designated as Class IV-Special activities.

#### *Development of Regulations for Sites Outside Spotted Owl Special Emphasis Areas*

Once the decision was made to protect only the Spotted Owl sites inside Spotted Owl Special Emphasis Areas, a strategy was needed to address the remaining sites outside Spotted Owl Special Emphasis Areas. Based on the U.S. Fish and Wildlife Service’s draft 4(d) rule, the operational assumption was that a 4(d) rule would be implemented to modify the Section 9 take prohibition of Spotted Owl sites outside the Spotted Owl



Special Emphasis Areas. Even with that understanding, however, the policy group wished to avoid any direct mortality of Spotted Owls associated with harvest of active nest sites during the nesting season. Consequently, harvest or other timber management activities *during the nesting season* within a 70-acre core of Spotted Owl habitat around all territorial site centers outside Spotted Owl Special Emphasis Areas were considered Class IV-Specials.

## **Amount and Quality of Critical Habitat (State)**

### Habitat Types

The 1996 rules provide descriptions of various types of Spotted Owl habitat. The habitat definitions in the rules reflect differences in habitat conditions and owl habitat use among eastern and western parts of the owl's range in Washington. Definitions for western Washington include old-growth, sub-mature and young forest marginal habitats, the latter two habitats having definitions unique to west-side forests (WAC 222-16-085 (1)(b)(i)). Definitions for the eastern slope of the Cascade Mountains include the aforementioned habitats (but the latter two habitats have definitions unique to east-side forests), as well as a fourth habitat, referred to as "young forest marginal (open canopy)" (WAC 222-16-085 (1)(b)(ii)). The definitions provide values of various forest structures, such as forest community, tree density and height, vertical diversity, canopy closure, snags/cavity trees, mistletoe (east-side only), downed wood, and shrub cover (west-side only), that are known to be important components of Spotted Owl habitat.

Spotted Owl dispersal habitat was also described in the 1996 rules. Due to suspected differences in habitat types used by dispersing owls in western and eastern portions of the owl's range, two definitions were presented (WAC 222-16-085 (2)(a) for western Washington and WAC 222-16-085 (2)(b) for eastern Washington). These definitions were intended only for use in the development of landscape-level plans (e.g. Landowner Option Plans) to address dispersal needs of the Spotted Owl, and do not apply to default circle management. Consequently, and because there was little scientific basis for the definitions, the rules also state that "dispersal support is provided by a landscape which includes dispersal habitat at the stand level interspersed with areas of higher quality habitat" (WAC 222-10-041 [2]).

### Critical Habitat State

In addition to descriptions of Spotted Owl habitat, the Forest Practices Board also adopted State Environmental Policy Act thresholds for the amount of habitat at the Spotted Owl sites. At all sites within Spotted Owl Special Emphasis Areas, any proposed harvest of suitable Spotted Owl habitat within a territorial owl circle (status 1, 2, or 3 in the Washington Department of Fish and Wildlife database) would be considered a "Class-IV special" and would trigger State Environmental Policy Act review. Guidance on how to avoid a significant adverse impact to Spotted Owls with respect to State Environmental Policy Act is provided in WAC 222-10-041. In general, the language establishes that enough suitable habitat should be maintained to protect the viability of

owls associated with each Spotted Owl site center, or to provide for the goals established in Spotted Owl Special Emphasis Areas. For individual site centers, the habitat considered necessary to maintain viability is as follows: all habitat within 0.7 miles of a site center; in the Hoh-Clearwater Spotted Owl Special Emphasis Area on the western Olympic Peninsula, at least 5,863 acres of habitat within a 2.7-mile circle of a site center; for all other Spotted Owl Special Emphasis Areas, at least 2,605 acres of habitat within a 1.8-mile circle. These acreage amounts represent 40% of the area of the two sizes of management circles used in Washington. The size of the management circles reflects the area of the median annual home range of Spotted Owls in those two regions of the state. Proposed harvest that would reduce habitat amounts below these levels are considered to have a significant probable adverse impact on the environment (WAC 222-10-041).

### *How Critical Habitat Standards Were Established*

Definitions of critical habitat (state) have changed since 1991 and differ from those reported in research studies. This section will provide a brief summary of how the 40% value was adopted as a critical habitat threshold for the State Environmental Policy Act.

The 40% value adopted in 1991 (for use in “Owl memo #3”) and again in 1996 was based on a landscape assessment conducted by Bart and Forsman (1990). Results of that analysis showed that both the rate of occurrence of Spotted Owls and reproductive output were higher in landscapes that had at least 40% suitable habitat. Although this corroborated the results of other studies, the results were controversial because the 40% value was not a distinct threshold due to the way the data were placed into categories for analysis. Nonetheless, due to the corroboration with other studies, the 40% value was used as part of the take prohibition guidelines adopted by the U.S. Fish and Wildlife Service and rescinded in 1991. This value was used to define critical habitat in “Owl memo #3” (Stearns 1991).

Between 1991 and 1996 a number of studies were conducted that produced estimates of the amount of habitat associated with Spotted Owl sites. (Some of the studies were not published until after 1996 but their results were available to the Spotted Owl Scientific Advisory Group and decision-makers.) Hansen et al. (1993) reported that Spotted Owl home ranges contained an average of 50%, 45% and 26% suitable habitat in the eastern Cascade Mountains, western Cascade Mountains, and Olympic Peninsula, respectively. Their summary included habitat used in greater proportion than its availability on the landscape (i.e., late successional forest); habitat used in equal proportion to its availability (i.e., comparatively younger forest) was not included in the recommended habitat amounts (Hanson et al. 1993). Hanson et al. (1993) felt these results were relevant based on the concept that an animal’s apparent preference best reflects its needs (as proposed by Ruggiero et al. 1988) and that all late successional suitable habitat within the home range was therefore essential. This was the only assessment that used areas of documented owl use to derive threshold values for regulatory purposes. To evaluate their results, Hanson et al. (1993) used data from landscapes (the northwestern Cascade Mountains, the southwestern Cascade Mountains, and two areas in or near the I-90 corridor in the central Cascade Mountains) that had been thoroughly surveyed for Spotted

Owls, and calculated the average amount of suitable habitat per owl site in each landscape. These landscape approaches suggested that Spotted Owls used about 2900 to 2924 acres of habitat per site in the Olympic Peninsula, 2600 to 3900 acres of habitat per site in the western Cascade Mountains, and 1760 to 2850 acres of habitat per site in the eastern Cascade Mountains (see pages 26 and 27 in Hanson et al. 1993). These values represent 20.0%, 32 – 49% and 27 – 44% of the area of median annual home ranges reported from these regions (see Hanson et al. 1993). A landscape capability analysis conducted by the U.S. Forest Service that included data from the Olympic Peninsula and the Cascade Mountains (U.S. Department of Agriculture 1988) produced results very similar to the values recommended by Hanson et al. (1993).

Several of the landscape studies that produced information potentially useful to establish regulatory thresholds for “critical habitat state” used fixed areas centered on the owl site and compared the amount of suitable habitat at occupied sites with the amount of habitat at random (non-owl) locations. In the eastern Cascades Mountains in Washington, Irwin (1992) found 36% and 33% suitable habitat at 1.5- and 2.1-mile circles around 49 sites in managed landscapes and 45% and 40% at 1.5- and 2.1-mile circles around 45 sites in unmanaged landscapes. On the Olympic Peninsula, Lehmkuhl and Raphael (1993) reported 49% suitable habitat around 59 Spotted Owl pair locations. Similarly, Meyer et al. (1998) reported between about 38% and about 49% suitable habitat within 2.0 miles of 50 Spotted Owl sites in three western Oregon provinces. Finally, analyses conducted for the Final Environmental Impact Statement conducted for Forest Practices Rule options (Washington Forest Practices Board 1996) reported that in various areas of the state owl sites with more habitat generally had higher levels of reproductive output. The thresholds depicted in the analyses were often not distinctly related to specified levels of reproductive output, but in some cases an appreciable shift in productivity appeared to occur between 30 and 50 percent suitable habitat.

While all these estimates were valuable, they obviously differed from one another and made for a difficult decision by the Timber-Fish-Wildlife group that was developing a proposed rule for the Board. Perhaps more importantly, the Timber-Fish-Wildlife group assumed that the U.S. Fish and Wildlife Service would promulgate a 4(d) rule that all parties envisioned would mesh with the Forest Practices Rules being negotiated at that time. To maintain this consistency, the Timber-Fish-Wildlife group adopted the 40% threshold used by the U.S. Fish and Wildlife Service.

### **Timing Restrictions**

To address concerns that certain types of noise disturbances might disrupt breeding behavior, seasonal timing restrictions of specific management activities were developed. Seasonal timing restrictions would be imposed by the Department of Natural Resources for proposed activities within 0.25 miles of a Spotted Owl site between 1 March and 31 August unless it could be demonstrated that Spotted Owls were not nesting that year. The timing restriction applies to the following activities: road construction, operation of heavy equipment (including tractor and wheeled skidding systems), blasting, felling and

bucking, cable yarding, helicopter yarding, and slash disposal or prescribed burning (WAC-222-24-030 and WAC 222-30-020 and subsequent sections).

## **Exemptions**

The Forest Practices Rules contain exemptions to the designation of a Forest Practices Application as a Class IV-Special for Spotted Owls in two specific circumstances. The first type of exemption is for landowners who have developed and implemented Habitat Conservation Plans or have an incidental take statement with the U.S. Fish and Wildlife Service. Landowners with an approved Habitat Conservation Plan for Spotted Owls must still submit Forest Practices Applications for timber management activities, but if the stated activity is covered by the Habitat Conservation Plan with an incidental take permit for Spotted Owls, even if it ordinarily would have been subject to State Environmental Policy Act review, the application is approved without further review for owl issues. This same exemption applies to other types of conservation agreements, including other conservation agreements approved by the U.S. Fish and Wildlife Service that address Spotted Owls and that have gone through National Environmental Policy Act review; state-approved landscape plans (including Landowner Option Plans specific to Spotted Owls; see below) or conservation agreements approved by the Department of Natural Resources or the Washington Department of Fish and Wildlife (depending on the situation) that have gone through State Environmental Policy Act review (see WAC 16-080-(6)(a-g) for details of other agreement types). In addition, any landowner with an ownership of 500 acres or less in a Spotted Owl Special Emphasis Area is exempt from Class IV-Special designation in Spotted Owl circles in that landscape as long as proposed harvest locations occur >0.7 mile from a status 1-3 Spotted Owl activity center (WAC 222-16-080 (1)(h)(iv)).

### *How the 500-acre Exemption Was Established*

The Timber-Fish-Wildlife policy group and the Forest Practices Board needed to address concerns that small, non-industrial landowners would be inordinately impacted by adoption of Forest Practices Rules for Spotted Owls. In response to this, the Department of Natural Resources developed a database and map of small landowner parcels of three *a priori* sizes classes (<100 acres, 101-250 acres, 251-500 acres) within proposed Spotted Owl Special Emphasis Areas. A preliminary analysis of the data showed that 137 Spotted Owl circles in Spotted Owl Special Emphasis Areas overlapped one or more small landowner parcels, although the amount of suitable habitat involved was not determined. Of the 137 sites, 23 had parcels of the smallest landowner category (<100 acres) within the 0.7-mile circle, 11 had 101-250 acre parcels within that distance, and 10 had 251-500-acre parcels. In sum, 44 of 137 sites (32%) had small landowners within the 0.7-mile management circle. Given the Timber-Fish-Wildlife policy group's view on the importance of habitat within the 0.7-mile circle, the exemption was not adopted for these areas. An additional assessment that incorporated a map of suitable habitat showed that at least 10 Spotted Owl sites in Spotted Owl Special Emphasis Areas would fall below the 40% threshold if the small landowner areas of suitable habitat were harvested. A recommendation was made to identify these sites for special site plans. This

recommendation was not adopted, and the Forest Practices Board decided that this level of potential impact was acceptable.

## **Planning Options**

During the negotiation process that led to the development of the current rules, stakeholders agreed that an optional process that allowed for more effective landscape-level planning for Spotted Owls should be included in the new rules. Consequently, the rules contain two provisions that allow for more flexible management of Spotted Owl habitats in Spotted Owl Special Emphasis Areas. The first of these is the Landowner Option Plan. Development of a Landowner Option Plan would enable a landowner to manage a landscape in a manner conducive to Spotted Owl conservation and more efficient timber management without the limitations imposed by Spotted Owl management circles. In short, the Landowner Option Plan concept recognized that Spotted Owls do not use habitat only within owl management circles and that conservation and innovative management activities implemented over a large landscape area could ultimately best serve the owl. The Landowner Option Plan is somewhat analogous to a federal Habitat Conservation Plan, except that an incidental take permit is not involved (i.e., the state lacks this authority) and that the outcome of the plan "... should be designed to achieve an appropriate contribution from nonfederal lands toward meeting SOSEA goals ..." (WAC 222-16-100 (1)(a)(i)(C)). The Landowner Option Plan is to be developed by the landowner and approved by the Department of Natural Resources, in consultation with Washington Department of Fish and Wildlife.

The second optional planning opportunity is the Cooperative Habitat Enhancement Agreement. This element of the rules was included to encourage creation, enhancement, or retention of Spotted Owl habitats in areas beyond the 1.8- or 2.7-mile radius management circles. Any disincentive for these types of activities was addressed in the rule by a guarantee that creation, enhancement, or retention of owl habitats outside known Spotted Owl circles would not result in future regulations restricting harvest options should an owl eventually reside in the habitats (WAC 222-16-105).

## **BIOLOGICAL BACKGROUND**

The Northern Spotted Owl is one of the most intensively studied bird species in the world. Literally hundreds of papers have been written on various aspects of the distribution, ecology, behavior, and population status of this species (see Courtney et al. 2004). The following section will briefly summarize aspects of the natural history of the Northern Spotted Owl, with an emphasis on information relevant to Washington.

### **Natural History**

#### Distribution and Subspecies

Spotted Owls are found throughout much of western North America, where three subspecies are recognized (American Ornithologists' Union 1957). The Northern

Spotted Owl (*Strix occidentalis caurina*) is distributed from extreme southwestern British Columbia south through the Cascade Mountains and coastal ranges to central coastal California (Gutiérrez et al. 1995). The California Spotted Owl (*S. o. occidentalis*) is found from the northern Sierra Nevada Mountains in northeastern California south, discontinuously, to isolated ranges in southern California and extreme northern Baja, Mexico (Gutiérrez et al. 1995). The Mexican Spotted Owl (*S. o. lucida*) is found in mountainous areas of southern Utah, southern Colorado, Arizona, New Mexico, extreme western Texas, and in forested mountains of northern Mexico south to Michoacan (Gutiérrez et al. 1995). Although an earlier analysis (Haig et al. 2001) failed to support the long-held belief that California and Northern Spotted Owls were separate subspecies (e.g. American Ornithologists' Union 1957), more recent analyses conclusively demonstrate that these subspecies are distinct (Haig et al. 2004a).

### Status of the Three Subspecies

The Northern Spotted Owl and Mexican Spotted Owl are listed as threatened species under the Endangered Species Act (U.S. Department of Interior 1990, 1993). The California Spotted Owl was recently the focus of a petition for listing, but the U.S. Fish and Wildlife Service ruled that it did not warrant listed-species status (U.S. Department of Interior 2003). All three subspecies are experiencing population declines (Northern: Anthony et al. 2004; California: LaHaye et al. 1994, Blakesley et al. 2001; Mexican: Seamans et al. 1999). The Washington Fish and Wildlife Commission designated the Northern Spotted Owl an endangered species in this state in 1988 (see Thomas et al. 1990). Additionally, the Spotted Owl was listed as endangered in British Columbia, Canada, in 1986 (Chutter et al., in preparation). The British Columbia population is extremely small (possibly less than 50 owls; Chutter et al., in preparation).

### Habitat

The Northern Spotted Owl is a habitat specialist and uses forests containing complex structure. In western Washington, Spotted Owls nest primarily in old forest habitat (Forsman and Giese 1997), but also in mature forests that contain structures like large-diameter snags, residual trees, and large downed wood that are characteristic of old-growth forests (e.g., Irwin et al. 1991). Spotted Owls do not build nests, but lay their eggs primarily in cavities or on the broken tops (“chimneys”) of large-diameter trees. Much of the old forest used by Spotted Owls is on federal lands (i.e., U.S. Forest Service, National Park Service). Conversely, a lower proportion of the Spotted Owl habitat used on non-federal (i.e., state, private, municipal) lands is comparatively younger mature forest. The vast majority of Spotted Owl nest sites in western Washington are in old forest (e.g., Forsman and Giese 1997), and comparatively few nests have been documented in mature or younger second growth forest areas (Washington Department of Fish and Wildlife, file data).

On the eastern slope of the Cascade Mountains, Spotted Owls exhibit a different pattern of habitat use than in western Washington. Spotted Owls use old forest in this region, but make much greater use of comparatively younger forests. For example, the median age

of dominant or co-dominant trees at 85 nest stands in the eastern Cascade Mountains was 122 years (Buchanan et al. 1995). Significant use of these comparatively younger-aged forests likely reflects differences in prey availability in the eastern Cascade Mountains (see Forsman et al. 2001). In addition, the younger stands often contain substantial amounts of Douglas-fir dwarfmistletoe (*Arceuthobium douglasii*), which is apparently a valuable resource for an important prey species of the Spotted Owl, the northern flying squirrel (*Glaucomys sabrinus*) (Forsman et al. 2001).

Spotted Owls in this region often nest atop clusters of mistletoe-infected branches and in existing nests built by Northern Goshawks (*Accipiter gentilis*) (Buchanan et al. 1993). As in western Washington, most of the old-growth forest is on federal lands (i.e., U.S. Forest Service). Most of the Spotted Owl habitat on non-federal lands (i.e., state and private) is mature forest or “young forest marginal” (see below), but the quality of these forests appears to be generally similar to forests of these age classes on federal lands (Joseph B. Buchanan, personal observation).

Spotted Owl habitat is often described in terms of its likely function for nesting, roosting or foraging purposes. The habitat conditions associated with these life requisites relate to owl resource needs within the annual home range area. Attributes of habitat used by Spotted Owls during dispersal, however, may differ from nesting, roosting and foraging habitats. To date, only a single study has been conducted to generate a better understanding of the stand- and landscape-level conditions used by dispersing Spotted Owls. That study showed that Spotted Owls used a variety of cover types (including areas that would be considered non-suitable habitat according to rule definitions), but exhibited a preference (in use versus availability analyses) for older forest conditions during dispersal (Miller et al. 1997).

### Prey

The Spotted Owl is a sit-and-wait predator that uses a wide variety of prey species, although one species is most prevalent in Washington. The northern flying squirrel is the most commonly encountered prey species in all parts of the owl’s range in Washington. It comprises between 29.3% and 54.3% of prey items and between 45.3 and 58.6% of prey biomass in different parts of the state (Forsman et al. 2001). Other important prey species included snowshoe hare (*Lepus americanus*), mice (*Peromyscus* spp.), bushy-tailed woodrat (*Neotoma cinerea*) and boreal red-backed vole (*Clethrionomys gapperi*) (Forsman et al. 2001). Prey habits differ between the eastern slope of the Cascade Mountains and western Washington (Forsman et al. 2001), as some species (e.g., snowshoe hare, bushy-tailed woodrat) are more common in the eastern Cascades. Birds and insects are also taken (Forsman et al. 2001). Most hunting occurs at night but some prey captures occur opportunistically during daylight hours (Sovern et al. 1994).

### Breeding and Territoriality

The territorial and reproductive behaviors of Spotted Owl have been well documented. Spotted Owls are territorial and readily respond to suspected intruders (including humans

imitating owl calls) during the breeding season (Gutiérrez et al. 1995). Like many other territorial species, territories are maintained by communication (vocalizations) between neighbors, and obvious conflicts over boundaries are rare (Gutiérrez et al. 1995). Outside the breeding season the owls use much larger areas than during the breeding season, and parts of the home range therefore can't be regularly patrolled and defended (via vocalizations). For this reason, portions of the home range may be shared with other owls (Eric Forsman, personal communication). Although breeding season home range use is essentially exclusive to the territory holder(s), non-breeding and non-territorial birds, referred to as floaters, may occasionally hide within the territory (Tracy Fleming, personal communication). Floaters enter the breeding population when a territorial bird dies or a territory otherwise becomes available.

The breeding season begins in February or March with courtship behavior occurring in the vicinity of the nest. Between one and four eggs (usually two) are laid in March or April, and these are incubated for about 30 days until hatching. Young birds remain in the nest for an additional 34-36 days (Gutiérrez et al. 1995), and disperse from the nest beginning in September or October (Forsman et al. 2002). After dispersal by the juvenile(s) the adults typically leave the nest area and use other parts of the home range. Although Spotted Owls are monogamous, paired adults often do not remain together during the winter season and may use distinctly different areas of the home range (Forsman et al. 1984). The adults return to the breeding area in late winter or early spring. Very rarely (about 5% of the time; Forsman et al. 2002) one or both of the adults will not return to the breeding area and will take up residency elsewhere.

### Home Range Size

Spotted Owl home ranges are relatively large and vary geographically in their spatial extent. Within the range of the northern subspecies (*S. o. caurina*) home ranges generally increase in size from south to north (Gutiérrez et al. 1995); the smallest home ranges are in northern California and the largest are in the Olympic Peninsula. In Washington, home ranges are generally larger in the Olympic Peninsula than elsewhere in the state although there is overlap in size among regions (Hanson et al. 1993). The median home range sizes of owl pairs reported for Washington are 14,232 acres (n = 7 pairs) in the Olympic Peninsula, 8,205 acres (n = 6 pairs) in the western Cascade Mountains, and 6,610 acres (n = 4 pairs) in the eastern Cascade Mountains (Hanson et al. 1993). These values were derived using the 100% minimum convex polygon method. Although the minimum convex polygon method has been criticized (e.g. Powell 2000), it was used by researchers to generate all values used by Hanson et al. (1993), and it produced values that corresponded with multi-year home range values derived using a modified minimum convex polygon (Carey et al. 1992). Data from the Olympic Peninsula and the combined Cascade Mountains areas were used for SEPA guidance for the current rules, and for take guidelines used by the U.S. Fish and Wildlife Service. For a discussion of the 100% minimum convex polygon method related to Spotted Owls, see Hanson et al. (1993).



## Dispersal

All juvenile Spotted Owls disperse from the natal area. Natal dispersal begins in September or October and is completed when the owl acquires a territory (Forsman et al. 2002). As juveniles have no experience in the area beyond the immediate vicinity of the natal area, dispersal is random with respect to direction from the natal area. Results of radio-telemetry work indicate that females, on average, disperse slightly greater distances than males (19.3 miles versus 14.0 miles, respectively) (Forsman et al. 2002). Habitat use during the dispersal period is described below.

## Life Span and Mortality

Spotted Owls have a long life span. A number of banded owls of known age were at least 16 years old, and an owl in captivity was at least 25 years old (Gutiérrez et al. 1995). Mortality factors include starvation and predation (see section on predation, below), as well as a variety of lesser factors including disease and accidents. Exposure during inclement weather may result in death of some dispersing juveniles (Gutiérrez et al. 1995).

## **Limiting factors**

A variety of factors have the potential to influence Spotted Owl populations, subpopulations or individuals, either in terms of species distribution, species occurrence or population performance. In describing these factors, below, an emphasis was placed on information published or made available since the 1996 implementation of the current rules for Spotted Owls.

## Habitat Loss and Degradation

Habitat loss is a well-known factor influencing Spotted Owl populations throughout the species' range (Thomas et al. 1990, Courtney et al. 2004, U.S. Fish and Wildlife Service 2004). As discussed above, Spotted Owls have very large home ranges (see Hanson et al. 1993). Within these home ranges, Spotted Owls exhibit a decided preference for old forests or, where old forest is absent or scarce, mature forests with substantial retention of legacy features (e.g. residual trees and large snags). Spotted Owls move across their home ranges over the course of the year (Forsman et al. 1984) searching for prey. Loss of suitable habitat reduces the amount of foraging area and likely reduces the overall population (and the availability) of prey, and thus reduces the quality of the landscape. Landscapes below a certain threshold of habitat amount (or quality) will not support Spotted Owls. This is an important limiting factor, and was the factor most influential in the listing of the Spotted Owl as a threatened species.

Since the implementation of Forest Practices Rules for Spotted Owls in 1996, several papers have been published on impacts to habitats used by Spotted Owls, or with respect

to responses of Spotted Owls to habitat changes. The following discussion of habitat loss is limited to these papers. In addition, the concept of fire suppression is briefly introduced, as this remains an important and controversial topic.

### *Fire Suppression*

A major concern in the eastern Cascade Mountains is the consequence of long-term fire suppression practices. It has been well documented that fire suppression over the last approximately 100 years has greatly influenced tree species composition and the horizontal and vertical continuity of fuels in forests (Agee 1993). Prior to the onset of fire suppression, frequent, low-intensity fires burned through the understory of forests in portions of the eastern Cascade Mountains and prevented the invasion of understory trees (Agee 1993). As a result of fire suppression, forest landscapes in the eastern Cascade Mountains have changed in three basic ways: 1) there has been an apparent increase in the amount of Spotted Owl habitat, 2) there has been an increase in the risk of stand-replacing fires, and 3) increased stocking in some forest stands has resulted in moisture stress and subsequent loss of tree vigor, resulting in greater susceptibility of trees to the effects of insect and disease outbreaks (Camp 1999, Hessburg et al. 2000). Many forest areas are characterized by tree species composition and forest structure that are considered unstable or that are highly vulnerable to a stand-replacing event (Agee 1993). Several large fires burned in 1994 and impacted Spotted Owl habitat in the eastern Cascade Mountains (Bevis et al. 1997, Gaines et al. 1997). The impacts of fires on Spotted Owls are variable, and some owls have subsequently been documented reproducing on territories that were only partly impacted by fires (Bevis et al. 1997, Gaines et al. 1997, Bond et al. 2002). Moreover, some areas are less likely to experience catastrophic fire (Camp et al. 1997), and owls likely evolved to make use of such landscape areas.

### *Forest Fragmentation*

Fragmentation of habitats is known to have many ecological consequences (Burgess and Sharpe 1981), and some wildlife species respond negatively to fragmentation (Harris 1984, Robbins et al. 1989). Numerous studies of Spotted Owl habitat have evaluated various indices of forest fragmentation and landscape configuration (see Franklin et al. 2002) in the vicinity of nest sites (e.g., Lehmkuhl and Raphael 1993, Meyer et al. 1998). These studies found large amounts and great concentrations of mature and older forest at Spotted Owl nest areas, compared to random locations in the landscape. A recent meta-analysis of data from throughout the range of the Northern Spotted Owl confirmed these findings (Franklin and Gutierrez 2002). There has otherwise been little indication of a negative relationship between Spotted Owls and forest fragmentation. In fact, recent research within the range of the Northern Spotted Owl in northern California has demonstrated that reproductive output was positively associated with the amount of edge between patches of suitable Spotted Owl habitat and other forest cover types (Franklin et al. 2000). This same analysis showed that although annual survival was positively associated with amount of interior old forest, this habitat factor was negatively associated with reproductive output. A study from coastal Oregon produced similar results (Olson

et al. 2004). Although there are no published data on this topic from Washington, an ongoing study in the western central Cascade Mountains appears to have found a positive relationship between the amount of forest edge and Spotted Owl productivity (Dale Herter, personal communication).

#### *Other Factors That May Influence Forest Habitat*

A number of factors have the potential to influence Spotted Owl habitat. These factors, in addition to others introduced elsewhere in this chapter, are known triggers of successional change and include landslides, volcanic eruptions, wind events, ice storms (Pickett and White 1985) and climate-change (Dale et al. 2001). The details of these factors and how they influence the Forest Practices Rules are beyond the scope of this document. Two recent papers from Washington describing “other” factors are worth noting. First, research on Spotted Owls in the eastern Cascade Mountains identified biotic and abiotic attributes related to occupancy and reproduction by Spotted Owls. Spotted Owl sites at higher elevations or that experienced more precipitation were less frequently occupied than lower and drier sites (Irwin et al. 2004). Sites in non-glaciated montane areas were less reproductively successful than those in glacially scoured areas (Irwin et al. 2004). In addition, sites that had not been occupied by Spotted Owls for the final three years of the study contained less seedling- and sapling-stage stands and more forest in pole timber compared to occupied sites (Irwin et al. 2004). More information is necessary to identify factors that influence occupancy and productivity of Spotted Owls.

Second, research conducted in the eastern Cascade Mountains found that certain landscape conditions were more stressful to Spotted Owls than others. In a study by Wasser et al. (1997), stress was measured as the level of fecal corticosterone, the primary glucocorticoid stress hormone in birds. The fecal corticosterone level was higher in males than in females (Wasser et al. 1997). Males at sites within 0.41 km of a recent (< 10 years) clear cut had significantly higher levels of fecal corticosterone than males at sites more distant from such areas (Wasser et al. 1997). Also, males had comparatively higher fecal corticosterone levels in the Wenatchee National Forest, where timber harvest was more intensive, than at sites in the less-intensively managed Yakama Indian Reservation (Wasser et al. 1997). Despite these findings, the level of disturbance that causes changes in site occupancy, reproductive output, fitness, or survival is not known.

#### Predation

Predation is one of the most significant causes of mortality in Spotted Owls (Gutiérrez et al. 1995). Predators are present in all landscapes used by Spotted Owls, but the risk of predation likely reflects the local abundance or proximity of capable predators, which in turn are influenced by habitat and prey resources of importance to predators. Potential predators include Northern Goshawks and Great Horned Owls (*Bubo virginianus*), although Cooper’s Hawks (*Accipiter cooperi*), Red-tailed Hawks (*Buteo jamaicensis*) and Barred Owls (*Strix varia*) may occasionally kill Spotted Owls (Gutiérrez et al. 1995, Leskiw and Gutiérrez 1998). Of the chief predators, Great Horned Owls are associated with open areas or fragmented forests. Consequently, their densities are higher in areas

with more openings and less old forest (Johnson 1992). Northern Goshawks are associated with older forest habitats and in the eastern Cascade Mountains Spotted Owls use nests built by this species (Buchanan et al. 1993) and occasionally nest in the same forest stands (J. Buchanan, personal observation). Forsman et al. (2002) suspected that Great Horned Owls were the chief cause of predation during natal dispersal. A variety of mammalian predators could potentially capture pre-flight young in the vicinity of the nest.

### Competition with Barred Owls

Competition with Barred Owls has the potential to (and may currently be) a negative influence on Spotted Owl populations in the region. The Barred Owl, a slightly larger species than the Spotted Owl, invaded the distributional range of the Northern Spotted Owl in the last few decades, after expanding westward across northern North America, and then south from British Columbia into Washington, Oregon, and California (see Dark et al. 1998). Between 1982 and 2000, an index of Barred Owl abundance increased at 8.6% per year in the southern western Cascade Mountains in Washington (Pearson and Livezey 2003).

A species of concern in parts of eastern North America (Mazur and James 2000), the Barred Owl is a habitat and prey generalist in the Pacific Northwest, and is therefore capable of using a comparatively wider selection of prey species and habitats than the Spotted Owl. In addition, Barred Owls generally have greater reproductive output, are much stronger dispersers, use smaller home ranges (Hamer 1988, Mazur and James 2000), and are more aggressive than Spotted Owls (Gutiérrez et al. 1995), ecological and life history attributes suggesting that Barred Owls have the potential to be competitively dominant over Spotted Owls in regions where both species exist. Anecdotal and correlative information suggests that competition between the two owl species is occurring (see Courtney et al. 2004).

Several studies have investigated aspects of the relationship between these two owl species in the Pacific Northwest. Hamer et al. (2001) reported on the food habits of the two owls in the Northern Cascade Mountains and found a great amount of overlap in prey use. They also found that Barred Owls used multiple prey species that were rarely or never used by Spotted Owls. In terms of habitat use, Spotted Owls generally occur in areas with steeper slopes (Pearson and Livezey 2003, Buchanan et al. 1995), whereas Barred Owls often use areas along river valleys or other areas near water (Pearson and Livezey 2003), particularly in the drier portions of the eastern Cascade Mountains (Herter and Hicks 2000, Buchanan et al. 2004). These results, however, are likely somewhat influenced by the topographic features of landscapes that support Spotted Owls (i.e., most such sites are in foothills or mountainous country). Herter and Hicks (2000) found that Barred Owls were more abundant in the wetter, western part of their study area in the central Cascade Mountains. Finally, attributes of Barred Owl nest sites differed from Spotted Owl sites in the eastern Cascade Mountains: Barred Owl sites were characterized by a greater presence of hardwoods, a greater richness of tree species, and different

structures used for nests (more cavity and broken-top nests) than at Spotted Owl sites (Buchanan et al. 2004).

Three studies attempted to identify potential competitive consequences of the noted association between Spotted Owls and Barred Owls. In the southwestern Cascade Mountains, there were more Barred Owl sites present in unoccupied Spotted Owl management circles (at 0.5-, 1.0-, and 1.8-mile radius analysis circles) than in occupied ones (Pearson and Livezey 2003). Although Spotted Owl sites (0.5-mile radius) had more suitable habitat than Barred Owl sites (Pearson and Livezey 2003), the analysis did not evaluate whether Spotted Owls left the site because of the presence of Barred Owls or that Barred Owls simply moved in after Spotted Owls departed for other reasons (e.g. insufficient amounts of habitat in the area). Although the Pearson and Livezey (2003) data are compelling, the data should be evaluated to address their spatial independence. In the northwestern Cascade Mountains, Iverson (2004) reported that Spotted Owl reproductive output was not influenced by Barred Owl presence. This study, however, was based on a very small sample size that likely precluded adequate and robust analysis according to Livezey (2005). Finally, analyses from demography research monitoring areas in western Washington (Olympic Peninsula) and western Oregon (H.J. Andrews, Coast Range, Roseburg) indicated that when Barred Owls were present at distances between  $>0.5$ - and  $\leq 1.5$ -miles of a known Spotted Owl site, occupancy rates of Spotted Owls there were similar to those at sites (and at similar distances) where no Barred Owls were present (Kelly et al. 2003). On the other hand, when Barred Owls were located within 0.5-mile of a known Spotted Owl site, occupancy by Spotted Owls was lower than at sites where Barred Owls were absent (Kelly et al. 2003). This analysis controlled for “year effects” (Kelly et al. 2003), but did not control for potential effects of habitat amount or quality. Therefore, although the results are compelling, they do not conclusively demonstrate competition because other confounding factors that may have influenced owl behavior (i.e., the effects of habitat amount or quality) were not evaluated (Courtney et al. 2004). Additional unpublished information from other landscapes in Washington indicates similar findings and is summarized in Courtney et al. (2004). The recent review of scientific information conducted for the U.S. Fish and Wildlife Service 5-year review of the owl’s status reached a conclusion (Courtney et al. 2004:7.31) that we believe is appropriate:

On balance, the data ... suggest a direct response of Spotted Owls to Barred Owl presence, but the data are not inconsistent with alternative hypotheses. Taken with the widespread negative correlation between the numbers of the two owl species, the panel feels that displacement of Spotted Owls by Barred Owls is likely occurring, but the rate and extent of this are unknown, and, further, whether this effect is exacerbated by other confounding issues is also uncertain.

### Hybridization with Barred Owls

Hybridization between Spotted Owls and Barred Owls was first documented in the Pacific Northwest over one decade ago. Hybridization, especially when it involves a rare species, is an issue of conservation concern because in extreme cases it can result in

genetic extinction (Rhymer and Simberloff 1996). By 1999, 47 Spotted Owl/Barred Owl hybrids had been reported from Washington and Oregon (Kelly and Forsman 2004). In instances where mixed-species pairs of owls were observed, all Spotted Owls were males and all Barred Owls were females; female Spotted Owls were never paired with male Barred Owls (Kelly and Forsman 2004). The offspring of mixed-species pairs are considered F1 hybrids. These F1 hybrids are capable of reproducing: 6 F1 hybrids were known to have bred with Spotted Owls (this is referred to as backcrossing) and produced only one young, whereas 10 F1 hybrids that backcrossed with Barred Owls produced 15 young (Kelly and Forsman 2004). Based on intensive monitoring efforts through 1999 at demography research study areas throughout the Pacific Northwest, a small number of mixed-species pairings was noted (Kelly and Forsman 2004). However, offspring produced from backcrossing resemble one parental species rather than the hybrid form, and are therefore likely difficult to detect in the field (Haig et al. 2004b), suggesting that some backcrossed hybrids may have gone undetected. Given the suspected low level of hybridization in the Pacific Northwest, Kelly and Forsman (2004) concluded that hybridization posed a lesser threat to Spotted Owls than the possible consequences of competition with Barred Owls.

#### Disease and Chemical Contaminants

Neither disease nor chemical pollutants are currently recognized as important limiting factors of Northern Spotted Owls. Diseases are relatively common in raptors (Cooper 1993), but generally do not limit populations (but see below). Acute septicemic spirochetosis was documented in a Spotted Owl from Kittitas County (Thomas et al. 2002). Other diseases have not been documented (at least at levels where they are problematic at the subpopulation level) in Spotted Owls.

The West Nile Virus, a disease new to the North American continent in 1999, is expected to impact native bird populations in Washington in the very near future, and may impact Spotted Owl populations or subpopulations. This virus has been reported in many groups of birds in North America (Bernard et al. 2001), including owls, which are vulnerable to the virus elsewhere in North America (Fitzgerald et al. 2003, Gancz et al. 2004). West Nile Virus apparently resulted in the death of a Spotted Owl held in captivity in Ontario, Canada, in 2002 (Gancz et al. 2004).

Chemical contaminants in quantities high enough to result in death should not currently be expected in Spotted Owls. Elevated levels of brodifacoum, an anticoagulant commonly used as a rodenticide (Mendenhall and Pank 1980), were found in a dead Spotted Owl from the eastern Cascade Mountains in the early 1990s (Tracy Fleming, personal communication). This owl nested near a fruit orchard and likely consumed prey that had been exposed to the rodenticide. Given that most forests suitable for Spotted Owls are not in close proximity to fruit orchards, it seems likely that this type of impact is rare.

## Human Disturbance

Human disturbance has become a significant factor influencing the behavior and distribution of wildlife (Hockin et al. 1992, Knight and Cole 1995). Human disturbance is here defined as any human activity, including those that may not modify habitat conditions, which influences the ecology or behavior of a species. Consequences of human disturbance may include altered activity budgets (Steidl and Anthony 2000), decreased nest attendance (Fernandez and Azkona 1993), or altered patterns of habitat use (van der Zande and Verstrael 1985). Activities with the potential to disturb Spotted Owls include operation of machinery associated with timber harvest (ranging from chainsaws to vehicles), blasting, and helicopter overflights. Other disturbance factors of potential concern include interactions with recreationists and owl surveyors.

Despite the stated concerns about human disturbance, little is known about the behavioral or physiological consequences of disturbance on Spotted Owls. To our knowledge, only five papers have been published on the response of Spotted Owls to human disturbance. In Utah, Mexican Spotted Owl behavior was influenced by the experimental presence of hikers at nest sites in narrow canyons (Swarthout and Steidl 2001, 2003). Although Spotted Owl activity budgets, nest attendance, and vocalization rates were influenced by the presence of hikers (Swarthout and Steidl 2003), the authors did not evaluate the influence of disturbances on reproductive rates or estimates of survival. The level of disturbance used in the Utah experiment is unlikely to be replicated at Spotted Owl sites in Washington, as the Utah owls nested in extremely narrow canyons near trails. Few Spotted Owls in Washington are known to nest in such close proximity to heavily used hiking trails. Additional studies of Mexican Spotted Owls found little response of owls to overflights by jet aircraft (Johnson and Reynolds 2002) or helicopters (Delaney et al. 1999). It is unclear whether Northern Spotted Owls would respond similarly to such disturbances.

In Washington, Spotted Owls exhibited elevated measures of stress in response to environmental conditions near the site center. As mentioned earlier, the level of fecal corticosterone, the primary glucocorticoid stress hormone in birds, was used to measure stress. Male Spotted Owls had higher levels of fecal corticosterone than females (Wasser et al. 1997). Males from sites within 0.41 km of a major logging road had higher fecal corticosterone levels than owls farther from roads or harvest units (Wasser et al. 1997). As indicated earlier, the level of disturbance that causes changes in site occupancy, reproductive output, fitness, or survival is not known.

Finally, concern has been expressed that long-term exposure of Spotted Owls to owl surveyors may influence their behavior. The reasons for the concern include owl habituation and attraction to the surveyor and an increase in territorial behavior. It is well known that owls become habituated to surveyors and learn to expect an offering of mice (mice are offered by surveyors as an aide to locate nests; Forsman 1983). Some owls will approach surveyors (or others) in anticipation of being offered a mouse. Owls that exhibit such behavior in the presence of those that would do them harm would be at potential risk to injury or death. The second type of disturbance related to surveyors is

the potentially greater amount of territorial encounters that might be initiated by the surveyor. Spotted Owls respond to imitations of their calls (Forsman 1983) and a surveyor making repeated visits to an area could elicit numerous territorial responses from the territorial owl. Owl responses, whether involving vocalizations or additional patrolling of the territory, may have energetic costs to the owl, particularly if they perceive the surveyor to be a stranger rather than a neighbor (Galeotti and Pavan 1993), and may predispose them to greater predation risk. A protocol was developed to provide guidance for conducting surveys (U.S. Fish and Wildlife Service 1991, 1992), including recommendations to minimize unnecessary disturbance, but an evaluation of potential surveyor effects has not been conducted.

Spotted Owls appear to be sensitive to human disturbance (Wasser et al. 1997). The effects of human disturbance are likely related to the type and intensity of the disturbance, and such disturbance may therefore be undesirable. However, as stated previously, the level of disturbance that causes changes in site occupancy, reproductive output, fitness, or survival has not been identified and therefore is not known, and evidence for such effects appear weak.

#### Isolation of Breeding Populations

The Northwest Forest Plan (U.S. Department of Agriculture and U.S. Department of Interior 1994) was designed in a manner that reflected, to a degree, modeling conducted by the Spotted Owl Recovery Team indicating persistence of subpopulation clusters connected by a matrix of functioning dispersal habitat on federal lands (Lamberson et al. 1994). The model indicated that the size of sub-population clusters (the number of owl sites and amount of habitat) and their proximity to other clusters influenced population persistence. Using a variety of data, including information on the dispersal ability of juvenile Spotted Owls, the model indicated that sites where turnover occurred could be recolonized by dispersing Spotted Owls. The conclusions of this modeling effort are important to management of Spotted Owls in Washington for two reasons. First, it suggested that Spotted Owl populations could be protected on a large array of reserves connected by landscapes through which Spotted Owls could disperse. Second, and more specifically, the model results suggested that sites or sub-populations could be “rescued” by owls originating from other areas.

The issue of population connectivity is relevant to Spotted Owl management because at some point the isolation of Washington’s population may become a concern. Spotted Owl sub-populations in Washington are contiguous with those in British Columbia. However, gaps exist in the distribution of habitat between these sub-populations, and the British Columbia population is extremely small (perhaps less than 50 birds) and declining (Chutter et al., in preparation). Without very substantial improvement in the demographic health of British Columbia’s owl population it is unlikely that meaningful demographic augmentation to Washington’s owl population would originate from that province in the near-term. To the south, Spotted Owls occur throughout much of western Oregon south of the Columbia River (Forsman et al. 1984). Given the great width of the Columbia River, and the sparse distribution of Spotted Owls and owl habitat in



southwestern Washington (Hanson et al. 1993) and northwestern Oregon (Forsman et al. 1977), the Columbia River Gorge represents the area where extant owl populations in the two states are in closest proximity. The Columbia River Gorge was previously identified as a landscape where interchange of owls between the two states might occur (Hanson et al. 1993), although interchange has not been examined or demonstrated.

Although recent genetic analyses indicate that owls from Washington and Oregon are from the same population (Haig et al. 2001), the Columbia River appears to represent a formidable barrier to demographic interchange. Radio telemetry data indicate that Spotted Owls do not readily fly across large bodies of water (Hanson et al. 1993, Forsman et al. 2002; see Courtney et al. 2004) such as the Columbia River. The significance of demographic isolation relates to the reserve designs of the Interagency Scientific Committee (Thomas et al. 1990), the draft Spotted Owl recovery Plan (U.S. Department of Interior 1992) and the Northwest Forest Plan (U.S. Department of Agriculture and U.S. Department of Interior 1994b). Those strategies all acknowledged the significance of reserves that were within the flight capability of dispersing Spotted Owls. They also recognized that dispersing Spotted Owls would fill “openings” that occur after site turnover (i.e. mortality of a territory-holder) or recruitment of new habitat. If reserve areas are located too far apart, or in this case are separated by a barrier, colonization would be impaired (and see Courtney et al. 2004). If Spotted Owls do not cross the Columbia River at a rate necessary to adequately recolonize sites or sub-population clusters in a manner suggested by the Lamberson et al. (1994) model, then the Washington population is demographically isolated from the population in Oregon.

### **Spotted Owl Demography**

Demography research on Spotted Owl subpopulations in Washington has been ongoing, beginning in the Olympic Peninsula in 1987 and the eastern Cascade Mountains in 1989. Results of demography research were released following each of three workshops held to facilitate standardization of the methodological approach and to conduct meta-population analyses (Forsman et al. 1996, Franklin et al. 1999, Anthony et al. 2004). The regional-scale demography studies reported were conducted in landscapes that included a small portion of the Hoh-Clearwater Spotted Owl Special Emphasis Area, and much of the Entiat, I-90 East, I-90 West, North Blewett, and White Salmon Spotted Owl Special Emphasis Areas (Table 2; Anthony et al. 2004).

Results of the most recent population trend analyses indicated a continuing population decline over much of the Spotted Owls’ range and particularly for study areas located in Washington. Overall, Spotted Owl subpopulations in the 14 demography study areas in Washington, Oregon and California declined 4.1% per year over the last 10 or more years of investigation (Anthony et al. 2004). Spotted Owl subpopulations in Washington declined in the Cle Elum and Wenatchee study areas (Table 3), and subpopulations appeared to have declined also in the Olympic and Rainier study areas (Table 3). The uncertainty associated with the latter two areas was related to the precision of the estimates of population change (Anthony et al. 2004). The rate of population change is reflected in the value of “lambda;” values of less than 1.0 indicate a declining population,

Table 2. Location of demography study areas relative to Spotted Owl Special Emphasis Areas in Washington.

Demographic Study Area (and years of investigation)	Geographic Location	Spotted Owl Special Emphasis Areas included (in whole or in part)
Cle Elum (1989-2003)	Central eastern Cascades	I-90 East
Olympic (1987-2003)	Olympic Peninsula	Hoh-Clearwater
Rainier (1992-2003)	Central western Cascades	I-90 West
Wenatchee (1990-2003)	Eastern Cascades	Entiat, North Blewett, White Salmon

whereas values at or above 1.0 indicate stable or increasing populations, respectively. The confidence intervals associated with the Olympic and Rainier lambda values included 1.0 (Table 3), indicating that the true value of lambda could exist within this range. It is noteworthy that the lambda value for the Rainier study area (Table 3) was the lowest value of all 14 demography study areas but along with the Olympic study area had relatively large confidence intervals. Three of the four lowest lambda values within the range of the Northern Spotted Owl came from study areas in Washington (Rainier, Wenatchee, Cle Elum; Anthony et al. 2004), suggesting greatest declines from this state.

The previous demography model attempted to account for a poorly understood level of juvenile emigration (Franklin et al. 1999). That model may have negatively biased estimates of survival and population change (Raphael et al. 1996, Franklin et al. 1999, Anthony et al. 2004). The current model addresses gains and losses (i.e., recruitment or mortality) more directly and does not require a correction factor for juvenile emigration (Anthony et al. 2004). Factors with the potential to bias the calculation of lambda have been identified (Raphael et al. 1996, Boyce et al. 2005), and some were evaluated relative to the previous model (Van Deusen et al. 1998, Manly et al. 1999). Those analyses found little substantive influence of several sources of potential bias (Van Deusen et al. 1998, Manly et al. 1999). Some factors (e.g. juvenile emigration) did not apply to the model used at the 2004 workshop (Anthony et al. 2004, Boyce et al. 2005). Additional evaluation is required to understand the scope of potential bias associated with estimates of population change (Boyce et al. 2005).

Supplementary data collected in various Washington landscapes provide additional indication that subpopulations in Washington are declining. Forsman et al. (1996) collected data on owl occupancy at two “density study areas” that were included in his demography study areas (Cle Elum, Olympic). Each density study area was carefully searched each year so that any changes in the actual number of sites could be documented over time. Results from the Cle Elum density study area indicated a statistically significant decline in the number of owl pairs detected annually between 1992 (120 owls) and 1997 (68 owls), a period during which survey effort remained constant (Forsman et al. 1997). This decline continued at an average rate of 7% (95% confidence interval = 5-9%) through 2001 (Forsman et al. 2002b). Similarly, surveys conducted by Plum Creek

Table 3. Estimates of lambda from four Spotted Owl demography study areas in Washington (from Anthony et al. 2004). Values of lambda < 1.0 indicate a declining population.

Study Area	Lambda	95% confidence interval	Percent decline
Cle Elum	0.938	0.901-0.976	6.2
Olympic	0.956	0.893-1.018	4.4
Rainier	0.896	0.788-1.003	10.4
Wenatchee	0.917	0.882-0.952	8.3

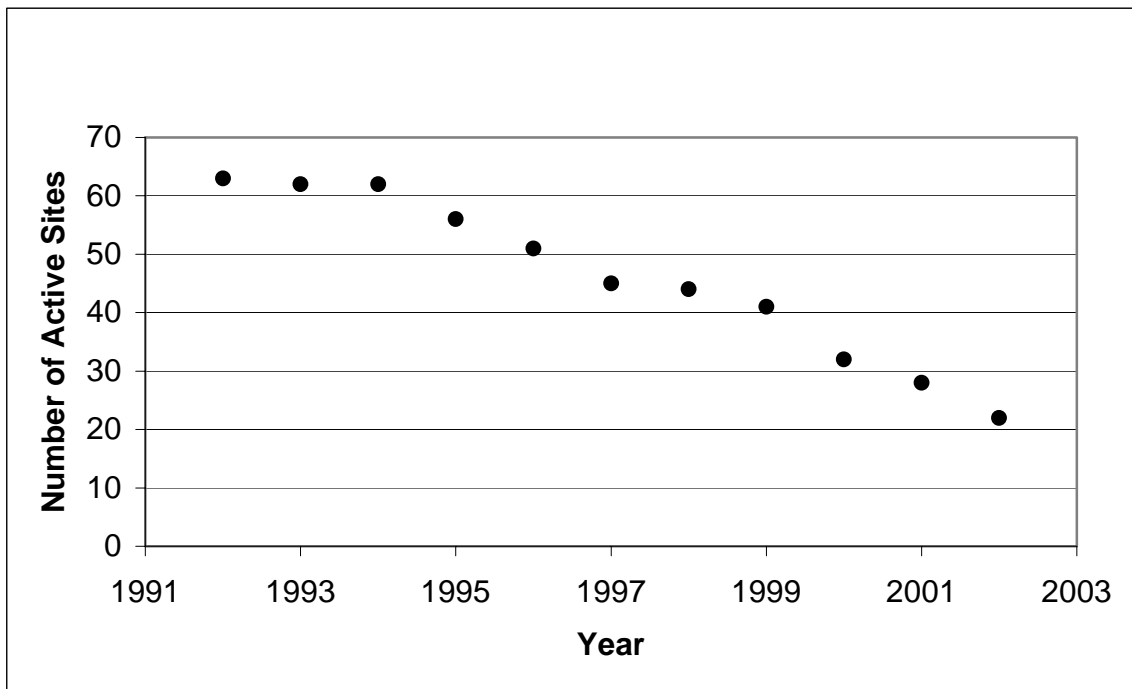


Figure 2. Downward trend in number of occupied Spotted Owl pair territories in a central Cascades study area (data from Hicks and Herter 2003).

Timber Company in portions of the I-90 East and I-90 West Spotted Owl Special Emphasis Areas indicated a decline in the number of active Spotted Owl sites from 63 in 1992 to 22 in 2002 (Hicks and Herter 2003), a decline of 65% in 10 years (Figure 2). Data from elsewhere in Washington (Rainier and Wenatchee demography study areas) indicate similar trends, and trends in the Olympic study area also indicated a substantial, but lesser, decline (Anthony et al. 2004).

## Status Designations of Spotted Owl Sites

Five Spotted Owl status categories are recognized in the Washington Department of Fish and Wildlife database. These categories were derived from the survey protocol endorsed by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 1991, 1992) and are summarized in Table 4. Sites of status categories 1, 2, and 3 are considered to be territorial. In Spotted Owl Special Emphasis Areas all owl sites of status 1-3 are protected. Spotted Owl sites in Washington with status 4 and status 5 designations are not protected by state Forest Practices Rules or federal take prohibitions. Each owl site in the Washington Department of Fish and Wildlife database is given a site status. Unless otherwise specified, all references to owl sites hereafter refer collectively to sites of status categories 1, 2 and 3.

## Spotted Owl Surveys, Survey Protocol and Data Management

### Types of Spotted Owl Surveys

The most reliable means to locate Spotted Owls and gather information about them is to conduct surveys. Although several procedures have been developed and used to conduct surveys for Spotted Owls in Washington (and elsewhere), the vast majority of surveys conducted since 1991 by landowners, resource management agencies, consultants and researchers have been conducted using established protocols (U.S. Fish and Wildlife Service 1992, U.S. Forest Service 1993) as guidance. A similar protocol is used in British Columbia (Hobbs et al. 2004). These protocols were designed to increase the likelihood of detecting a Spotted Owl if one was actually present. Elements of the protocols include a reference to regionally appropriate amounts of area to be surveyed at each site, recommendations for station placement or area coverage, timing of site and station visits, procedures for responding to owl detections, and procedures to conclude site status or reproductive output for a given year.

Table 4. Categories and definitions of Spotted Owl site status (taken from U.S. Fish and Wildlife Service 1991, 1992).

Status	Definition and explanation
1	Pair location. This determination is based on the detection of a pair of owls, a single adult with young, or young owls identifiable as Spotted Owls.
2	Two birds, pair status unknown. This determination is made when two birds of the opposite sex are detected, but it is unknown whether the birds are paired.
3	Resident single. This determination reflects sites with three or more detections (without detections of the opposite sex) in the same general area, an indication of territorial behavior.
4	Status unknown. This determination reflects sites with less than three detections (either because the owl was not territorial or the survey effort was discontinued after the initial detection), such that territorial status can't be assigned.
5	Unoccupied.

Over the last decade, some surveys in Washington were conducted using only certain elements of the protocol, and were therefore not considered to have been conducted in a manner consistent with the protocol. Adequate area coverage was typically the missing protocol element in these cases (Washington Department of Fish and Wildlife database). These surveys were often conducted where landowners wished to survey the immediate vicinity of a planned timber harvest unit, but not the remainder of the area that would ordinarily be surveyed if the objective had been strict adherence to the protocol endorsed by the U.S. Fish and Wildlife Service. Some surveys conducted for demography research purposes also lacked the area coverage element, and focus primarily on monitoring at or around the site center (Washington Department of Fish and Wildlife database). Other surveys were conducted using fewer site visits than stated in the protocol (Washington Department of Fish and Wildlife database).

### Review of Spotted Owl Surveys

During the era of “Owl Memo #3” (Stearns 1991), the Washington Department of Fish and Wildlife reviewed Spotted Owl surveys conducted by landowners (including the Department of Natural Resources) or their consultants. These surveys were conducted as a requirement in the Forest Practices Rules in place at the time. While most surveys were conducted in a manner consistent with the protocol, some deviated substantially from the protocol, the chief problem being inadequate spatial coverage of suitable habitat in the survey area (Buchanan 1997). At the time, a failed survey often required that additional surveys be conducted before an application could be approved for harvest involving suitable Spotted Owl habitat. To address this problem, the Washington Department of Fish and Wildlife offered to review the proposed layout of survey stations prior to the survey season in an attempt to upgrade survey quality (Buchanan 1997). This service was offered to resolve conflict about survey quality, and was not a required element of a protocol survey. The review of proposed layout of survey stations was conducted in two survey seasons prior to Owl Memo #3 being ruled invalid by the Forest Practices Appeals Board. After March 1993, the only station layout review conducted by Washington Department of Fish and Wildlife was for surveys intended to change sites to status 5. At about that same time, the Washington Department of Fish and Wildlife also developed a document outlining standards used to review and evaluate the quality of Spotted Owl surveys (Washington Department of Wildlife 1994).

### Washington Department of Fish and Wildlife Database

The Washington Department of Fish and Wildlife maintains statewide databases for all Spotted Owl location data. Two databases are maintained, one for site center locations and one for observation data. The Spotted Owl site center database is the repository for data collected in the field that are used to establish or update the location and status of individual sites. Data included in this database include site code, site name, location, highest status, year of highest status, most recent year detected, most recent status, and official status (Buchanan 1993). The Spotted Owl observation database contains details associated with all Spotted Owl detections at a site. Data included in this database include site number, site name, reference number (a unique number for each site record),

location, observer name, date of observation, map index code, land ownership, whether the detection was from a formal survey effort, timing of the detection, response type (e.g., single, pair, nest), and other owl species detected (Buchanan 1993). In addition, for all owls detected, the database contains fields for information on owl species, sex, age, type of detection (e.g. audio, visual, both), source of mortality (if applicable), time, elevation, and association with other owl detections in the database (Buchanan 1993).

#### Procedures Used to Establish or Update Site Centers

Updates to the Spotted Owl site center database are made when detection data are submitted to the Washington Department of Fish and Wildlife. When Spotted Owls are detected in new areas distinct from existing sites, department biologists evaluate the response data and establish the location of the new site center. All owl detections from the general area are aggregated and evaluated to determine whether new detections should be associated with an existing site or used to establish a new site. Sites are established by considering owl densities in the area, occupancy information from adjacent sites, other response data from the survey, topographic features of the area, and the distribution of potentially suitable habitat.

At the scale of the individual site, evaluation of survey data to establish a site center follows general guidelines that account for the type of detection and other information. The most definitive site center is the location of the current year's known nest. Site centers at sites with multiple nests will be based on the current year's nest. Evaluation of data at sites where nest locations are not known follows a hierarchy of information including, in descending order of importance: location of adults with young, location of pairs, or location of singles. If data for sites with territorial singles are used, other information becomes relevant, including, but not limited to, the location of the most recent detection if detections span multiple years, and assessments of diurnal versus nocturnal and early-season versus late-season locations.

#### Spotted Owl Surveys in Spotted Owl Special Emphasis Areas

Survey effort for Spotted Owls was uneven in the Spotted Owl Special Emphasis Areas between 1996 and 2004. The most intensive survey effort was in the eastern Cascades where monitoring occurred at many sites in the Entiat, I-90 East, North Blewett, and White Salmon Spotted Owl Special Emphasis Areas (Table 5). Parties involved in these survey efforts included NCASI (National Council for Air and Stream Improvement), the U.S. Forest Service (U.S. Forest Service Ranger Districts and Pacific Northwest Research Station), and consultants for private landowners. These surveys, many of which were discontinued in 2003, were designed to monitor known sites; new locations generally were not sought out. Due to the extensive nature of the survey effort beginning in the late 1980s, however, all or nearly all site centers in these Spotted Owl Special Emphasis Areas are likely known, with the possible exception of the White Salmon landscape, where some areas of suitable habitat have apparently not been surveyed. Non-protocol surveys and protocol surveys at selected individual sites were conducted in other Spotted Owl Special Emphasis Areas (e.g. Hoh-Clearwater, Mineral Block, Mineral Link).

Table 5. Summary of survey and monitoring efforts for Spotted Owls in Spotted Owl Special Emphasis Areas since 1996.

SOSEA name	Majority of sites monitored	Few or no sites monitored
Columbia Gorge		•
Entiat	•	
Finney		•
Hoh-Clearwater <sup>a, b</sup>		•
I-90 East	•	
I-90 West	•	
Mineral Block/Link		•
North Blewett	•	
Siouxon		•
White Salmon	•	

<sup>a</sup> Monitoring discontinued after 2001.

<sup>b</sup> Monitoring in this landscape was conducted at varying levels of intensity at varying numbers of sites each year.

Surveys or monitoring efforts are essentially lacking for the Columbia Gorge, Finney, and Siouxon Spotted Owl Special Emphasis Areas in the period between 1996 and 2004.

### **Spotted Owl Distribution, Abundance and Management Designation**

#### Current Number of Spotted Owl sites

The number of Spotted Owl site centers documented in Washington has increased slightly since the implementation of the Forest Practices Rules in 1996. The number of territorial sites now totals 1044. This change in the number of Status 1, 2, and 3 sites represented an increase of 3.9 percent between 1996 and 2001 (Table 6). The increase in number of Spotted Owl sites over the past five years is less than the increase noted earlier in the 1990s, both statewide and in the Spotted Owl Special Emphasis Areas (Figure 3). We believe that the increase in Spotted Owl numbers is a result of increased survey effort in new landscapes. This perspective is based on the fact that recently discovered Spotted Owl sites were found in habitats where they would be expected to occur and in areas not previously surveyed (Hanson et al. 1993, Buchanan 1997). This is an important point because the best estimates of population demography come from areas surveyed repeatedly through time and they show consistent population decline. Further, we believe that there are likely to be very few additional Spotted Owl sites discovered in the state except for those present in remote portions of landscapes, such as Olympic National Park, that have not been thoroughly surveyed.

Two important factors must be acknowledged when considering the tally of known Spotted Owl site centers in Washington. First, the values reported above indicate the number of site centers known by Washington Department of Fish and Wildlife at any time in the past 30 years. It is likely that some Spotted Owl sites have been abandoned due to fires or other disturbances that eliminated habitat, but remain in the database as

Table 6. Changes in the number of known Spotted Owl activity centers in Washington since the implementation of Forest Practices Rules in 1996.

Date	Site status category <sup>a</sup>					Total	Total Status 1-3
	1	2	3	4	5		
6 July 1996	864	23	115	160	12	1174	1002
15 June 2004	906	21	117	161	31	1236	1044

<sup>a</sup> Site status categories are defined as: (1) pair or reproductive, (2) two birds, pair status unknown, (3) territorial single, (4) single, territorial status unknown, and (5) abandoned.

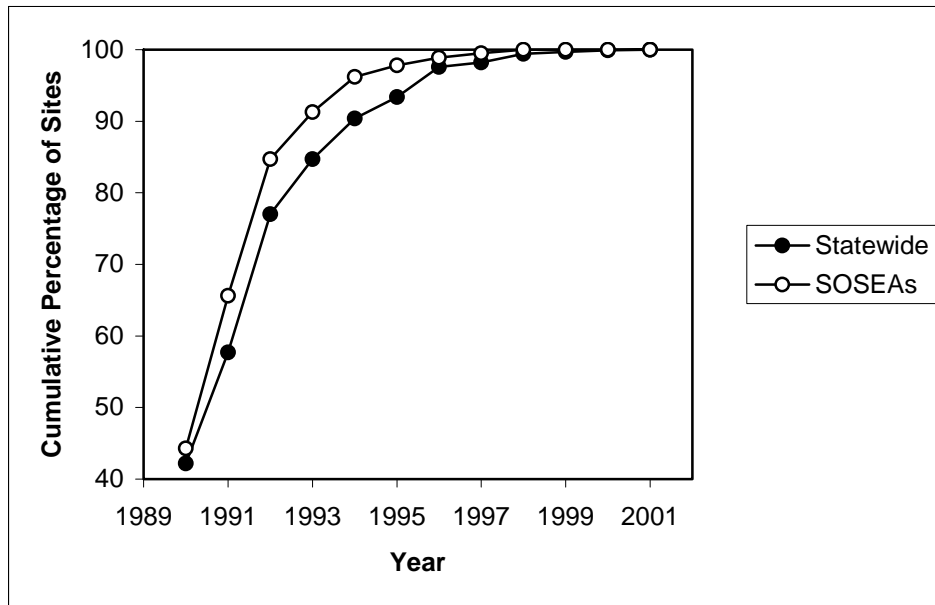


Figure 3. Cumulative percent of known territorial (status 1-3) Spotted Owl activity centers statewide and in Spotted Owl Special Emphasis Areas. These points represent the sites recorded in the Washington Department of Fish and Wildlife Spotted Owl database in January of each year between 1990 and 2001.

active sites because we do not have the information necessary to revise their status. For example, the Hatchery Complex wildfire in the eastern Cascade Mountains in 1994 burned portions of six Spotted Owl sites (Gaines et al. 1997); this and the Tye fire, also from 1994, likely rendered >10 sites unusable by Spotted Owls due to the extensive destruction of owl habitat (Joseph B. Buchanan, personal observation). Because Washington Department of Fish and Wildlife has changed sites to abandoned status only at the request of landowners, we evaluated the status of only one owl site within the perimeter of the 1994 fires. Therefore, of the approximately 10 sites potentially destroyed or substantially degraded by the fires, all except one site are still considered active in the Washington Department of Fish and Wildlife database. The second factor to consider is that many sites are no longer protected by the Forest Practices Rules and these have been, and likely will continue to be, impacted by forest management, particularly



outside of Habitat Conservation Plan areas. For example, since the listing of the owl, habitat loss has occurred in territorial Spotted Owl sites on nonfederal lands located both inside and outside Habitat Conservation Plan areas (examples of verified loss of habitat inside owl circles were documented in an August 2003 letter from the Washington Department of Fish and Wildlife to the U.S. Fish and Wildlife Service).

### Management Designation

Spotted Owl sites in Washington occur on lands designated under a variety of protection strategies. Spotted Owl sites in Washington occur on, or overlap to, federal, state, tribal, municipal, and private lands. Most Spotted Owl sites in Washington are centered on federal lands (Table 7). As of October 2004, there were 878 territorial Spotted Owl sites centered on federal lands, including lands managed by the National Park Service and U.S. Forest Service (land designation data provided by the U.S. Fish and Wildlife Service; Lacey, Washington). Of these, 719 (82%) occur in areas that will be protected or largely protected from timber harvest under the Northwest Forest Plan or other federal management (Table 7). The remaining sites occur in matrix areas (12% of federal sites) and “Adaptive Management Areas” (6%). Sites on Matrix and some Adaptive Management Area lands can be harvested in accordance with Section 7 consultations between the U.S. Forest Service and the U.S. Fish and Wildlife Service. Although harvest levels are currently below those anticipated under the Northwest Forest Plan, harvests in matrix areas are expected to produce most of the timber volume removed from federal lands in Washington.

Although the bulk of the conservation value for Spotted Owls is derived from federal lands, it is not accurate to assume that all owls found on protected federal lands are buffered from impacts associated with habitat loss. For example, some owls that reside in federal reserved areas could be impacted by timber management activities that remove or degrade foraging areas beyond reserved area boundaries (Table 8). This could occur where a reserved area boundary does not contain an owl’s entire home range. This is a relevant concern because, for example, 55% of the 878 territorial sites centered on federal lands have home range management circles that extend onto state or private lands (Table 9), indicating that a substantial number of owls may use nearby suitable habitat on nonfederal lands. Radio telemetry data on habitat use by Spotted Owls at the federal/non-federal interface (e.g. I-90 East, Olympic Peninsula) confirm that Spotted Owls use suitable habitat on non-federal lands in these areas (Hanson et al. 1993; E. Forsman, personal communication).

With the exception of 13 owl sites on tribal lands, the rest of the territorial (status 1-3) Spotted Owl sites in Washington ( $n = 153$ ) are found on non-federal lands. Of these, 91 (59%) sites are centered in Spotted Owl Special Emphasis Areas, where more restrictive Forest Practices Rules apply (Table 10), and 62 (41%) sites are outside Spotted Owl Special Emphasis Area boundaries, where there are less restrictive Forest Practices Rules. There are also four different situations in which suitable Spotted Owl habitat can be legally harvested according to current Forest Practices Rules: 1) within the provincial home range radius circle centered on non-federal lands outside the Spotted Owl Special

Table 7. Number of territorial Spotted Owl sites centered on federal lands of various management allocation in Washington. Non-federal sites are shown for comparative purposes. Land allocation data were obtained from the Western Washington Field Office of the U.S. Fish and Wildlife Service (February 2003) and corrected for a small number of errors in ownership designation.

Status	Land allocation or ownership					
	Federal lands				Tribal	Non-federal <sup>c</sup>
	Congressionally or administratively withdrawn <sup>a</sup>	Late successional reserve <sup>b</sup>	Adaptive management area	Matrix		
1	228	412	49	86	13	116
2	8	5	2	2	0	4
3	30	36	4	16	0	33
<i>Total</i>	266	453	55	104	13	153

<sup>a</sup> This category includes National Park Service lands (n = 140 sites).

<sup>b</sup> This category includes three types of Late Successional Reserves.

<sup>c</sup> Includes sites on state, private and city lands.

Emphasis Areas; 2) in the portion of circles that are centered in Spotted Owl Special Emphasis Areas but that extend beyond Spotted Owl Special Emphasis Areas boundaries; 3) habitat on non-federal portions of circles centered on federal lands that extend outside the Spotted Owl Special Emphasis Areas; and 4) habitat outside Spotted Owl circles whether inside or out of a Spotted Owl Special Emphasis Area, except if specifically protected by a Habitat Conservation Plan. Finally, 246 owl sites (84% of the 292 sites that occur in or overlap Spotted Owl Special Emphasis Areas from federal lands, or that are centered in the Spotted Owl Special Emphasis Areas) are covered, in whole or in part, under Habitat Conservation Plans negotiated with the U.S. Fish and Wildlife Service. However, many of these sites can be legally harvested according to conditions specified in the plans. In addition, over half of the areas in owl circles within Spotted Owl Special Emphasis Areas are not covered by Habitat Conservation Plans. Details on Habitat Conservation Plans are provided later in this document.

#### Spotted Owl Sites in Spotted Owl Special Emphasis Areas

Although the information needed to assess changes in the status of individual sites is incomplete, with the exception of sites changed to status 5, there have been few changes in owl site status within Spotted Owl Special Emphasis Areas since rule implementation. There are 91 Spotted Owl sites with activity centers located on nonfederal lands within Spotted Owl Special Emphasis Areas (Table 10); only 2 of these sites have been found

Table 8. Summary of protection expected to occur at territorial Spotted Owl sites in various landscapes in Washington. The levels of protection reflect the anticipated protection that would be afforded under full implementation of the Northwest Forest Plan, state Forest Practices Regulations (i.e., following development of Landowner Option Plans in dispersal landscapes), and current Habitat Conservation Plans.

Site designation	Full protection of sites <sup>a</sup>	Partial protection of sites <sup>b</sup>	Not designated for long-term protection
<i>Federal lands</i>			
Late successional reserve/withdrawn	•		
Adaptive management areas		•	
Matrix			•
<i>Non-federal lands in Spotted Owl Special Emphasis Areas</i>			
Sites covered by habitat conservation plans <sup>c</sup>	•	•	•
Sites in demographic support areas <sup>d</sup>	•		
Sites in dispersal landscapes			•
Sites changed to “status 5”			•
<i>Non-federal lands outside Spotted Owl Special Emphasis Areas</i>			
Sites covered by habitat conservation plans		•	
Other sites			•

<sup>a</sup> Owl territories with foraging areas outside the boundaries of protected areas may be impacted by activities outside those areas.

<sup>b</sup> Partial protection means that either some sites may not receive the amount of protection for continued occupancy, or that some sites may not be protected at all.

<sup>c</sup> HCPs provide differing approaches to Spotted Owl management. The level of protection ranges from complete (or an equivalent landscape approach) to none.

<sup>d</sup> The State Environmental Policy Act provides for an assessment of potential impacts, but does not prevent them.

Table 9. Landownership within the provincial home range radii of territorial Spotted Owl sites in Washington. Sites centered on tribal lands (n = 17) are treated the same as sites on federal lands.

Status	The entire management circle overlaps only federal lands	The management circle overlaps non-federal lands, but not DNR	The management circle overlaps non-federal lands, including DNR
1	422	261	223
2	7	5	9
3	41	26	50
4	52	49	60
5	0	13	18
Total 1-3	470	292	282

Table 10. Number and status of territorial Spotted Owl sites centered on three categories of non-federal lands in Washington.

Status	Ownership or management entity			Total
	State <sup>a</sup>	Private	City	
<i>In Spotted Owl Special Emphasis Areas</i>				
1	46	30	2	78
2	1	0	0	1
3	6	4	2	12
<i>Total</i>	53	34	4	91
<i>Outside Spotted Owl Special Emphasis Areas</i>				
1	18	20	0	38
2	1	2	0	3
3	13	8	0	21
<i>Total</i>	32	30	0	62
<i>Total all areas</i>	85	64	4	153

<sup>a</sup> Includes one status 1 and one status 3 site on lands managed by Washington Department of Fish and Wildlife.

since 1996: an upgrade of a Status 4 to a Status 3 site in the Entiat Spotted Owl Special Emphasis Area and the discovery of a new Status 1 site in the I-90 East Spotted Owl Special Emphasis Area. There were also three new sites found on adjacent federal lands that overlap Spotted Owl Special Emphasis Areas.

Owl sites in Spotted Owl Special Emphasis Areas occur in areas under each of the three conservation functions designated by the Forest Practices Rules. Of the 91 non-federal sites centered within Spotted Owl Special Emphasis Areas, 52% are centered in demographic support areas, 35% are in “combined function” areas, and the remainder (13%) are in dispersal support areas (Table 11). In addition, 223 sites are centered on federal lands in or nearby such that the owl circle overlaps the Spotted Owl Special Emphasis Areas (Table 12).

Table 11. Current number of territorial Spotted Owl sites centered on non-federal land in areas of various functions within Spotted Owl Special Emphasis Areas.

SOSEA	Number of sites centered in designated areas		
	Demographic support	Dispersal support	Combined function
Columbia Gorge	0	0	7
Entiat	1	2	0
Finney	1	0	1
Hoh-Clearwater	16	0	3
I-90 East	13	4	5
I-90 West	6	3	0
Mineral Block/Link	0	3	3
North Blewett	1	0	0
Siouxon	9	0	0
White Salmon	0	0	13
<i>Totals</i>	47	12	32

Table 12. Number of territorial Spotted Owl sites centered in or overlapping Spotted Owl Special Emphasis Areas.

Spotted Owl Special Emphasis Area	Spotted Owl site center locations			Total
	On federal land within SOSEA	Management circle overlaps from federal lands outside SOSEA	On non-federal lands inside SOSEA	
Columbia Gorge	1	6	7	14
Entiat	15 <sup>a</sup>	3 <sup>a</sup>	3	21
Finney	3	22	2	27
Hoh-Clearwater	10	20	19	49
I-90 East	40	15	22	77
I-90 West	23	4	9	36
Mineral Block/Link	18	9	6	33
North Blewett	9	10	1	20
Siouxon	0	3	9	12
White Salmon	4	6	13	23
<i>Totals</i>	123	98	91	312 <sup>b</sup>

<sup>a</sup> Sites centered on federal land, whether within or overlapping the Entiat Spotted Owl Special Emphasis Area, are not subject to the same provisions established for sites in any other Spotted Owl Special Emphasis Areas.

<sup>b</sup> Includes 19 sites in or overlapping the Entiat Spotted Owl Special Emphasis Area from adjacent federal land; the adjusted total is 312 – 19 = 293 sites.

## RULE IMPLEMENTATION

### **Use of Landowner Option Plans or Cooperative Habitat Enhancement Agreements**

When the current Forest Practices Rules were developed, stakeholders agreed that the Landowner Option Plan and Cooperative Habitat Enhancement Agreement processes were important elements of the rule package. The Landowner Option Plan was a means to manage Spotted Owl habitat on a landscape scale rather than on a circle-by-circle basis, and the Cooperative Habitat Enhancement Agreement provided a regulatory incentive for landowners to recruit or retain patches of suitable Spotted Owl habitat without the risk of the particular forest area later becoming encumbered by regulations. Both processes are optional parts of the Forest Practices Rules.

The optional provisions in the rules to develop landscape plans have been scarcely utilized. One Landowner Option Plan has been completed, and no Cooperative Habitat Enhancement Agreements have been developed. Washington Department of Fish and Wildlife and the Department of Natural Resources have had discussions with three non-industrial landowners, all in the White Salmon Spotted Owl Special Emphasis Area, about these planning options (one Cooperative Habitat Enhancement Agreement, two Landowner Option Plans). The first two of these landowners elected to discontinue the planning processes for their landholdings, each of which totaled less than about 50 acres. Washington Department of Fish and Wildlife and the Department of Natural Resources have recently completed a Landowner Option Plan with the third landowner, who owns 540 acres. In addition, Washington Department of Fish and Wildlife and the Department of Natural Resources have recently begun negotiations with an industrial forest landowner for a 50,000-acre Landowner Option Plan in the I-90 East Spotted Owl Special Emphasis Area, and with another smaller timberland owner in the I-90 East Spotted Owl Special Emphasis Area who owns several separate parcels.

Since the release of the first draft of this report, we met with large forest landowners to discuss their perspective on Landowner Option Plans and landscape planning in general. Landowners cited the lack of coordination between state and federal permitting processes as a primary reason for their disinterest in preparing Landowner Option Plans. They also cited concerns with the cost of and need for preparing an Environmental Impact Statement for individual Landowner Option Plans when those plans could result in an overall improvement of environmental conditions as a disincentive. In addition, some landowners noted the lack of consensus regarding standards for Landowner Option Plan approval and the possibility that without agreed upon standards, negotiations in the planning process could be unnecessarily long.

The lack of coordination between federal and state planning mechanisms and thus permitting processes stems from the fact that the U.S. Fish and Wildlife Service's proposed 4(d) rule (see discussion in context section of this report) was never finalized. During negotiations for the current forest practices rules, the U.S. Fish and Wildlife Service, which attended many negotiation sessions, promised that a 4(d) rule for Spotted Owls, one designed to be consistent with state forest practices rules, would be

implemented. Importantly, because the state does not have authority to issue incidental take permits, the 4(d) rule would have to contain a mechanism, discussed in concept but not in detail during stakeholder negotiations, to facilitate the state's ability to efficiently negotiate and implement Landowner Option Plans with private landowners. The absence of a 4(d) rule for Spotted Owls, and the consequent mechanism for implementing a state planning process involving harvest of Spotted Owl habitat, means that landowners, in order to minimize their Endangered Species Act liability, should possess an incidental take permit if they propose to manage habitat in a way that may harm Spotted Owls. Incidental take permits for non-federal landowners are usually issued along with Habitat Conservation Plans authorized under Section 10 of the Endangered Species Act.

We believe that the lack of landscape planning constitutes one of the most serious conservation challenges associated with implementation of the 1996 Spotted Owl rules. Discussions are underway with the full stakeholder community, including U.S. Fish and Wildlife Service, landowners, and environmental groups regarding ideas for addressing these issues in a manner that removes disincentives for landscape planning.

### **Lack of Protection of Status 5 Spotted Owl Sites**

The survey protocol endorsed by the U.S. Fish and Wildlife Service contains a status description for Spotted Owl sites that are no longer occupied. The protocol states that "if no responses have been obtained from an historical site after 3 years of survey (using the guidelines established in this document), the site may be considered unoccupied, barring other evidence to the contrary" (U.S. Fish and Wildlife Service 1992:4). Unoccupied sites are changed to "status 5" in the Washington Department of Fish and Wildlife database, and these sites are not protected by state Forest Practices Rules or subject to the federal take guidelines. We believe that the use of the protocol has resulted in a conflict between on-the-ground management and the policy intent of the Forest Practices Rules within Spotted Owl Special Emphasis Areas.

When a site is changed to historic status in the context of the Forest Practices Rules, two problems arise. First, Spotted Owl Special Emphasis Areas were established to provide long-term conservation for spotted owls. When the regulatory trigger for assessing the impact of harvest of habitat is removed by changing a site to historic status, the intended assessment and planning mechanisms contained in the State Environmental Policy Act and the Landowner Option Plan provisions of the rule are not implemented. Also, we believe the incentives for development of those plans are diminished with each site status change. Second, habitat that may be temporarily unoccupied can be logged and is then no longer available to the current or former occupants, other owls in the landscape, or owls that could re-colonize it in the future (see below).

The number of status 5 sites in Spotted Owl Special Emphasis Areas has increased substantially since rule implementation. As of October 2004, 32 sites in Washington had status 5 designation. Prior to rule implementation there was one status 5 owl site in a Spotted Owl Special Emphasis Area and as of October 2004 there were 12 (Table 13). An additional eight sites are currently being surveyed for the purpose of changing those

Table 13. General location of Spotted Owl sites changed to status 5 before and after rule implementation.

Site Number	Spotted Owl Special Emphasis Area or general region				
	Any SOSEA	Olympic Peninsula	Southwestern Washington	Western Cascades	Eastern Cascades
<i>Sites changed to status 5 between 1991 and 1995</i>					
204					•
360					•
452			•		
454			•		
455			•		
689				•	
764	•				
822			•		
953			•		
1014					•
<i>Subtotals</i>	1	0	5	1	3
<i>Sites changed to status 5 after rule adoption in 1996</i>					
655	• <sup>a</sup>				
691	•				
692	•				
696	• <sup>a</sup>				
701	•				
729	•				
730					•
744	•				
756				•	
773	• <sup>a</sup>				
817	•				
838				•	
887				•	
981				•	
985				•	
986		•			
989				•	
990			•		
1010	• <sup>a</sup>				
1033				•	
1143				•	
1174	•				
<i>Subtotals</i>	11	1	1	8	1
<i>Totals</i>	12	1	6	9	4

<sup>a</sup> Site is covered to some extent by a Habitat Conservation Plan.



sites to status 5; seven of these sites were in Spotted Owl Special Emphasis Areas (I-90 East, Mineral Block, White Salmon) (Table 14). As there is no requirement for landowners or consultants to indicate their intent to conduct status 5 surveys, additional sites may have ongoing surveys of which we are unaware. If there are no Spotted Owl responses in the latter seven sites centered in Spotted Owl Special Emphasis Areas during the current surveys, the total number of status 5 sites would increase to 19. Of these 19 sites, 17 are centered within Spotted Owl Special Emphasis Areas, representing 17% of the 98 territorial sites that occurred within Spotted Owl Special Emphasis Areas when the rules were implemented in 1996 (this represents 6% of the sites that are in or overlap Spotted Owl Special Emphasis Areas). Between 1996 and October 2004, the proportion of sites changed to status 5 is nearly five times greater inside Spotted Owl Special Emphasis Areas (11 of 98; 11.2%) than for sites centered outside Spotted Owl Special Emphasis Areas (11 of 476 (2.3%). If any current surveys result in sites being changed to status 5, this value will be even greater.

These data suggest that efforts to change sites to status 5 have been greater in Spotted Owl Special Emphasis Areas than in other areas, particularly since implementation of the 1996 rules. Only four of the 19 sites that have been changed to status 5 or that are being surveyed for this purpose were covered by Habitat Conservation Plans obtained by the particular landowner (Table 13), meaning that 79% of the changes were unrelated to any type of management planning activity.

Some have argued that the three-year survey provision is a valid way to remove “extra” sites from the Washington Department of Fish and Wildlife database, claiming that sites that are not occupied for three consecutive years are not valid sites. To address this issue, we looked at the site history of Spotted Owl sites in the eastern Cascade Mountains that were monitored for 10 or more years (beginning in the early 1990s and extending to 2003, although we did not have all 2003 data). These sites were part of ongoing demography research efforts in the region. We summarized the length of periods with no detection of owls that occurred between reports of known occupancy. (For the sake of this discussion, we will say that a lack of detections in a given year meant the site was unoccupied, but it should be understood that a lack of detections during a survey does not prove a site is unoccupied, only that an owl did not respond.) We found that 152 of 190 sites (80%) were never unoccupied for more than two consecutive years between records of occupancy. However, 50 sites had periods of at least two consecutive years with no detections not bounded by a Spotted Owl detection as of 2003. These values are likely slightly inflated due to a lack of thorough survey coverage in the home range (i.e., where site center monitoring was used instead of home range-level surveys). Thirty-eight sites (20%) had periods of between three and ten years with no Spotted Owl detections between records of occurrence. Of the 38 sites that were unoccupied for three or more years, 25 (66%) of them supported pairs or had multiple detections of a single owl in the years following reoccupation. Of the remaining sites, six (16%) supported single owls in or after 2001, indicating recent activity at these sites. These data indicate that a portion of the declining population of Spotted Owls is not detected (or not present) on territory for multiple years, but that these territories retain their functional value as indicated by the subsequent presence of owls. Therefore, lack of occupancy for some time period

Table 14. Summary of sites changed to status 5, or in the process of being surveyed for that purpose. Three sites changed to status 5 that have had owl responses since being changed are not included in this table. The table does not include additional surveys that we have not been able to confirm, but that may be underway.

Landscape Area	Number of sites centered in SOSEA	Number of sites on federal lands with circle extending to SOSEA	Outside SOSEAs
<b>Sites changed to status 5</b>			
Columbia Gorge			-
Entiat			-
Finney			-
Hoh-Clearwater	1 (DNR)		-
I-90 East	8 (HCP: 4)		-
I-90 West			-
Mineral Block/Link	3		-
North Blewett			-
Siouxon			-
White Salmon			-
<i>SOSEA totals</i>	12		-
Non-federal sites outside SOSEA	-	-	20 (DNR: 9)
Exclusively federal circles	-	-	
<i>Total of sites changed</i>	12		20
<i>Ongoing surveys conducted to change status designation</i>			
Columbia Gorge			-
Entiat			-
Finney			-
Hoh-Clearwater			-
I-90 East	3	1	-
I-90 West			-
Mineral Block/Link	1	1	-
North Blewett			-
Siouxon			-
White Salmon	1		-
<i>SOSEA totals</i>	5	2	-
Non-federal sites outside SOSEA	-	-	1
Exclusively federal circle	-	-	
<i>Total of sites being surveyed</i>	5	2	1

does not mean that the site is unsuitable or unimportant to the population. Once a site is downgraded to status 5 and subsequently harvested it is unlikely to function again as Spotted Owl habitat for many decades.

Although according to the survey protocol status 5 sites are considered unoccupied (U.S. Fish and Wildlife Service 1992), it is difficult to make this determination with certainty. Spotted Owls are territorial, but a lack of responses does not confirm absence, only that an owl did not respond (or that an observer did not hear a vocalization). Spotted Owls may not respond to an observer due to the presence of competitors or predators, or they may be less responsive to familiar-sounding vocalizations (i.e., taped recordings or voice calls given by a single surveyor) than to those they do not recognize, as has been demonstrated for certain other owl species (Galeotti and Pavan 1993). Furthermore, three of the sites changed to status 5 (about 9% of the 35 sites originally changed to the status 5 designation) have had subsequent owl detections, including one site that supported a reproductive pair of Spotted Owls. Resurveying status 5 sites is not standard practice; to our knowledge, the three sites with subsequent owl detections were the only ones resurveyed (Washington Department of Fish and Wildlife database).

### **Ambiguous Language**

We identified a potentially significant element of the rules that contained ambiguous language. The concept of “combination support” landscapes was created by the Timber-Fish-Wildlife policy group and adopted by the Board to identify particular landscapes that would provide a defined function somewhere between the contributions of demographic support and dispersal. Specifically, the rules state:

Either suitable Spotted Owl habitat should be maintained to protect the viability of the owl(s) associated with each northern Spotted Owl site center or a variety of habitat conditions should be provided which in total are more than dispersal support and less than demographic support. This can be accomplished by providing:

- a) dispersal support as described in subsection (2) of this section;
- b) areas of suitable Spotted Owl habitat that contain some opportunities for nesting as well as roosting and foraging habitat; and
- c) connectivity between areas of SOSEAs designated for demographic support or adjacent federal lands which are designated as late successional reserves, congressionally reserved areas, or administratively withdrawn areas [WAC 222-10-041 (3)].

This language is ambiguous in that it describes seemingly contradictory functions. Specifically, some rule language emphasizes demographic support (i.e., “opportunities for nesting as well as roosting and foraging habitat”) whereas other language contradicts this by specifying a desired condition that would be “more than dispersal support but less than demographic support.” Demographic support cannot be achieved with something less than demographic support conditions.

The problematic rule language appears to result from a misinterpretation of an explanation of “combined function” that was provided to the Timber-Fish-Wildlife policy group that proposed the existing rules (Buchanan et al. 1996). When negotiating

Landowner Option Plans, the lack of a clear standard can result in disagreement or impasse over the proper level of owl habitat management in a combined function landscape. Identification of demographic support and dispersal support areas within combination support Spotted Owl Special Emphasis Areas is one way to eliminate the need for a third category of landscape function.

### **Habitat Use by Spotted Owls**

Two basic questions about Spotted Owl habitat will be addressed in this section: 1) Are there new data on habitat used by the species, and if so, are the current definitions adequate? 2) Are there problems implementing the rule definitions of suitable habitat?

#### Basis for Rule Definitions and Assumptions Used

Habitat definitions used in the Forest Practices Rules were derived primarily from the Spotted Owl Scientific Advisory Group (Hanson et al. 1993). The bulk of the work of the advisory group focused on younger habitat types because this is where the least study had been conducted, and because there was consensus regarding both the importance and the attributes of old forest habitats used by Spotted Owls. Certain elements of the definitions used in the rule were revised or added during the negotiation phase of rule development. The definitions developed by Hanson et al. (1993) were based on the available published and unpublished literature or data summaries from within Washington; most of the studies they consulted were descriptive in nature. Habitat descriptions were derived from values of stand attributes (e.g., trees per acre, tree height, species composition) that were measured in forest stands used by owls for nesting, roosting or foraging.

The Spotted Owl Scientific Advisory Group had two main caveats for use of their definitions. The first was that new data should be analyzed and the definitions updated as appropriate. Second, Hanson et al. (1993:51) stated that:

Although the **individual** characteristics we use to distinguish high and low quality younger forest habitat are well documented from field research, the **combinations** of characteristics that we recommended for evaluating younger forest habitat have not been field-tested. Consequently, the evaluation procedure will require validation and revision [emphasis in the original].

More recent studies are now available on various aspects of Spotted Owl habitat use since publication of the Spotted Owl Scientific Advisory Group's report in 1993. It is important to note that systematic testing of the validity of the combination of habitat characteristics, or their relative importance if one or more characteristic does not meet the recommended target, has not been conducted since the rules went into effect, with the exception of Buchanan et al. (1999) on the Olympic Peninsula. In this section, we review information published (or made available) on stand-level attributes since 1993, when the basis for the current rule definitions was developed, and discuss emerging issues relating to implementation of habitat definitions in the field.

## New Studies on Nesting, Roosting and Foraging Habitat

A number of studies on Spotted Owl habitat use have been published since 1993 or were not included in the effort to develop habitat definitions proposed by Hanson et al. (1993). Four studies conducted in the eastern Cascades included: 1) an additional analysis of data collected for an earlier study of Spotted Owl nest site use (Buchanan and Irwin 1998); 2) a description of habitat at nests in Klickitat County (Buchanan 1996), an area not represented in earlier studies; 3) an evaluation of forest areas within 2900 feet of Spotted Owl nests (Everett et al. 1997); and 4) a description of habitats within home ranges of owls on the Yakama Reservation (Pidgeon 1995). Four studies were conducted in western Washington: 1) a description of nest site attributes in old-growth forest on the Olympic Peninsula (Forsman and Geise 1997), 2) a description of non-old-growth habitat used within home ranges on the western Olympic Peninsula (Buchanan et al. 1999), 3) a description of roost sites on the west side of the central Cascade Range (Herter et al. 2002), and 4) a description of foraging habitat at three locations in western Washington (North et al. 1999).

Almost without exception, the results of these studies were consistent with the definitions of Spotted Owl habitat described in the rules. The two use-versus-availability studies in the eastern Cascades demonstrated statistical differences between used and random locations in owl landscapes (Pidgeon 1995, Buchanan 1996), but neither of them presented values that extended beyond current rule definitions. Similarly, Buchanan and Irwin (1998) described geographic variation in nest site conditions in the eastern Cascade Mountains that may prove useful for landscape planning, but values reported generally did not deviate from the rule definitions (exceptions being tree densities Fire Management Analysis Zone 5 and canopy closure in Fire Management Analysis Zone 4). Everett et al. (1997) studied vegetative characteristics of nest stand “neighborhoods.” Using cluster analysis, they discerned nine nest-stand types. One of these stand types was characterized by a higher number of trees per acre (370 trees per acre  $\geq$  5 inches diameter at breast height) than the current rule definition for eastern Washington. Young forest marginal habitat has a maximum live tree density of 300 trees per acre of 4 inch trees and larger (see Table 15).

Table 15. Forest Practices Rules definitions of sub-mature and young forest marginal Spotted Owl habitats in the eastern Cascade Mountains, Washington.

Attribute	Sub-mature	Young forest marginal (closed)	Young forest marginal (open)
tree density, tree height and vertical diversity	110-260 trees per acre ( $\geq 4$ inches dbh) and dominant/co-dominant trees $\geq 90$ feet tall; OR dominant/co-dominant trees $\geq 90$ feet tall with $\geq 2$ layers and 25-50 percent intermediate trees	100 – 300 trees per acre ( $\geq 4$ inches dbh); dominant and co-dominant trees $\geq 70$ feet tall; $\geq 2$ canopy layers or 25 to 50 percent intermediate trees	100 - 300 trees per acre ( $\geq 4$ inches dbh); dominant and co-dominant trees $\geq 70$ feet tall; $\geq 2$ canopy layers or 25 to 50 percent intermediate trees
canopy closure	$\geq 70$ percent	$\geq 70$ percent	$\geq 50$ percent
snags/cavity trees/mistletoe	$\geq 3$ snags or cavity trees/acre ( $\geq 20$ inches dbh and 16 feet tall); OR high or moderate mistletoe infection	N/A	$\geq 2$ snags or cavity trees that are $\geq 20$ inches dbh and 16 feet tall; high to moderate mistletoe infection
Dead and Down Wood	$\geq 5\%$ of the ground covered with 4 inch diameter or larger wood	N/A	N/A
Forest Community	$\geq 40$ percent fir	$\geq 40$ percent fir	$\geq 40$ percent fir

The results of studies conducted in western Washington were similarly supportive of existing understanding about Spotted Owl habitat. Herter et al. (2002) found differences between used and random locations, and North et al (1999) found differences associated with intensity of use based on radio telemetry. However, neither study reported habitat attribute values that obviously differed from existing values in the Forest Practices Rules. In a study on the western Olympic Peninsula, Buchanan et al. (1999) found greater values of large-diameter snags and tree abundance than are included in the habitat definitions for western Washington (Table 16). Forsman and Geise (1997) provided information on nest sites in old forest but this information does not clarify definitions in the Forest Practices Rules.

Studies have also been conducted on habitat attributes important to Spotted Owl prey. In the Oregon Coast Range, Carey et al. (1999) found that abundant down wood, large cavity trees, and snags were significantly correlated with high flying squirrel density. Flying squirrels were not found in areas with less than 5 percent cover of down wood. This finding bears on the sub-mature habitat definition, which does not require a down wood component. If snags in a stand of trees eventually fall down and provide less than 5 percent cover this could result in temporal gaps in suitability for stands that would then meet neither the snag nor downed wood elements of the habitat definition. The young forest marginal definition calls for at least 10 percent cover of down wood, though it is an either/or situation with snags qualifying as the alternative. It may be important to consider whether the definition for sub-mature habitat should be changed to require both snags and

Table 16. Forest Practices Rules definitions of sub-mature and young forest marginal Spotted Owl habitats in western Washington.

Attribute	Sub-mature	Young forest marginal
Tree density, tree height, vertical diversity	115 - 280 trees per acre ( $\geq 4$ inches dbh) and dominant/co-dominant trees $\geq 85$ feet tall; OR dominant/co-dominant trees $\geq 85$ feet tall with $\geq 2$ layers and 25 to 50 percent intermediate trees	115 - 280 trees per acre ( $\geq 4$ inches dbh); dominant and co-dominant trees $\geq 70$ feet tall; $\geq 2$ canopy layers or 25 to 50 percent intermediate trees
Canopy closure	$\geq 70$ percent	$\geq 70$ percent
Snags/cavity trees/shrub cover	$\geq 3$ snags per acre ( $\geq 20$ inches dbh and 16 feet in height)	$\geq 2$ snags per acre ( $\geq 20$ inches dbh and 16 feet in height); OR $\geq 10$ percent ground cover with 4 inch diameter or larger wood, with 25 to 60 percent shrub cover
Forest community	Conifer or conifer hardwood mix; $\geq 30$ percent conifer	$\geq 30$ percent fir

down wood given that squirrels appear to be absent in stands without a significant down wood component.

In summary, some studies have been conducted which look at habitat characteristics important to nesting, roosting, and foraging Spotted Owls. However, we are in much the same situation as we were when the definitions were originally crafted: there are fragmentary pieces of information that are difficult to weave into one comprehensive, integrated definition in which we have high confidence. In addition, it is likely that habitat characteristics may be important in somewhat different amounts or dimensions by sub-regions of the state – e.g., the North Cascades versus the South Cascades. There is limited information that suggests the importance of regionally specific definitions (e.g. Buchanan et al. 1999), but in general, there has not been enough research to develop these definitions.

#### New Information on Dispersal Habitat

There are no new studies bearing specifically on the vegetation characteristics that facilitate survival of juvenile owls during dispersal (i.e., the period after fledging and lasting until territory establishment). The results of a dispersal study by Miller et al. (1997) were available at the time of rule development. The current definition of dispersal habitat in the Forest Practices Rules describes, as a minimal condition of dispersal habitat, forest in the competitive exclusion stage of forest development. Forests in the competitive exclusion stage of development provide little or no foraging opportunities for juvenile Spotted Owls and likely do not meet other life requisites of the owl (Carey et al. 1999, Buchanan 2005). Although data from studies of dispersing owls are lacking, it appears that the likelihood that dispersing owls will starve increases as the proportion of the landscape in this condition (stem exclusion) increases. Certain landscapes, particularly those including federal lands, have forest conditions that support dispersing Spotted Owls. The issue of identifying and managing for functional dispersal habitat

remains an area of important research. However, given that there have yet to be any Landowner Options Plans that address Spotted Owl dispersal, this lack of knowledge has not yet had any practical significance in terms of rule implementation.

### Implementation of Habitat Definitions

Important issues have arisen in implementing the habitat definitions as described in rule language. There has been little research that was designed specifically to address the relative importance of each element of the habitat definition or possible interaction effects among them. The rule language is written in such a way that requires all elements of the definition to be present at the specified levels (e.g., three 20 inch diameter at breast height snags per acre or no more than 300 trees per acre that are 4 inch and larger) for a stand to count as habitat. When a landowner is using the circle management option of the rule rather than a landscape planning option - for example, when harvest of rule-defined habitat in a circle would be classified as a Class IV Special - the effect of designating a stand as non-habitat would allow its harvest. Thus, when a stand has all the attributes of Spotted Owl habitat as defined in the rules except one attribute that does not quite meet the threshold requirements, a stand can be harvested, even though it may be providing functional habitat value.

There have been cases with several proposed Forest Practice Applications where the attributes of the forest proposed for harvest deviated only slightly from the habitat definitions in the rules. In these cases the number of trees per acre fell just beyond the rule definition parameters. There have also been cases when all attributes were present but the stand was clearly over-stocked and well above the maximum number of trees per acre under the definitions contained in WAC 222-16-085. In the first scenario, we believe the stands in question were likely functioning as habitat. In the second scenario, had a landowner been operating under a landscape plan, a plan incentive could have favored thinning the stand versus overstory removal to reduce stocking; such an approach could have provided functional habitat (immediately or in the short-term, depending on the harvest) and resulted in larger trees for the landowner.

In the first case in which the stand is very close to meeting the habitat definition, the Department of Natural Resources, Washington Department of Fish and Wildlife and landowners used an approach in which sampling theory is used to determine whether a stand is indeed outside the bounds of the habitat definitions in the rules. In short, we wished to determine that the stand in question was delineated and sampled adequately for the habitat parameter in question, in this case trees per acre, and that proper procedures were applied to the plot data to determine variability of samples within the stand. We recommended in these field situations that a confidence interval be applied to the data, and if the mean number of trees per acre fell within a 90 percent confidence interval of the required number (300 for young forest marginal habitat in eastern Washington), the stand would be considered habitat if all other parameters met the definition (with or without using a confidence interval). While we feel this was an adequate approach given the current rule language, some landowners were uncomfortable because it was not described in the rules or in the Board Manual. We believe that other procedures could be



equally or more useful for determining whether forests actually function as habitat for Spotted Owls. An improved understanding of the ecological relationships among variables could give better guidance on how to address these issues.

### *Additional Challenges with Implementation of Habitat Definitions*

Several additional issues involving habitat definitions may pose obstacles to efficient and effective implementation of the Forest Practices Rules. These issues, most of which to our knowledge had not been identified previously, have the potential to be problematic in either circle management or landscape planning efforts.

- ❖ **Mistletoe component of “young forest marginal” (open canopy) habitat.** The definition of Spotted Owl habitat in the rules requires, among other things, a high or moderate infection of mistletoe for a stand to qualify as “young forest marginal - open canopy” (WAC 222-16-085 (1)). The level of infection required to meet the high or moderate standard was not specified.
- ❖ **Forest community component for east-side habitats.** The definitions require at least 40% fir in patches of suitable Spotted Owl habitat in the eastern Cascade Mountains (WAC 222-16-085 (1)). This definition, taken at face value, would include forests dominated by Douglas-fir (although this is not a true fir) and grand fir, and would exclude forest types that are known to be suitable habitat for Spotted Owls (e.g., forests dominated by western hemlock or western white pine).
- ❖ **Vertical diversity component in east-side and west-side forests.** All definitions of “sub-mature” and “young forest marginal” habitats in Washington require 25-50% intermediate trees (WAC 222-16-085 (1)). This element of the definition was not based on field data and its adequacy is therefore unknown.
- ❖ **Dispersal habitat definitions.** Definitions of dispersal habitat for eastern and western Washington are provided in the Forest Practices Rules (WAC 222-16-085 (2)). The definitions describe conditions associated with very young forests. Elsewhere in the rules (WAC 222-16-010), dispersal support is defined as being “provided by a landscape consisting of stands of dispersal habitat interspersed with areas of higher quality habitat, such as suitable Spotted Owl habitat found within RMZs, WMZs or other required and voluntary leave areas.” As mentioned elsewhere in this report, the definitions of dispersal habitat are not well supported by research on dispersing Spotted Owls. This fact, in combination with the potential divergence between WAC 222-16-085 (2) and WAC 222-16-010, suggest that the standards for approving a dispersal-based Landowner Option Plan are not certain. Moreover, even by using WAC 222-16-085 (2) as a standard, the success of a dispersal-based plan would be unclear because the relationship between the dispersal habitat definition and documented habitat use by successfully dispersing Spotted Owls has not been demonstrated.
- ❖ **Gap between sub-mature and young forest marginal habitats.** Definitions of suitable habitat in the eastern Cascade Mountains include several differences between sub-mature and young forest marginal habitats (WAC 222-16-085 (1)). Within these differences lies a forest condition that is intermediate between the sub-mature and young forest marginal types, but that does not qualify as suitable

habitat in either category. Such a forest stand is one that meets the sub-mature definitions for forest community, tree density and height, and canopy closure elements, but does not meet the sub-mature forest definition for vertical diversity (this is not a required element) and does not contain snags or mistletoe. The forest stand in question, by not having two or more canopy layers, which is not required in sub-mature forest, would still be suitable if it had three snags or at least moderate mistletoe infection. Consequently, stands that meet the particular sub-mature forest standard for tree density and height that does not require two layers, and that meet all other standards for young forest marginal, a lower classification of habitat, would not meet conditions for either category and would not be considered suitable habitat. Another forest condition intermediate between sub-mature and young forest marginal types would be any stand with 100-109 or 261-300 trees per acre that otherwise meet all conditions of sub-mature habitat.

### **Conservation, Management and Regulatory Taking Challenge Activities in SOSEAs**

In this section we assess how recently approved conservation plans, management plans or activities, and legal challenges compare with provisions set forth in the Forest Practices Rules. The purpose of this section is not to criticize the intent of entities that undertook a planning effort, but to describe the content of these plans in comparison to the conservation goals established for Spotted Owl Special Emphasis Areas and the overall rule. This distinction is especially important with regards to Habitat Conservation Plans, given that most of the existing forest Habitat Conservation Plans were either completed or negotiated to the point where significant elements were already agreed upon prior to completion of the current rule. Our intent is to assist in the process of evaluating what might need to occur in the future, given existing plans, to meet Spotted Owl Special Emphasis Area goals and the overall intent of the Board in its original crafting of the rule, and in meeting any revised or additional goals its chooses to establish.

#### Habitat Conservation Plans

Before describing the individual Habitat Conservation Plans, the reader should note that information on the spatial extent of these plans, the amount of forest present and harvested, and the amount of suitable owl habitat present and harvested is presented in Pierce et al. (2005). That report was not completed in time to include in the present document. Of the 293 Spotted Owl sites centered in or overlapping Spotted Owl Special Emphasis Areas, 246 (84%) overlap a Habitat Conservation Plan area to some degree (Table 17). Habitat Conservation Plans cover 44% of the area in owl circles inside Spotted Owl Special Emphasis Areas (Table 18).

Seven Habitat Conservation Plans for Spotted Owls have been implemented on private industrial forestlands, state lands, or municipal watersheds in Washington. Five of these plans, covering an area of roughly 2 million acres, occur wholly or partly within one or more of the Spotted Owl Special Emphasis Areas. These five Habitat Conservation Plans comprise an estimated 717,247 acres in the Spotted Owl Special Emphasis Areas, or about 46% of those areas (Table 19). Each Spotted Owl Special Emphasis Area contains

Table 17. Number of territorial Spotted Owl sites whose management circles overlap a Habitat Conservation Plan in a Spotted Owl Special Emphasis Area.

Spotted Owl Special Emphasis Area	Number of sites that overlap a Habitat Conservation Plan
Columbia Gorge	11 <sup>a</sup>
Entiat	14
Finney	22
Hoh-Clearwater	51
I-90 East	76 <sup>b</sup>
I-90 West	36 <sup>b</sup>
Mineral Block	5 <sup>c</sup>
Mineral Link	7 <sup>c</sup>
North Blewett	4
Siouxon	13
White Salmon	23 <sup>a</sup>
<i>Total</i>	246 <sup>d</sup>

<sup>a</sup> Includes two circles that overlap between Columbia Gorge and White Salmon Spotted Owl Special Emphasis Areas.

<sup>b</sup> Includes 13 circles that overlap between the I-90 East and I-90 West Spotted Owl Special Emphasis Areas.

<sup>c</sup> Includes one circle that overlaps between Mineral Block and Mineral Link Spotted Owl Special Emphasis Areas.

<sup>d</sup> Total does not include the second tally for the 16 sites that overlap two Spotted Owl Special Emphasis Areas.

at least one Habitat Conservation Plan, two of these landscapes – I-90 East and Mineral Block/Link – have two Habitat Conservation Plans, and one landscape – I-90 West – has 4 Habitat Conservation Plans and one Section 7 agreement. The Washington Department of Natural Resources manages Habitat Conservation Plan lands in 8 Spotted Owl Special Emphasis Areas. One Habitat Conservation Plan – Plum Creek Timber Company – occurs in two Spotted Owl Special Emphasis Areas. Figure 4 depicts Habitat Conservation Plan areas in relation to Spotted Owl Special Emphasis Area boundaries. Although some of the Habitat Conservation Plans that include lands within Spotted Owl Special Emphasis Areas were approved or significantly negotiated prior to adoption of the current Forest Practices Rules, all of the plans will be reviewed to summarize their potential benefits or impacts to Spotted Owls in the Spotted Owl Special Emphasis Areas. This more inclusive assessment is warranted because the actions of the various plans are ongoing and influence the conditions present in the Spotted Owl Special Emphasis Areas.

Table 18. Area (in acres) of Spotted Owl management circles associated with Habitat Conservation Plans (HCPs) implemented in Spotted Owl Special Emphasis Areas (SOSEAs) in Washington.

SOSEA	Total area of owl circles in SOSEAs		Total area of owl circles inside Habitat Conservation Plan areas in SOSEAs		Total area of owl circles in SOSEAs but not in Habitat Conservation Plans	
	Owl circles centered on federal lands and extending into the SOSEA	Owl circles centered on non-federal lands within SOSEA	Owl circles centered on federal lands and extending to HCP area	Owl circles centered on non-federal lands and within HCP area	Owl circles centered on federal lands and not extending to HCP area	Owl circles centered on non-federal lands and not extending to HCP area
Columbia Gorge	10,105	22,176	3,501	15,808	6,604	6,368
Entiat Ridge	0	8,420	0	550	0	7,870
Finney Block	33,500	8,494	7,854	1,862	25,646	6,632
Hoh-Clearwater	75,076	186,678	25,785	128,479	49,291	58,198
I-90 East	121,957	116,357	14,667	50,806	107,290	65,551
I-90 West	71,038	51,234	43,459	40,440	27,579	10,794
Mineral Block	52,416	12,604	6,216	0	46,200	12,604
Mineral Link	9,814	16,979	965	12,977	8,848	4,002
North Blewett	36,189	5,834	0	64	36,189	5,769
Siouxon	967	28,203	266	26,149	701	2,054
White Salmon	18,243	57,190	3,209	32,782	15,034	24,408
<i>Totals</i>	429,305	514,169	105,922	309,917	323,382	204,250
Total area in SOSEAs	943,474					
Total area in HCPs			415,839			
Total area outside HCPs					527,632	

Table 19. Habitat Conservation Plans and other planning efforts associated with Spotted Owl Special Emphasis Areas in Washington.

SOSEA Name	Habitat Conservation Plan or Other Planning Effort						Size (in acres) of non-federal portion of SOSEA	Proportion of Non-federal Land in SOSEA not included in HCP
	City of Seattle	City of Tacoma	Plum Creek	WA Dept. Nat. Res.	West Fork Timber Co.	Weyerhaeuser		
Columbia Gorge				•			88,443	66
Entiat				•			28,661	85
Finney Block				•			232,062	71
Hoh-Clearwater				•			344,249	38
I-90 East			•	•			264,464	62
I-90 West	•	•	•	•		•	134,712	19
Mineral Block				•	•		53,081	78
Mineral Link				•	•		192,482	59
North Blewett				•			19,321	100
Siouxon				•			34,424	11
White Salmon				•			149,932	52

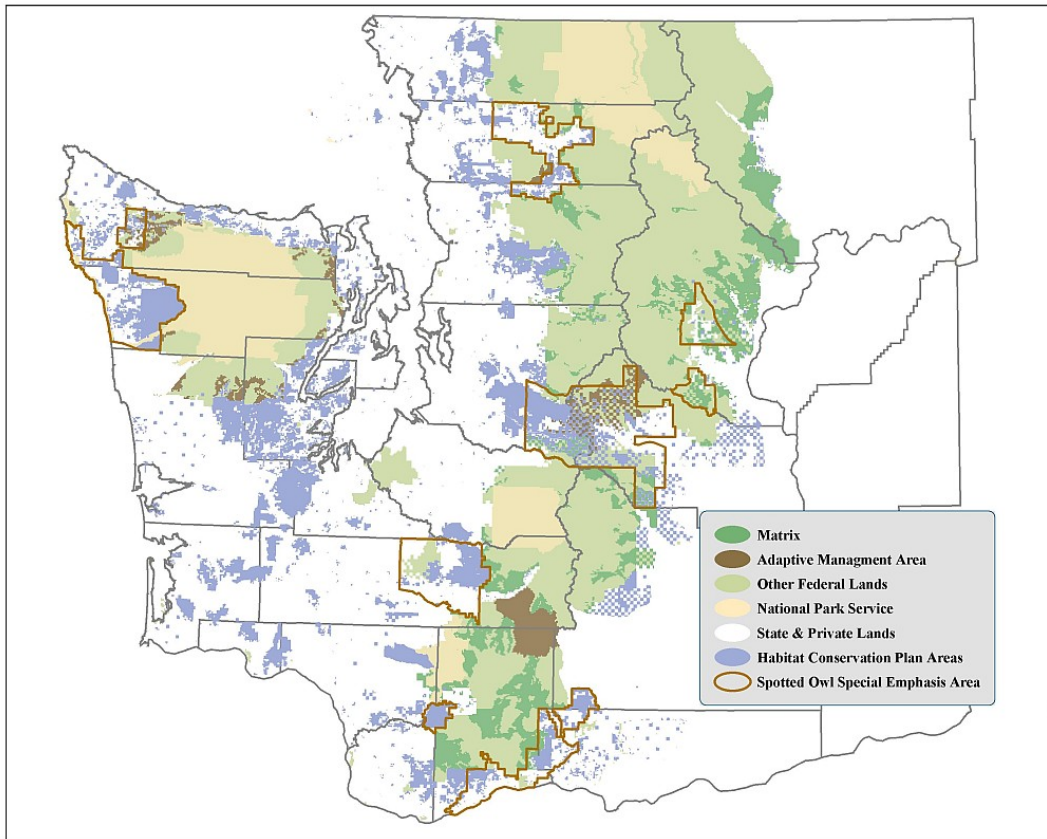


Figure 4. Location of Habitat Conservation Plan areas in Washington. Some plan areas do not occur within Spotted Owl Special Emphasis Area boundaries.

*Plum Creek Timber Company*

Plum Creek completed a Habitat Conservation Plan in the central Cascades in 1996. This Habitat Conservation Plan extends to both the I-90 West and I-90 East Spotted Owl Special Emphasis Areas. The land ownership within this Habitat Conservation Plan was modified somewhat after a land exchange that was completed in 1998. As a result of this land exchange, a net of approximately 10,700 acres of nesting habitat and 12,300 acres of foraging habitat went to the Forest Service within the I-90 East and I-90 West Spotted Owl Special Emphasis Areas (Bill Vogel, personal communication). Under the Northwest Forest Plan, these lands now managed by the Forest Service will remain in a Spotted Owl habitat condition. Thus, the land exchange resulted in a net transfer of habitat into a long-term management status that will contribute to demographic support of the species in these two Spotted Owl Special Emphasis Areas on federal lands.

After the land exchange is considered, the Plum Creek Habitat Conservation Plan will result in a decrease in nesting, roosting and foraging habitat on Plum Creek lands from 19

percent to 6 percent as a result of forest management, with a slight increase back to 7 percent by the end of the planning period in 2045 (Plum Creek Timber Company 2000). There are 106 owl site centers in the vicinity, of which 40 have 100 or more acres of nesting, roosting and foraging habitat on Plum Creek lands. Of these 40 sites, 14 were considered to have adequate habitat on federal lands so as to not restrict harvest on Plum Creek lands. Plum Creek will defer harvest (for 20 years) of habitat in core areas of 11 sites and conduct some selective harvest in marginal habitat away from the site center. The remaining 15 sites receive no protection because Plum Creek determined that they were sufficiently degraded and not likely to persist. Plum Creek will increase its amount of foraging and dispersal habitat through active management, though much of this increase comes through lowering the quality of existing nesting, roosting and foraging habitat. Plum Creek's Habitat Conservation Plan involves deferrals of suitable habitat on 11 sites for 20 years with no requirement for habitat protection beyond 20 years and no commitment to develop nesting, roosting and foraging habitat on a landscape scale on any of its ownership. There are currently 50 owl sites whose circles overlap Plum Creek Habitat Conservation Plan land in the demographic support portions of the I-90 East and I-90 West Spotted Owl Special Emphasis Areas. Thus, Plum Creek's Habitat Conservation Plan results in a decrease in habitat support on its lands for Spotted Owl sites. The areas within the dispersal support portions of the Spotted Owl Special Emphasis Areas will produce dispersal quality habitat under provisions of the Habitat Conservation Plan. Plum Creek lands within the combination support portion of the I-90 East Spotted Owl Special Emphasis Area are not being managed for long-term maintenance of owl pairs.

#### *City of Seattle*

The watershed contains approximately 90,000 acres of forestland and is located in the I-90 West Spotted Owl Special Emphasis Area. There are 4 Spotted Owl site centers within the Seattle City Watershed. One of these sites has been consistently occupied and periodically reproductive since 1987. The Habitat Conservation Plan protects all 13,899 acres of old-growth forest that exists in the watershed, ends commercial logging in second growth, and provides for ecological or restoration thinning on 13,000 acres of second-growth forest. This Habitat Conservation Plan contains land in both the dispersal support and demographic support portions of the I-90 West Spotted Owl Special Emphasis Area and will likely continue to provide demographic support to owls in both functional compartments (City of Seattle 2000).

#### *City of Tacoma*

This Habitat Conservation Plan lies partially within the I-90 West Spotted Owl Special Emphasis Area. The land in the watershed under City of Tacoma ownership is in a generally linear shape along the Green River. The general management strategy under the Habitat Conservation Plan is to not harvest in a zone closest to the river, an area of 5,850 acres. All stands in the "conservation" zone that are over 100 years old will not be harvested. Stands younger than 70 years old, and stands in the commercial zone, furthest from the river, will be managed on a 70-year harvest rotation. It is projected that the

acreage of stands older than 75 years old will increase in the plan area from 3,500 acres in 1998 to nearly 5,000 acres by 2048. Under its provisions, up to 675 acres of existing suitable Spotted Owl habitat within nine known Spotted Owl circles could be harvested. Of this, 348 acres are within 0.7 miles of owl site centers. Specific provisions for Spotted Owls include seasonal timing restrictions within 0.25 miles and a prohibition on harvesting habitat within 0.125 miles of a known activity center (Tacoma Public Utilities 2001). Most of the lands within this Habitat Conservation Plan are in the demographic support portion of the I-90 West Spotted Owl Special Emphasis Area. The effects of the management strategy are likely to be short-term impacts to known sites through harvest of existing habitat, but an overall long-term increase in habitat that should support resident spotted owl pairs will occur and thus contribute to the demographic support function of the Spotted Owl Special Emphasis Area.

#### *Washington Department of Natural Resources*

The Washington Department of Natural Resources has the largest Habitat Conservation Plan affecting Spotted Owls in the state. It went into effect in 1997 and includes a 70-year incidental take permit for Spotted Owls over a total of 1.6 million acres of State Trust Lands. The Department of Natural Resources has owl management areas in all Spotted Owl Special Emphasis Areas. The Department of Natural Resources' approach to owl management was to designate landscape areas for nesting, roosting, and foraging habitat management that were either within 2 miles of federal Late Successional Reserves or that had medium to large clusters of Spotted Owls. They also designated some landscapes for dispersal management that were located between large blocks of federal land or large blocks of other ownerships that are important for long-term owl persistence. They are required to provide 209,000 acres of nesting, roosting and foraging habitat and 100,000 acres of dispersal habitat by the end of the 70-year permit period. Outside of the western Olympic Peninsula, in areas that are below a 50 percent habitat threshold within a Watershed Analysis Unit (or quarter township for dispersal habitat only in eastern Washington), no current habitat can be harvested. The Department of Natural Resources uses a slightly modified version of the sub-mature habitat definition contained in the Forest Practices Rules as its minimum target for habitat quality.

The strategy for Spotted Owl conservation on the Olympic Experimental State Forest is different. The strategy for that landscape requires that each of 11 sub-landscapes be managed such that 40 percent of each landscape is in Spotted Owl habitat. Twenty percent must be in old forest habitat while the other 20 percent can be Young Forest Marginal or better.

In the Final Environmental Impact Statement for the Department of Natural Resources' Habitat Conservation Plan, it was estimated that between 144 and 155 Spotted Owl territories would be at risk of take over the life of the plan. Owl territories that are outside of Department of Natural Resources designated nesting, roosting and foraging areas were estimated to be vulnerable to permanent loss given that these areas were not going to be managed for Spotted Owl habitat. The territories that overlap nesting, roosting and foraging management areas or the Olympic Experimental State Forest may



experience periodic disruption to territories resulting in the need for owls to move their territories, but that the landscape nature of their plan would always provide adequate habitat nearby to support nesting pairs. In other words, take would be a temporary phenomenon within nesting, roosting and foraging areas and the Olympic Experimental State Forest. In general, most of the permanent take of owls overlapping Department of Natural Resources lands occurs outside of Spotted Owl Special Emphasis Areas. Most of Department of Natural Resources lands that are being managed for Spotted Owl habitat fall within Spotted Owl Special Emphasis Areas, though they designated some nesting, roosting and foraging management areas outside of them.

The Department of Natural Resources recently amended its Habitat Conservation Plan in a manner that increased lands to be managed for nesting, roosting and foraging habitat and concomitantly decreased its dispersal acres in the White Salmon Spotted Owl Special Emphasis Area. The amendment increases the amount of nesting, roosting and foraging habitat that will be provided by 15,000 acres (Washington Department of Natural Resources 2004), thus increasing the potential for demographic support in a combination function Spotted Owl Special Emphasis Area. Five additional known Spotted Owl sites would be supported by this change.

Contiguous blocks of Department of Natural Resources land within the Hoh-Clearwater, Siouxon, and Columbia Gorge Spotted Owl Special Emphasis Areas are all to be managed on a landscape basis to increase current amounts of nesting, roosting and foraging habitat and are thus expected to provide demographic support to the owl population in those Spotted Owl Special Emphasis Areas. Most Department of Natural Resources land in the Finney Spotted Owl Special Emphasis Area falls within 2 miles of late-successional reserves, and is being managed for nesting, roosting and foraging habitat even though some of this land falls within either the combination support or dispersal portions of the Spotted Owl Special Emphasis Area. Though these lands are more scattered than in a contiguous block, they should cumulatively contribute to demographic support in that Spotted Owl Special Emphasis Area (Washington Department of Natural Resources 1997).

#### *West Fork Timber Company*

In 1993, West Fork Timber Company, then known as Murray Pacific Corporation, completed the first Habitat Conservation Plan for Spotted Owls in Washington. The planning area encompassed 53,527 acres in the Mineral Block and Mineral Link Spotted Owl Special Emphasis Areas, representing about 22% of the combined two Spotted Owl Special Emphasis Areas. West Fork Timber Company owned 4,678 acres of suitable Spotted Owl habitat in the planning area, 1,980 acres of which occurred in three owl management circles (status 1-3) on or overlapping their property (Beak Consultants Incorporated 1993). The focus of the Habitat Conservation Plan was to provide dispersal habitat so that Spotted Owls could disperse between the Mineral Block, an isolated area of federal land in north-central Lewis County, and the main body of federal lands in the Cascade Mountain foothills further to the east. The basis for completing a dispersal-based Habitat Conservation Plan in this landscape was generally consistent with

recommendations in the Draft Final Recovery Plan for Spotted Owls. In essence, the Habitat Conservation Plan allowed the company to harvest the owl habitat in exchange for the long-term management of the landscape for dispersal habitat.

In the Mineral Block portion of the Habitat Conservation Plan area, the incidental take permit allows the company to harvest suitable nesting, roosting and foraging habitat and mitigate this harvest by providing dispersal habitat. The Mineral Block is a “combined function” Spotted Owl Special Emphasis Area. This function was established in rule after the West Fork Habitat Conservation Plan was completed. The lands managed by the company are inter-mixed with federal land and other Spotted Owl sites that are being managed, at the federal level, for demographic support. Given the presence of the late successional reserves on the federal portion of the Mineral Block, we believe that the most appropriate interpretation of combined function is one that emphasizes demographic support of existing sites. According to this interpretation of combined function, implementation of the Habitat Conservation Plan provisions for dispersal habitat in this landscape would not be consistent with the goals of a combined function landscape.

Within the Mineral Link Spotted Owl Special Emphasis Area, an area with a stated function of providing dispersal habitat, the Habitat Conservation Plan was developed in a manner very consistent with the subsequently developed rules. As would occur under the most optimal implementation of the rules, West Fork Timber Company will create dispersal habitat in their planning area in exchange for the ability to legally harvest suitable Spotted Owl habitat that exists within three Spotted Owl management circles. The potential benefit of the plan is that it provides a landscape of dispersal habitat for Spotted Owls. A potentially negative consequence of the Mineral Link portion of the Habitat Conservation Plan is that harvest within the Spotted Owl circles will eventually result in abandonment of the circles and eliminate the trigger for development of a Landowner Option Plan by other landowners in the landscape with ownership in those circles. However, such an outcome was anticipated in development of the rule for dispersal landscapes (Washington Forest Practices Board 1996).

### Land trades

#### *Weyerhaeuser*

As part of a land trade involving the Weyerhaeuser Company and the U.S. Forest Service, the former obtained a Section 7 exemption for several Spotted Owl sites. Weyerhaeuser agreed to develop a Habitat Management Agreement for 7,579 acres of their land within the I-90 West Spotted Owl Special Emphasis Area, as well as lands they would receive in trade from the U.S. Forest Service (6,273 acres; see Foster Wheeler Environmental Corporation 1996). The land trade involved 31,189 acres (Tony Melchior, personal communication) being transferred from Weyerhaeuser to the U.S. Forest Service (the acreage values reported in the Final Environmental Impact Statement were 32,010 in Alternative 2 and 30,155 in Alternative 3; see Foster Wheeler Environmental Corporation 1996). Those lands occurred in the I-90 West Spotted Owl Special Emphasis Area and in other areas from Skagit County to Pierce County. The

U.S. Forest Service land involved in the trade was located in a dispersal support portion of the I-90 West Spotted Owl Special Emphasis Area. Of the 31,189 acres, 925 acres were mature or late-successional forest, including 792 acres in riparian areas; 3% of the lands traded by Weyerhaeuser were likely suitable for Spotted Owls. We were unable to determine the amount of suitable habitat that remained inside the Spotted Owl Special Emphasis Area. The U.S. Forest Service traded 6,273 acres to Weyerhaeuser; of this amount, 2,717 acres (43%) was mature or late-successional forest likely suitable for Spotted Owls (Foster Wheeler Environmental Corporation 1996).

The management plan proposes to provide dispersal habitat. Dispersal habitat was defined according to most of the stand-level attributes presented in the Forest Practices Rules. However, the definition included landscape-level components that will not likely provide adequate conditions for dispersing Spotted Owls. Specifically, a commitment was made that 37.5% of the dispersal habitat would function as foraging habitat. The subsequent definition of foraging habitat, however, included an element (thinned stands with 70-foot dominant/co-dominant trees) that has not been described or supported in the scientific literature. The definition also lacks specific requirements for retention or creation of snags and defective trees, which are important to Spotted Owl prey. Relying on passive recruitment of snags makes the effectiveness of this approach doubtful. In addition, the definition specified protection around the 70-acre cores located at the existing owl sites as long as the sites were active. The plan outlined how three-year surveys could be used to demonstrate site inactivity and result in the sites being changed to Status 5. As a result, the 70-acre cores – possibly the highest quality stepping-stones across the landscape – would be available for harvest.

### Other Plans

During the negotiation of the current rules, Rayonier Timberlands approached the Timber-Fish-Wildlife group and requested that the boundary of the Hoh-Clearwater Spotted Owl Special Emphasis Area be adjusted to exclude a large area of their ownership. In exchange for this, the company developed a landscape plan for management of their land in the area excluded from the proposed Spotted Owl Special Emphasis Area (Washington Forest Practices Board 1996). The provisions of the plan were developed by the company and described in a Final Environmental Impact Statement (Washington Forest Practices Board 1996). The stated intent of the plan was to provide dispersal habitat for Spotted Owls. However, like other dispersal management plans, this plan lacked empirical support of Spotted Owl use of such habitats during dispersal (see Washington Forest Practices Board 1996; Buchanan 2005), and it did not contain adaptive management provisions. Because the plan area falls outside a Spotted Owl Special Emphasis Area, additional discussion here is not warranted.

### Take Avoidance Letters From the U.S. Fish and Wildlife Service

The rules adopted in 1996 contained a provision that allowed a landowner an exemption from the critical habitat (state) designation if they obtained a “take avoidance letter” from the U.S. Fish and Wildlife Service. A take avoidance letter provides a statement that, in

the opinion of the U.S. Fish and Wildlife Service, a particular forest management activity will not result in take of Spotted Owls in accordance with the federal take prohibition guidelines. These guidelines, unfortunately, are not consistent with Washington's Forest Practices Rules (i.e., the federal guidelines recognize a threshold of 500 acres within 0.7-miles of the site center, whereas the state rules, as a default, consider all habitat in this area to be important). When the state rules were being negotiated, there was discussion about federal implementation of a 4(d) rule that would streamline activities such as landscape planning, and would eliminate inconsistencies between state and federal regulations. A 4(d) rule for Spotted Owls was never finalized.

A landowner with land-holdings in one of the Spotted Owl Special Emphasis Areas chose to obtain two "take avoidance letters" that were then submitted to the Department of Natural Resources with the landowner's Forest Practices Applications. The proposed harvest units, which were in suitable habitat, were in a dispersal landscape. Therefore, approval of the two proposed harvests, according to the provisions in the Forest Practices Rules, should have triggered a Class IV Special or the development and implementation of a Landowner Option Plan in the Spotted Owl Special Emphasis Area. Instead, the applications were approved by the Department of Natural Resources because of the associated take avoidance letters. The Forest Practices Board subsequently took action to eliminate this pretext by requiring an issuance date of prior to 20 March 2000 for all take avoidance letters (WAC 222-16-080 [6] [g]).

#### Lack of Coordination Between State and Federal Landscape Planning

It has long been recognized that effective landscape planning becomes more complex in landscapes with multiple landowners. A potential problem with Habitat Conservation Plan management within Spotted Owl Special Emphasis Areas is that landowners receiving incidental take permits for Spotted Owl sites may have different management objectives than a potential multitude of landowners in the same landscape. For example, when a landowner exercises their permit in a way that results in site abandonment, this may conflict with actions of other landowners to protect habitat in the same circle. Without effective coordination there is little assurance that such management conflicts will not result in impacts to Spotted Owls.

#### Regulatory Takings Challenge

A single legal action involving a proposed harvest unit containing Spotted Owl habitat in the White Salmon Spotted Owl Special Emphasis Area had the potential to undermine the state Forest Practices Rules. In short, a timber management company desired to harvest much of the habitat at and immediately surrounding a Spotted Owl site center. An Environmental Impact Statement was drafted to evaluate the potential impacts of the proposed activity (Washington Department of Natural Resources 1998). The Environmental Impact Statement indicated that the proposed timber harvest would likely result in abandonment of the site and remove a productive site from the subpopulation (Washington Department of Natural Resources 1998). Based on the findings of the Environmental Impact Statement, the Department of Natural Resources approved but

conditioned the application to impose substantial harvest limitations. This was unacceptable to the landowner and they subsequently filed suit in Yakima County Superior Court (SDS Lumber Company v. State of Washington, Department of Natural Resources) claiming that implementation of the Forest Practices Rules resulted in a taking of private property by the State of Washington. The Yakima County Superior Court ruled on behalf of the company and the Department of Natural Resources filed an appeal. The parties subsequently agreed to settle out of court. The eventual agreement, which was implemented in the 2003 legislative session, provided 2.7 million dollars to the Department of Natural Resources to purchase the proposed timber harvest unit. The Department of Natural Resources now owns the property.

### **500 Acre Exemption**

The Forest Practices Rules contain a provision that exempts small landowners from the State Environmental Policy Act trigger if they own less than 500 acres as long as the proposed harvest is further than 0.7 miles from the activity center. While this provision can provide relief for small landowners, it can be problematic when site centers move. In such cases, habitat that may still be important to an owl can become available for harvest if a site center moves. This may also lead a landowner to make short term decisions about their land if they perceive only a brief time frame exists in which they may be able to harvest.

We were unable to assess the full extent of these issues due to a problem involving access to forest practices applications filed by small landowners (i.e., such applications are not specifically identified in the Department of Natural Resources forest practices computer database). However, we were aware of three situations where landowners wished to harvest suitable Spotted Owl habitat within 0.7 miles of Status 1 owl sites. In one case the landowner waited until the site center shifted outside the 0.7-mile circle. In another case the landowner chose to conduct a three-year survey (with hopes of demonstrating the site was inactive). In the third case discussions with the landowner are ongoing. These kinds of situations can be frustrating to landowners and also lead to decisions that are potentially harmful to Spotted Owls.

The 500-acre exemption is potentially much more concerning if non-small forest landowners subdivide their ownership within a Spotted Owl Special Emphasis Area to related companies or individuals to avoid having to comply with provisions of the rules. For example if an entity owns 2,500 acres within a Spotted Owl Special Emphasis Area, some portion of which is within spotted owl circles, and that company subdivides their ownership to 499 acre parcels, any habitat within circles that was on the original 2,500 acre ownership would no longer be subjected to Class-IV Special State Environmental Policy Act triggers. An analysis of the issue may be warranted to determine whether a change in regulatory language is required to prevent this application of the rule, and still provide some relief to actual small forest landowners.

## **Forest and Habitat Loss in the Spotted Owl Special Emphasis Areas**

In the draft briefing report (Buchanan and Swedeen 2004) we included an assessment of the amount of forest loss in Spotted Owl Special Emphasis Areas between 1996 and 2000. Since that time, an effort has been made to produce a more comprehensive estimate of forest and habitat change since 1996. The results of this study were not available in time to include in the present report, and will be presented elsewhere (Pierce et al. 2005).

## **Informational or Database Needs for Future Assessments**

While compiling information for this assessment we noted a number of substantive information or database needs. We anticipated that these information sources would be important for subsequent assessments by the Board, and for this reason summarized this information below.

### GIS Databases

A procedure for evaluating loss of habitat in the Spotted Owl Special Emphasis Areas is needed. This is necessary to evaluate whether habitat amounts are being maintained in Spotted Owl Special Emphasis Areas at levels necessary to achieve the conservation function of the landscapes. This is particularly relevant in landscapes where habitat loss may be occurring because of timber harvest allowed under Habitat Conservation Plans, timber harvest outside owl circles, or other factors such as wildfire. The study conducted by Pierce et al. (2005) fills part of this need. To be effective, the owl habitat database will require current information and must be regularly updated. A post-harvest mapping and stand classification system, one that addresses landowner concerns about proprietary information, would be required for this purpose.

A complementary database that would be helpful in future evaluations of the Spotted Owl would track location, acreage, and management commitments of landscape plans. This database would not contain proprietary information, but only publicly available information. The information contained in this database, in conjunction with the habitat database, should allow the Forest Practices Board to evaluate ongoing progress towards meeting landscape goals for Spotted Owls.

### 500-acre Exemption Database

Information on the effects of the small landowner exemption on both small landowners and Spotted Owls is required. One approach for information about small landowners would be for the Department of Natural Resources and Washington Department of Fish and Wildlife to conduct a survey of small landowners in owl circles to learn more about their experiences with the exemption. The survey could be distributed or facilitated by both the Department of Natural Resources' small landowner office and groups such as the Farm Forestry Association. For data about impacts to owls, the Department of Natural Resources maintains a computerized database of Forest Practices Applications

referred to as Forest Practices Application Retrieval System (FPARS). Unfortunately, the Forest Practices Application Retrieval System does not specifically identify Forest Practices Applications that qualify under the small landowner exemption for Spotted Owls. Personnel in Department of Natural Resources' southeastern regional office estimated that between 6 and 10 small landowner exemption Forest Practices Applications are approved annually (Charlie McKinney, personal communication). This level of potential impact should be evaluated, but because these Forest Practices Applications are not specifically coded in Forest Practices Application Retrieval System this evaluation will require a manual search. To more readily evaluate the small landowner exemption in the future, these Forest Practices Applications should be identifiable in the Forest Practices Application Retrieval System and tracked in a specific database for small landowner exemptions. Moreover, it may be helpful to evaluate the Forest Practices Application Retrieval System to determine whether other modifications might be made to expedite future analyses of Forest Practices Applications.

### Research Needs for Adaptive Management of Spotted Owls and Their Habitat

There is much yet to learn about Spotted Owls, and at least five topics are particularly important to implementation of the Forest Practices Rules. First, there is still very little information available on how Spotted Owls respond to changes in the structure of forest areas managed to recruit or enhance suitable habitat. Such knowledge would be especially valuable for landscape planning efforts and to address fire risk in the eastern Cascade Mountains.

Second, definitions of Spotted Owl habitat for the eastern Cascade Mountains were largely derived from studies conducted in and adjacent to the Wenatchee National Forest. New information from Klickitat County, in the southernmost eastern Cascade Mountains (e.g. the White Salmon Spotted Owl Special Emphasis Area), suggests some slight differences in habitat conditions at nest sites in that region (Buchanan 1996). The nest site study characterized attributes at nest sites and did not investigate conditions associated with other forest areas within Spotted Owl home ranges. For this reason, a radio-telemetry study in the Klickitat County area would help refine stand- and home range-scale definitions of critical habitat state.

Third, definitions of Spotted Owl dispersal habitat are not well supported by science. Moreover, it remains unknown how effective these landscape-level strategies are in facilitating successful dispersal of Spotted Owls from natal areas to territories that they can occupy (Buchanan 2004). Research that addresses habitat use, prey selection, and survival rates of juveniles during dispersal would likely improve management of dispersal habitat in Spotted Owl Special Emphasis Areas.

Fourth, additional information is needed on the amount and configuration of habitat needed to support Spotted Owls. Existing information on home range size is derived from a small sample of owls. This sample may not adequately reflect within- and among-region variability of Spotted Owl home range size. Moreover, it would be particularly important to understand the attributes (e.g., amount of habitat, habitat quality, prey

abundance) that most influence home range size. Although habitat fragmentation has not been clearly demonstrated to negatively influence Spotted Owl productivity, a certain level of fragmentation may exist beyond which owl productivity declines. Generating information about these issues likely will be important to effectively transition from circle-based management to landscape-level management in Spotted Owl Special Emphasis Areas.

Finally, research is needed to understand the relationship between Spotted Owls and Barred Owls. Many of the research issues identified in this section could contain a component on Barred Owls, as this species is found in nearly all parts of the Spotted Owl's range. The importance of this issue should not be underemphasized. A workshop on Barred Owls and Spotted Owls was held in June 2005, and discussions are ongoing to generate funding support to begin investigations.

## SYNTHESIS

### **The Declining Population of Spotted Owls**

The demography data collected over the last decade indicate that Spotted Owl populations are declining. This decline is significant and appears to be accelerating in Washington. Data from various study areas suggest that nearly two-thirds of the pair locations known about one decade ago are not currently active.

Population ecologists recognize two groups of factors that influence the dynamics and viability of small or declining populations. These factors can be classified as either deterministic or stochastic (Gilpin and Soulé 1986). The systematic large-scale loss of habitat is an example of a deterministic factor. Stochastic factors are those that can occur both naturally or as the result of unintended human actions and typically occur rarely or at low levels in the environment. Examples of stochastic factors include windstorms or wild fires. Unfortunately, deterministic and stochastic factors can be additive, and in combination can adversely affect populations (Gilpin and Soulé 1986, Pimm 1991). Moreover, stochastic factors that may be relatively unimportant to healthy populations may impact declining or small populations, and in some cases, contribute to extirpation.

The Spotted Owl population in Washington has been subjected to multiple deterministic and stochastic factors. The population was initially impacted by harvest of a large proportion of the structurally complex old forest habitats (U.S. Department of Interior 1990 and 1992). The effects of this habitat loss were population reduction, range contraction, and likely increased predation rates and dispersal inefficiency. Recent stochastic factors that are having known or strongly suspected negative impacts on Spotted Owls include competitive interactions with Barred Owls, a closely related species that only recently invaded the Pacific Northwest, and additional habitat loss resulting from catastrophic fires and spruce budworm outbreaks in the eastern Cascade Mountains. The West Nile Virus may impact Spotted Owls to some degree in the near future, as the virus has resulted in numerous deaths in other owl species in North America. In short,



the population of Spotted Owls is declining and stochastic factors have apparently become significant.

A panel of experts was recently contracted to review information about Spotted Owls that would be used in the U.S. Fish and Wildlife Service five-year status review of the species. The panel of scientists was especially concerned about the population decline and the effects of Barred Owl competition and West Nile Virus, which they thought would be deleterious to Spotted Owls (Courtney et al. 2004). The U.S. Fish and Wildlife Service expressed these same concerns in their five-year review (U.S. Fish and Wildlife Service 2004). The scientific panel expressed concern about the overall protection of Spotted Owl populations as they pass through the bottleneck of Barred Owl and West Nile Virus exposure (Courtney et al. 2004).

### **Landscape Management Versus Circle Management**

When the current Forest Practices Rules were being negotiated in the Timber-Fish-Wildlife process, all parties agreed that landscape planning would be more beneficial to Spotted Owls than the current mode of circle-by-circle management. The negotiating parties also agreed that landscape planning would provide more and better opportunities for flexible timber management. The current reliance on circle management and the lack of landscape planning results in lost opportunities for effective conservation management in some Spotted Owl Special Emphasis Areas. A delay in transitioning from circle management to landscape-level management could result in a disproportionate delay in meeting a “shifting-mosaic” landscape condition capable of supporting Spotted Owls in managed forest landscapes. The shifting mosaic strategy involves managing forests such that patches of varying age “move across the landscape” through time. The dynamic nature of the strategy means that habitat patches are present for a certain period of time before being harvested (this does not apply to all acres if there are permanent set-asides). If the amount of suitable habitat outside owl circles is substantially reduced, the opportunity for these patches of forest to become part of the shifting mosaic of suitable habitat is delayed (or potentially prohibited). This delay is particularly problematic in the eastern Cascade Mountains, where the shifting mosaic concept may be an essential component in management strategies that address Spotted Owls, timber management and the effects of fire suppression on forest health. Consequently, lost options for managing habitat and the lack of landscape-level planning may result in longer-term patterns of forest management that are generally undesirable and inconsistent with the stated Spotted Owl Special Emphasis Area functions.

Perhaps the greatest current management problem is the lack of protection afforded sites where three-year surveys have failed to detect Spotted Owls. This is a problem for conservation planning because reliance on these surveys rather than proactive habitat management undermines the already limited utility of circle management. It has long been known that Spotted Owls are impacted by most modern-day harvest methods. When the loss or degradation of habitat reaches a certain threshold because of these activities, owl persistence at a site is no longer possible. The predominant management strategy utilized under the Forest Practices Rules is to manage based on individual circles

that are the size of the average Spotted Owl home range, regulating harvest inside circles and allowing all proposed harvests in suitable habitat outside circles. The problem with this approach is that Spotted Owls do not have circular home ranges; the “owl circle” is simply a management convention adopted for consistent application across all ownerships and landscapes.

The circle approach provides a certain amount of protection but it is not likely adequate in many cases and especially at the level of sub-populations. Telemetry data from Washington indicate that Spotted Owl home ranges are irregularly shaped and are often not contiguous patches of forest (Eric Forsman, personal communication; Gina King, personal communication). Consequently, an owl's actual home range typically extends far beyond the bounds of the “management circles” used in Forest Practices Rules. Most, if not all, of the owl circles in the Spotted Owl Special Emphasis Areas were below the State Environmental Policy Act threshold when the current rules were adopted, and many of these owls therefore already use - and likely require - other areas of habitat outside the management circles. In some landscapes, habitat outside of circles is not available, thus owls with lesser amounts of habitat available to them will likely be unable to persist. This is where the significance of the three-year survey becomes evident. In most instances when an owl site is changed to status 5, the habitat contained within the owl management circle retains its functionality for any owls present in the landscape (i.e., the focal site or other sites nearby). After harvest of habitat from within the status 5 Spotted Owl circle, however, even less habitat is then available for owls. The process just described, when repeated, could conceivably degrade an entire Spotted Owl Special Emphasis Area. Circle management, particularly when site abandonment provisions are exercised, is clearly incompatible with landscape-level population management. Problems with circle management were known during rule negotiation and were the motivation for including the Landowner Option Plan process in the rule package delivered by the Timber-Fish-Wildlife group to the Forest Practices Board. (See earlier discussion of issues identified by landowners as impediments to landscape planning, and the discussion on Habitat Conservation Plans.)

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## APPENDIX

Appendix 1. Area (in acres) of Spotted Owl Special Emphasis Areas (and subunits) according to their conservation function.

SOSEA name and subunit	Demographic support	Dispersal support	Combined function	Total
<i>Columbia Gorge</i>	<b>0</b>	<b>0</b>	<b>88,443</b>	<b>88,443</b>
<i>Entiat</i>	<b>8,378</b>	<b>20,283</b>	<b>0</b>	<b>28,661</b>
Beaver Creek	2,227	-	-	
Chumstick Creek	-	20,283	-	
Eagle Creek	1,041	-	-	
Tumwater	5,110	-	-	
<i>Finney Block</i>	<b>38,057</b>	<b>108,013</b>	<b>85,992</b>	<b>232,062</b>
Cascade River	22,498	-	-	
Darrington	-	-	66,901	
Jackman Creek	2,652	-	-	
Pressentin	11,630	-	-	
Rocky Creek	1,277	-	-	
Skagit River	-	108,013	-	
South Fork Nooksack River	-	-	19,091	
<i>Hoh-Clearwater</i>	<b>151,259</b>	<b>71,370</b>	<b>92,582</b>	<b>315,211</b>
Bear Creek	12,797	-	-	
Goodman Creek	-	-	39,717	
Interior Crescent	113,186	-	-	
Kalaloch	-	20,845	-	
La Push	25,276	-	-	
Lower Hoh River	-	50,525	-	
Miller Creek	-	-	49,643	
Quillayute Strip	-	-	3,222	
Sappho	-	-	29,038	
<i>I-90 East</i>	<b>151,708</b>	<b>54,389</b>	<b>58,367</b>	<b>264,464</b>
Easton	-	41,836	-	
Manastash Creek	-	12,553	-	
Teanaway	-	-	58,367	
Yakima River Basin	151,708	-	-	
<i>I-90 West</i>	<b>57,968</b>	<b>76,744</b>	<b>0</b>	<b>134,712</b>
Cedar River	57,968	-	-	
Hansen Creek	-	2,013	-	
Snoqualmie Greenwater Strip	-	58,603	-	
Upper Green River	-	16,128	-	
<i>Mineral Block</i>	<b>0</b>	<b>0</b>	<b>68,273</b>	<b>68,273</b>
<i>Mineral Link</i>	<b>0</b>	<b>192,482</b>	<b>0</b>	<b>192,482</b>
<i>North Blewett</i>	<b>4,249</b>	<b>15,072</b>	<b>0</b>	<b>19,321</b>
Allen Creek	2,793	-	-	
Peshastin	-	15,072	-	
Sand Creek	1,456	-	-	
<i>Siouxon</i>	<b>34,424</b>	<b>0</b>	<b>0</b>	<b>34,424</b>
<i>White Salmon</i>	<b>0</b>	<b>0</b>	<b>149,932</b>	<b>149,932</b>

